Asset Condition Assessment
&
Asset Management Plan

Prepared by

Melika Jafarian, B.Sc. (Eng.)

Babak Jamali, M.Sc., P.Eng.

Shawn Otal, MBA, P.Eng.

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Executive Summary

This report summarizes (a) the results of an asset condition assessment study carried out with the objective of establishing the health and condition of fixed assets employed on Erie Thames Power Lines' (ETPL)'s distribution system and (b) provides an asset management plan, covering capital and preventative maintenance investments in distribution system fixed assets for the next 10 years.

The recommendations in the report are based on a risk based asset management strategy, described in the Asset Management Standard PAS-55, a specification developed by British Standards Institute (BSI) and commonly employed by progressive electric utilities. A risk based asset management strategy determines the timing and scope of investments into asset renewal, based on the risk of an asset's failure determined by the condition of the asset.

A comprehensive methodology has been developed and documented in Section 3 of the report, to conduct condition assessment of all fixed assets employed on ETPL's distribution network, including the assets employed in substations, overhead lines and underground distribution system. By applying this methodology, condition assessment of the assets has been completed and is documented in Section 4. Estimates of capital investment required for asset sustainment have been developed by evaluating the risk of in-service asset failures, based on assets' age profiles and anticipated life expectancy of assets. Estimates of capital expenditure required for new services and road widening programs have been prepared by taking into account typical historic costs. Similarly estimates of capital expenditure for revenue metering equipment, motor vehicles, IT equipment, building upgrades and office furniture have been prepared through consultations with the ETPL's staff, based on the identified needs.

Overall capital investments required during the next 10 years for asset sustainment in **optimal** condition are summarized below:

	Annual CAPEX
Annual capital expenditure for sustainment of fixed distribution assets	2 723 581
Annual capital expenditure to permit new connections and service upgrades	285 000
Annual capital expenditure to permit municipal road upgrades	50 000
Annual capital expenditure in revenue metering and equipment	45 000
Annual capital expenditure tools equipment	35 000
Annual capital expenditure IT equipment	25 000
Annual capital expenditure on building improvements, office equip & furniture	40 000
Annual capital expenditure on motor vehicle fleet	340 000
Total annual capital expenditure requirement	3 543 581

1 Introduction

This report summarizes the results of an asset condition assessment study carried out by METSCO Inc. on behalf of ETPL's, with the objective of establishing the health and condition of fixed assets employed on ETPL' distribution system. The report also provides an asset management plan, covering capital and preventative maintenance investments in fixed assets for the 10 years.

The fixed assets covered by the report include:

a) Wood, steel and concrete poles;
b) 3-ph and 1-ph overhead distribution lines, including medium voltage and low voltage circuits;
c) 3-ph and 1-ph underground cables, including medium voltage and low voltage circuits;
d) Distribution transformers, typically installed in pole-mounted and pad-mounted configurations;
e) Distribution substations and related substation equipment, including power transformers, 27.6 kV switchgear and fused disconnects, 4 kV switchgear, protection and controls, and substation buildings.

The report is organized into five sections including this introductory section. Section 2 describes the principles of a risk based asset management strategy to achieve optimal operation of the distribution grid. Section 3 provides the methodology for implementation of the recommended asset management strategy. Section 4 summarizes the results of asset condition assessment exercise and Section 5 summarizes the asset management plan and provides the scope of capital and maintenance investments required for asset sustainment.

2 Strategic Management of Distribution Fixed Assets

Decisions involving investment into fixed assets play a major role in determining the optimal performance of distribution system fixed assets. A majority of the investments in fixed assets are triggered by either declining performance in the areas of supply system reliability, power quality or safety; or increasing operating and maintenance costs associated with aging assets; or anticipated growth in demand requiring capacity upgrades. In either case, investments that are either oversized or made too far in advance of the actual system need may result in non-optimal operation. On the other hand, investment not made on time when warranted by the system needs raise the risk of performance targets not being achieved and would also result in non-optimal operation. Optimal operation of distribution system is achieved when "right sized" investments into renewal and replacement (capital investments) and into asset repair, rehabilitation and preventative maintenance are planned and implemented based on a "just-in-time" approach. In summary, the overarching objective of the asset management strategy is to find the right balance between capital investments in new infrastructure and operating and maintenance costs so that the combined total cost over the life of the asset is minimized.

A risk based asset management strategy, therefore, determines the risk of asset failure based on the condition of the asset, which is commonly measured with the help of a yard stick of "Asset health indices", and computes the valuation of the risk based on consequences of asset failure and identifies the optimal risk mitigation alternative through an evaluation of all available options. Asset management covers the full life cycle of a fixed asset, from preparation of the asset specification and installation standards - to the scope and frequency of preventative maintenance during the assets service life – and finally to the determination of the assets end-of-life and retirement from service. At each stage of an asset's life cycle, decisions are made to achieve the right balance between achieving maximum life expectancy, highest operating performance, lowest initial investment (capital costs) and lowest operating costs. The best-in-class asset management strategies employ integrated processes that allow optimal levels of financial and operating performance to be achieved, using transparent and objective criteria that can easily be audited and inspected by regulators.

PAS-55, a specification for asset management, was developed by British Standards Institute (BSI) and offers one of the best in class strategies for risk management associated with fixed assets of electricity distribution systems. To be compliant with PAS-55 asset management standard, the asset management approach must contain the essential elements documented in Exhibit 2.1.

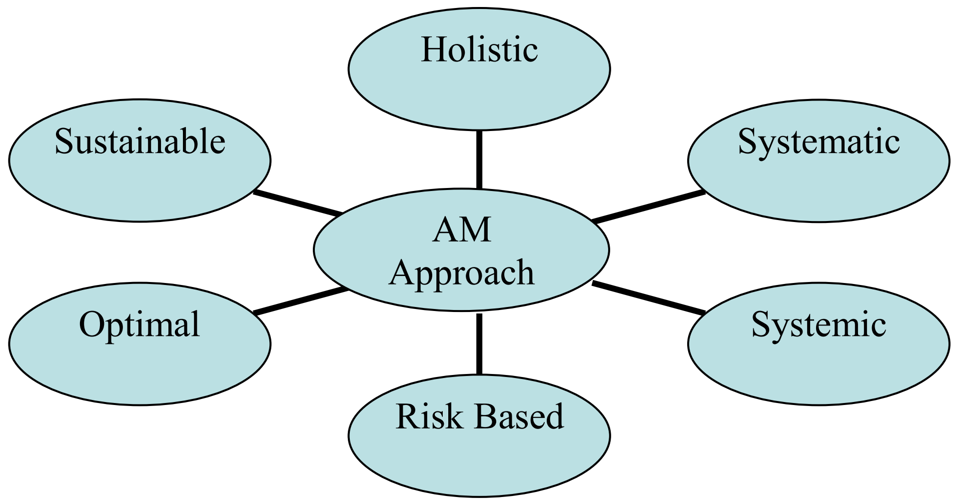


Exhibit 2-1: Essentials of PAS-55 Compliant Asset Management Strategy

The overarching objective is to develop capital and preventative maintenance investment plans, which could be implemented over a period of five to ten years to achieve optimal system performance by placing appropriate weights on corporate objectives and performance criteria, as shown in Exhibit 2.2.

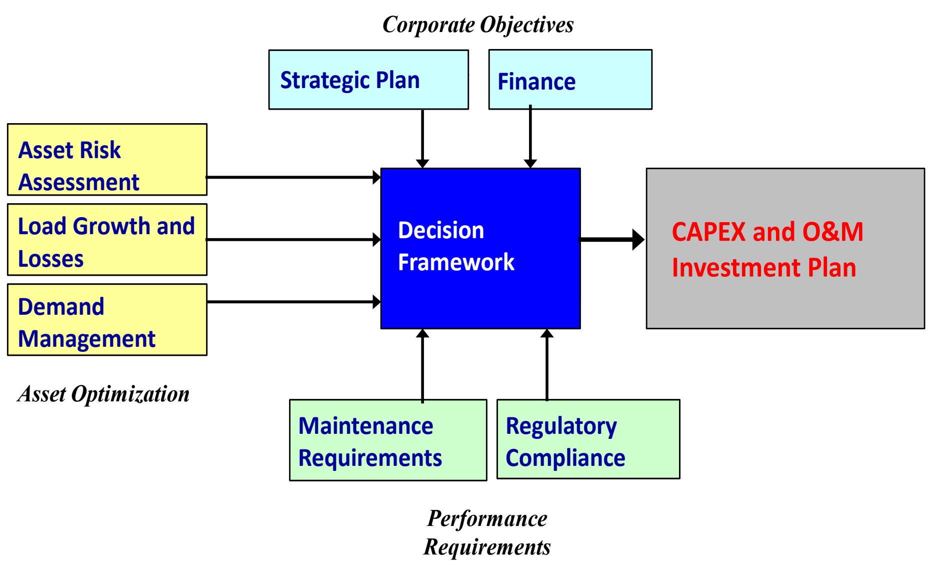


Exhibit 2-2: Multi-Prong Decision Framework

For regulated transmission and distribution businesses, the key considerations in development of a strategic asset management plan include:

a) Regulatory Compliance
b) Public and Employee Safety
c) Protecting Brand Name and Image
d) Operating Efficiency
e) Reliability and Supply System Security
f) Customer Service Quality
g) Getting Full Life out of Assets
h) Return on investment
i) Risk Based Maintenance Strategy
j) Minimizing Asset Life Cycle Costs
k) Minimizing Risk of Premature Failures
l) Minimizing Environmental Risks

Exhibit 2.3 shows the basic decision support model employed under a risk based strategy. The timing and size of investments is selected to minimize the "Total Cost" of risk and risk mitigation initiatives.

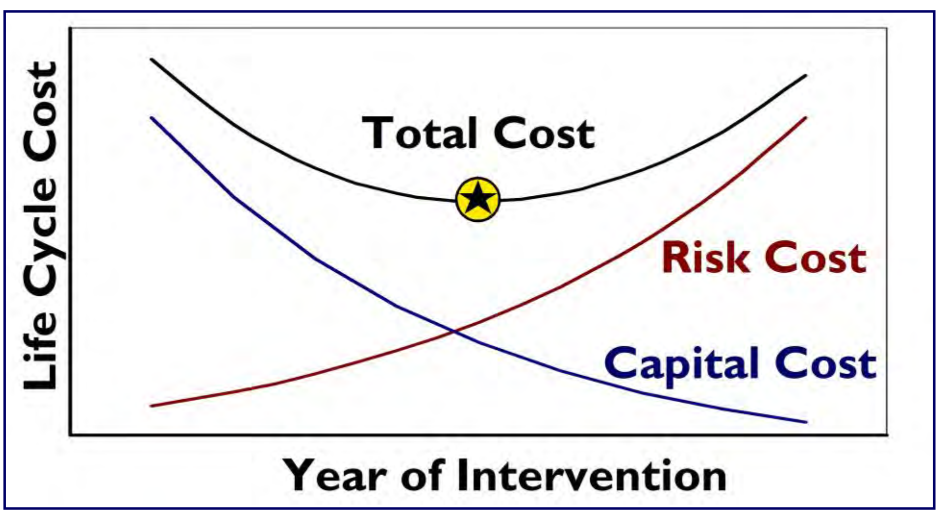


Exhibit 2-3: Risk Based Decision Support System

Exhibit 2.4 summarizes a practical matrix to sift through a large number of assets, typically employed on T&D systems to objectively identify assets that present the highest risk of in-service failures so that the investments could be targeted into assets that present the highest risk. Numeric health indices, typically normalized to a scale of 100, are commonly used to express the health and condition of assets, as shown in Exhibit 2.5 and this allows separation of the assets in good condition that require minimal risk mitigation from those in poor condition, requiring a higher level of investments. This exercise allows development of an investment plan as shown in Exhibit 2.6 that could be implemented over a 5-10 year period.

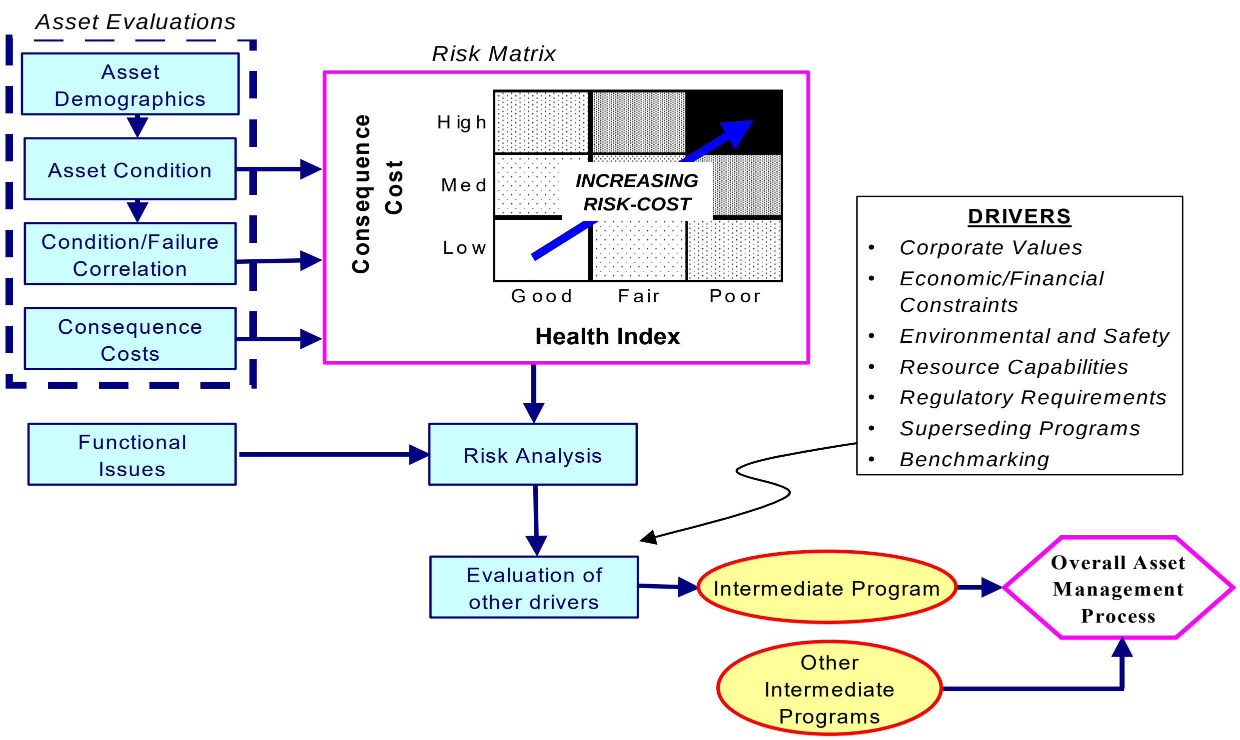


Exhibit 2-4: Model to Identify Assets with Highest Risks

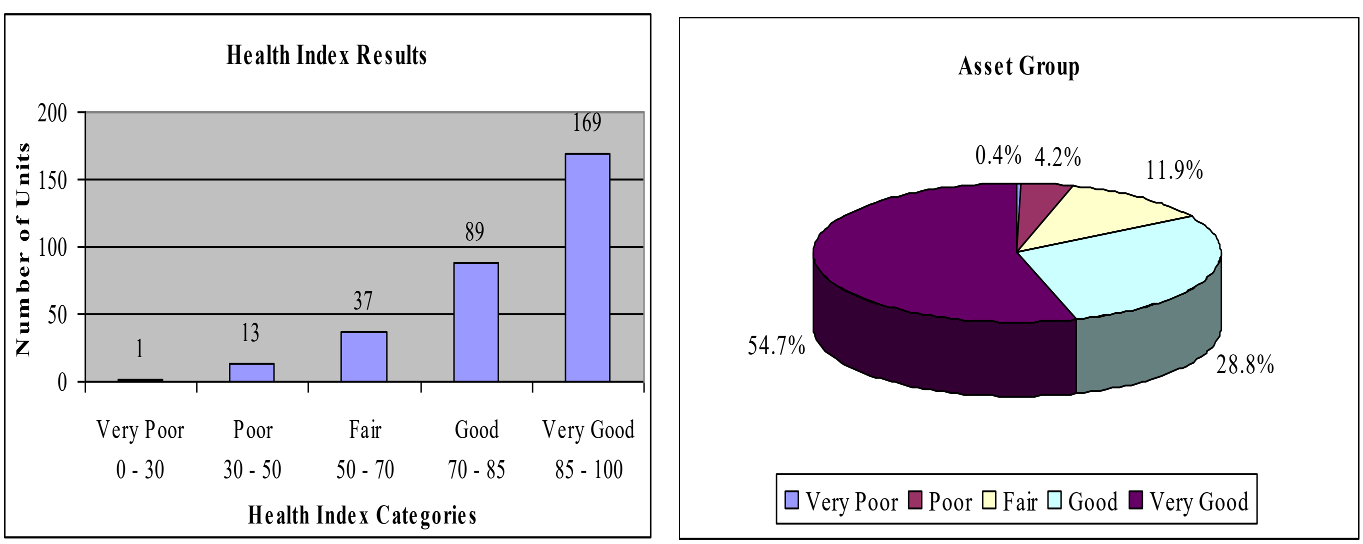


Exhibit 2-5: Model to Identify Assets with Highest Risks

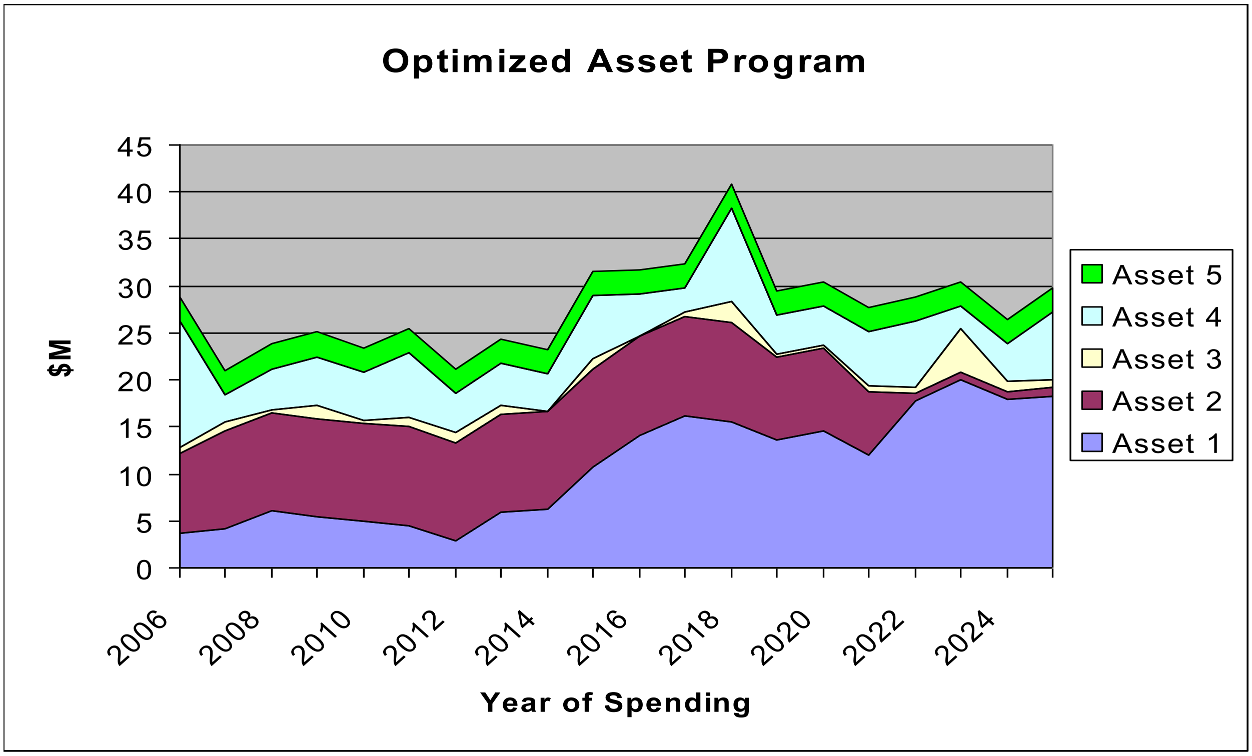


Exhibit 2-6: Investment Plan

3 ASSET CONDITION ASSESSMENT METHODOLOGY

This section describes in detail an asset condition assessment methodology for different categories of fixed assets employed on ETPL's distribution system. Adoption of this methodology would require periodic asset inspections and recording of their condition to identify the assets most at risk, requiring focussed investments into risk mitigation.

Asset condition assessment methodologies are described below for the following distribution system asset categories:

a) Overhead Lines
b) Underground Lines
c) Substations
d) Distribution Transformers (Pole mounted, pad mounted and vault mounted)
e) Distribution Switches and Fused Cut-outs (Pole mounted, pad mounted and vault mounted)

3.1 Overhead Lines

Condition assessment methodologies for the following components employed on overhead lines are discussed below:

- ✓ Poles
- ✓ Insulators
- ✓ Hardware
- ✓ Conductors and splices

3.1.1 Condition Assessment Criteria for Poles:

Because wood is a natural material, its degradation processes are different from other assets on distribution systems. The most critical degradation process for wood poles involves biological and environmental mechanisms such as fungal decay, wildlife damage and effects of weather. Fungi attack both external surfaces and the internal heartwood of wood poles. The process of fungal decay requires the presence of fungus spores in the presence of water and oxygen. For this reason, the area of the pole most susceptible to fungal decay is at and around the ground line, although pole rot is also known to begin at the top of the pole. To prevent the decay of wood poles, utilities treat them with preservatives before installation. Wood preservatives have two basic functions:

- ➢ keep out moisture that supports fungi by sealing the surfaces, and
- ➢ kill off the fungal spores.

Most power companies install only fully treated wood poles these days, however this was not always the case and the lines constructed 40 years ago or earlier may not have been constructed with fully treated poles but only butt treated poles may have been used. Typically, fully treated poles are expected to provide a longer service life in relation to butt treated poles.

The following factors represent some of the more critical factors affecting wood pole strength as poles age:

- Original type and class of wood pole;
- Original defects in wood (e.g. knots, cracks or rot);
- Rate of decay in service life which depends on type of treatment and environmental conditions;
- Pole damage by woodpeckers, insects, and other wildlife; and
- Wood burns.

Several types of damage can also deform bolt holes in poles. Generally, such deformities do not present immediate problems. However, in some cases deformed holes can result in both failure of the structure and failure of other components attached to the pole. Bolts also can become loose, elongated, bent, cracked, sheared/broken and lost.

Visual inspection can detect the following types of wood pole damage readily:

- Fiber damage that may occur when wind hits a wood pole with force beyond the pole's bearing capacity;
- Partial damage that may result when objects hit wood poles and reduce effective pole circumference. If the damage affects only part of a pole's cross-section the utility may keep the pole in service with a reduced factor of safety.
- Wood splits from various causes that may accelerate the end of a pole's life, depending upon the extent of the split damage;
- Mis-orientation from excessive transverse forces that may result in pole tilting as well as "stretching" (i.e., loosening) and breaking of guys and guying systems;
- Burning from conductor faults and insulator flashovers that may damage wood poles, wooden support cross-braces and timber, reducing the ability of these structures to withstand mechanical stress changes or causing their complete loss through fire; and
- Wood cracks or checks that may hold moisture and cause decay or weaken the structures through freeze/thaw forces during winter.

Utilities have sought objective and accurate means to assess pole condition and remaining life, as a result of which, a wide range of wood pole assessment and diagnostic tools and techniques has developed. These include techniques designed to apply traditional probing and hammer tests in more controlled, repeatable and objective ways. Indirect and non-destructive techniques such as ultrasonics, X-rays, and electrical resistance have received widespread testing.

Concrete poles also undergo whether related degradation which may manifest itself in form of concrete spalling, exposure of steel rebar and rusting of steel rebar, which reduces the pole strength with age.

3.1.2 Condition Assessment Criteria for Insulators:

The types of insulators and configurations typically used in Distribution systems include dead-end, suspension, post and pin types. The insulating portion may consist of porcelain or polymer. The metallic parts usually are made from zinc coated ductile or malleable iron. Both electrical and mechanical stresses may affect insulators. Degradation and eventual failure generally result from the loss of either dielectric or mechanical strength. Mechanical loading on suspension and line post insulators consists of a combination of tensile, torsional, cantilever, vibration and compression forces resulting from factors such as conductor vibration and galloping, accumulation of high density snow or ice, and sudden ice shedding. Line post, strut and pin type insulators are unique since they may experience a combination of cantilever, transverse and tensile forces simultaneously. Impact or contact induced damage also may occur.

Contamination of insulator surface with road salt, freezing rain, and snow accumulation may induce flashovers resulting in dielectric failure of insulators. Electrical flashovers can cause both external and internal damage to porcelain and composite insulators. Visual inspection can detect the following external insulator damage readily:

- Broken porcelain from the shell caused by a flashover (lightning) or impact damage (vandalism);
- Flashover burn markings on the porcelain shell resulting from burns/arching damage/galvanizing;

Latent damages, typically internal to the porcelain shell, metal fitting and hardware include:

- Internal cracks under the metal cap or inside the porcelain head from lightning flashovers or line galloping, which in essence cause electrical shorts in the insulator that can distort the insulator string's voltage profile;
- Radial cracks (come from cement growth) through the porcelain shell;

Composite insulators consist of a glass fibre reinforced rod covered in either EPDM or silicone rubber weather sheds with appropriate end fittings. While the composite insulators offer a great range of mechanical strengths and much lower weight than other types of insulators, the EPDM silicone rubber material also is soft and easily cut, ripped or punctured by sharp objects. The integrity of the sheath and weather sheds is critical. Failure commonly occurs when moisture enters into the glass fibre rod area.

Noticeable damage to insulator includes cuts, splits, holes, erosion, tracking, or burning of the rubber shed and sheath material, plus separation or degradation of the rubber sheath material where it meets the metal end fittings. Any signs of power arc, lightning damage, or corrosion on the metal end fittings also indicate deterioration of the component.

3.1.3 Condition Assessment Criteria for Metal Cross arms or Hardware

Degradation or reduction in strength of insulator hardware may occur due to the following:

- Loss of galvanization and corrosion of steel members;
- Loss in strength due to fatigue;

- Loosening of hardware due to conductor vibrations; or
- Hardware failure during major storm events.

Close-up visual inspections generally can determine the extent of degradation. Laboratory testing can further corroborate results of visual investigations.

3.1.4 Ranking Condition of Poles and Accessories through Multiple Criteria

The condition assessment process includes scoring based on multiple parameter criteria as described below:

(a) Age Related Score:

Since the service age provides a reasonably good measure of the remaining strength of wood poles, cross arms, hardware and insulators, it is employed as an assessment parameter, with the following scores:

Line Age	Assigned Score
0 to 10 years	5
10 to 20 years	4
20 to 30 years	3
30 to 40 years	2
40 to 50 years or older	1

Exhibit 3-1: Overhead Lines – Age Related Health Score

(b) Preservative Treatment Based Scoring for Wood Poles

Since the rate of pole degradation is affected by the effectiveness of the preservative treatment, wood pole treatment is employed in health index formation of line sections, as indicated in the table below:

Type of Pole Treatment	Assigned Score
Fully Treated	5
Butt Treated	3
No Treatment	1

Exhibit 3-2: Overhead Lines – Pole Treatment Based Health Score

(c) Condition Rating Based on Visual Examinations of Pole Line Components:

Different components of the pole line, including wood poles, cross-arms, hardware, insulators and pole grounding are visually inspected by qualified staff during line patrols. By taking into account the results of these inspections, the health and condition of each component is scored in accordance with the following table:

Component Condition	Assigned Score
Component is in “as new” condition	5
Component has normal wear expected with age	4
Component has many minor problems or a major problem that requires close attention and monitoring;	3
Component has many problems and the potential for its failure would rapidly escalate unless preventative maintenance is performed	2
Component has damaged/degraded beyond repair and will require replacement	1

Exhibit 3-3: Overhead Lines - Visual Inspections Based Health Score

3.1.5 Condition Assessment Criteria for Conductors:

Conductors allow flow of current through them facilitating the movement of power from substations to customers’ premises. Overhead line conductors are typically supported on wood pole structures to which they are attached by insulators suitable for the voltage at which the lines operate. The conductors on a line are sized by taking into account the amount of current to be carried. The maximum current carrying capacity of conductors is determined by their thermal rating. However distribution line conductors are commonly sized to provide the right balance between energy loss in conductors (copper loss) and the capital cost of conductors. As a result the distribution lines often operate under loads significantly below the thermal rating of the conductors.

Overhead line conductors must have adequate tensile strength, enabling them to be stretched between poles. Distribution lines typically have span length of 40 m to 60 m. Three different types of conductors are commonly used on distribution lines:

- Aluminum Conductors Steel Reinforced (ACSR),
- Aluminum Stranded Conductors (ASC),
- Aluminum Alloy Conductors (AAC).

Steel reinforced aluminum conductors have galvanized steel core strands that supply most of their tensile strength. The steel core has both tensile and ductile properties, allowing the core to withstand both longitudinal forces and bending movements without failure. AAC conductors cost less in relation to ACSR conductors, but their tensile strength is significantly lower than those of the ACSR conductors. Both the price and tensile strength of AAC conductors lie in between those of ASC and ACSR conductors.

Because of the relatively short span lengths employed on distribution lines in relation to transmission lines, the tensile strength of conductors on distribution lines is not as critical as it is on transmission lines. Most distribution utilities these days, therefore, employ all aluminum conductors on distribution lines. Aluminum alloy conductors are sometimes used on distribution lines with longer span lengths.

As current passes through the conductors, the resistance causes its temperature to rise, the temperature change is proportional to the square of the load current passing through the conductor. The rise in temperature causes the conductor to lengthen and sag between points of support, reducing the height of the conductor above ground. Although it seldom happens on distribution lines, line operation at loads beyond conductors' thermal rating of approximately 90° C may lead to annealing of conductors, resulting in permanent loss of its tensile strength.

Distribution systems of older vintage employ copper conductors of #4 or #6 AWG. The small conductor sizes often break in service making the live line to come down and pose a serious safety risk to public.

To provide their intended functions on distribution lines, conductors must retain both their conductive properties and mechanical (i.e., tensile) strength. Aluminum conductors have three primary modes of degradation, corrosion, fatigue and creep. The rate of each degradation mode depends on several factors, including the size and construction of the conductor as well as environmental and operating conditions.

Generally, corrosion represents the most critical life-limiting factor for ACSR conductors. Environmental conditions affect degradation rates from corrosion. Both aluminum and zinc-coated steel core conductors are susceptible to corrosion from chlorine-based pollutants, even in low concentrations, but the rate of corrosion of steel core is significantly greater than that of aluminum. While fatigue degradation is a serious concern for transmission lines that are strung with significantly higher tension, it is commonly not a serious issue for distribution lines.

Overloading lines operating beyond their thermal capacity can suffer from a loss of tensile strength due to annealing at elevated operating temperatures. Each elevated temperature event adds cumulative damage to the conductors. After loss of 10% of a conductor's rated tensile strength, significant sag occurs, requiring either resagging or replacement of the conductor. ACSR conductors can withstand greater annealing degradation compared to ASC.

Phase to phase power arcs can result from conductor galloping during severe storm events. This can cause localized burning and melting of a conductor's aluminum strands, reducing strength at those sites and potentially leading to conductor failures.

Other forms of conductor damage include:

- Broken strands (i.e., outer and inners)
- Strand abrasion
- Elongation (i.e., change in sags and tensions)
- Burn damage (i.e., power arc/clashing)
- Birdcaging.

Although laboratory tests are available to determine the degree of corrosion and assess the tensile strength and remaining useful life of conductors, distribution line conductors rarely require testing. Conductors on distribution lines often outlive the poles and are not usually on the critical path to determine end of life for a line section.

The only exception to the above rule might be where small copper conductors susceptible to frequent breakdowns are in use or where line conductors are too small for line loads resulting in sub optimal system operation due to high line loss.

3.1.6 Condition Assessment Criteria for Splices:

Conductor splices generally have a larger cross-sectional area than the conductor itself. When properly installed, splices should outlast the conductor. However, when improperly installed, splices can reduce a conductor's life. Improperly crimped splices represent the weakest link in conductors under tension.

In extreme cases, splice failures lead to excessive conductor annealing that may cause the conductor's strands to be pulled from the compression splice. Any strand damage that occurs during splice installation may lead to localized weakening of the conductor and premature splice failure. Failure to use non-oxidizing grease in splices also may lead to the development of hot spots and splice failure.

3.1.7 Ranking Condition of Conductors and Splices through Multiple Criteria

Computing the Health Index for overhead line conductors and splices requires developing end-of-life criteria for conductors. The condition assessment process includes scoring based on the following parameters:

(a) Age Related Scoring

Since the service age provides a reasonably good measure of the remaining strength of conductors and all the defects are not easily detected through visual inspections, an age based criteria is proposed as indicted below:

Line Age	Assigned Score
0 to 10 years	5
10 to 20 years	4
20 to 30 years (or	3
30 to 40 years	2
40 to 50 years or older	1

Exhibit 3-4: Conductors and Splices – Age Related Health Score

(b) Small Conductor Risk

Since small sized conductors pose a serious safety risk, the value of this risk is scored separately with help of the table below:

Type of Pole Treatment	Assigned Score
Presence of small sized conductors (#4 to #6 copper)	1
Absence of small sized conductors	5

Exhibit 3-5: Overhead Lines - Small Conductor Related Health Score

(c) Valuation of System losses:

In addition to the above criteria, % losses on the feeder will be calculated and when significantly greater than the average distribution system losses on ETPL' system, will be included in valuation as indicated below:

Line Loss	Assigned Score
Less than or Equal to Average system loss	5
5% higher from the average system loss	4
10% higher from the average system loss	3
20% higher from the average system loss	2
30% higher from the average system loss	1

Exhibit 3-6: Overhead Lines – System Losses Related Score

3.1.8 Health Index Formulation for Overhead Lines

Health indexing quantifies equipment conditions relative to long-term degradation factors that cumulatively lead to an asset's end-of-life. Health indexing differs from maintenance testing, which emphasizes finding defects and deficiencies that need correction or remediation to keep the asset operating during some time period.

For purposes of formulating the Health Index for overhead line sections, it is proposed to assign the following weights to various health index criteria described in Section 3.1.1 and 3.1.7.

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age of pole line	1 - 5	5	3	15
2	Pole treatment	1 - 5	5	1	5
3	Visual inspection of poles	1 - 5	5	1	5
4	Pole testing	1 - 5	5	4	20
5	Visual inspection of insulators	1 - 5	5	1	5
6	Visual inspection of hardware	1 - 5	5	1	5
7	Age of conductors	1 - 5	5	1	5
8	Small conductor risk	1 - 5	5	5	25
9	Energy loss in conductors	1 - 5	5	3	15
	Total				100

Exhibit 3-7: Overhead Lines – Health Index Calculation

3.2 Underground Distribution System

The major assets employed on underground distribution systems can be grouped into the following categories:

- Cables, splices and terminations
- Manholes and vaults

3.2.1 Condition Assessment Criteria for Cables, Splices and Terminations

Safety, reliability, aesthetics and operating costs govern the design and construction standards for underground distribution lines. Underground cables can be constructed in a number of configurations, including direct buried cables, cables installed in direct buried conduits and cables installed in a concrete encased duct manhole system. Medium voltage underground cables have the following key components:

- Cables
- Cable Splices
- Cable Terminations

Medium voltage cables may employ either copper or aluminum conductors. They may be constructed in either single phase or three phase configurations. Two major types of cables are in common use in Ontario: paper insulated lead covered (PILC) and cross linked polyethylene (XLPE). The Distribution Standards Manual used by ETPL's contains information on design and construction standards employed.

The original designs of medium voltage cables were constructed out of oil impregnated layers of paper covered with a lead jacket and these cables are commonly referred to as paper insulated lead covered (PILC) cables. For these cables, the two significant long-term degradation processes are corrosion of the lead sheath and dielectric degradation of the oil impregnated paper insulation. Isolated sites of corrosion resulting in moisture penetration or isolated sites of dielectric deterioration resulting in insulation breakdown can result in localized failures. However, if either of these conditions becomes widespread there will be frequent cable failures and the cable can be deemed to be at effective end-of-life.

Polymer insulations for cables were introduced as an economic alternative to PILC cables in 1970's. The insulation system in these cables consists of a semi-conducting sheath over the conductor, the insulation, another semi-conducting layer over the insulation, a metallic shield tape or concentric neutral and a jacket. For the early generation of these cables, manufactured in the 1970's, two unexpected factors entered into the failure mechanism: presence of impurities in the insulation system and ingress of moisture that made these cables susceptible to premature failures due to water treeing. Water treeing in XLPE cables of 1970's vintage are the major cause of excessive cable failures on EPC's distribution system. Corrosion of concentric neutral conductors is another potential mode of failure.

Water treeing is the most significant degradation process for polymeric cables. The original design of cables with polymeric sheaths allowed water to penetrate and come into contact with the insulation. In the presence of electric fields water migration can result in treeing and ultimately breakdown. The rate of growth of water trees is dependent on the quality of the polymeric insulation and the manufacturing process. Any contamination voids or discontinuities will accelerate degradation. This has been the reason for poor reliability and relatively short lifetimes of early polymeric cables. As manufacturing processes have improved the performance and ultimate life of this type of cable has also improved. In addition to manufacturing improvements, development of tree retardant XLPE cables and designs to incorporate metal foil barriers and water migration control have further reduced the rate of deterioration due to treeing.

Distribution underground cables are one of the more challenging assets on electricity systems from a condition assessment and asset management viewpoint. Underground cables are relatively expensive and have long effective lifetimes. However, it is very difficult and therefore very expensive to obtain meaningful condition information for buried cables. Furthermore, cable systems have a good reliability record and when failures do occur they can be repaired at much lower cost than replacement. For all these reasons, the standard approach to managing cable systems has been monitoring of cable failure rates and the impacts of in service failures on reliability and operating costs.

3.2.2 Condition Assessment Criteria for Cable Splices and Terminations

Cable splices and terminations are subject to the same type of insulation degradation and aging as the cables themselves. But improperly made splices may be susceptible to moisture ingress and as a result may experience higher failure rates compared to cables. Compound filled cable pot terminations employed on PILC cable laterals are particularly vulnerable to failure from moisture ingress.

3.2.3 Ranking Condition of Cables and Splices through Multiple Criteria:

Computing the Health Index for an underground cable section requires developing end-of-life criteria for its various components. The condition assessment process includes scoring based on multiple parameter criteria as described below:

(a) Age Related Scoring

Since the service age provides a reasonably good measure of the remaining useful life of cables, splices and terminations, it can be employed as an assessment parameter, with the following scores:

Line Age	Assigned Score
0 to 10 years	5
10 to 20 years	4
20 to 30 years	3
30 to 40 years	2
40 to 50 years or older	1

Exhibit 3-8: Underground Cables: Age Related Score

(b) **Cable Design and Construction**

Since PILC cable designs are known to provide significantly longer service life compared to XLPE cables and earlier vintages of XLPE cables that did not employ tree retardant designs are subject to premature failures, design of cable is employed in health index formation, as indicated in the table below:

Type of Pole Treatment	Assigned Score
PILC Cables	5
Tree Retardant XLPE	4
Earlier vintages of XLPE	1

Exhibit 3-9: Underground Cables Design Related Health Score

(c) Circuit Loading

The rate of insulation degradation is directly related to the operating temperature. Assuming similar types of backfills result in uniform rates of heat dissipation for all circuits, current loading of circuits measured as % of circuit's rated current carrying capacity, can be employed as an indicator of cable health as indicated below:

Component Condition	Assigned Score
Circuit loaded less than 25% of its rating	5
Circuit loading of 25% to 50% of its rating	4
Circuit loading of 50% to 75% of its rating	3
Circuit loading of 75% to 100% of its rating	2
Circuit loading of greater than 100% of its rating	1

Exhibit 3-10: Underground Cables – Loading Related Score

(d) Historic Rates of Circuit Failures:

Historic failure rates on a cable circuit are an excellent indicator of the cable health and condition and its useful remaining life and therefore employed in cable health index formulation as indicated below:

Component Condition	Assigned Score
No Failures in the last 10 years	5
1 Failure in the last 10 years	4
2 Failure in the last 10 years	2
3 or more Failures in the last 10 years	1

Exhibit 3-11: Underground Cables – Failure Related Score

(e) **Condition of Cable Terminator:**

Physical condition of cable terminators can be employed in assessing overall condition of the cable circuit:

Component Condition	Assigned Score
Terminator appears in good condition, no indication of moisture ingress	5
Normal wear, no apparent damage or compound leak, no evidence of moisture ingress	3
Poor condition, leaking compound indicates potential moisture ingress or IR indicates hot spot	1

Exhibit 3-12: Underground Cables: Terminator Related Health Score

3.2.4 Condition Assessment Criteria for Manholes and Vaults

Manholes provide the junction point on underground ducts to facilitate cable pulling and provide access for inspection of cable splices. Vaults provide below grade space of installation of electrical equipment such as submersible transformers or switches. In the case of both manholes and vaults, steel reinforced concrete is used for walls, roofs and floors. In locations subject to flooding floor drains and sump pumps are provided. Vaults where heat generating equipment such as distribution transformers are installed are also equipped with ventilation grates. Man access is provided through the top. When vaults and manholes are located in road ways, parking lots or other areas open to vehicular traffic, the structures must be designed by a structural engineer. Since manholes and vaults are confined spaces, they must be adequately sized to rescue trapped workers during a fire or explosion inside the vault or manhole.

The common degradation mode for manholes and vaults is the deterioration of concrete structures due to concrete spalling and corrosion of rebar, sinking of the roof top surfaces allowing rain water to collect and flood the manhole and vaults. Functional obsolescence, where the size of the manhole or vault no longer meets the space requirements can also lead to end of life of a structure.

3.2.5 Ranking Condition of Manholes and Vaults through Multiple Criteria

The health and condition of manhole and vaults can be measured through visual inspections, looking for:

- Structural damage to concrete walls or roof
- Frequent flooding incidents of the vaults or manholes
- Non functioning drains or sump pumps
- Inadequate space

(a) Structural Condition:

Inspections	Assigned Score
No deficiencies in the vault or manhole	5
Only minor deficiencies	3
Major deficiencies requiring immediate repairs/replacement	1

Exhibit 3-13: Manhole and Vaults Structural Health Score

(b) Flooding Incidents, Drains, Sump pumps

Inspections	Assigned Score
No incidents of Flooding at this location	5
Occasional Flooding, working sump pumps and drains	3
Frequent Flooding, No sump pumps or drains	1

Exhibit 3-14: Manhole and Vaults: Flooding Related Health Score

(c) Vault Size and Access:

Inspections	Assigned Score
Adequate ergonomic size and safe access to vault	5
Vault size slightly smaller than ideal, but adequate for safe working and reasonable access to vault	3
Vault size or access inadequate for safe working or worker rescue during an accident immediate repairs/replacement	1

Exhibit 3-15: Manholes and Vaults Size Related Health Score

3.2.6 Health Index Formulation for Underground Cables, manholes and vaults

Health indexing quantifies equipment conditions relative to long-term degradation factors that cumulatively lead to an asset's end-of-life. Health indexing differs from maintenance testing, which emphasizes finding defects and deficiencies that need correction or remediation to keep the asset operating during some time period.

For purposes of formulating the Health Index for underground cables and manholes/vaults, it is proposed to assign the following weights to various health index criteria:

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age of Cable Circuit	1 – 5	5	3	15
2	Type/Design of Cable	1 – 5	5	3	15
3	Loading of Cable Circuit	1 – 5	5	5	25
4	Historic Failure rates	1 – 5	5	8	40
5	Visual inspection of terminators	1 – 5	5	1	5
	Total				100

Exhibit 3-16: Cables, Splices and Terminators Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Structural Integrity	1 – 5	5	8	40
2	Flooding and Its mitigation	1 – 5	5	4	20
3	Size and Access	1 – 5	5	8	40
	Total				100

Exhibit 3-17: Manholes and Vaults Health Index

3.3 Substations

The major assets employed in substations include:

- Power Transformers
- Circuit Breakers or Reclosers
- Controls and Protective Relays
- Control Battery and Chargers
- Condition of Ground Grid
- Fences
- Buildings

3.3.1 Condition Assessment of Power Transformers

The key role of the power transformers is to step down transmission or sub-transmission voltage to distribution voltage. In case of ETPL, power transformers step down from 27.6 kV sub-transmission voltages to 4.16kv. Power transformers are virtually always pad mounted. The key components of a power transformer are:

- primary and secondary coils, made of copper of aluminium conductors
- magnetic core made of iron laminations
- insulation system, commonly consisting of paper and mineral oil
- transformer tank, either sealed or breather type, and
- primary and secondary bushings.
- Auxiliary devices

The most critical component in transformer aging consideration is the insulation system, consisting of mineral oil and paper. Transformer oil consists of hydrocarbon compounds that degrade with time due to oxidation, resulting in formation of moisture, organic acids and sludge. The oil oxidation rate is a function of operating temperature. Increased acidity and moisture content in insulating oil causes accelerated degradation of insulation paper. Formation of sludge adversely impacts the cooling efficiency of transformer, resulting in higher operating temperatures and further increasing the rate of oxidation of both the oil and the paper. Condition assessment of transformer oil, therefore, provides extremely useful information in assessing the health and condition of a transformer.

The paper insulation consists of long cellulose chains, that break as the paper ages (oxidizes). Tensile strength and ductility of insulation paper are important properties that are determined by the average length of the cellulose chains. As the paper oxidizes, its mechanical strength is gradually reduced, making it weak and brittle. This can lead to insulation failure if the transformer is subjected to mechanical shocks that are common in normal operating conditions. Insulation degradation and failure can also result from electrical activity inside insulation, such as partial discharge activity, which is initiated if the level of moisture in oil builds up or if other minor defects develop within the insulation. Partial discharge and other electrical and thermal faults in the transformer can be detected and monitored by measurement of hydrocarbon gases in the oil through Dissolved Gas Analysis (DGA).

Oil analysis provides information on three critical factors:

- condition of the oil from moisture, acidity and breakdown strength measurements,
- condition of the paper insulation from Furan, carbon dioxide, carbon monoxide and moisture measurements, and,
- presence of any incipient electrical or thermal faults within the transformer from the DGA results.

Some other tests that can be applied to oil samples such as interfacial tension, power factor etc.

3.3.2 Ranking Condition of Power Transformers through Multiple Criteria

Computing the Health Index for a transformer requires developing end-of-life criteria for its various components. Each criterion represents a factor critical in determining the component's condition relative to potential failure. The condition assessment process includes scoring based on multiple parameter criteria as described below:

(a) Age Related Scoring

Since the service age provides a reasonably good measure of the remaining life of transformers, it is employed as an assessment parameter, with the following scores:

Power Transformer Age	Assigned Score
0 to 10 years	5
10 to 20 years	4
20 to 30 years	3
30 to 50 years	2
50 years or older	1

Exhibit 3-18: Power Transformers Age Related Health Score

(b) Condition Assessment Based on Loading Level

The rate of insulation degradation is directly related to the operating temperature and operating temperature is directly related to loading levels. Peak loading level of the transformers expressed in % of nameplate rating can therefore be employed as an indicator of transformer health:

Component Condition	Assigned Score
Peak load less than 50% of its rating	5
Peak load of 50% to 75% of its rating	4
Peak load of 75% to 100% of its rating	3
Circuit loading of 100% to 125% of its rating	2
Circuit loading of greater than 125% of its rating	1

Exhibit 3-19: Power Transformers – Load Related Health Score

(c) Visual Inspections

Visual inspections can provide a good indication of the physical condition of transformers, which can be ranked as indicated below:

Visual Inspections	Assigned Score
No rust on tank/radiator, no damage to bushings, no sign of oil leaks, forced air cooling fully functional	5
Only one of the following defects: Minor rust, or minor cracks in bushings or minor oil leak	4
Two or more of the above indicated defects present but do not impact safe operation	3
Tank/radiator badly rusted or major damage to bushing or major oil leak	2
Two or more of the above indicated defects or the cooling fans do not work	1

Exhibit 3-20: Power Transformers Health Score Based On Visual Inspections

(d) Condition Rating Based on Evaluation of the oil tests:

Various insulation tests can be interpreted by an expert to rank the overall condition of transformer insulation system:

Test Results	Assigned Score
Test results indicate excellent insulation condition, no indication of moisture, arcing, overheating or degradation of paper	5
Tests indicate normal aging, no concerns about insulation health	4
Tests indicate slightly above average but stable moisture content or presence of arcing overheating related gases	3
Some of the tests indicates significant concerns about insulation condition	2
Two or more of the tests indicate rapidly deteriorating insulation condition	1

Exhibit 3-21: Power Transformers – Health Score Based on Oil Tests

3.3.3 Condition Assessment Criteria for Circuit Breakers and Reclosers

Medium voltage circuit breakers provide local or remote control for closing and opening of power supply circuits and in conjunction with protective relays provide an important safety function to automatically detect and isolate faulty circuits in order to provide safe, stable and reliable operation with desired selectivity. A pole mounted recloser virtually provides the same functions as a circuit breaker. While its design is significantly different, the recloser employs the same operating principle as a circuit breaker.

When a circuit breaker interrupts current, an electrical arc is produced in the ionized insulation medium. In order for the circuit breaker action to succeed, the large amount of energy contained in the arc must be successfully extinguished by the breaker's interrupting medium. Depending on the type of arc interrupting medium employed, circuit breakers (or reclosers) are classified as oil circuit breakers, magnetic air circuit breakers, SF-6 circuit breakers or Vacuum circuit breakers. In order to deliver the desired functions, circuit breakers and reclosers are required to possess the following properties and characteristics:

- highly conductive contact material, capable of withstanding repeated arcs;
- High quality of contact make with extremely low resistance;
- High quality contact mating, capable of retaining high conductivity over time
- Adequate contacts parting distance in open position for the rated voltage;
- Adequate line to ground insulation for the rated voltage;
- Stable insulating medium, capable of withstanding repeated arcs;
- Fast speed during opening and closing of contacts;
- Appropriate arc blowing techniques to extinguish arcs;
- Adequate energy imparting mechanisms for making or breaking of short circuit currents.

Different types of circuit breakers employed on ETPL' distribution system are described below:

(a) Oil Circuit Breakers (OCB)

In minimum oil circuit breakers, insulating oil provides the role of arc quenching only, but in bulk oil circuit breakers, the insulating oil provides both the arc quenching and the insulation functions. OCBs generally perform well at low ambient temperatures. They also provide long and reliable service life when the number of loading switching or fault interruption operations is infrequent. However, frequent switching fault interruption applications must be accompanied by frequent preventative maintenance. OCBs do not perform well in switching capacitive loads, during switching operations of which high peak recovery voltages are produced. Generally, after 4 to 8 fully rated interruptions, OCB's require preventative maintenance, during which excessive contact erosion, carbonisation of oil, and maintenance of operating mechanism may need to be attended to. The manufacture of new OCBs has been discontinued for at least 25 years now. The original equipment manufacturers (OEMs) provided service support and spares for these OCBs until the late 1990s. Many utilities in North America continue to successfully employ older vintages of OCBs on their systems.

(b) Air Magnetic Circuit Breakers (Air Magnetic Breakers)

Air magnetic breakers employ the magnetic effect of the current in their design, by forcing the electric arc produced during opening on the contacts into an arc chute. The arc chute causes elongation of the arc path and allows cooling, splitting and eventual extinction of the arc. In some designs, an auxiliary puffer is employed to blast air into the arc, which allows successful interruption of low-level currents with weaker magnetic fields. Air magnetic breakers represent the second oldest technology in circuit breaker design, next to OCBs. They are also no longer in manufacture and have been superseded by SF6 and vacuum technologies since the late 1970s.

(c) Vacuum Circuit Breakers

In a Vacuum circuit breaker, vacuum interrupters are employed to make or break load or fault current. Upon separation of the contacts, the current initiates a metal vapour arc discharge and flows through the plasma until the next current zero. The arc is extinguished at current zero and the conductive metal vapour condenses on the metal surfaces during a very short time internal measured in micro seconds. Therefore, the dielectric strength in the breaker builds up very rapidly. The effectiveness of vacuum interrupter depends largely on the material and form of the contacts. In modern designs, oxygen free copper chromium alloy is commonly employed as it is believed to be the best material for the application. This material combines good arc extinguishing characteristic with a reduced tendency to contact welding.

The operating mechanism of circuit breakers and reclosers consists of numerous moving parts that are subject to wear and tear during breaker operation. Because circuit breakers are required to frequently “make” and “break” heavy currents, the contacts are subjected to arcing that accompanies such operations. Each time a circuit breaker opens or closes, the contact surfaces undergo some degradation and degraded contacts produced higher degree of arcing in subsequent operations. Heat produced during contact arcing also decomposes metal surface from the contacts as well as the insulation medium and the by-products so decomposed are deposited in surrounding insulation materials. The mechanical energy required to generate high contact velocities also results in wear and tear of the mechanical parts in operating mechanism.

A number of factors influence the overall rate of wear and severity of degradation of circuit breakers, including type of the insulating medium, design of the contacts, operating environment, and the duty cycle of the circuit breaker. Load current switching or fault current interruption seldom lead to sudden failure of circuit breakers, but repeated operations result in overall wear and tear which lead to eventual end of life.

Circuit breakers mounted outdoors may experience adverse environmental conditions that may further contribute to the rate and severity of degradation. The following factors represent environmental degradation of outdoor mounted circuit breakers:

- Corrosion of enclosures and metal parts;
- Potential ingress of moisture into operating parts and insulating system;
- Bushing/insulator deterioration under the influence of moisture, fog, ice; and
- Deterioration of mechanical parts;

OCBs typically have longer current interruption duration compared with other types of designs. Contacts and the insulation medium are therefore subjected to severe arcing, resulting in deterioration of the contact surface as well as insulation. Thus, both contacts and oil degrade more rapidly in case of OCBs than they do in either SF6 or vacuum designs, especially when the OCB undergoes frequent switching operations. Generally, 4 to 8 interruptions under fault or heavy load will cause contact erosion and oil carbonisation, requiring contact maintenance and possibly oil filtration. OCBs have therefore higher operating costs compared to other designs.

3.3.4 Ranking Condition of Circuit Breakers and Reclosers through Multiple Criteria

Computing the Health Index for circuit breakers requires collection of data on a number of condition indicators:

(a) Age Related Scoring

Service age provides a reasonably good measure of the remaining life of circuit breakers and reclosers. Since the outdoor mounted reclosers, exposed to the weather elements experience a faster rate of aging, two separate sets of criteria are provided for outdoor and indoor mounted circuit breakers / reclosers:

Age	Assigned Score
0 to 7 years	5
8 to 15 years	4
16 to 24 years (or	3
25 to 32 years	2
33 years or older	1

Exhibit 3-22: Outdoor Circuit Breakers – Age Related Health Score

Age	Assigned Score
0 to 10 years	5
11 to 20 years	4
21 to 30 years (or	3
31 to 40 years	2
41 years or older	1

Exhibit 3-23: Indoor Circuit Breakers – Age Related health Score

(b) Visual Inspections

Visual inspections can provide a good indication of the physical condition of circuit breakers, which can be ranked as indicated below:

Visual Inspection Indicators	Assigned Score
No rust on tank/enclosure, no damage to bushings, no leaks, controls and wiring in excellent condition	5
Only one of the following defects: Minor rust, or	4

minor cracks in bushings or minor oil leak	
Two or more of the above indicated defects present but do not impact safe operation	3
Tank/enclosure badly rusted or major damage to bushing or major oil leak	2
Two or more of the above indicated defects or the cooling fans do not work	1

Exhibit 3-24: Circuit Breakers – Visual Inspections Based Health Score

(c) **Condition Rating Based on Evaluation of the test tests**:

Various interruption chamber tests can be interpreted by an expert to rank the overall condition of transformer insulation system:

Test Results	Assigned Score
Test results indicate excellent condition of contacts, operating mechanism, insulation condition and protection relays	5
Normal aging, each of the four indicators within specified limits	4
One of the above four indicators is slightly beyond the specified limits	3
Two or more of the above four indicators beyond the specified limits	2
Two or more of the indicators beyond specifications and cannot be brought to comply with the specifications	1

Exhibit 3-25: Circuit Breakers – Testing Based Health Score

3.3.5 Condition Assessment Criteria for Protection Relays and Remote Terminal Units

The function of protection relays on distribution systems is to detect and annunciate abnormal operating conditions and initiate circuit breaker or recloser trip to isolate faulty circuits from healthy. Protection relays obtain their input from instrument transformers, process the information and automatically take corrective action with adequate speed and selectivity. There is currently no SCADA link to substations and no remote terminal units (RTUs) are employed at ETPL substations.

Electro-mechanical designs of protection relays have been in use in the industry for several decades, but the industry best practice has been to replace these relays with solid state and microprocessor relays. Electro-mechanical relays have many moving parts and require calibration at regularly scheduled intervals to assure accurate operation. Modern micro-processor relays have no moving parts and can provide much more accurate operation without requiring frequent calibration.

The electro-mechanical relays with many moving parts lose their operating accuracy due to the moving parts developing friction or the springs becoming weak with passage of time and need to be readjusted from time to time. Voltage and current surges can also harm electrical components of relays. The micro-processor and the solid state relays do not require frequent calibrations, but they are vulnerable to voltage and current surges.

3.3.6 Ranking of Protection Relays Condition through Multiple Criteria

(a) Age Related Scoring

Service age provides a reasonably good measure of the remaining life of protection relays. Since the relays are either installed indoors or in weatherproof cabinets, they are protected from the weather elements.

Age	Assigned Score
0 to 10 years	5
11 to 20 years	4
21 to 30 years (or	3
31 to 40 years	2
41 years or older	1

Exhibit 3-26: Protection Relays Age Based Health Score

(b) Condition Rating Based on Evaluation of the test tests:

Calibration tests can be interpreted by an expert to rank the overall condition of protection relays:

Test Results	Assigned Score
Excellent operating condition, calibration well within specified limits	5
Normal aging, calibration within the specified limits	4
Frequent calibration required, but it is possible to meet specified limits	3
Not possible to calibrate the relays to bring settings to specified limits	1

Exhibit 3-27: Protection Relays Testing Based Health Score

3.3.7 Control Battery and Chargers

The purpose of substation control batteries is to provide power for critical control functions such as trip coils of circuit breakers. Two types of batteries are commonly used: lead acid batteries and nickel cadmium batteries. Batteries are carefully sized to store adequate energy for system operation during an AC power failure.

The key parts of a control battery include two electrodes immersed in an electrolyte inside a jar. The battery terminals are brought out for cable connections. While the earlier vintages of control batteries required frequent maintenance and monitoring of electrolyte, modern batteries employ sealed design and are virtually maintenance free for the service life.

Battery chargers employ solid state rectifiers and are equipped with normal slow charge or fast charge functions.

Both the electrodes and electrolyte in control batteries undergo aging with repeated charge and discharge cycles, which result in gradual reduction of battery storage capacity. The end of life is reached when the battery is no longer able to retain adequate charge for required functions.

Battery chargers can experience component failures, but these can be easily replaced and as a result the charger often outlasts the battery.

3.3.8 Ranking Condition Control Batteries through Multiple Criteria

(a) Age Related Scoring

Since different types of batteries can have significantly different life expectancy, age related scoring needs to be measured in terms of manufacturer recommended life expectancy:

Actual Battery Age	Assigned Score
Less than 25% of manufacturer recommended age	5
Less than 50% of manufacturer recommended age	4
Less than 75% of manufacturer recommended age	3
Less than manufacturer recommended age	2
More than manufacturer recommended age	1

Exhibit 3-28: Control Batteries and Chargers Age Related Health Score

(b) Condition Rating Based on Evaluation of the test tests:

Test Results	Assigned Score
Battery capable of storing full rated energy	5
Battery stores marginally less than full rated energy, but still adequate for required functions	3
Battery stores significantly less than the full rated energy, inadequate for required functions	1

Exhibit 3-29: Control Batteries and Chargers Test Based Health Score

3.3.9 Substation Ground Grids

The purpose of substation ground grid is to provide a low resistance ground electrode for system neutral, for equipment case grounding and to maintain safe potential gradients within the station yards during abnormal operating conditions, i.e. line-to-ground faults.

The station ground electrode consist of multiple ground rods driven into the ground and located strategically and connected with underground copper conductors to make a mesh of sufficiently low resistance. All feeder neutrals are connected to the electrode. Cases of each piece of power equipment are also bonded to the ground electrode. All fences and gates are bonded to the perimeter ground grid.

Where the ground potential rise (GPR) exceeds safe limits, surface stone of high resistivity is used in the substation yard to maintain step potential within safe limits.

Buried ground rods, conductors and connectors are subject to corrosion, which reduces the effectiveness of the ground electrode with passage of time. Above ground components of the electrode and copper conductors are subject to vandalism and damage. The surface stone can degrade in quality due to growth of weeds.

3.3.10 Ranking Condition of Ground Grids through Multiple Criteria

The health and condition of ground grid can be verified though ground grid resistance measurements and integrity tests.

(a) Age Related Scoring

Actual Battery Age	Assigned Score
Ground Electrode less than 10 years old	5
Ground Electrode Between 10 and 20 years Old	4
Ground Electrode Between 20 and 30 years Old	3
Ground Electrode Between 30 and 40 years Old	2
Ground Electrode More than 40 years Old	1

Exhibit 3-30: Ground Grid Age Related Score

(b) **Condition Rating Based on Evaluation of the test tests**:

Test Results	Assigned Score
Ground electrode resistance and GPR within safe limits, all electrode components pass integrity test	5
Ground electrode resistance and GPR within safe limits but a few electrode components do not pass integrity test	3
Ground electrode resistance or GPR not within safe limits or many electrode components pass integrity test	1

Exhibit 3-31: Ground Grid Testing Related Health Score

(c) **Rating Based on Condition of Surface Stone**

Test/Inspection Results	Assigned Score
Resistivity of Surface Stone >3000 Ohm-m, no sign of vegetation growth	5
Resistivity of Surface Stone marginally less than <3000 Ohm-m, but no sign of vegetation growth	3
Resistivity of Surface Stone significantly less than <3000 Ohm-m, and signs of vegetation growth	1

Exhibit 3-32: Ground Grid Testing Related Health Score

3.3.11 Substation Fences

The purpose of substation fences is to provide security for substation assets by not allowing entry into the yard to unauthorized people or wild life.

To achieve this objective the fence has to be of a minimum height of 6' to comply with the electrical safety act and topped three rungs of barbed wire covering a height of 12". The fence must be secured with posts of adequate strength and should limit the crawl space between the fence and ground to 4" or less. Where a fence connects into another steel fence, an insulated section should be added to prevent transfer of harmful potential to remote locations.

The fence should be grounded and bonded throughout. The gates should be lockable and locked and warning signs should be provided.

The common degradation mode for station fences are rusting and corrosion, damage to fence posts and gates, soil erosion increasing the crawl space under the fence and vandalism to damage and deface warning signs.

3.3.12 Ranking Condition of Fences through Multiple Criteria

(a) Condition Rating Based on Evaluation of the test tests:

Inspections	Assigned Score
No deficiencies in the fence	5
Only minor deficiencies	3

Major deficiencies requiring immediate attention	1

Exhibit 3-33: Fences Health Score based on Visual Inspections

3.3.13 Substation Buildings

Substation buildings provide protection to critical substation assets, i.e. circuit breakers and protection relays against weather elements. While the switchgear is commonly located on the main floor, the basements serve as an oversized manhole to provide exit for feeder cables.

The common degradation mode for substation buildings is deterioration of roofs, sidings, doors and windows. A small leak in the roof can cause a lot of harm to electrical equipment and defeat the very purpose of the substation building.

3.3.14 Ranking Condition of Substation Buildings through Multiple Criteria:

The health and condition of substation building can be measured through visual inspections:

Inspections	Assigned Score
No deficiencies in the building	5
Only minor deficiencies	3
Major deficiencies requiring immediate attention	1

Exhibit 3-34: Substation Buildings Health Score

3.3.15 Health Index Formulation for Substation Equipment

Since each piece of substation equipment can be independently replaced or rehabilitated, rather than developing an overall health index for substations, methodology for developing health indices for key substation assets is provided below:

For purposes of formulating the Health Index for major substation assets, it is proposed to assign the following weights to various health index criteria described in the previous sections:

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age of transformer	1 - 5	5	6	30
2	Peak loading	1 - 5	5	4	20
3	Visual inspection	1 - 5	5	2	10
4	Testing	1 - 5	5	8	40

	Total				100

Exhibit 3-35: Power Transformers – Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age	1 - 5	5	8	40
2	Visual inspection	1 - 5	5	4	20
3	Testing	1 - 5	5	8	40
	Total				100

Exhibit 3-36: Circuit Breakers – Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age	1 - 5	5	10	50
2	Testing	1 - 5	5	10	50
	Total				100

Exhibit 3-37: Protection Relays and RTUs – Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age	1 – 5	5	10	50
2	Testing	1 – 5	5	10	50
	Total				100

Exhibit 3-38: Substation Control Batteries and Chargers Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age	1 - 5	5	8	35
2	Testing	1 - 5	5	8	35
3	Condition of Surface Stone	1 - 5	5	4	30
	Total				100

Exhibit 3-39: Substation Ground Grid Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score

1	Visual Inspection	1 – 5	5	20	100
	Total				100

Exhibit 3-40: Substation Fences Health Index

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Visual Inspection	1 – 5	5	20	100
	Total				100

Exhibit 3-41: Substation Buildings Health Index

3.4 Distribution Transformers

Four main types of distribution transformers are employed on ETPL]'s distribution system:

- Pole mounted transformer
- Pad mounted transformer
- Poles Trans
- Submersibles

Aside from the different design and construction standards employed in their manufacture and installation, each type of transformers serve the same functions and the same asset management strategy can be employed for both of these assets as described below:

Distribution transformers step down to the medium voltage distribution power to final utilization voltage of either 120/240V, or 120/208V or 347/600 V. Both single phase and three phase transformers are in use. In pole top applications, three single phase transformers are commonly employed to create a three phase bank, however for pad mounted applications, three phase transformers are used for three phase applications.

The key components of a distribution transformer are

- primary and secondary coils, made of copper of aluminium conductors
- magnetic core made of iron laminations
- insulation system, commonly consisting of paper and mineral oil
- sealed transformer tank,
- primary and secondary bushings or bushing wells to accommodate elbows.
- Auxiliary devices

The most critical component in transformer aging consideration is the insulation system, consisting of mineral oil and paper. Transformer oil consists of hydrocarbon compounds that degrade with time due to oxidation, resulting in formation of moisture, organic acids and sludge. The oil oxidation rate is a function of operating temperature. Increased acidity and moisture content in insulating oil causes accelerated degradation of insulation paper. Formation of sludge adversely impacts the cooling efficiency of transformer, resulting in higher operating temperatures and further increasing the rate of oxidation of both the oil and the paper. Distribution transformers commonly fail when the age weakened insulation system is subjected to a voltage surge during lightening.

Most utilities run the distribution transformers to failure, i.e. replace them only after they fail. With the exception of rust proofing and painting of the tanks, replacing a damaged bushing or repairing a leaky gasket, very little invasive preventative maintenance or testing is carried out on distribution transformers.

3.4.1 Ranking the Condition of Distribution Transformers through Multiple Criteria:

Computing the Health Index for a distribution transformer requires developing end-of-life criteria for its various components. Each criterion represents a factor critical in determining the component's condition relative to potential failure. The condition assessment process includes scoring based on multiple parameter criteria as described below:

(a) **Age Related Scoring**

Since the service age provides a reasonably good measure of the remaining life of transformers, it is employed as an assessment parameter, with the following scores:

Distribution Transformer Age	Assigned Score
0 to 10 years	5
10 to 20 years	4
20 to 30 years	3
30 to 40 years	2
40 years or older	1

Exhibit 3-42: Distribution Transformers Age Based Health Scoring

(b) **Condition Assessment Based on Loading Level**

The rate of insulation degradation is directly related to the operating temperature and operating temperature is directly related to loading levels. Peak loading level of the transformers expressed in % of nameplate rating can therefore be employed as an indicator of transformer health:

Component Condition	Assigned Score
Peak load less than 50% of its rating	5
Peak load of 50% to 75% of its rating	4
Peak load of 75% to 100% of its rating	3
Circuit loading of 100% to 125% of its rating	2
Circuit loading of greater than 125% of its rating	1

Exhibit 3-43: Distribution Transformers – Load Based Health Scoring

(c) Visual Inspections

Visual inspections can provide a good indication of the physical condition of transformers, which can be ranked as indicated below:

Visual Inspections	Assigned Score
No rust on tank/enclosure, no damage to bushings, no sign of oil leaks, padlocks in good condition on pad mounted transformers	5
Only one of the following defects: Minor rust, or minor cracks in bushings or minor oil leak	4
Two or more of the above indicated defects present but do not impact safe operation	3
Tank/radiator badly rusted or major damage to bushing or major oil leak	2
Two or more of the above indicated defects	1

Exhibit 3-44: Distribution Transformers – Inspections Based Health Scoring

3.4.2 Health Index Formulation for Distribution Transformers

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age of transformer	1 – 5	5	6	30
2	Peak loading	1 – 5	5	6	30
3	Visual inspection	1 – 5	5	8	10
	Total				100

Exhibit 3-45: Distribution Transformers Health Index

3.5 Disconnect Switches and Cut-outs

This asset class include pad and vault mounted medium voltage switchgear as well as pole mounted ganged disconnect switches and single phase solid blade or cutouts. Disconnect switches provide means of load disconnect and isolation for equipment, such as underground laterals or distribution transformers.

The key components of a distribution switch are

- Switch blades
- Operating handle and mechanism
- Insulator bushings
- Grounding and bonding conductors

In case of pad mounted disconnects, it has following additional components:

- Pad or Vault mounted metal enclosure
- Inter-phase glass polyester barriers
- Padlocks

The most critical components in the disconnect switch are the switch blades and operating mechanism. Misaligned or poorly surfaced contacts can result in excessive arcing during switch opening or closing, resulting in further deterioration of the blades. Corrosion may cause rusting of the links and pins in operating mechanism reducing the blade movement speed. Broken grounds or damaged insulators are some other defects that may appear with age.

Pad or vault mounted disconnect switch enclosures are vulnerable to corrosion due to road salt spray. Non functioning padlocks or broken inter phase barriers are other serious defects that may develop with aging.

3.5.1 Ranking Condition of Disconnect Switches through Multiple Criteria

(a) Age Related Scoring

Since the service age provides a reasonably good measure of the remaining life of disconnect switches, it is employed as an assessment parameter, with the following scores:

Disconnect Switch Age	Assigned Score
0 to 10 years	5
10 to 20 years	4
20 to 30 years	3
30 to 40 years	2
40 years or older	1

Exhibit 3-46: Disconnect Switches and Cutouts Age Based Health Scoring

(b) Visual Inspections

Visual inspections can provide a good indication of the physical condition disconnect switches. IR scan can provide indication of hot spots resulting from misaligned blades.

Visual Inspections	Assigned Score
No rust on tank/enclosure, no damage to bushings, padlocks in good condition on pad mounted switchgear, operating mechanism and blades in excellent condition.	5
Only minor wear, no defects.	4
No more than one of the above indicated defects present but does not impact safe operation	3
Two or more of above indicated defects, but they can be repaired	2
Two or more of the above indicated defects, but they cannot be repaired	1

Exhibit 3-47: Disconnect Switches and Cutouts Inspections Based Scoring

3.5.2 Health Index Formulation for Disconnect Switches

	Criteria	Rankings	Highest Score	Weight Assigned	Maximum weighted Score
1	Age of disconnect	1 - 5	5	10	50
2	Visual inspections and IR Scan	1 - 5	5	10	50
	Total				100

Exhibit 3-48: Distribution Switches and Cutouts – Health Index

4 ASSET DEMOGRAPHICS AND CONDITION ASSESSMENT

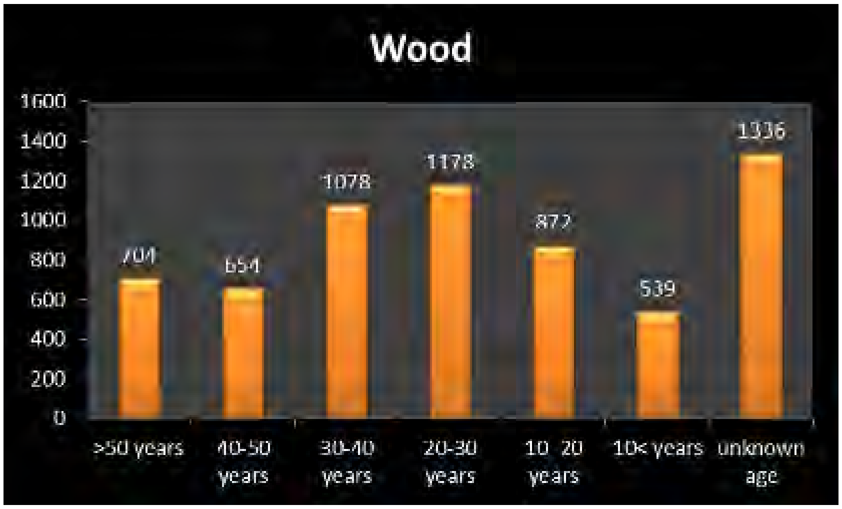
The methodology described in detail in section 3 provides means of accurate and comprehensive condition assessment of all major assets employed on ETPL's distribution network. However, complete data required for condition assessment thorough this methodology is not presently available and would require some time for collection from the field.

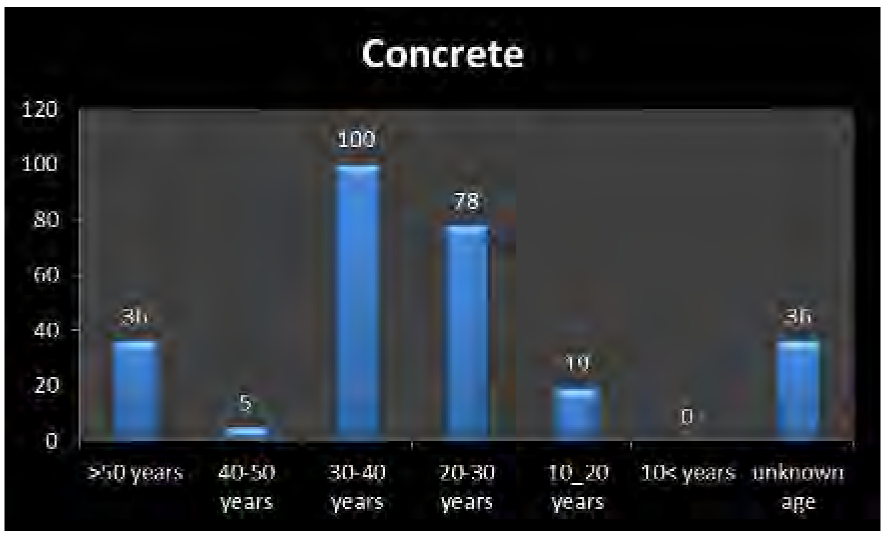
In this section we have completed the condition assessment of the assets by taking into account all of the available information and asset condition specific data. We have developed estimates of the overall investment requirement by evaluating the risk of in-service asset failures, based on assets' age profiles and mean life expectancy of assets. It is recommended that data required for condition assessment of the assets, described in Section 3 be collected and analyzed for targeting investments into those assets that are at the highest risk of in-service failures.

This section of the report, essentially, provides a snap shot into the general condition of the assets employed on ETPL' distribution network, based on the demographic information retrieved from the GIS system and physical inspections of a representative sample of assets.

4.1 Overhead Line Support Poles:

There are approximately 8,617 poles employed on ETPL' distribution network. Approximately 1890 of these poles (22% of the total) are employed in the newly acquired region of Mitchel, Dublin and Clinton (North Region) and the remaining78% are employed in the southern service territory (South Region). Demographic information on distribution poles is presented in Exhibits 4.1 and 4.2, respectively for South Region and North Region. As indicated a vast majority of the poles employed on ETPL distribution system are wood poles and more than 20% of these poles have been in service for over 40 years and are approaching the end of the their useful service life.





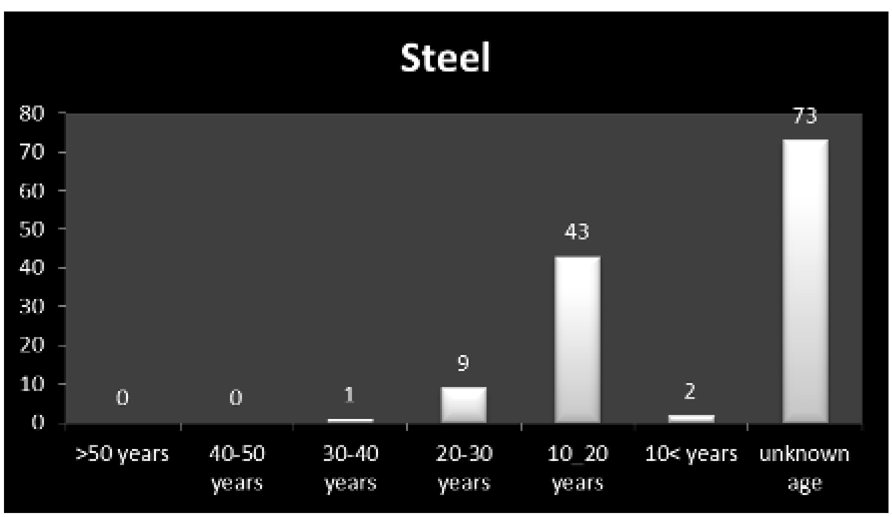


Exhibit 4-1: Pole Demographics (South Region)

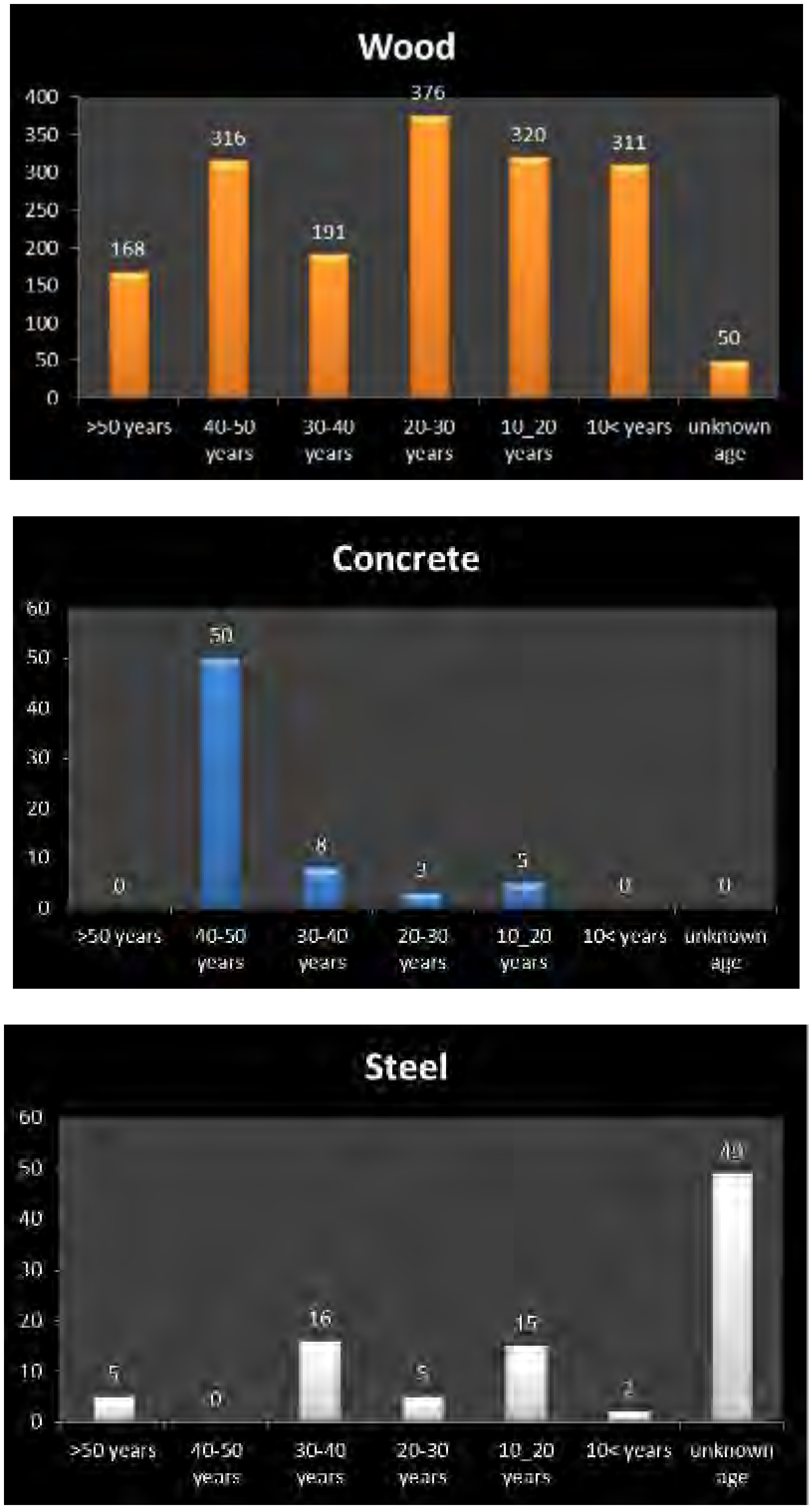


Exhibit 4-2: Pole Demographics (North Region)

Poles are employed in different configurations on overhead lines, some support only low voltage circuits, while others may support multiple circuits of different voltage lines, requiring taller poles. Exhibit 4-3 shows the number of poles of different heights employed on ETPL distribution system.

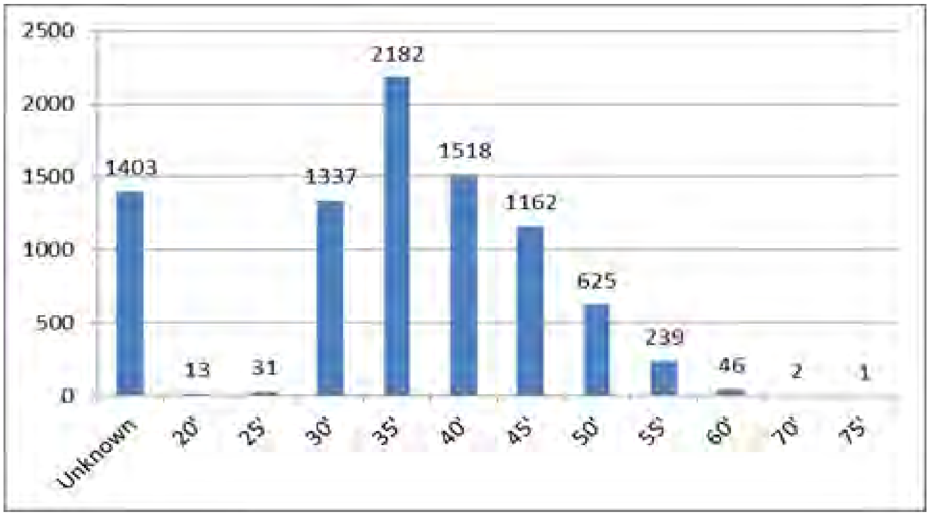


Exhibit 4-3: Pole Heights

A sample of approximately 1000 wood poles in Embro, Thamesford and Tavistock districts (all in South Region) have been tested recently and we have reviewed the test report. Approximately 3% of the poles were found to be in poor condition and in need of immediate replacement. It is noteworthy that the pole conditions deviate significantly from one district to another. For example, approximately 7% of the poles tested in Tavistock were found to be in poor condition, but only 1% of the poles tested in Embro district were determined to be in poor condition.

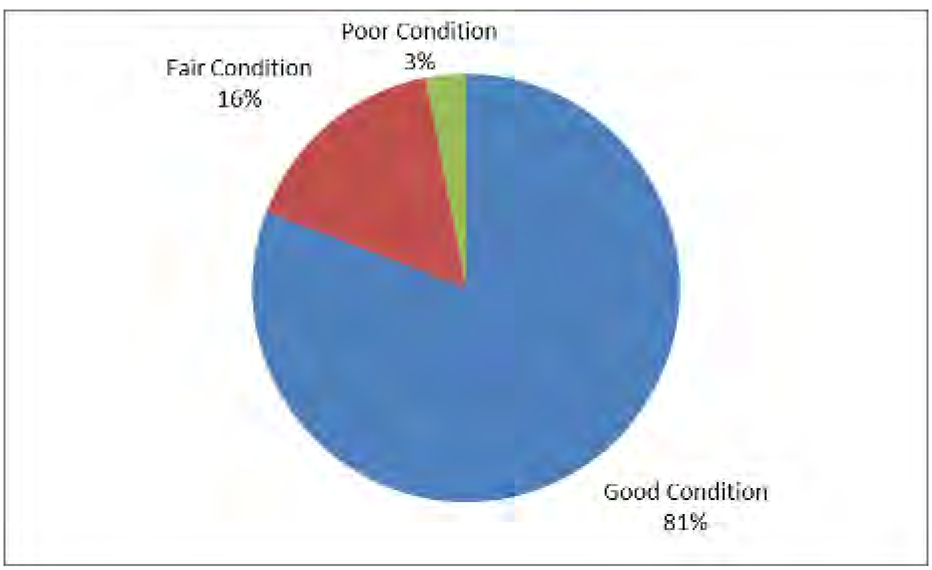


Exhibit 4-4: Pole Conditions (Based on Test Results

4.2 Medium Voltage Overhead Line Circuits:

The overhead distribution network at ETPL employs 27 kV, 8 kV and 4 kV medium voltage lines. Total circuit lengths employed on 3-phase and 1-phase lines at different voltages are indicated in Exhibit 4.5.

Since no records are available to indicate the original installation dates for various lines, we have estimated ages for various overhead lines using the pole age as a proxy for the lines and the age profile for distribution lines presented in Exhibit 4-5 has been developed in this manner. Exhibit 4-6 displays the overhead line age profile in form of a pie chart. The overhead distribution lines in North Region are generally older in age, in relation to the overhead lines in South Region.

		Installed Quantity	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	>50 yrs
Overhead Lines		km						
	Overhead lines 3 ph 27.6 kV	78.8	16.5	26.8	23.6	11.8	-	-
	Overhead lines 3 ph 8.32 kV	8.4	-	-	1.7	3.8	2.9	-
	Overhead lines 3 ph 4.16 kV	41.8	-	-	4.2	8.4	9.6	19.6
	Overhead lines 1 ph 16 kV	14.8	3.4	4.9	4.4	2.1	-	-
	Overhead lines 1 ph 4.8 kV	23	-	-	4.1	10.7	8.1	-
	Overhead lines 1 ph 2.4 kV	31.8	-	-	3.2	6.4	7.3	14.9
	Total of overhead Lines	198.6	20.0	31.7	41.3	43.1	28.0	34.6

(a) Overhead Lines (South Region)

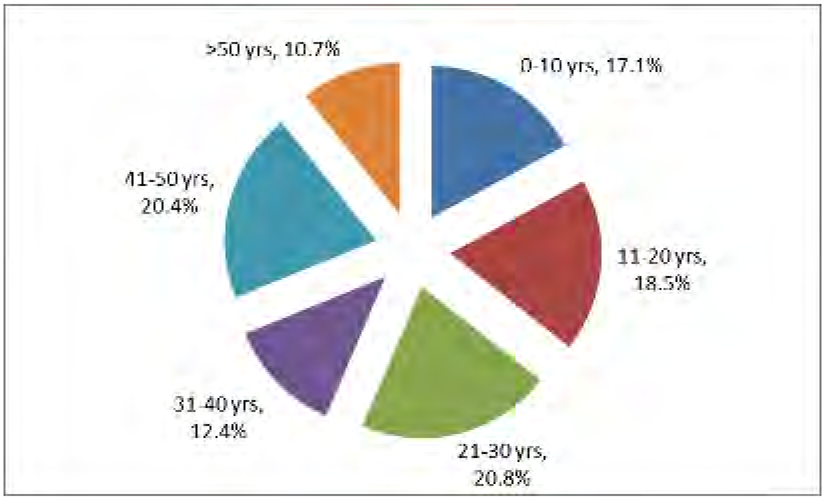
		Installed Quantity	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	>50 yrs
Overhead Lines		km						
	Overhead lines 3 ph 27.6 kV	42.3	9.7	18.2	8.5	5.9	-	-
	Overhead lines 3 ph 8.32 kV	3.9	-	-	0.6	1.8	1.4	-
	Overhead lines 3 ph 4.16 kV	39.3	-	-	2.0	7.9	9.0	18.5
	Overhead lines 1 ph 16 kV	6	1.3	2.8	1.2	0.8	-	-
	Overhead lines 1 ph 4.8 kV	1.4	-	-	0.1	0.7	0.5	-
	Overhead lines 1 ph 2.4 kV	9.8	-	-	0.5	2.0	2.3	4.6
	Total of overhead Lines	102.7	11.0	20.9	12.8	18.9	13.2	23.1

(b) Overhead Lines (North Region)

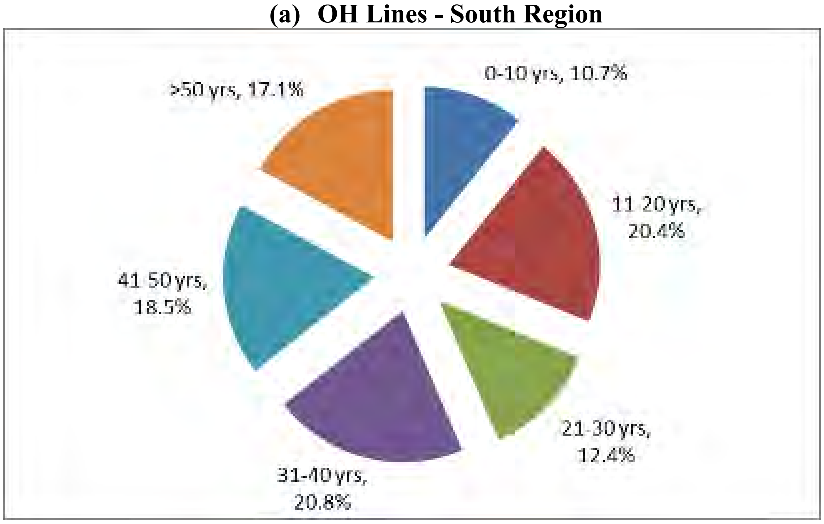
		Installed Quantity	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	>50 yrs
Overhead Lines		km	km	km	km	km	km	km
	Overhead lines 3 ph 27.6 kV	121.1	26.3	45.0	32.1	17.7	0.0	0.0
	Overhead lines 3 ph 8.32 kV	12.3	0.0	0.0	2.3	5.5	4.3	0.0
	Overhead lines 3 ph 4.16 kV	81.1	0.0	0.0	6.1	16.2	18.7	38.1
	Overhead lines 1 ph 16 kV	20.8	4.7	7.6	5.6	2.9	0.0	0.0
	Overhead lines 1 ph 4.8 kV	24.4	0.0	0.0	4.2	11.4	8.6	0.0
	Overhead lines 1 ph 2.4 kV	41.6	0.0	0.0	3.7	8.3	9.6	19.6
	Total of overhead Lines	301.3	30.9	52.6	54.0	62.0	41.2	57.7

(c) Overhead Lines (Total)

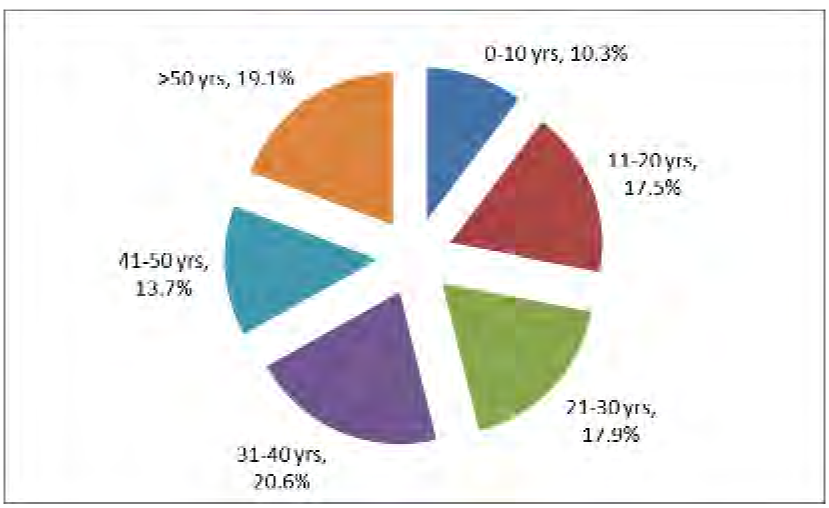
Exhibit 4-5: Overhead Line Demographic Information



(a) OH Lines - South Region



(b) OH Lines – North Region



(c) OH Lines – Total

Exhibit 4-6: Overhead Line Age Profiles

Under normal service conditions, overhead lines are expected to provide a mean service life of approximately 50 years. Exhibit 4.7 indicates the extent of lines that are currently of 40 years or older vintage and will therefore reach the end of their useful service life during the next 10 years.

		41-50 yrs	>50 yrs
Overhead Lines			
	Overhead lines 3 ph 27.6 kV	-	-
	Overhead lines 3 ph 8.32 kV	2.9	-
	Overhead lines 3 ph 4.16 kV	9.6	19.6
	Overhead lines 1 ph 16 kV	-	-
	Overhead lines 1 ph 4.8 kV	8.1	-
	Overhead lines 1 ph 2.4 kV	7.3	14.9
	Total of overhead Lines	28.0	34.6

South Region

		41-50 yrs	>50 yrs
Overhead Lines			
	Overhead lines 3 ph 27.6 kV	-	-
	Overhead lines 3 ph 8.32 kV	1.4	-
	Overhead lines 3 ph 4.16 kV	9.0	18.5
	Overhead lines 1 ph 16 kV	-	-
	Overhead lines 1 ph 4.8 kV	0.5	-
	Overhead lines 1 ph 2.4 kV	2.3	4.6
	Total of overhead Lines	13.2	23.1

North Region

		41-50 yrs	>50 yrs
Overhead Lines		km	km
	Overhead lines 3 ph 27.6 kV	0.0	0.0
	Overhead lines 3 ph 8.32 kV	4.3	0.0
	Overhead lines 3 ph 4.16 kV	18.7	38.1
	Overhead lines 1 ph 16 kV	0.0	0.0
	Overhead lines 1 ph 4.8 kV	8.6	0.0
	Overhead lines 1 ph 2.4 kV	9.6	19.6
	Total of overhead Lines	41.2	57.7

Total

Exhibit 4-7: Overhead Lines Requiring Replacement during Next 10 years

4.3 Medium Voltage Underground Circuits

Exhibit 4-8 indicates the circuit lengths of underground medium voltage cables employed on ETPL distribution system. There are no records of cable age or cable type available. In consultation with Erie Thames Power Line's operating staff, we have assigned the age profile indicated in Exhibit 4-8 to underground circuits. Exhibit 4-9 displays the underground cable circuit age profile in form of a pie chart. As indicated, the underground distribution cables in North Region are generally older in age, in relation to the cables in South Region.

		Installed Quantity	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	>50 yrs
Undrground Cicuits		km						
	Underground 3 ph cables 27.6 kV	6.8	2.0	2.0	2.0	0.7	-	-
	Underground 3 ph cables 8.32 kV	0.2	-	-	0.1	0.1	-	-
	Underground 3 ph cables 4.16 kV	2.6	-	-	0.7	0.7	0.7	0.7
	Underground 1 ph cables 16 kV	35.6	10.7	10.7	10.7	3.6	-	-
	Underground 1 ph cables 4.8 kV	3.4	-	-	1.7	1.7	-	-
	Underground 1 ph cables 2.4 kV	15.2	-	-	3.8	3.8	3.8	3.8
	Total of UG Cables	63.8	12.7	12.7	19.0	10.5	4.5	4.5

(a) Underground Lines (South Region)

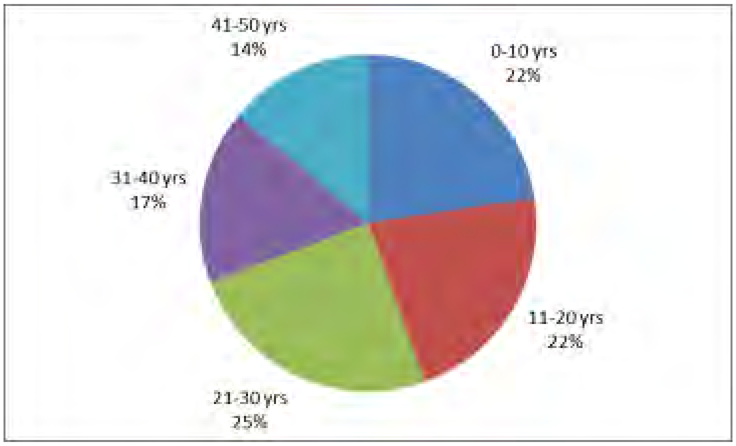
		Installed Quantity	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	>50 yrs
Underground Cables	Underground 3 ph cables 27.6 kV	0	-	-	-	-	-	-
	Underground 3 ph cables 8.32 kV	0	-	-	-	-	-	-
	Underground 3 ph cables 4.16 kV	4.5	-	-	1.1	1.1	1.1	1.1
	Underground 1 ph cables 16 kV	0	-	-	-	-	-	-
	Underground 1 ph cables 4.8 kV	0.1	-	-	0.1	0.1	-	-
	Underground 1 ph cables 2.4 kV	3.2	-	-	0.8	0.8	0.8	0.8
	Total of UG Cables	7.8	-	-	2.0	2.0	1.9	1.9

(b) Underground Lines (North Region)

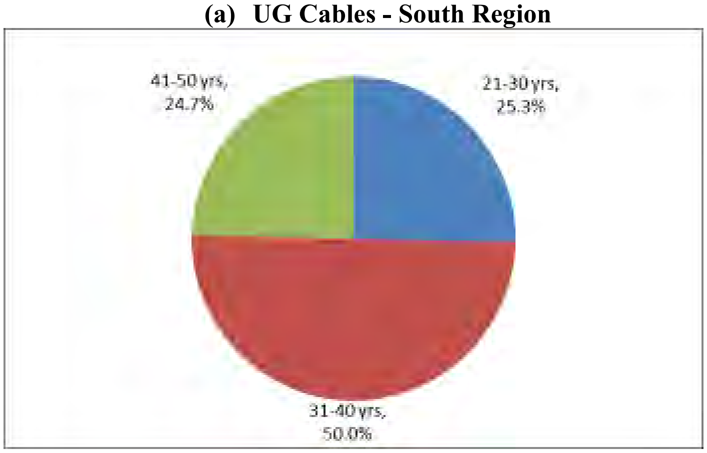
Undrground Cicuits		km						
	Underground 3 ph cables 27.6 kV	6.8	2.0	2.0	2.0	0.7	0.0	0.0
	Underground 3 ph cables 8.32 kV	0.2	0.0	0.0	0.1	0.1	0.0	0.0
	Underground 3 ph cables 4.16 kV	7.1	0.0	0.0	1.8	1.8	1.8	1.8
	Underground 1 ph cables 16 kV	35.6	10.7	10.7	10.7	3.6	0.0	0.0
	Underground 1 ph cables 4.8 kV	3.5	0.0	0.0	1.8	1.8	0.0	0.0
	Underground 1 ph cables 2.4 kV	18.4	0.0	0.0	4.6	4.6	4.6	4.6
	Total of UG Cables	71.6	12.7	12.7	20.9	12.5	6.4	6.4

(c) Underground Lines (Total)

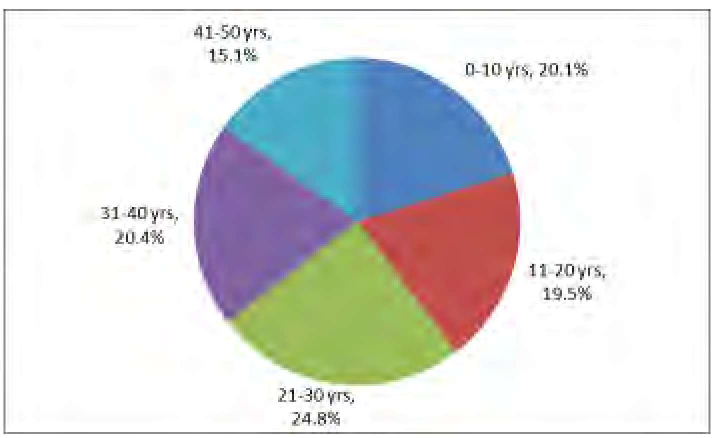
Exhibit 4-8: Underground Line Demographic Information



(a) UG Cables - South Region



(b) UG Cables – North Region



(c) UG Cables Total

Exhibit 4-9: Underground Cables

Age Profiles

Under normal service conditions, underground cables, particularly the TR XLPE insulated cables employed on 27.6 kV system and the older vintage XLPE cables employed on 4 kV system are expected to provide a mean service life of approximately 40 years. Exhibit 4.10 indicates the extent of underground cables that are currently of 30 years or older vintage and will therefore reach the end of their useful service life during the next 10 years.

		31-40 yrs	41-50 yrs
Undrground Cicuits	Underground 3 ph cables 27.6 kV	-	-
	Underground 3 ph cables 8.32 kV	0.1	-
	Underground 3 ph cables 4.16 kV	1.3	1.3
	Underground 1 ph cables 16 kV	-	-
	Underground 1 ph cables 4.8 kV	1.7	-
	Underground 1 ph cables 2.4 kV	7.6	7.6
	Total of UG Cables	10.7	8.9

South Region

		31-40 yrs	41-50 yrs
Underground Cables	Underground 3 ph cables 27.6 kV	-	-
	Underground 3 ph cables 8.32 kV	-	-
	Underground 3 ph cables 4.16 kV	2.3	1.1
	Underground 1 ph cables 16 kV	-	-
	Underground 1 ph cables 4.8 kV	0.1	-
	Underground 1 ph cables 2.4 kV	1.6	0.8
	Total of UG Cables	3.9	1.9

North Region

		31-40 yrs	41-50 yrs
Undrground Cicuits	Underground 3 ph cables 27.6 kV	0.0	0.0
	Underground 3 ph cables 8.32 kV	0.1	0.0
	Underground 3 ph cables 4.16 kV	3.6	2.4
	Underground 1 ph cables 16 kV	0.0	0.0
	Underground 1 ph cables 4.8 kV	1.8	0.0
	Underground 1 ph cables 2.4 kV	9.2	8.4
	Total of UG Cables	14.6	10.8

Total

Exhibit 4-10: UG Cables Requiring Replacement During the Next 10 Years

4.4 Distribution Transformers

Like most other LDCs, ETPL employs the strategy to run the distribution transformers to failure, i.e. replace them only after they fail and we recommend this practice to continue. However, when older vintage distribution transformers are replaced prior to their failure during voltage upgrade programs, reduction in distribution transformer losses and avoided cost of emergency repairs upon in-service failures provides additional financial incentives in support of early replacement of old vintage distribution transformers.

Energy loss in distribution transformers takes place in two forms: (a) iron loss consisting of eddy current and hysteresis loss, which represents the energy loss in conversion of electric energy into magnetic energy and from magnetic energy back into electric energy in a transformer and (b) copper loss which represents the I^2R loss due to current flow in transformer windings.

Over the years with technological advancements energy losses in transformers have been decreasing with energy efficient designs and improvement in designs and materials. Exhibit 4-25 illustrates the typical energy efficiency of distribution transformers built over different time periods during the last 50 years.[1] The slope of the chart in Exhibit 4-25 indicates that the energy efficiency of distribution transformers has been improving at the rate of approximately 0.025% per year; or in other words by replacing a 40 year old distribution transformer with a modern transformer, energy efficiency of the transformer could be improved by about 1%.

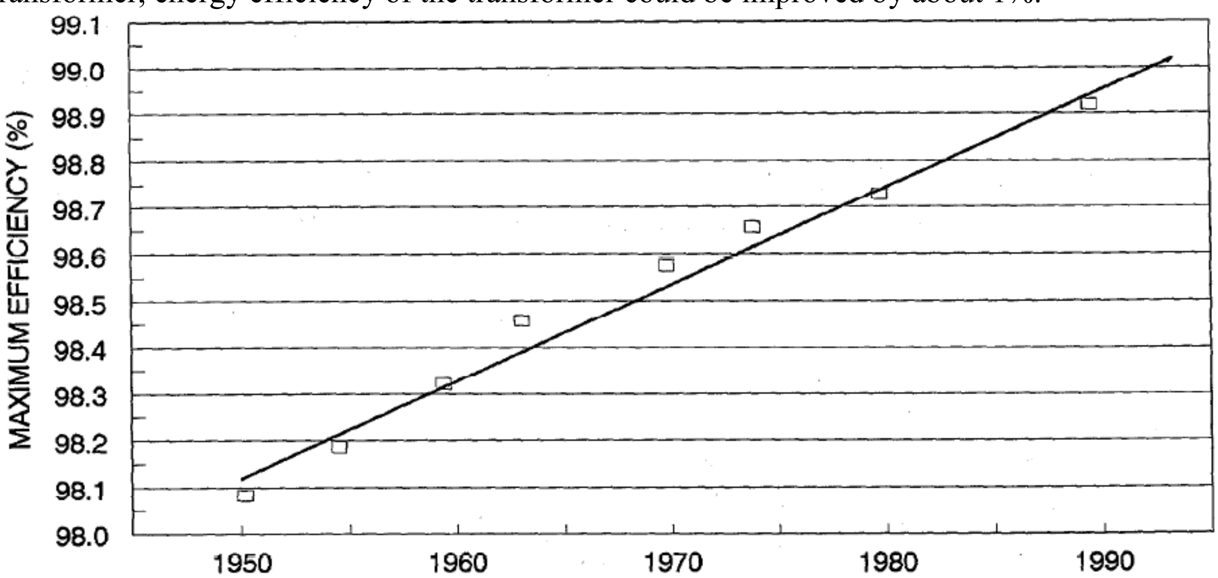


Exhibit 4-11: Energy Efficiency of Distribution Transformers Built at Different Times during the Last 50 years

The second direct financial benefit from proactive replacement of distribution transformer occurs in form of avoided emergency repair costs. Proactive and planned replacement of distribution transformers reduces the labor costs by almost 75% from those incurred in emergency repairs upon in-service failure of a distribution transformer. Proactive replacement of distribution transformers also results in non-tangible benefits in form of improved reliability and reduced risk of tank rupture or oil spill during an eventful failure of an old transformer.

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[1] U.S. Department of Energy (DOE), Annual Energy Outlook, 1994, DOE/EIA-0383(93)

In the absence of nameplate data for distribution transformers, we have assumed a uniformly distributed age profile for different age groups of distribution transformers, as shown in Exhibit 4-12. The single phase transformers listed in Exhibit 4-12 also include those employed on pole mounted three phase transformer banks. Assuming an average life expectancy of 40 years for distribution transformers, Exhibit 4-13 shows the indicative number of distribution transformers that would require replacement (upon failure), during the next 10 years.

		Installed Quantity	0-10 yrs	11-20 yrs	21-30 yrs	31-40 yrs	41-50 yrs	>50 yrs
Overhead Dist Transformers	Pole mounted 5 kVA, 1-ph	11	2	2	2	2	0	0
	Pole mounted 10 kVA, 1-ph	61	12	12	12	9	3	0
	Pole mounted 15 kVA, 1-ph	62	12	12	12	9	3	0
	Pole mounted 25 kVA, 1-ph	466	93	93	93	70	23	0
	Pole mounted 37 kVA, 1-ph	205	41	41	41	31	11	0
	Pole mounted 50 kVA, 1-ph	780	156	156	156	117	39	0
	Pole mounted 75 kVA, 1-ph	404	81	81	81	61	20	0
	Pole mounted 100 kVA, 1-ph	182	36	36	36	27	9	0
	Pole mounted 167 kVA, 1-ph	67	14	14	14	10	3	0
	Total of OH transformers	2238	447	447	447	336	111	0
Underground Transformers	Padmount 25 kVA, 1-ph	2	0	0	0	0	0	0
	Padmount 50 kVA, 1-ph	303	61	61	61	46	28	0
	Padmount 75kVA, 1-ph	194	39	39	39	16	10	0
	Padmount 100 kVA, 1-ph	41	8	8	8	6	2	0
	Padmount 167 kVA, 1-ph	5	1	1	2	1	0	0
	Padmount 45 kVA, 3-ph	2	0	0	2	0	0	0
	Padmount 75 kVA, 3-ph	5	1	1	1	0	0	0
	Padmount 150 kVA, 3-ph	12	2	2	2	2	4	0
	Padmount 225 kVA, 3-ph	20	4	4	4	3	1	0
	Padmount 300 kVA, 3-ph	38	8	8	8	5	6	0
	Padmount 500 kVA, 3-ph	17	3	3	3	2	1	0
	Padmount 750 kVA, 3-ph	15	3	3	3	2	2	0
	Total of Pad mounted Transformers	654	130	130	133	83	54	0

Exhibit 4-12: Pole-mounted and Pad-mounted Distribution Transformers

		31-40 yrs	41-50 yrs
Overhead Dist Transformers	Pole mounted 5 kVA, 1-ph	2	0
	Pole mounted 10 kVA, 1-ph	9	3
	Pole mounted 15 kVA, 1-ph	9	3
	Pole mounted 25 kVA, 1-ph	70	23
	Pole mounted 37 kVA, 1-ph	31	11
	Pole mounted 50 kVA, 1-ph	117	39
	Pole mounted 75 kVA, 1-ph	61	20
	Pole mounted 100 kVA, 1-ph	27	9
	Pole mounted 167 kVA, 1-ph	10	3
	Total of OH transformers	336	111
Underground Transformers	Padmount 25 kVA, 1-ph	0	0
	Padmount 50 kVA, 1-ph	46	28
	Padmount 75kVA, 1-ph	16	10
	Padmount 100 kVA, 1-ph	6	2
	Padmount 167 kVA, 1-ph	1	0
	Padmount 45 kVA, 3-ph	0	0
	Padmount 75 kVA, 3-ph	0	0
	Padmount 150 kVA, 3-ph	2	4
	Padmount 225 kVA, 3-ph	3	1
	Padmount 300 kVA, 3-ph	5	6
	Padmount 500 kVA, 3-ph	2	1
	Padmount 750 kVA, 3-ph	2	2
	Total of Pad mounted Transformers	83	54

Exhibit 4-13: Pole-mounted and Pad-mounted Distribution Transformers Requiring Replacement During Next 10 Years

4.5 *Other Line Assets:*

Other distribution line assets include low voltage customer service drops. The expected service life of LV service lines is substantially longer than the medium voltage lines and they should not require significant investment for sustainment, during the next 10 years.

4.6 *Distribution Substations:*

Distribution Substations on ETPL' system step down power from 27.6 kV to 4.16 kV. There are a total of 10 distribution stations owned and operated by ETPL'. The main components of the substations include:

(a) 27.6 kV fused disconnect
(b) Power Transformers
(c) 4 kV Switchgear or recloser
(d) Substation Buildings and yards

Based on visual inspections of the substations equipment and service age, the relative ranking of the health and condition of stations is summarized in Exhibit 4.14.

All of the distribution stations are expected to reach the end of their useful service life within the next 15 years. Based on the condition of the major power equipment employed at the stations, the following stations will need to be either rebuilt/replaced or retired, with conversion of the 4 kV distribution systems to 27.6 kV, during the next 10 years:

(a) Clinton MS 2
(b) Aylmer Forest DS
(c) Mitchel DS
(d) Ingersoll MS#3
(e) Clinton MS1
(f) Tavistock DS.

The equipment employed at Clinton MS #2 and Aylmer Forest, is particularly old and obsolete and these two stations are virtually at the end of their economic service life now.

						Condiition Assessment					
	Station Rating	No. of 4 kV feeders	27 kV Switchgear	4 kV switchgear	Estimated Xformer Age (Yrs)	Results of Xformer Oil	Xformer Visual Inspection	27 kV Switchgear	4 kV Switchgear	Overall Score (Out of 45)	Priority for Conversion and Station Retirement
Clinton MS 2	3 x 1 MVA	3	Fused Disconnect	Reclosers mounted	80	2	3	2	2	6	1
Aylmer Forest	1 X 3.6 MVA	2	Pole mounted	Pole mounted	55	2	3	3	3	10.5	2
Mitchel	1 x 3 MVA	2	Pole mounted	S&C Outdoor	43	3	3	4	4	14.7	3
Ingersol MS#3	1 x 5 MVA	3	S&C Padmounted	ITE magnetic	45	3	4	4	4	15.5	4
Clinton MS1	1 X 5 MVA	4	Pole mounted	Indoor metal clad	40	3	4	4	4	16	5
Tavistock DS	1 x 5 MVA	3	Pole mounted	ITE magnetic	40	3	4	4	4	16	6
Beachville DS	1 x 3 MVA	2	S&C Padmounted	Pole mounted	35	3	5	4	3	16.5	7
Aylmer BcBrien	2 x 3 MVA	4	Pole mounted	Pad mounted	31	3	4	4	4	16.9	8
Port Stanley	1 x 5 MVA	3	S&C Padmounted	Indoor switchgear	32	3	5	4	4	17.8	9
Ingersol MS #1	1 x 5 MVA	3	S&C Padmounted	CGE metal clad	25	3	6	4	4	19.5	10

Exhibit 4-14: Distribution Station Condition Assessment Summary

4.7 Smart Grid Initiative:

Ontario Energy Board has mandated the local distribution companies (LDCs) to develop and implement smart grid initiative within their jurisdictions to improve reliability and operating efficiency of the distribution grid and to increase its capacity to accept connection of distributed generation from environmentally friendly initiatives. A significant part of ETPL distribution systems currently operates at 4 kV, which is planned to be upgraded to 27.6 kV operating voltage.

There is virtually no automation currently in existence at the 27.6/4.16 kV distribution substations. But because the aging distribution stations are fast approaching the end of their service life and will be all retired from service during the next 15 years, we are not recommending any investments for automation in these substations.

Voltage upgrade initiatives provide a number of benefits, including reduce system losses, lower operating costs and increased capacity for small scale generation from renewable resources. However, because 27.6 kV feeders are significantly longer in relation to 4 kV feeders, in the absence of automated sectionalizing, they can result in degradation of reliability. We are therefore proposing a pilot project involving use of fully automated switching to reconfigure the overhead radial circuits into a loop and to isolate faulted lines to improve supply system reliability of distribution system serving commercial customers in Ingersoll. The conceptual design of the recommended smart grid initiative is shown in Exhibit 4.15.

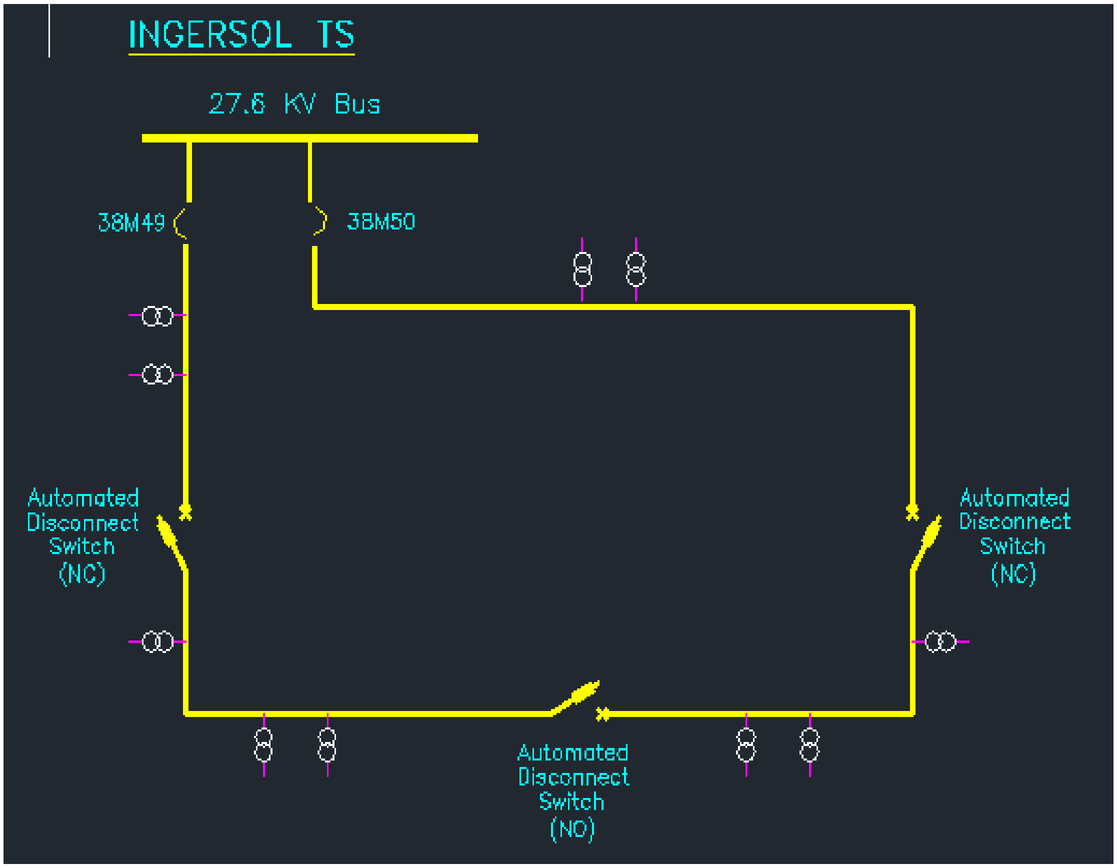


Exhibit 4-15: Smart Grid Pilot Project Initiative

No micro-FIT or FIT applications have been refused to date due to lack of adequacy of distribution system capacity. Aside from the system capacity increase which would result from planned voltage conversions, no additional reinforcements are required to facilitate implementation of the small scale green energy generation within ETPL's service territory.

4.8 Preventative Maintenance:

We have reviewed the fixed asset preventative maintenance program currently in use at ETPL and determined that it is in line with the best utility practices. The reliability performance over the recent years, indicted in Exhibit 4-16, provide evidence that the current preventative maintenance strategy is working well. Therefore, no changes are recommended in the preventative maintenance program, which is briefly described below:

(a) Critical assets installed in substations are inspected monthly. Major maintenance on substation equipment is carried out on a 5-year cycle, but the scope of the maintenance is determined based on the asset needs by taking into account asset condition.

(b) Overhead lines and underground pads are inspected on a 3-year cycle, to comply with Electrical Safety Authority's regulations.

(c) Load Break Switch Maintenance has been carried out on a 5-year cycle in the past, which has been considered to be satisfactory.

(d) Tree trimming has been carried out on a 3–year cycle in the past, which we consider to be satisfactory.

(e) In accordance with the best utility practices, thermograph inspections of distribution assets are carried out with infra-red cameras and any hot spots are promptly attended. From our review of the test results for the past year, the thermograph inspections appear to be extremely effective in detecting incipient faults and we recommend these should be continued as part of the maintenance program.

(f) Due to the advanced age of distribution stations, power transformer oil samples are obtained and tested annually. The results of previous years oil testing have been used in assessing and ranking the condition of power transformers employed at distribution stations.

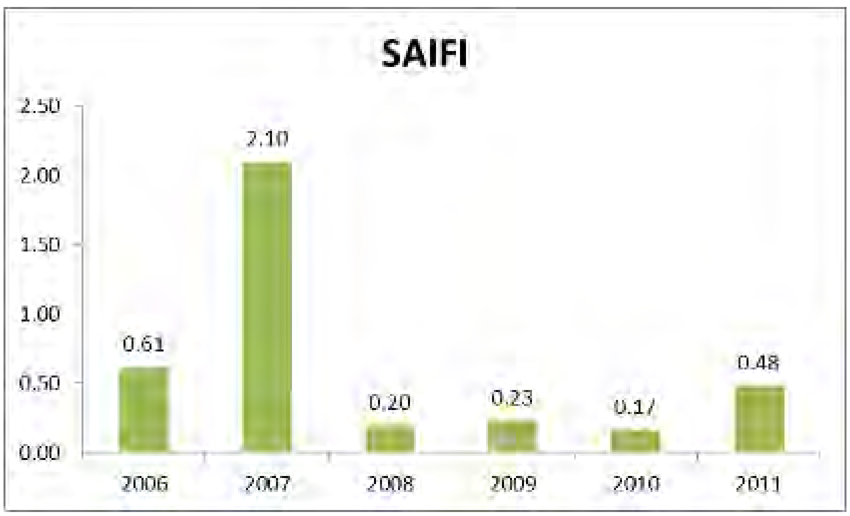


Exhibit 4-16: Reliability Performance

5 Asset Management Plan - Capital and Maintenance Investments

Based on the condition assessment of major assets employed in substations, overhead lines and underground distribution system, this section provides the budgetary estimates of capital investments required during the next ten years to keep the system operating at optimal levels. Recommendations for a preventative maintenance program are also provided.

5.1 Overall Long Term Capital Expenditure Requirements

Based on the 2011 replacement cost estimate of assets, under assumptions detailed in Exhibit 5.1, average capital expenditure of approximately $1,960,000 would be required annually to sustain the assets presently employed on overhead and underground distribution system. This cost estimate does not include capital expenditure into substations. It also does not include investments needed for system expansions and extensions required to serve new loads.

In line with the established best utility practices, we have assumed that the 4 kV distribution lines will be rebuilt and upgraded to 27.6 kV when they reach the end of their service life, thus eliminating the need for 27.6 to 4 kV step-down substations. This approach will result in avoidance of substation rebuild costs detailed in Exhibit 5.2.

However owing to inadequate level of investment during the past years, investment levels over the next 10 years will need to be higher than the above indicated annual average investment level. The following sections describe in detail the level of capital investments needed.to sustain distribution assets in safe and reliable condition.

		Installed Quantity	Estimated Replacement Unit Cost	Estimated Replacement Total Cost	Annual Sustainment Cost
Overhead Lines		km	$	$	
	Overhead lines 3 ph 27.6 kV	121.1	200	24 220 000	
	Overhead lines 3 ph 8.32 kV	12.3	200	2 460 000	
	Overhead lines 3 ph 4.16 kV	81.1	200	16 220 000	
	Overhead lines 1 ph 16 kV	20.8	100	2 080 000	
	Overhead lines 1 ph 4.8 kV	24.4	100	2 440 000	
	Overhead lines 1 ph 2.4 kV	41.6	100	4 160 000	
	Total of overhead Lines	301.3		51 580 000	1 031 600
Overhead Dist Transformers		#	$		
	Pole mounted 5 kVA, 1-ph	11	3000	33 000	
	Pole mounted 10 kVA, 1-ph	61	3500	213 500	
	Pole mounted 15 kVA, 1-ph	62	4000	248 000	
	Pole mounted 25 kVA, 1-ph	466	4500	2 097 000	
	Pole mounted 37 kVA, 1-ph	205	5500	1 127 500	
	Pole mounted 50 kVA, 1-ph	780	6000	4 680 000	
	Pole mounted 75 kVA, 1-ph	404	7000	2 828 000	
	Pole mounted 100 kVA, 1-ph	182	8500	1 547 000	
	Pole mounted 167 kVA, 1-ph	67	10500	703 500	
	Total of OH transformers	2238		13 477 500	336 938
Disconne	27.6 kV 3 ph load break switches	71	4500	319 500	
	4.16 kV 3 ph load break switches	30	2500	75 000	
	Total of Disconnect Switches	101		394 500	
Undrground Cicuits		km			
	Underground 3 ph cables 27.6 kV	6.8	350	2 380 000	
	Underground 3 ph cables 8.32 kV	0.2	350	70 000	
	Underground 3 ph cables 4.16 kV	7.1	350	2 485 000	
	Underground 1 ph cables 16 kV	35.6	150	5 340 000	
	Underground 1 ph cables 4.8 kV	3.5	150	525 000	
	Underground 1 ph cables 2.4 kV	18.4	150	2 760 000	
	Total of UG Cables	71.6		13 560 000	339 000
Underground Transformers		#			
	Padmount 25 kVA, 1-ph	2	8800	17 600	
	Padmount 50 kVA, 1-ph	303	10200	3 090 600	
	Padmount 75kVA, 1-ph	194	11600	2 250 400	
	Padmount 100 kVA, 1-ph	41	13200	541 200	
	Padmount 167 kVA, 1-ph	5	16800	84 000	
	Padmount 45 kVA, 3-ph	2	15500	31 000	
	Padmount 75 kVA, 3-ph	5	22600	113 000	
	Padmount 150 kVA, 3-ph	12	25500	306 000	
	Padmount 225 kVA, 3-ph	20	28500	570 000	
	Padmount 300 kVA, 3-ph	38	34400	1 307 200	
	Padmount 500 kVA, 3-ph	17	46700	793 900	
	Padmount 750 kVA, 3-ph	15	61500	922 500	
	Total of Pad mounted Transformers	654		10 027 400	250 685
	Total Annual sustainment Cost				1 958 223

Exhibit 5-1: Estimate of Annual Capital Investment to Sustain Existing Asset Base

	Station Rating	No. of 4 kV feeders	27 kV Switchgear	4 kV switchgear	Estimated Replacement
Clinton MS 2	3 x 1 MVA	3	Fused Disconnect	Reclosers mounted on OH structure	$ 600 000
Elmer Forest	1 X 3.6 MVA	2	Pole mounted Fused Disconnect	Pole mounted Fused	$ 660 000
Mitchel	1 x 3 MVA	2	Pole mounted Fused Disconnect	S&C Outdoor Switchgear metal enclosed	$ 600 000
Ingersol MS#3	1 x 5 MVA	3	S&C Padmounted Fused Disconnect	ITE magnetic air breakers	$ 800 000
Clinton MS1	1 X 5 MVA	4	Pole mounted Fused Disconnect	Indoor metal clad switchgear	$ 800 000
Beachville DS	1 x 3 MVA	2	S&C Padmounted Fused Disconnect	Pole mounted Reclosers	$ 600 000
Elmer BcBrien	2 x 3 MVA	4	Pole mounted Fused Disconnect	Pad mounted S&C Switchgear	$ 900 000
Tavistock DS	1 x 5 MVA	3	Pole mounted Fused Disconnect	ITE magnetic air breakers	$ 800 000
Port Stanley	1 x 5 MVA	3	S&C Padmounted Fused Disconnect	Indoor switchgear with breakers	$ 800 000
Ingersol MS #1	1 x 5 MVA	3	S&C Padmounted Fused Disconnect	CGE metal clad breakers	$ 800 000
Total Estimated Replacement Cost of All Stations					$ 7 360 000

Exhibit 5-2: Estimate of Substation Rebuild Cost (Avoided with Voltage Upgrade

5.2 Overhead Lines

Based on the condition of existing overhead lines described in Section 4, Exhibit 5.3 indicates the approximate circuit length of 4 kV lines that would reach a service life of 50 years or greater over the next 10 years. In order to keep the risk of in-service equipment failures at acceptable level and to prevent deterioration in supply system reliability and safety, budgetary estimates for replacement of 1-ph and 3-ph 4 kV overhead lines and upgrade to 27.6 kV during the next 10 years are provided in Exhibit 5-3.

A number of the 4 kV to 27 kV voltage upgrade initiatives carried out during previous decades, have been completed using inadequate pole heights and pole top extensions that no longer meet the current construction standards. These lines require replacement of some poles with taller poles to conform to current standards. It is estimated that approximately 5% of the existing overhead lines would require upgrades during the next 10 years.

Exhibit 5-3 indicates estimates of capital investments required into overhead lines for voltage upgrade of 4 kV lines, as well as for replacement of sub-standard poles on 27 kV lines during the next 10 years.

	Installed Quantity	Replacement /Rebuild Required Over 10 years	CAPEX Required Over 10 Years	Annual CAPEX
	km	km	$	$
Overhead lines 3 ph 27.6 kV	121.1	6.1	1 211 000	
Overhead lines 3 ph 8.32 kV	12.3	4.3	861 000	
Overhead lines 3 ph 4.16 kV	81.1	56.8	11 354 000	
Overhead lines 1 ph 16 kV	20.8	1.0	104 000	
Overhead lines 1 ph 4.8 kV	24.4	8.6	863 760	
Overhead lines 1 ph 2.4 kV	41.6	29.1	2 912 000	
Total of overhead Lines	301.3		17 305 760	1 730 576

Exhibit 5-3: Capital Investment Needs – OH Lines

5.3 Underground Cable System

Based on the condition of existing underground cables described in Section 4, Exhibit 5-4 shows the circuit length of cables that will reach the end of economic service life of 40 years, during the next 10 years. In order to prevent deterioration in supply system reliability due to excessive cable failures, Exhibit 5-4 provides budgetary estimates for replacement of 1-ph and 3-ph cables during the next 10 years.

		Installed Quantity	Replacement /Rebuild Required Over 10 years	CAPEX Required Over 10 Years	Annual CAPEX
Undrground Cicuits	Underground 3 ph cables 27.6 kV	6.8	0.0	-	
	Underground 3 ph cables 8.32 kV	0.2	0.1	35 000	
	Underground 3 ph cables 4.16 kV	7.1	6.0	2 091 250	
	Underground 1 ph cables 16 kV	35.6	0.0	-	
	Underground 1 ph cables 4.8 kV	3.5	1.8	262 500	
	Underground 1 ph cables 2.4 kV	18.4	17.6	2 640 000	
	Total of UG Cables	71.6		5 028 750	502 875

Exhibit 5-4: Capital Investment Needs - U/G Cables

5.4 Distribution Transformers:

Exhibits 5-5 and 5-6, respectively, provide budgetary estimates for replacement of pole and pad mounted transformers that are expected to fail during the next 10 years.

		Installed Quantity	Replacement /Rebuild Required Over 10 years	CAPEX Required Over 10 Years	Annual CAPEX
Overhead Dist Transformers		#			
	Pole mounted 5 kVA, 1-ph	11	2	6 000	
	Pole mounted 10 kVA, 1-ph	61	12	42 000	
	Pole mounted 15 kVA, 1-ph	62	12	48 000	
	Pole mounted 25 kVA, 1-ph	466	93	418 500	
	Pole mounted 37 kVA, 1-ph	205	42	231 000	
	Pole mounted 50 kVA, 1-ph	780	156	936 000	
	Pole mounted 75 kVA, 1-ph	404	81	567 000	
	Pole mounted 100 kVA, 1-ph	182	36	306 000	
	Pole mounted 167 kVA, 1-ph	67	13	136 500	
	Total of OH transformers	2238		2 691 000	269 100

Exhibit 5-5: Capital Investment Needs – Pole-mounted Transformers

		Installed Quantity	Replacement /Rebuild Required Over 10 years	CAPEX Required Over 10 Years	Annual CAPEX
Underground Transformers	Padmount 25 kVA, 1-ph	2	0	-	
	Padmount 50 kVA, 1-ph	303	74	754 800	
	Padmount 75kVA, 1-ph	194	26	301 600	
	Padmount 100 kVA, 1-ph	41	8	105 600	
	Padmount 167 kVA, 1-ph	5	1	16 800	
	Padmount 45 kVA, 3-ph	2	0	-	
	Padmount 75 kVA, 3-ph	5	0	-	
	Padmount 150 kVA, 3-ph	12	6	153 000	
	Padmount 225 kVA, 3-ph	20	4	114 000	
	Padmount 300 kVA, 3-ph	38	11	378 400	
	Padmount 500 kVA, 3-ph	17	3	140 100	
	Padmount 750 kVA, 3-ph	15	4	246 000	
	Total of Pad mounted Transformers	654		2 210 300	221 030

Exhibit 5-6: Capital Investment Needs – Pad-mounted Transformers

5.5 Recommended CAPEX Investments into Asset Sustainment:

Exhibit 5-7 provides a summary of the overall annual capital expenditure required during the next 10 years for asset sustainment.

	CAPEX Required Over 10 Years	Annual CAPEX
	$	$
Total of overhead Lines	17 305 760	1 730 576
Total of OH transformers	2 691 000	269 100
Total of UG Cables	5 028 750	502 875
Total of Pad mounted Transformers	2 210 300	221 030
Total Annual sustainment Cost	27 235 810	2 723 581

Exhibit 5-7: Overall Capital Investment Needs – Asset Sustainment

5.6 Recommended CAPEX Investments into Smart Grid:

In addition to the capital investments proposed in Exhibit 5-7, capital budget of approximately $200,000 year over year will be required to procure equipment and implement the proposed smart grid pilot project,. Phase 1, ETPL is budgeting in 2012 the introduction of a SCADA system that will provide real time data on the distribution systems throughout our service territory. The system will requires annual upgrades to either hardware or software to improve system security, as well as the integration of new devices (automated switch's) to enhance smart grid automation going forward. ETPL will be installing automated switches on the distribution system to help improve system performance and monitoring. These switches are able to determine where a fault has occurred on the distribution system, and reconfigure the system to minimize the number of affected customers. ETPL will initially conduct a small pilot project in 2013, described in Section 4-7, with three of these switches, and when the project is deemed successful, a plan will be created for additional switches to be added over the next several years as required. The location and quantity of switches will be studied, optimized and finalized during the Annual Capital Budget preparation, based on performance history (feeder reliability statistics – targeting the worst performing feeders) and future use (load growth considerations). Ongoing maintenance costs to the SCADA system will be a low cost item set in the Annual Maintenance Budget.

5.7 Non-Discretionary CAPEX Investments Requirements:

ETPL is required to invest into distribution system extensions and expansions to meet its regulatory obligations to serve new residential and commercial customers within its service territory. Based on prior years' experience an annual investment of $285,000 is required to cover such capital expenditures.

Similarly, the LDC is required to relocate its lines installed in the public right of ways when requested by the local municipalities in conjunction with their road widening projects. Historically, ETPL have incurred approximately $50,000 capital cost, annually to cover such expenditure, which is expected to continue.

5.8 Revenue Metering Investments:

ETPL's Revenue metering requirements have been reviewed and approximately $45,000 in capital investment is needed annually to purchase approximately 40 C&I meters at $400/meter and approximately 200 residential meters at $100/meter plus test blocks and miscellaneous items. During 2012 an additional investment of $10,000 is required to build up the necessary inventory of revenue meters to satisfy the measurement Canada requirement for compliance sampling.

5.9 Information Technology (IT) System Investments:

Based on the historical capital expenditures, approximately $25,000 of annual investment is needed for IT systems sustainment to replace/upgrade approximately 10 computers, printers and monitors. An additional $40,000 of capital investments is needed, annually for building/leasehold improvements, upgrades and office furniture and equipment.

5.10 Buildings and Fixtures

These include two main buildings (Ingersoll Business Administration and Operations Service Centre Hub along with Aylmer Service Centre) as well as two distribution substation buildings, a storage switch gear substation building, and a leased service depot in the town of Mitchell as well as in Clinton. These assets are inspected monthly by staff, and major components (such as HVAC units) are inspected by external contractors annually. Major upgrades such as HVAC replacements and roof replacements are included as part of the Annual Capital Budget submission. In most cases, replacements or upgrades are determined based on physical condition, maintainability, and safety impacts, but where possible, upgrades that improve energy efficiency (such as occupancy sensors) and security enhancements are also considered. The Ingersoll Operations building had a new roof installed in 2008Repairs or replacements that do not meet the capitalization policy are put into the Annual Maintenance Budget for this category (which also includes tasks such as snow removal, lawn care, etc).
ETPL is not expected to incur any major capital investments to the existing building over the next 5 years and therefore is budgeting $40,000 per year for general improvements based on past years of experience.

5.11 Tools and Equipment

Tools and miscellaneous equipment includes devices used to assist in various aspects of the operation. Purchases that exceed $1000 are generally capitalized, with the remainder being charged to maintenance. During the Annual Capital Budget preparation, tools and other equipment are identified for replacement or purchase, primarily based on physical condition. Typically, these tend to be several relatively low cost items that are replacing existing units that have reached the end of their useful life. Most of these items are inspected routinely as well as being inspected prior to use by the worker. When the item requires a significant repair that approaches half the cost of replacement, the item is then replaced. Due to the unpredictable nature of these types of equipment failures, specific items are not always identified in the Budget, but may be grouped into categories such as replacement of safety equipment, replacement of operations tools, etc. The Annual Maintenance Budget for this category is normally based on prior years' experience. Erie Thames is budgeting $35,000 year over year for tools and equipment based on past years expenditures. In 2012 ETPL will be required to spend an additional onetime spend of $40,000 for a new pole trailer and fork lift for the Hwy 8 operations.

5.12 Motor Vehicle Fleet

Exhibit 5-8 summarizes all operating motor vehicle owed by ETPL and the replacement timeframe, inclusive of the HWY 8 operations vehicles, Clinton Power (CPC) and West Perth Power (WPP). A report covering a five year motor vehicle investment plan was reviewed and approved by the ETPL board in 2010 prior to the merge of the three LDC's.

The report recommends replacing one - large bucket truck or RBD at a cost of $300,000 each and one pickup truck or van at a cost of $40,000 each year, for a total annual investment of $340,000 over the next 5 years, beginning in 2011. ETPL's vehicle spend in 2011 was $390,000 inclusive of Hwy 8 North Operations, CPC and WPP. ETPL anticipates through the merge of the three LDC's one RBD will be deemed surplus to the overall operations. The RBD being surplus has reached its end of useful life allowing $300,000 in cost avoidance and allowing ETPL to stick with the 5 year plan with very little change.

The fleet assets consist of the large construction vehicles (such bucket trucks and radial boom derricks), passenger vehicles, and trailers. The upgrading or replacement of these assets is based on the physical condition, performance history, maintenance records, and maintainability. The physical condition is monitored by employees (workers and fleet mechanic) and annual independent testing and inspections. The performance history and maintenance records are tracked and kept on file and the status is reviewed annually to set priorities and a five year replacement schedule. Maintainability is assessed annually by the operations manager to ensure parts are readily available. Each asset has a set maintenance schedule based on either manufacturer recommendations or good utility practice. During the Annual Capital Budget preparation, all the criteria are reviewed to set priorities and determine the replacement schedule. This review is summarized in exhibit 5-8. Due to the long lead time required for the larger construction vehicles, replacements are ordered approximately 12 months before they are expected to be required. A vehicle is scheduled for replacement when the physical condition is rated as "fair" or "poor", the performance history indicates issues experienced in the past, and the maintenance records show a trend to increasing repair costs (above the average for that type of asset), along with excessive mileage, end of useful life expectancies and applied utilization factor for the vehicle. The Annual Maintenance Budget for this category is based on the average costs for replacements based on the assessed needs plus any known major repairs that are expected.

TRUCK	Description	Location	MODEL	YEAR	Maint $	ODOMETER	MAINT $	Utilization	Condition	Recommend
					2009	2010 KM	2010			
01-02	1500 Ing Foreman	Ing	DODGE	2002	$ 1,464.13	177107	$ 1,937.17	5	Poor	replace in 2012
03-02	1500 Yard Truck	Ing	DODGE	2002	$ 2,269.44	164265	$ 580.86	2	Fair	replace in 2015
05-07	47' single bucket mat.	Ayl	FRHT	2007	$ 7,810.48	52337	$ 3,463.69	5	Good	
06-11	CHEV SIVERADO PICKUP	Ayl	CHEV	2011		n/a		4	Very Good	pickup replacement
07-02	50' single bucket mat.	Ayl	FRHT	2002	$ 4,532.76	121843	$ 3,775.42	3	Fair	replace in 2016
08-07	RBD Ayl single axel	Ayl	INTL	2007	$ 5,786.46	17912	$ 3,107.80	3	Very Good	
10-11	GMC SIERRA PICKUP	HWY 8	GMC	2011		n/a		4	Very Good	pickup replacement
11-92	42' Amador Single Bucket	HWY 8	INTL	1992		56785	>$6000	4	Very Poor	replace in 2012
12-92	RBD King K14	HWY 8	GMC	1992		46886	<$5000	3	Poor	surplus 2013
13-08	Dodge Ram 4X4	HWY 8	DODGE	2008		42877	<$2000	5	Good	
14-10	Ford Pickup	HWY 8	Ford	2009		32380	<$2000	4	Good	
15-09	50' Double Buck Posi	HWY 8	FRHT	2010		2387	<$3000	5	Very Good	
16-09	Terex 40-47 RBD	HWY 8	INTL	2009		14300		3	Very Good	demo bought in 2011
20-02	50' single bucket mat.	Ing	FRHT	2002	$ 7,216.39	120334	$ 7,981.22	5	Fair	replace in 2014
21-97	50' double bucket mat.	Ing	FRHT	1997	$ 4,986.45	10601	$ 7,825.47	3	Poor	replace in 2013
22-06	RBD Ing tandem axel	Ing	INTL	2005	$ 3,549.66	40856	$ 3,073.88	3	Good	
23-05	42' single bucket	Ing	FRHT	2005	$ 9,763.44	128314	$ 5,758.20	5	Fair	replace in 2015
24-07	Caravan	Ing	DODGE	2007	$ 500.09	59602	$ 1,050.61	4	Fair	replace in 2015
25-07	Caravan	Ing	DODGE	2007	$ 772.53	102319	$ 606.57	4	Fair	replace in 2014
29-11	GMC SIERRA PICKUP	Ing	GMC	2011		n/a		4	Very Good	pickup replacement
30-02	1500 4x4	Ing	DODGE	2002	$ 3,315.30	113051	$ 1,595.49	4	Fair	
31-11	GMC Terrain	HWY 8	GMC	2011		n/a		4	Very Good	pickup replacement
34-06	Caravan	Ing	DODGE	2006	$ 93.81	41329		5	Fair	replace in 2014
36-08	2500 4X4 (stores)	Ing	DODGE	2008	$ 412.09	45562	$ 1,020.02	3	Good	
40-08	CHEV 4X4	Ing	CHEV	2008	$ 8,218.52	22000	$ 621.84	2	Good	
41-09	VUE Hybrid (Engineering)	Ing	SATURN	2009	$ 1,884.34	53323	$ 68.25	3	Good	
42-09	NISSAN	Ing	NISSAN	2009		71300		3	Good	
02-12	Ford Escape Hybrid	Ing	FORD	2012		n/a		3	Very Good	van replacement

Exhibit 5-8: Motor Vehicle Inventory

5.13 Estimate of Annual Capital Expenditure:

Based on the various capital expenditure requirements itemized in Sections 5.1 to 5.13 Exhibit 5-9 represents a prudent and optimal estimate of total capital investments, required annually.

	Annual CAPEX
Annual capital expenditure for sustainment of fixed distribution assets	2 300 000
Annual capital expenditure to permit new connections and service upgrades	285 000
Annual capital expenditure to permit municipal road upgrades	50 000
Annual capital expenditure in revenue metering and equipment	45 000
Annual capital expenditure in tools and equipment	35 000
Annual capital expenditure IT equipment	25 000
Annual capital expenditure on building improvements, office equip & furniture	40 000
Annual capital expenditure on motor vehicle fleet-$340k, trailer & forklift-$40k	380 000
Total annual capital expenditure requirement	3 325 000

Exhibit 5-9: Overall Annual Capital Investment Requirements

Appendix A

Distribution Station Photographs

A1-Beachville DS

A2-Clinton DS#1

A3-Clinton DS#2

A4-Aylmer Forest DS




A5-Aylmer Mcbrien DS

A6-Ingersoll MS #1

A7-Ingersoll MS#3

A8-Mitchell DS

A9-Pt Stanley DS

A10-Tavistock DS

APPENDIX H - 2015 ASSET MANAGEMENT PLAN (ETPL)

ERIE THAMES POWERLINES

Asset Condition Assessment (ACA) & Asset Management Plan (AMP)

This document has been created to provide an overview of the assets managed by Erie Thames Powerlines ("ETPL") and outline the policies, strategy, objectives and expenditures required to provide safe, reliable and cost effective hydro to our customers.

UPDATED:

* February 2015

* A few minor updates were made to the AMP early in 2017 and are reflected throughout the document. This includes changes to the pole testing program and additional information regarding the cost to own the nine (9) municipal substations.

Contents

Executive Summary

The following document has been created as an update to the Asset Condition Assessment (ACA) & Asset Management Plan (AMP) generated by METSCO Energy Solutions for Erie Thames Powerlines in 2011.

The original ACA & AMP recommended a risk based asset management strategy to be implemented moving forward. This risk based strategy is very much dependant on an accurate condition assessment of all major assets and this document is focused on any updates to these assessments, along with additional detail and adjustments to ETPL's decision framework.

As a goal, the recommended capital spending level derived in this document intends to mitigate any sharp changes in spending from year to year and also looks to maintain or slightly improve the reliability experienced by customers.

In order to arrive at a recommended spending level all major distribution assets were compared against their typical useful life; modelled after the Kinectrics Asset Depreciation Study completed for the Ontario Energy Board (OEB). We are then able to predict the number of assets reaching their end of life each year moving forward and estimate the expected costs to replace these assets each year.

In order to mitigate drastic changes in spending year to year a simple average spending level was established and the results of this level were examined with respect to effects on ETPL's asset base. Using poles as an indicator it can be seen that this spending level will drastically reduce the number of end of life assets within the system over time. It does however assume that all capital is targeted directly to end of life assets, which in reality does not occur.

From 2012 to 2015 the average pole replacement age was 35 years old, indicating a level of approximately 70% efficiency when targeting capital investments at end of life assets. Examining the trend in asset base with the knowledge that newer assets are occasionally replaced for various reasons a recommended spending level was determined.

The recommended spending level should be **$2,529,288** to mitigate sharp spending increases, and as a minimum maintain reliability in line with the asset management strategy and corporate goals.

Introduction

This document has been created to provide an overview of the assets managed by Erie Thames Powerlines ("ETPL") and outline the purpose, strategy, objectives and expenditures required to provide safe, reliable and cost effective hydro to our customers. Asset Management is not a new concept and has been in implemented in the ETPL system for decades however a formalized Asset Management Plan has only been in place since 2011. In 2011 ETPL engaged METSCO Energy Solutions to produce an Asset Condition Assessment and Asset Management Plan to guide our capital and maintenance investments moving forward. Since this time ETPL has looked to improve the process through the collection of more accurate asset data allowing more informed asset based decisions.

ETPL Mission Statement

"As <u>*Your Home Town Utility*</u> we provide you, our valued customers, with safe and reliable power line services. Our mission and pledge to our customers is to provide exceptional, cost effective electrical service. We distribute and maintain the flow of electricity to our customers from Ontario's energy grid. We take pride in providing our customers with knowledgeable staff and a reliable energy distribution system"

Corporate Goals

ERTH Corporation is committed to conducting its business activities in a manner that creates a positive impact in the communities that we serve, consistent with the values of our staff and our clients.

Since our inception in 2000, sustainability has been ingrained in our founding principles, which include local presence and employment and a commitment to the social, environmental and economic needs of our customers, employees and shareholder communities. We believe that these principles are key ingredients in building stronger communities and a more sustainable business.

We understand that our actions impact the communities in which we operate. We also understand that this impact will affect future generations and the prosperity of our shareholder communities. It is important to recognize that the scope of sustainability stretches much further than simply conservation and environmental preservation. Therefore, ***sustainability to ERTH means promoting business practices that are sustainable from an environmental, social and economic perspective***

Purpose of the Asset Management Plan

As an infrastructure based organization ETPL recognizes that our assets are the key element to providing value to our customers, shareholders and communities. ETPL implements a risk based asset management plan enabling the following to be realized through informed asset based decisions.

- The ability to maintain or improve the reliability of our distribution system
- Long term planning horizons resulting in stabilized financial impacts to customers
- The proper balance between capital investments in new infrastructure and O&M costs ensuring that the total cost over the life of the asset is minimized.

Decisions involving investment into fixed assets play a major role in determining the optimal performance of distribution system fixed assets. The majority of the investments in fixed assets are triggered by either declining performance in the areas of supply system reliability, power quality and safety; or increasing operating and maintenance costs associated with aging assets; or anticipated growth in demand requiring capacity upgrades. In either case, investments that are either oversized or made too far in advance of the actual system need may result in non-optimal management. On the other hand, investment not made on time when warranted by the system needs raise the risk of performance targets not being achieved and would also result in non-optimal management. Optimal management of the distribution system is achieved when “right sized” investments into renewal and replacement (capital investments) and into asset repair, rehabilitation and preventative maintenance are planned and implemented based on a “just-in-time” approach.

Asset Management Strategy

In order to facilitate “right sized” investments into the distribution system on a “just-in-time” approach ETPL has adopted a risk based asset management strategy as recommended by METSCO Energy Solutions in our initial 2011 plan. A risk based asset management strategy determines the risk of asset failure based on the condition of the asset, which is commonly measured with the help of a yard stick of “Asset Health Indices” and computes the valuation of the risk based on consequences of asset failure and identifies the optimal risk mitigation alternative through an evaluation of all available options. Asset management covers the full life cycle of a fixed asset, from preparation of the asset specification and installation standards - to the scope and frequency of preventative maintenance during the assets service life – and finally to the determination of the assets end-of- life and retirement from service. At each stage of an asset’s life cycle, decisions are made to achieve the right balance between achieving maximum life expectancy, highest operating performance, lowest initial investment (capital costs) and lowest operating costs. The best-in-class asset management strategies employ integrated processes that allow optimal levels of financial and operating performance to be achieved, using transparent and objective criteria that can easily be audited and inspected by regulators.

The following figure illustrates the structure of the process for creating the CAPEX and O&M Investment Plan and where the Asset Management Plan fits.

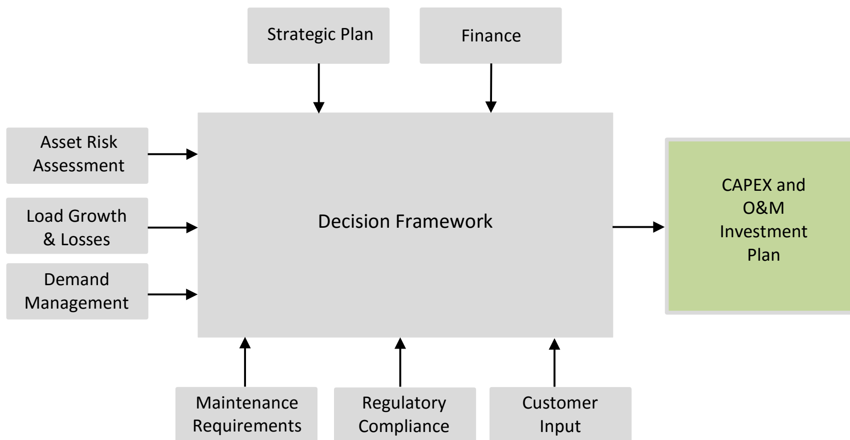


Figure 1: Decision Framework

For regulated distribution businesses the key considerations in development of a strategic asset management plan include:

a) Regulatory Compliance
b) Public and Employee Safety
c) Protecting Brand Name and Image
d) Operating Efficiency
e) Reliability and Supply System Security
f) Customer Service Quality
g) Getting Full Life out of Assets
h) Return on investment
i) Risk Based Maintenance Strategy
j) Minimizing Asset Life Cycle Costs
k) Minimizing Risk of Premature Failures
l) Minimizing Environmental Risks

The following illustration shows the basic decision support model employed under a risk based strategy. The timing and size of investments is selected to minimize the "Total Cost" of risk and risk mitigation initiatives.

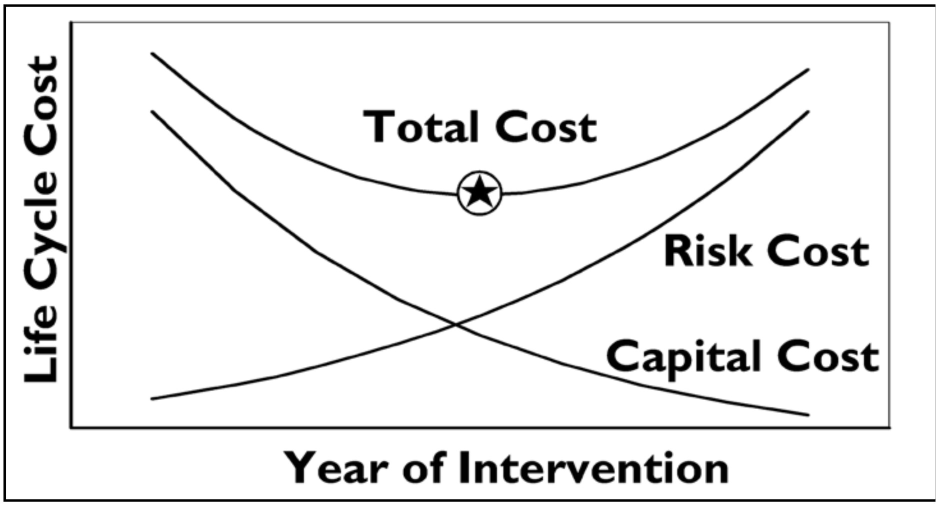


Figure 2: Decision Support Model

The following illustration summarizes a practical matrix to sift through a large number of assets, typically employed on T&D systems to objectively identify assets that present the highest risk of in-service failures so that the investments could be targeted into assets that present the highest risk. Numeric health indices, typically normalized to a scale of 100, are commonly used to express the health and condition of assets, which allows separation of the assets in good condition that require minimal risk mitigation from those in poor condition, requiring a higher level of investments.

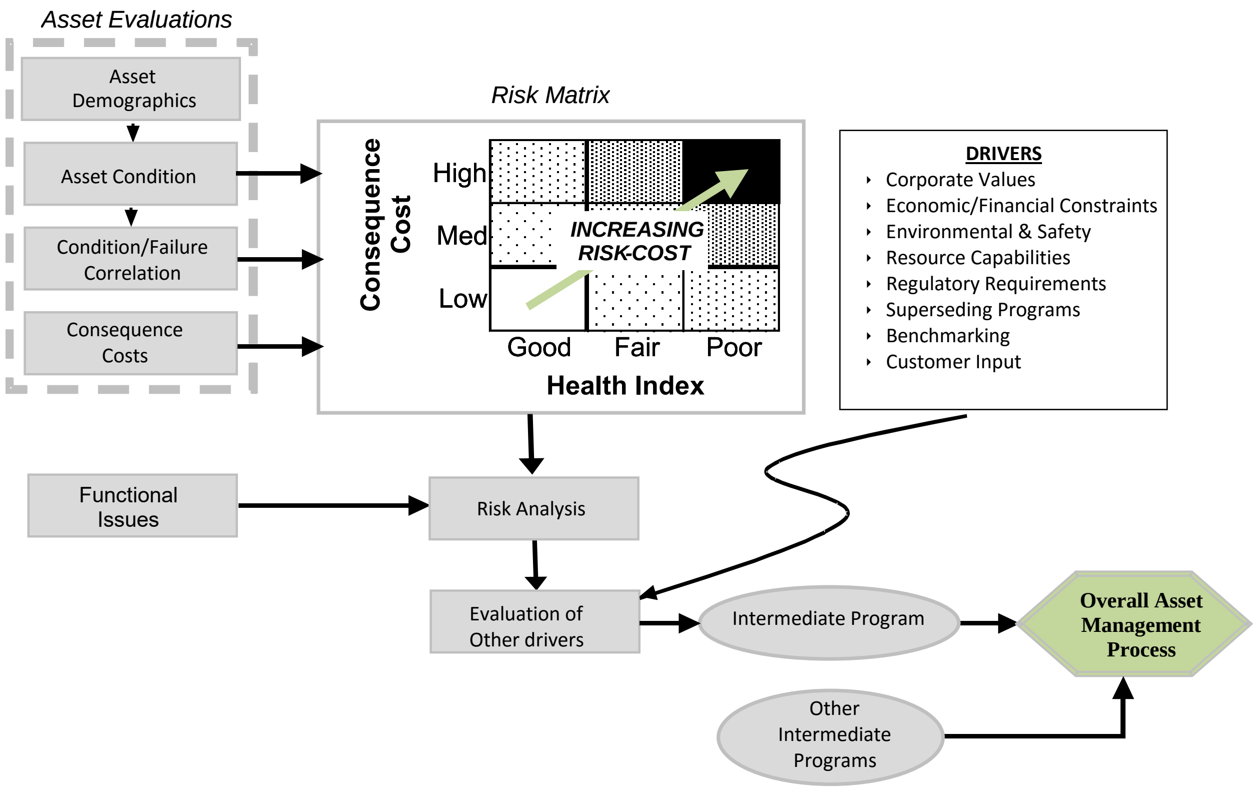


Figure 3: Risk Matrix Model

ETPL has adopted the following Typical Useful Life benchmarks along with the associated replacement strategies for the various major assets considered in its Asset Management Plan. Power transformers and substation equipment have not been included as they undergo a more stringent inspection and maintenance schedule and any planned replacements are based on this information.

Table 1: Typical Useful Life Estimates

Asset	*Typical Useful Life (Years)*	*Replacement Strategy*
Overhead Line Poles		
‣ Wood Pole	50	Proactive
‣ Concrete Pole	65	Proactive
‣ Steel Pole	65	Proactive
Overhead Distribution Transformer	40	Run to Failure
Padmounted Distribution	40	Run to Failure
UG Medium Voltage Cable	40	Proactive
OH Load Break Switches		Proactive
Padmounted Switchgear/ Junctions		Proactive

External Challenges & Commitments

ETPL must fulfill various requirements that require capital investments into fixed distribution assets that are beyond our control which include:

- Relocation of assets driven by municipal infrastructure upgrades such as road widening.
- System access projects driven by a requirement to service new connections and developments.

Although these investments are difficult to accurately forecast ETPL maintains good communication with our municipalities and developers to help minimize any unforeseen investments. ETPL uses historical trends with regards to municipal and developer driven projects to minimize the impacts to our Asset Management and Capital Plans.

Prioritization of Capital Expenditures

ETPL implements the use of a software based investment optimizer to ensure that planned projects are targeted to areas of the distribution system most in need. This allows the objectives set out in the mission statement and corporate goals to be realized while minimizing risk to customers, employees and shareholders.

Each project being considered for capital expenditure is assigned risk based on consequence and probability for a number of categories. The categories as defined in the investment optimizer are explained in detail below.

Financial (11%)

- *Value* - The financial category aims to quantify any financial impacts as a result of the project completion. Consideration is given to the project cost, revenue and cost savings in the form of reduced maintenance, or operating costs.
- *Risk* - the risk assigned under this category is based on the loss of revenue and/or cost avoidance as a result of not completing the particular project. The financial consequences are linked to the probability of an event occurring on a scale ranging from four (4) events a year to one (1) event every ten (10) years.

Service Quality (13%)

SAIFI

- *Value* - SAIFI quantifies the number of times a customer experiences a power interruption and consideration is given to the current SAIFI trend in the proposed project area.
- *Risk* - risk for SAIFI considers the potential impact to outage frequency resulting from asset failure if the project is not completed. The consequences assigned to the project range from individual customers (<50kW) to transmission feeders (>50% of

customers) experiencing an outage and the probability range from four (4) events a year to one (1) event every ten (10) years.

SAIDI

- *Value* - SAIDI quantifies the duration of outages experienced by a customer and consideration is given to the current SAIDI trend in the proposed project area.
- *Risk* - risk for SAIDI considers the potential impact to outage duration resulting from asset failure if the project is not completed. The consequences assigned to the project range from a momentary outage (<3min) to a sustained outage (>12 hours) and the probability ranges from four (4) events a year to one (1) event every ten (10) years.

Company Image (8%)

- Value - The company image category looks to address any formal complaints made to ETPL as a result of a particular portion of the distribution system related to a proposed project.
- Risk - the risk assigned under the company image category is based on the consequences of a formal complaint ranging from individual concerns made to the company to general public outcry - national media coverage and again is assigned a probability ranging from four (4) events a year to one (1) event every ten (10) years.

Legal (8%)

- *Value* - the legal category looks to consider the litigation costs related to a particular project.
- *Risk* - the risk assigned to a project under the legal category is based on the litigation costs that may result of a project not being completed. The consequences range from litigation costs of less than $1000 to greater than $500,000, and are assigned a probability ranging from four (4) events a year to one (1) event every ten (10) years.

Regulatory (18%)

- *Value* - The value assigned under the regulatory category looks to consider the impacts of a project on compliance to regulatory requirements.
- *Risk* - the consequences as a result of not completing the proposed project range from non-reportable compliance issues to damaging OEB regulatory impacts resulting in the loss of licence and are assigned a probability ranging from four (4) events a year to one (1) event every ten (10) years.

Safety (26%)

Public

- *Value* - The value considered in this category is specific to public safety and looks to quantify the possibility of a safety incident related to a member of the public.
- *Risk* - If the potential project is not completed the consequences range from the potential of a non-life threatening injury with no prior history to a potentially life threatening hazard with a known history and assigned a probability ranging from four (4) events a year to one (1) event every ten (10) years.

Employee

- *Value* - The value considered in this category is specific to employee safety and looks to quantify the possibility of a safety incident related to a utility worker.
- *Risk* - If the potential project is not completed the consequences range from a minor employee injury with internal reporting required to a major loss time injury or fatality and assigned a probability ranging from four (4) events a year to one (1) event every ten (10) years.

Environmental (16%)

- *Value* - the environmental category aims to consider the environmental impacts of the distribution system and to ensure any environmental concerns are mitigated.
- *Risk* - the risk assigned under the environmental category if a project is not completed range in consequence from a minor disturbance with environmental documentation not necessary to a disturbance requiring MOE and company environmental assistance. The possible consequences under this category are assigned probability ranging from four (4) events a year to one (1) event every ten (10) years.

The investment optimizer requires that all categories be assigned importance and the following figure demonstrates the weighting that has been adopted by ETPL in line with our internal and corporate objectives.

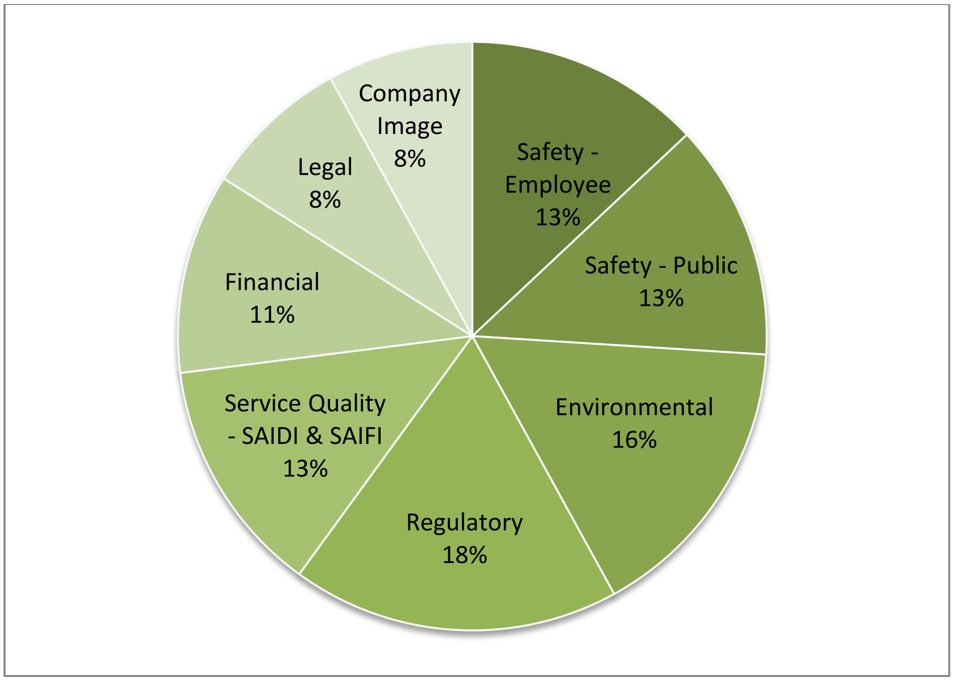


Figure 4: Risk Analysis Weighting

Currently ETPL utilizes the investment optimizer to complete a yearly optimization of all capital expenditures involving fixed distribution assets. This requires approximately 2-3 years of potential projects to be defined, budgeted and assigned risk. The optimizer then analyzes the available projects and chooses a mix of projects that not only minimize risk as illustrated in Figure 2, but fall within prescribed spending levels. This ensures that projects are identified, selected and prioritized using disciplined risk based analysis.

Asset Condition Assessment Methodology

A detailed asset condition assessment methodology was recommended in Section 3 of the 2011 METSCO report and ETPL is currently in the process of moving towards a comprehensive risk based condition assessment as proposed. In order to fully adopt the methodology, extensive amounts of data collection is required along with regular inspections of all of the major assets considered. ETPL has begun to implement the use of electronic inspection forms to more easily compile asset condition data and have been using resources as available to compile a more accurate data set for all of our major assets, however to date a complete condition based assessment is not implemented.

Currently all major assets excluding distribution substations have been examined using available age data. In cases where data regarding the age of a major asset is unknown certain assumptions and representations have been used to create a data set to be used for analysis. For example, the age data for underground cables is poor and therefore the age distribution for pad mounted transformers has been used as a proxy for the majority of underground cable as this would be a reasonable assumption.

Period and Accuracy of Data

This report has been prepared with data assumed to be accurate to the best knowledge of ETPL as of February 2015.

Asset Demographics and Condition Assessments

Overhead Line Poles

The ETPL distribution system consists of approximately 8,511 overhead line poles with the following characteristics and age distribution.

Table 2: Overhead Line Pole Characteristics

Total Overhead Line Poles	8,511	**Wood**	7964	93.57%
		Concrete	340	3.99%
		Steel	207	2.43%
Maximum Age	76 years			
Average Age	31 years			

Aylmer Operations	**Aylmer**	1160	14%	27%
	Belmont	338	4%	
	Port Stanley	724	9%	
Ingersoll Operations	**Beachville**	369	4%	51%
	Burgessville	138	2%	
	Embro	296	3%	
	Ingersoll	1937	23%	
	Norwich	516	6%	
	Otterville	357	4%	
	Tavistock	438	5%	
	Thamesford	350	4%	
Mitchell Operations	**Mitchell**	991	12%	22%
	Clinton	776	9%	
	Dublin	121	1%	

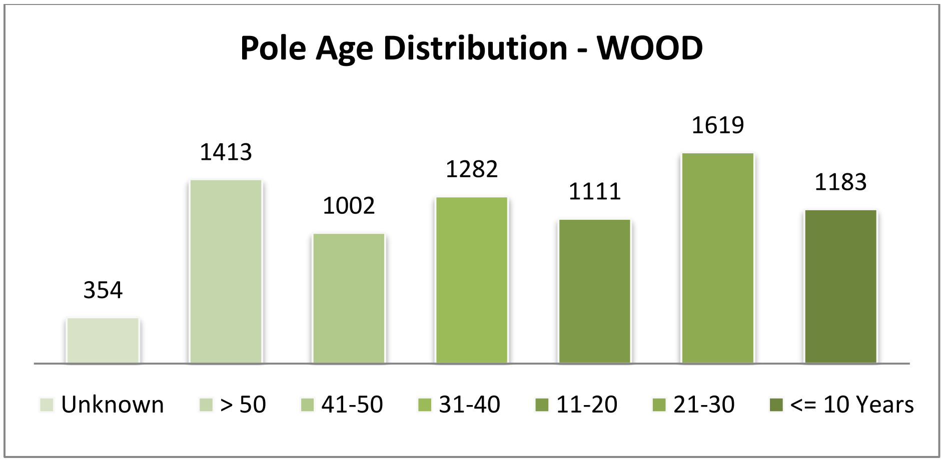


Figure 5: Pole Age Distribution - WOOD

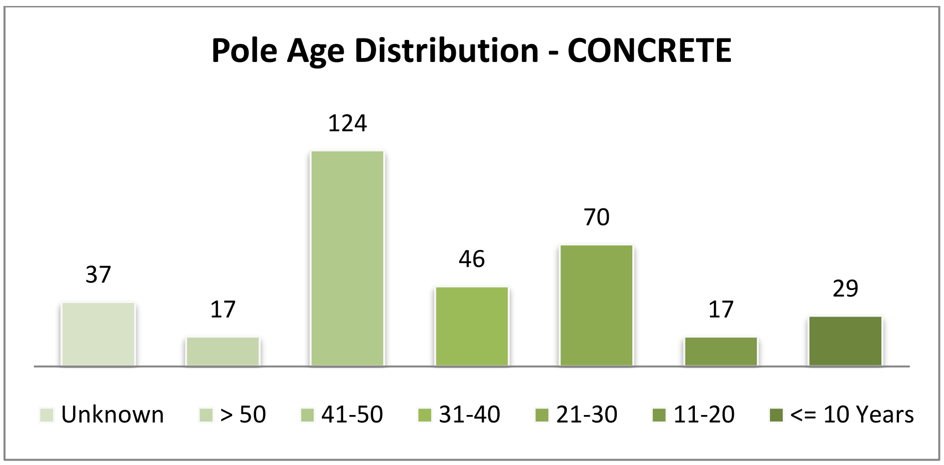


Figure 7: Pole Age Distribution - CONCRETE

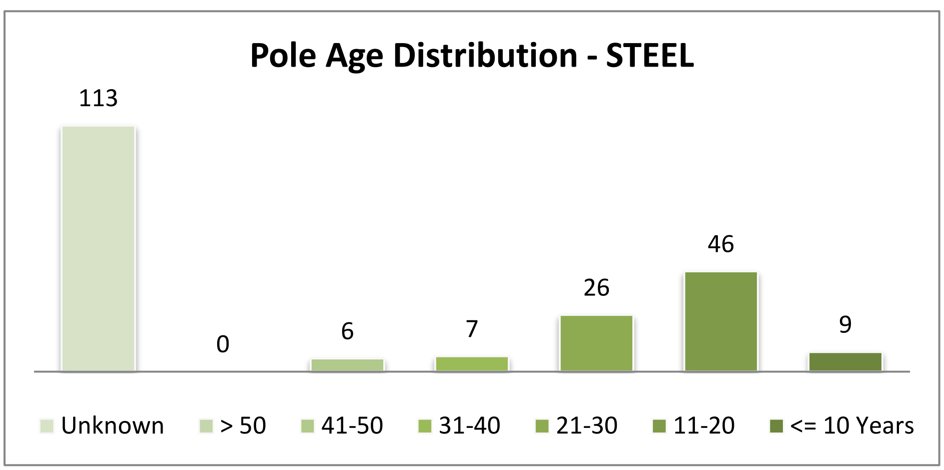


Figure 6: Pole Age Distribution - STEEL

As previously noted ETPL has adopted a useful life of 50, 65 and 65 years for wood, concrete and steel poles respectively and the following illustrates the expected number of poles reaching end of life over the next 50 years. The pole age is accurately known for 94% of ETPL poles and any unknown pole ages are due to the physical integrity of the pole markings. All poles with unknown age have been classified as operating past their useful life and it can be seen that currently there are approximately 1917 poles operating past their useful life which represents approximately 22% of the poles in the ETPL distribution system.

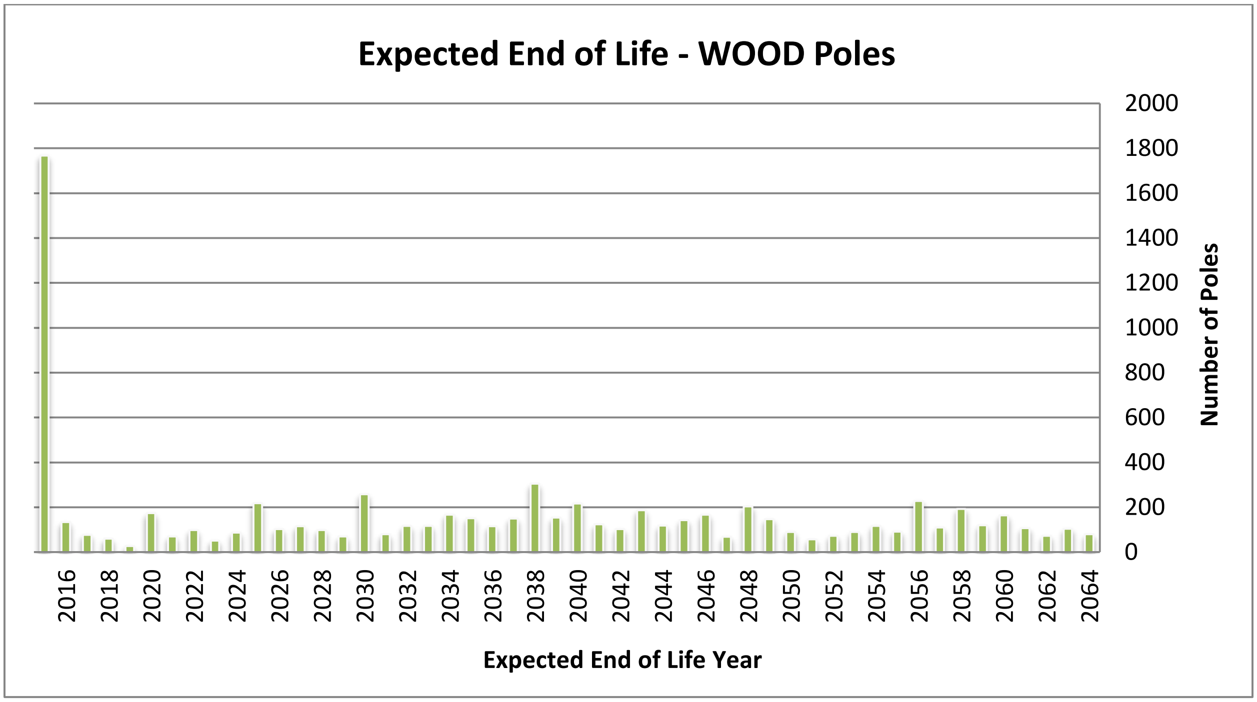


Figure 8: End of Life Expectancy - WOOD Poles

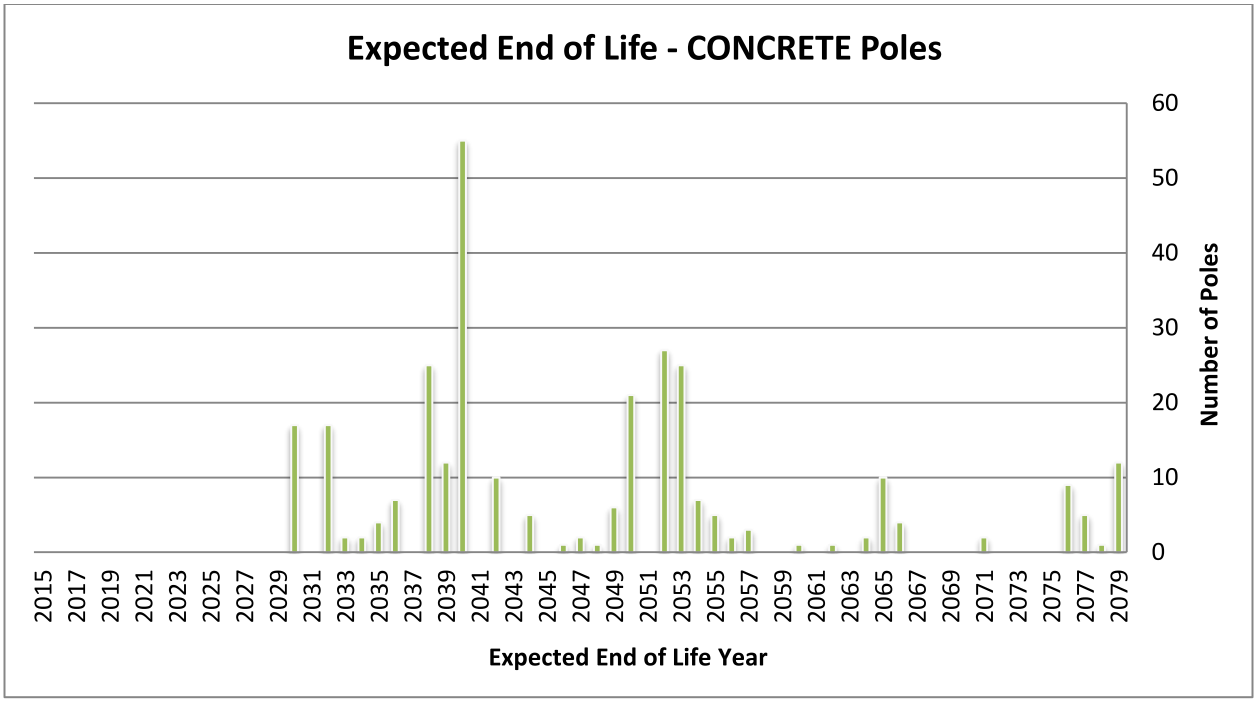


Figure 9: End of Life Expectancy - CONCRETE Poles

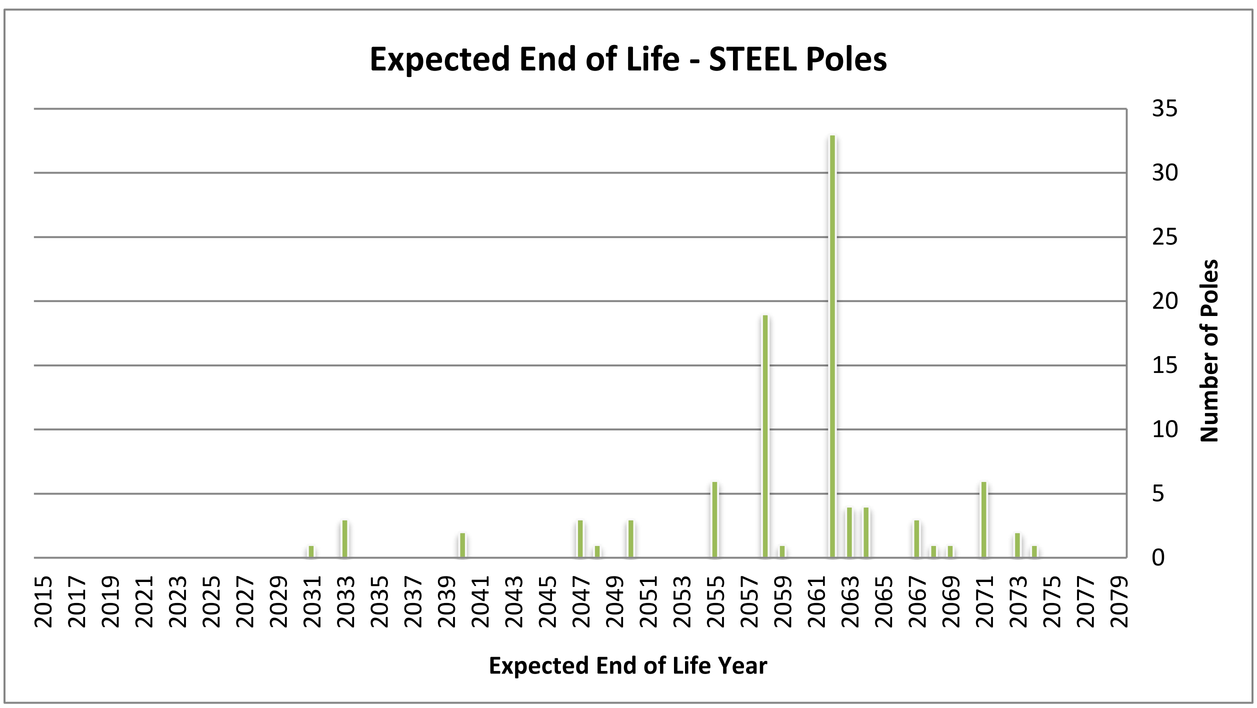


Figure 10: End of Life Expectancy - STEEL Poles

In order to mitigate a sharp increase in spending resulting from a large number of poles currently operating past their useful life these poles have been distributed evenly over the useful life cycle to facilitate more normalized replacement levels and minimize the number of costly reactive replacements that are required. This allocation of end of life poles results in the following distribution with an average replacement level of 173 poles per year.

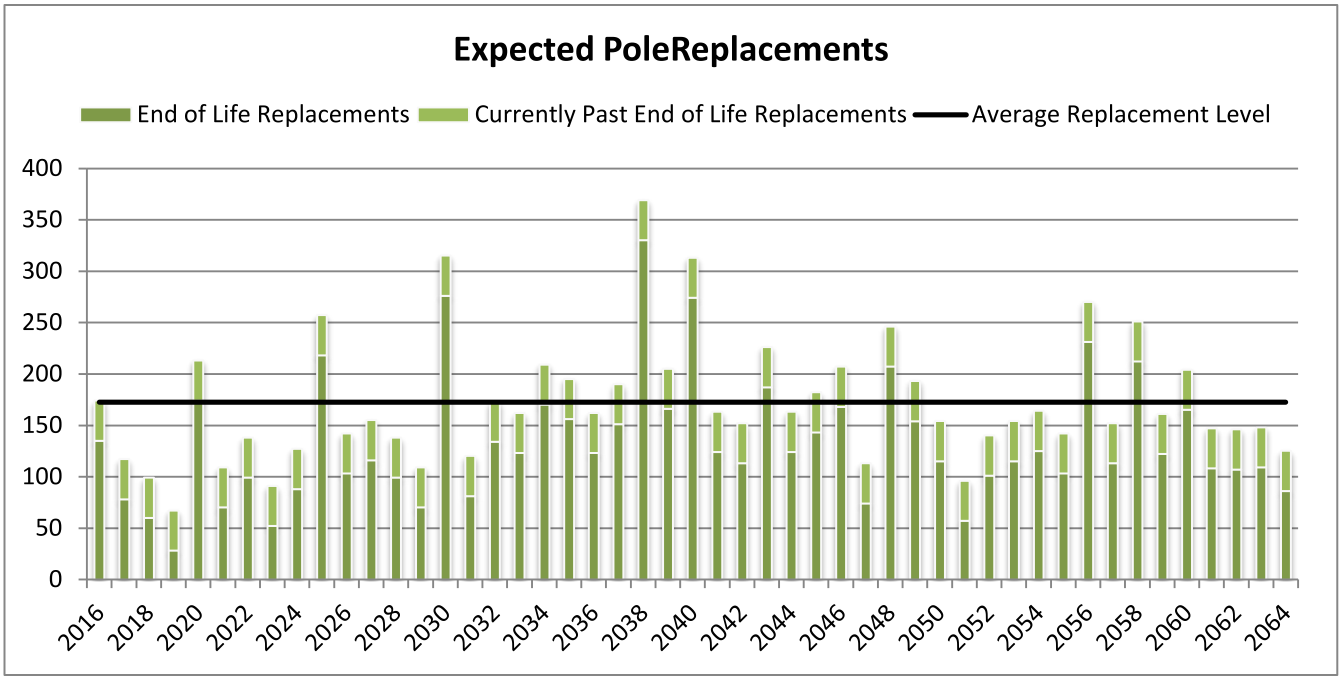


Figure 11: Expected Pole Replacement Timing

Distribution Transformers

The ETPL distribution system consists of approximately 3,310 distribution transformers and it should be noted that pole mounted transformers include those being employed in a three phase installation. It should also be noted that ETPL has approximately eighty five (85) “Pole Tran” installations in service in its system and through voltage conversion will eventually replace these units with pad mounted transformers; these numbers have been incorporated into any pad mounted transformer totals moving forward.

The following illustrates the characteristics and age distribution of pole and pad mounted transformers.

Table 3: Distribution Transformer Characteristics

Total Distribution Transformers	3,310	**Polemount**	2446	73.90%
		Padmount 1PH	744	22.48%
		Padmount 3PH	120	3.63%

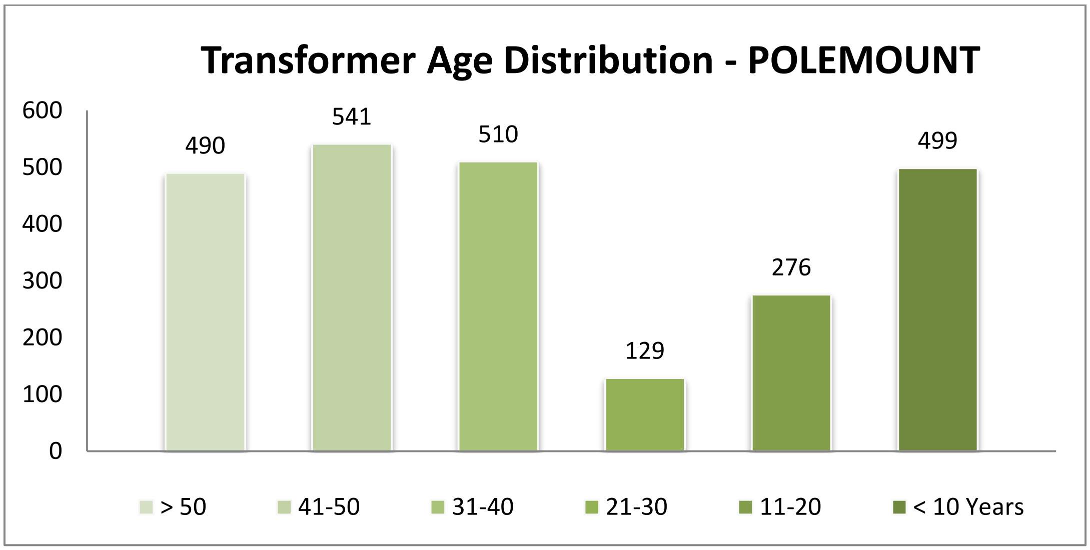


Figure 12: Transformer Age Distribution - POLEMOUNT

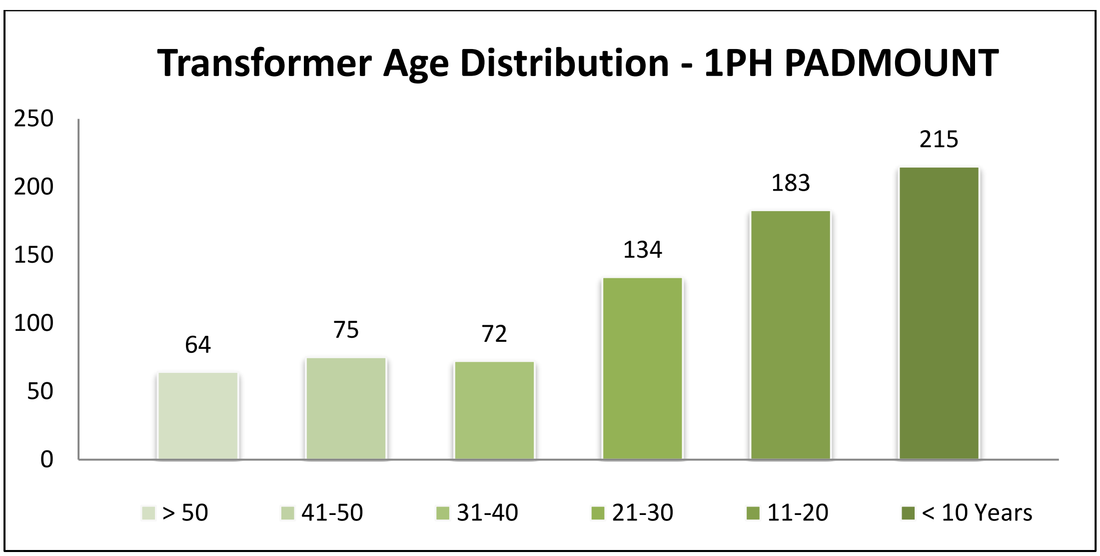


Figure 13: Transformer Age Distribution - 1PH PADMOUNT

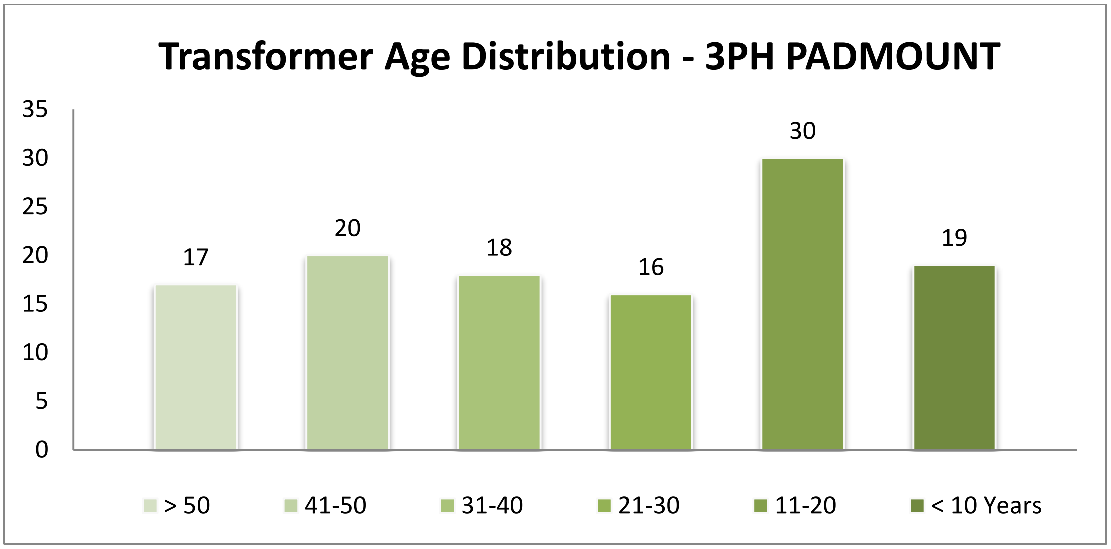


Figure 14: Transformer Age Distribution - 3PH PADMOUNT

As previously noted ETPL has adopted a useful life of 40 years for distribution transformers and the following illustrates the expected number reaching end of life over the next 40 years. The absence of nameplate data has resulted in accurate transformer age in only 53% of installations. Any installations with unknown age have been evenly distributed from 31 to > 50 years old as it can be reasonably assumed that any transformers without nameplate data are of an older vintage.

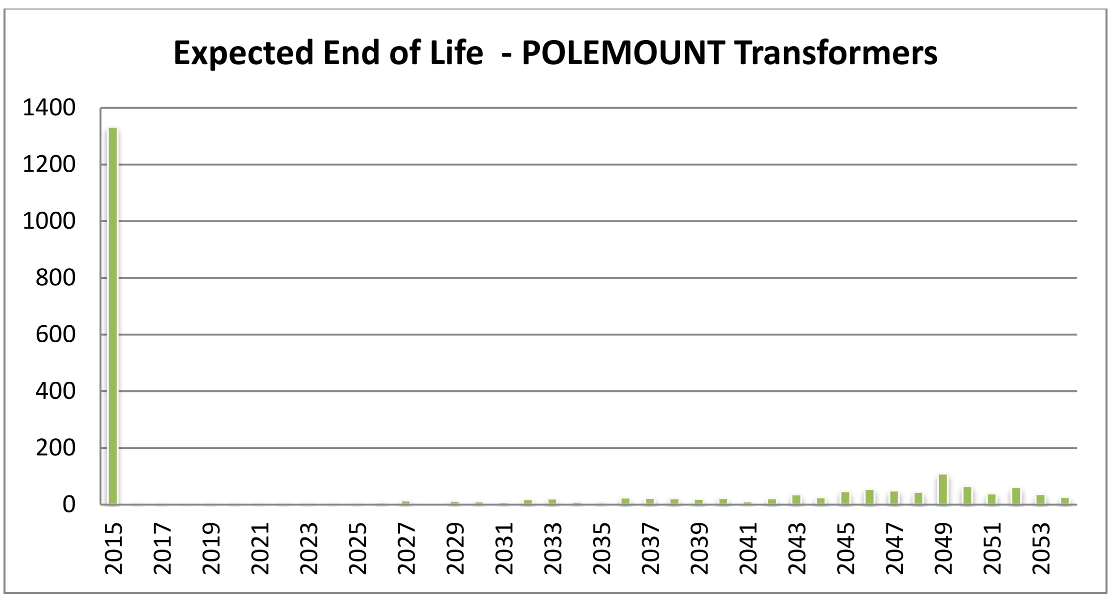


Figure 15: End of Life Expectancy - POLEMOUNT Transformers

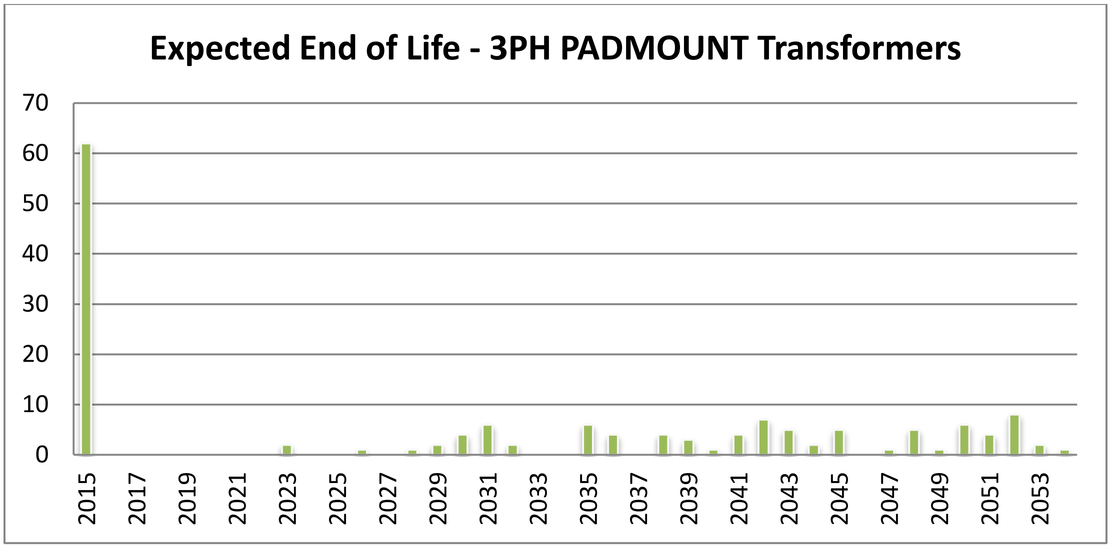


Figure 16: End of Life Expectancy - 3PH PADMOUNT Transformers

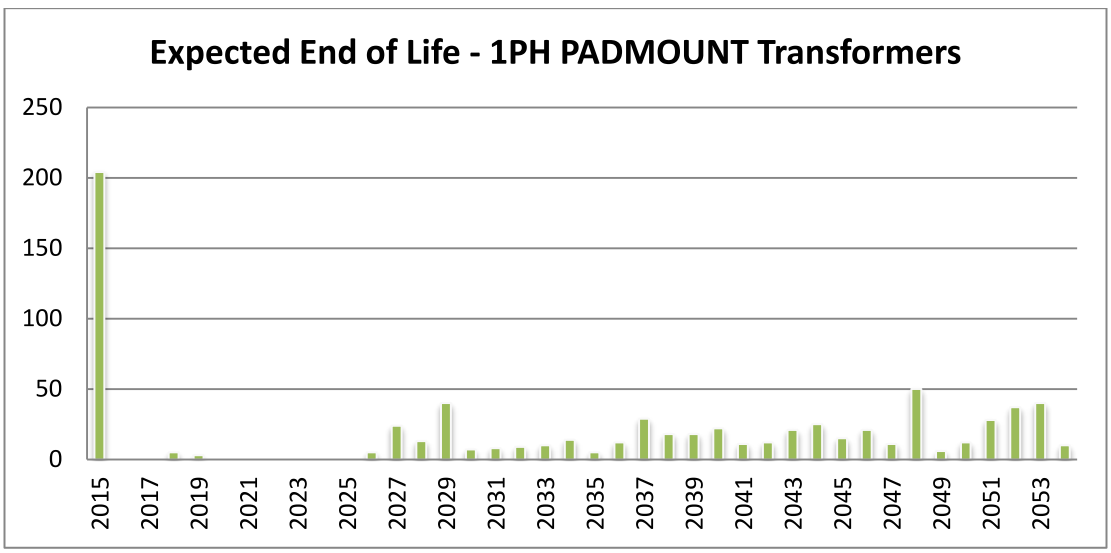


Figure 17: End of Life Expectancy - 1PH PADMOUNT Transformers

Again, in order to mitigate a sharp increase in spending resulting from a large number of distribution transformers currently operating past their useful life these transformers have been distributed evenly over the useful life cycle to facilitate more normalized replacement levels. This allocation of end of life poles results in the following distribution with an average replacement level of 58 - Polemount, 19 - 1PH Padmount and 4 - 3PH Padmount transformers per year.

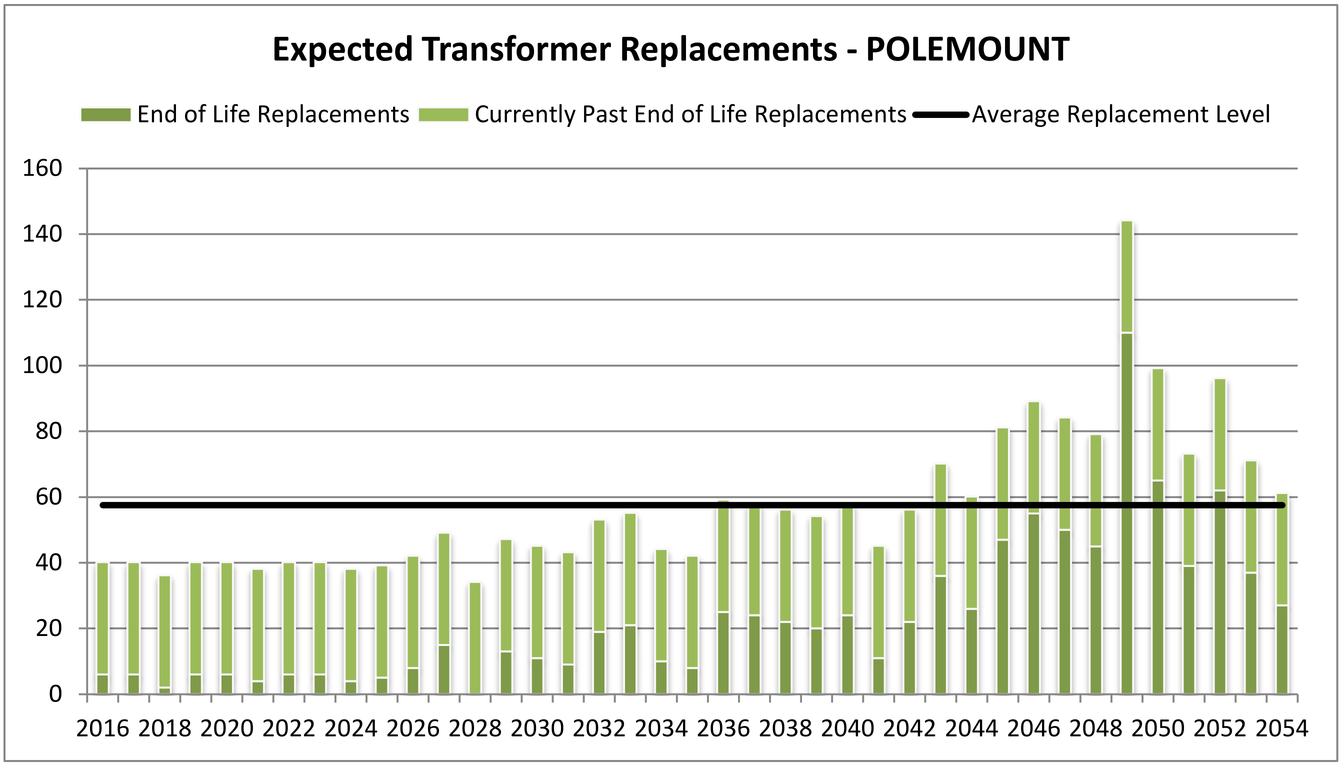


Figure 18: Expected POLEMOUNT Replacement Timing

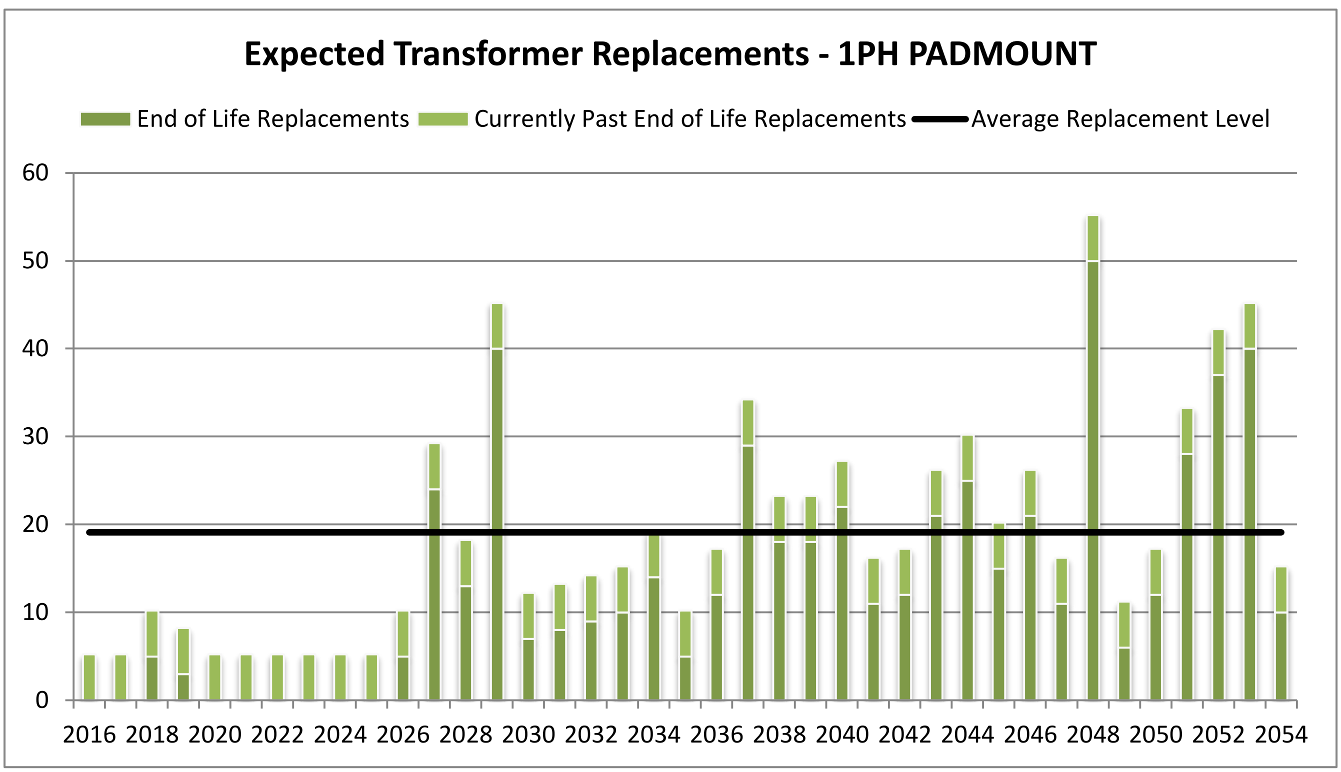


Figure 19: Expected 1PH PADMOUNT Replacement Timing

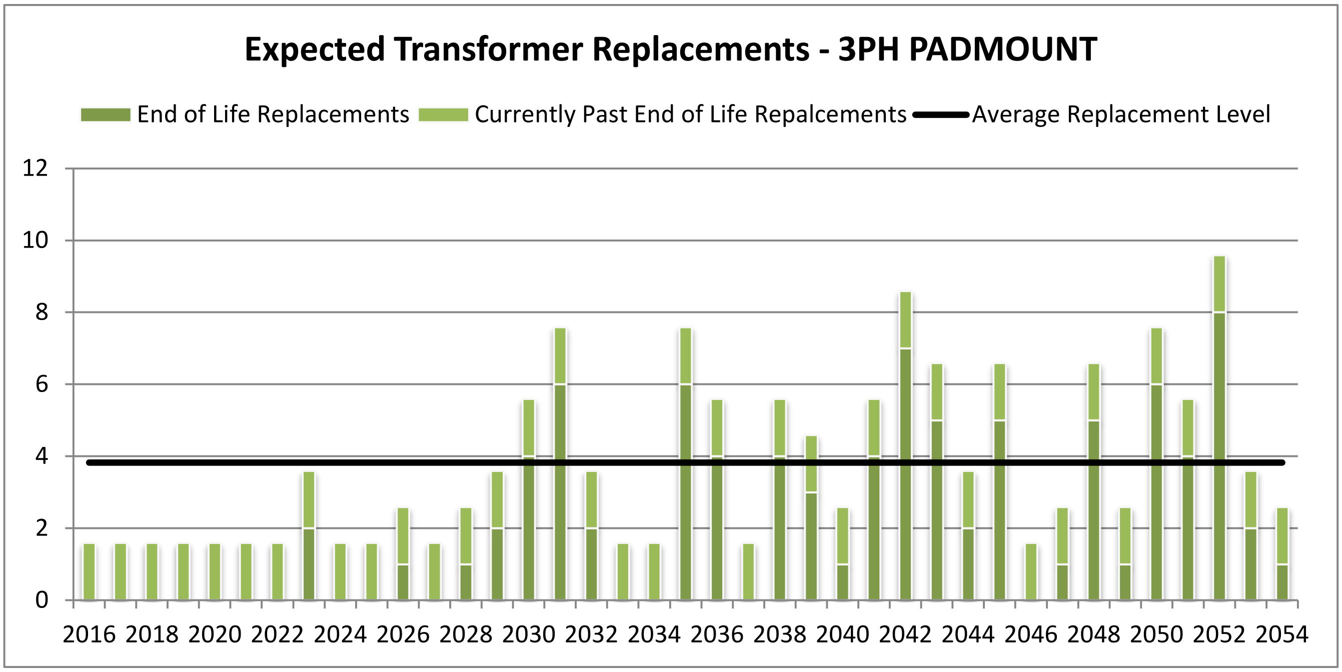


Figure 20: Expected 3PH PADMOUNT Replacement Timing

Medium Voltage Underground Circuits

The ETPL distribution system consists of approximately 129km of medium voltage underground cable, of which 21% has accurate age data. In order to develop a more accurate age profile for underground cable the following pad mount transformer distributions have been applied to the unknown cable data and distributed accordingly.

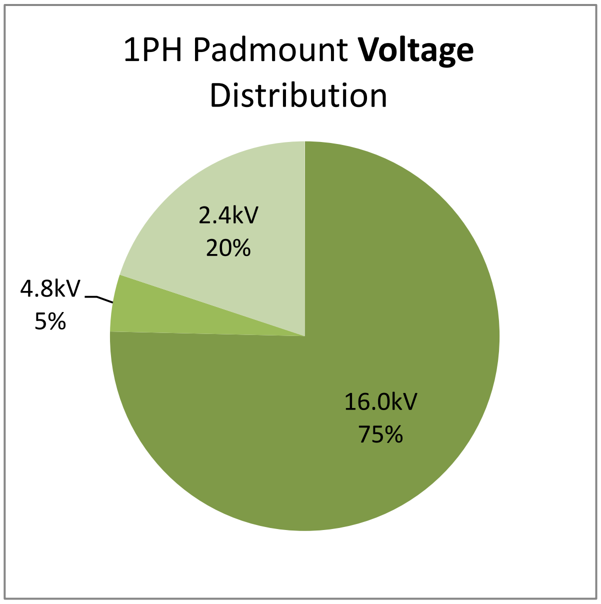


Figure 21: 1PH PADMOUNT Voltage Distribution

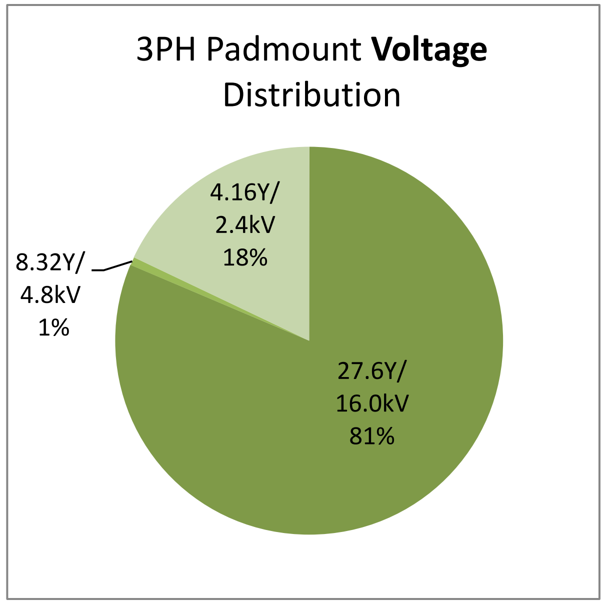


Figure 22: 3PH PADMOUNT Voltage Distribution

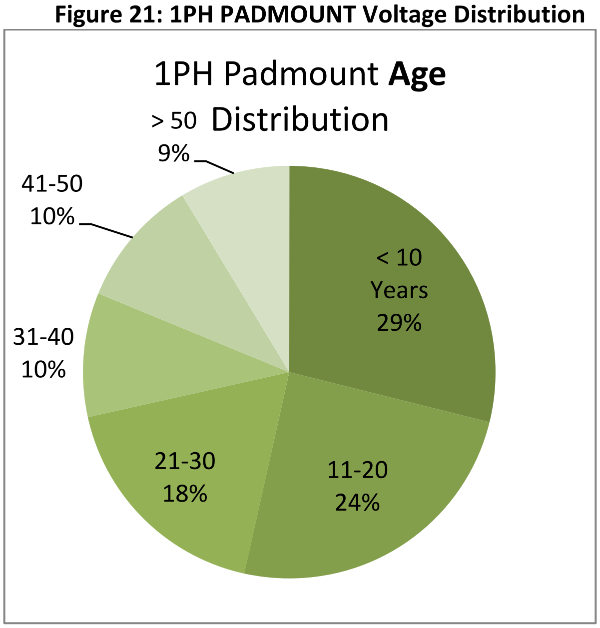


Figure 23: 1PH PADMOUNT Age Distribution

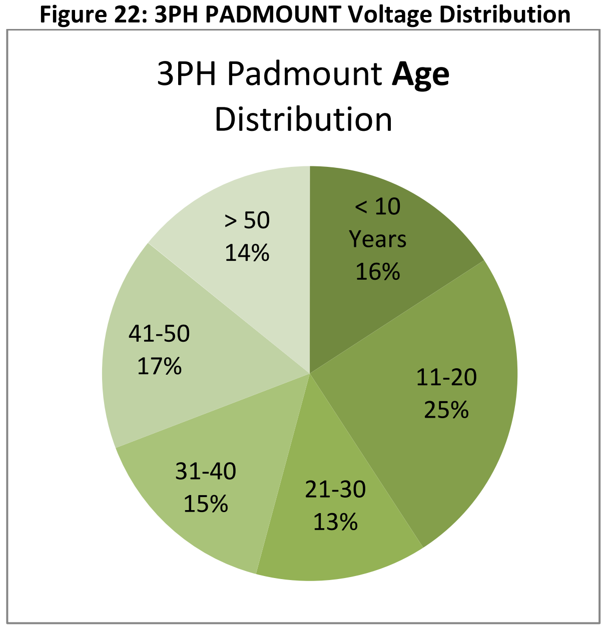


Figure 24: 3PH PADMOUNT Age Distribution

This distribution of unknown cable results in the following data.

Table 4: UG Cable Age Distribution

	<10 years	11-20	21-30	31-40	41-50	>50 years	TOTALS
3PH - 27.6Y/16.0kV	2.90	2.2	1.1	1.3	1.5	2.7	11.76
3PH - 8.32Y/4.8kV	0.02	0.0	0.0	0.0	0.0	0.0	0.11
3PH - 4.16Y/2.4kV	0.56	0.5	0.3	0.3	0.4	0.6	2.56
1PH - 16.0kV	28.38	14.9	9.1	5.0	5.0	4.5	66.78
1PH - 4.8kV	2.08	0.8	0.6	0.3	0.3	0.3	4.44
1PH - 2.4kV	4.47	3.4	2.4	1.3	1.3	1.2	14.10
TOTALS	38.40	21.76	13.49	8.27	8.53	9.30	99.74

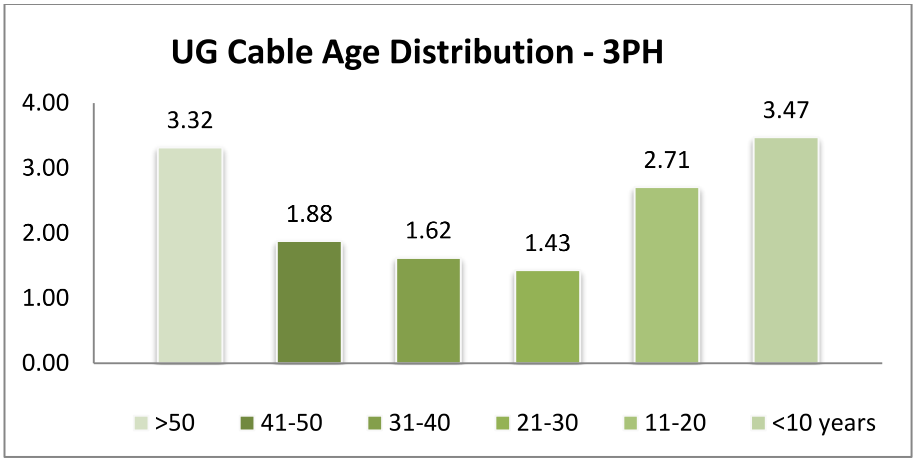


Figure 25: UG Cable Age Distribution - 3PH

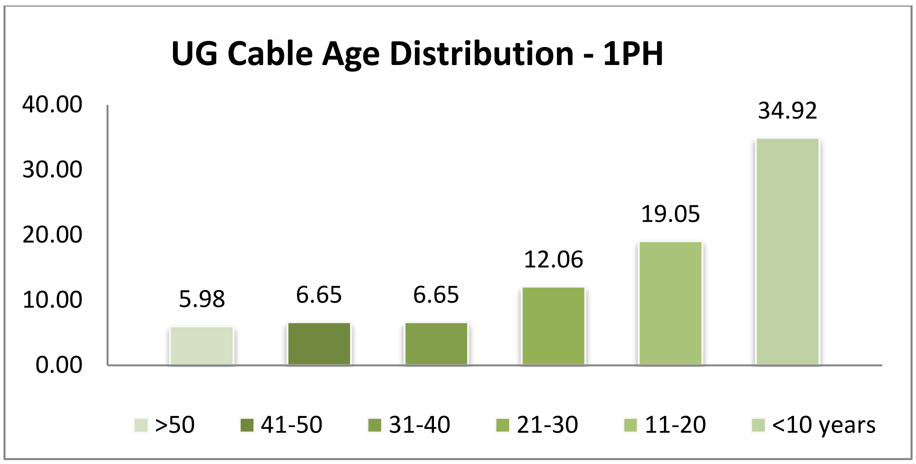


Figure 26: UG Cable Age Distribution - 1PH

As previously noted ETPL has adopted a useful life for underground medium voltage cables to be 40 years and following illustrates the expected cable reaching end of life over the next 40 years.

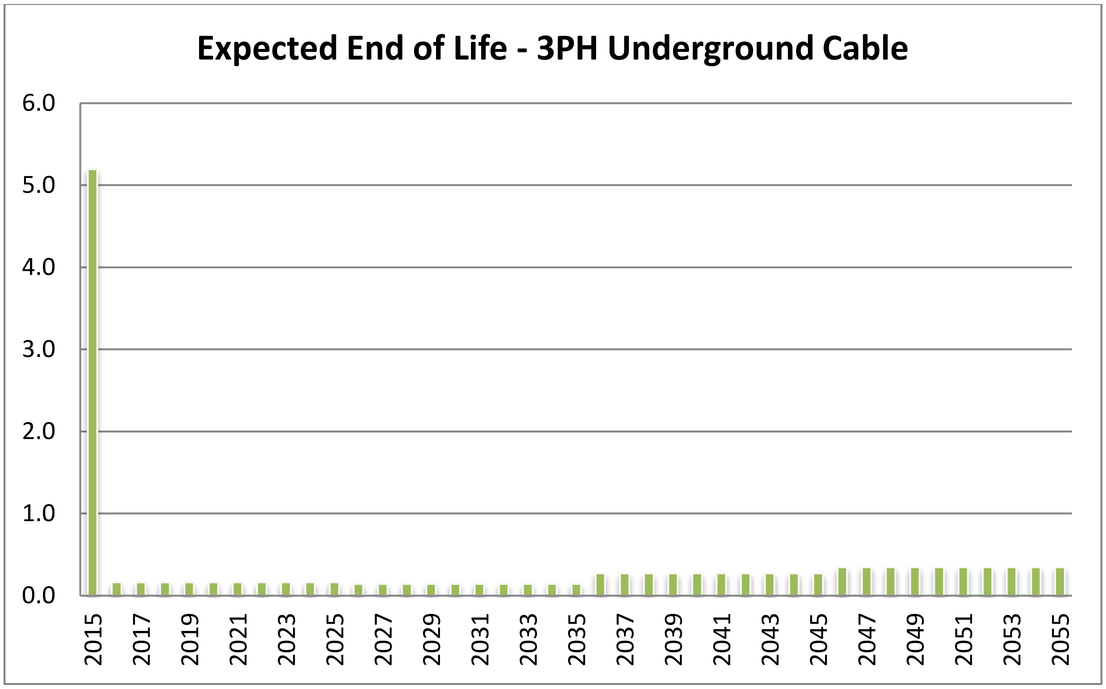


Figure 27: End of Life Expectancy - 3PH UG Cable

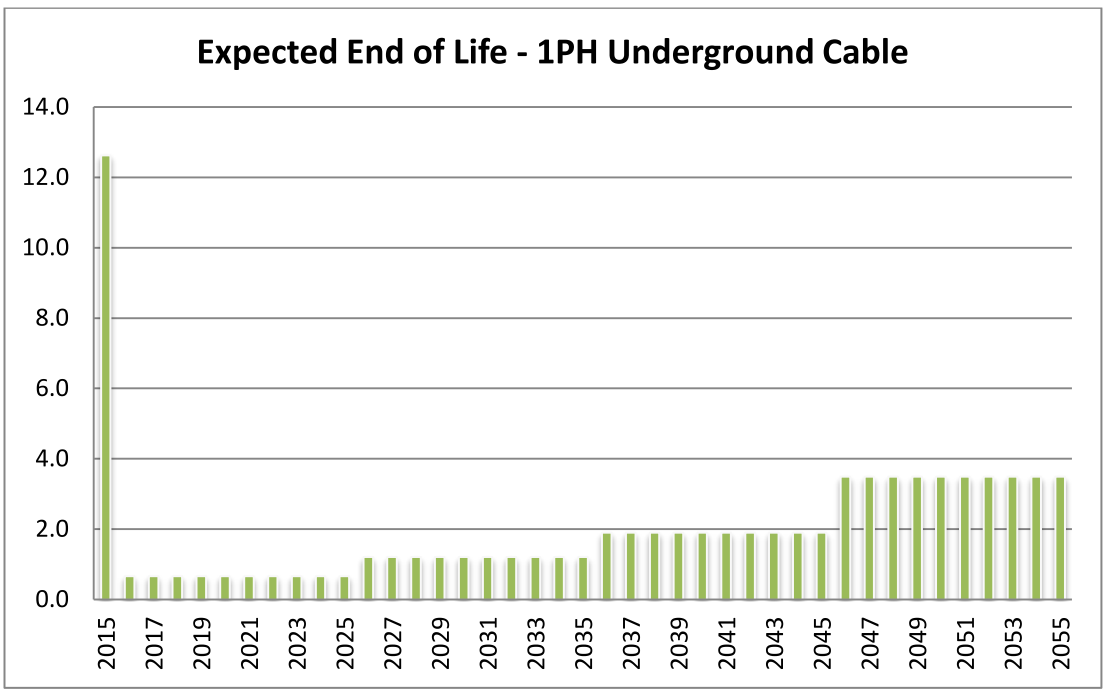


Figure 28: End of Life Expectancy - 1PH UG Cable

Again, in order to mitigate a sharp increase in spending resulting from a large amount of underground cables currently operating past their useful life these cables have been distributed evenly over the useful life cycle to facilitate more normalized replacement levels. Allocation of end of life cable results in the following distribution with an average yearly replacement level of 0.364km and 2.14km of three phase and single phase cable respectively.

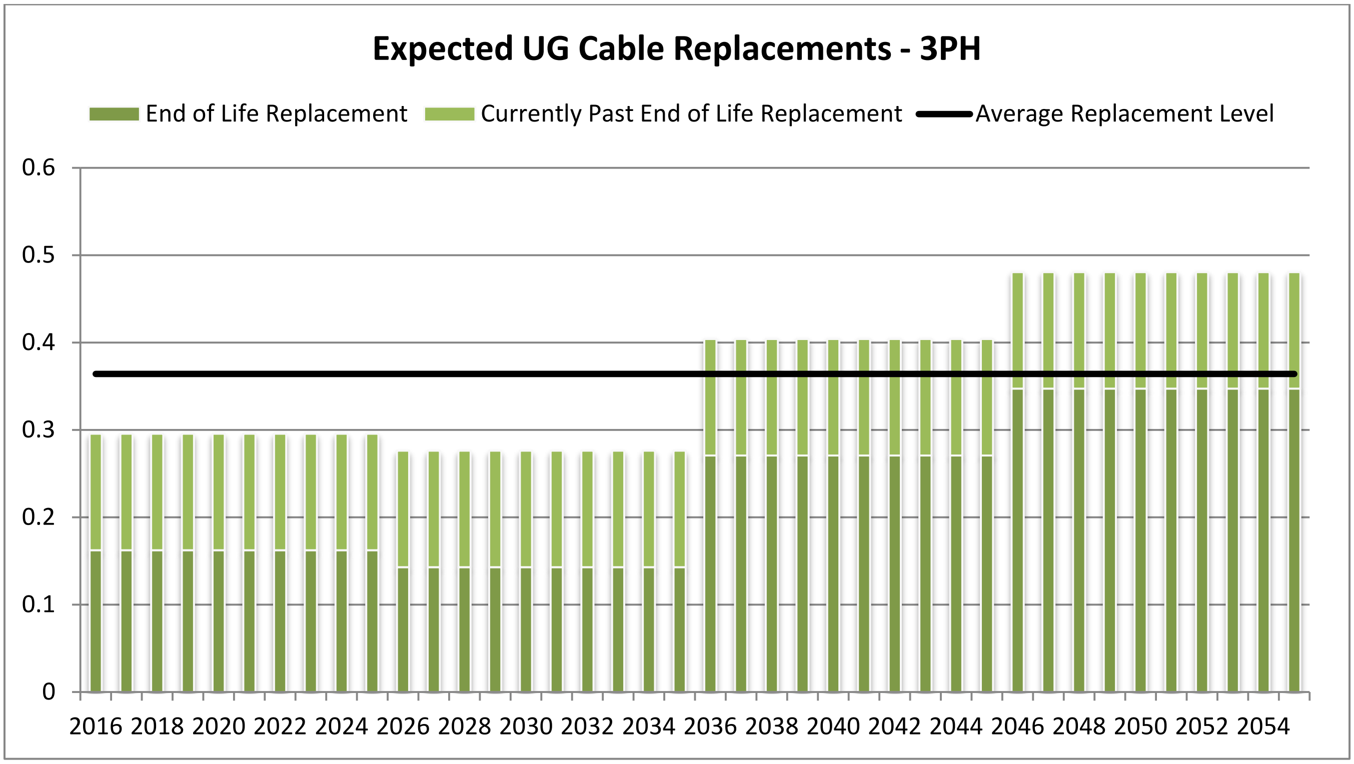


Figure 29: Expected 3PH UG Cable Replacement Timing

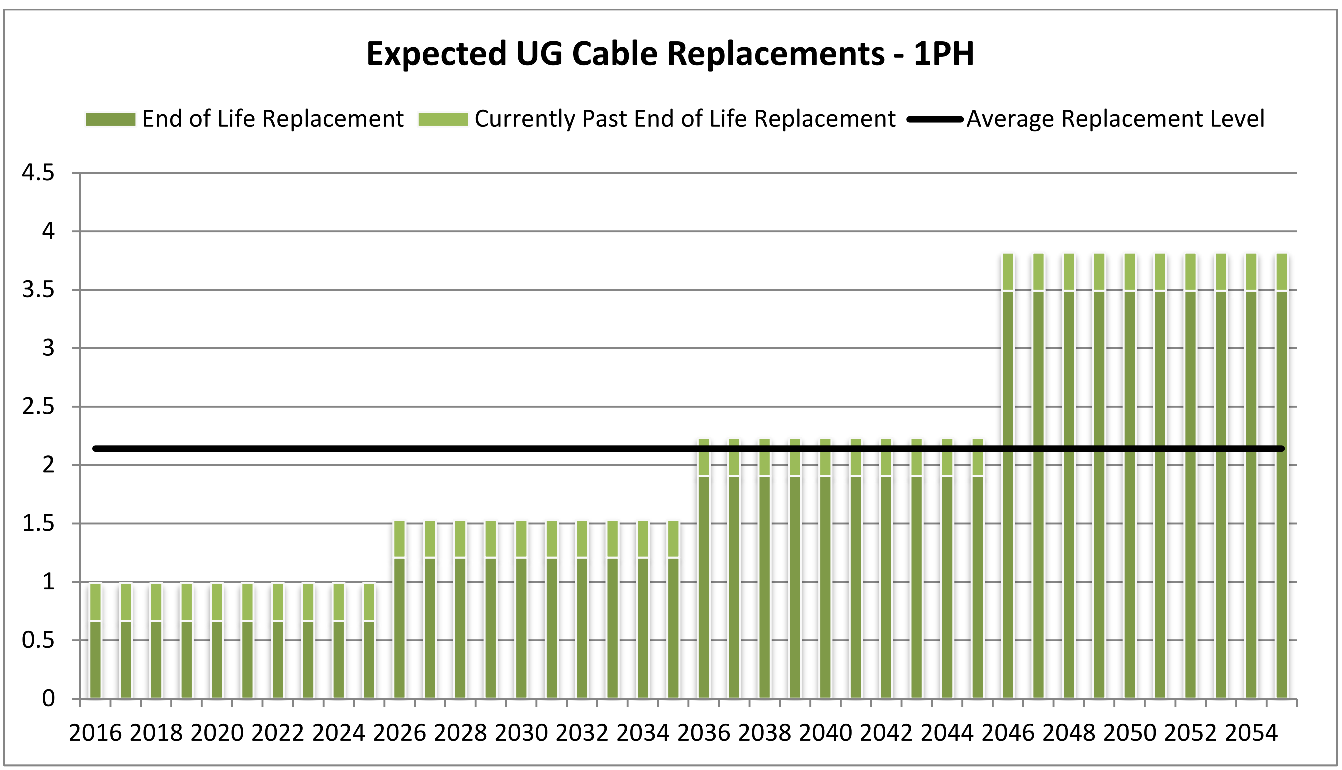


Figure 30: Expected 1PH UG Cable Replacement Timing

Distribution Substations

ETPL currently owns, maintains and operates nine (9) distribution substations that stepdown voltage from 27.6kV to 4.16kV. The major determining factor in the useful service life of the stations is the condition of the power transformer(s). This is due to the high cost of replacement and lack of maintenance practices available to extend their useful life.

Table 5: End of Life Estimate - Power Transformers

Asset	*Typical Useful Life (Years)*	*Replacement Strategy*
Power Transformers	50	Proactive

The 2011 METSCO report indicated that Clinton MS2 should be prioritized for station retirement and since that time ETPL has fully decommissioned and taken Clinton MS2 out of service. The previous METSCO report also indicated that Aylmer MS1 should be a top priority as a result of the condition of the station transformer. Due to the number of customers supplied from Aylmer MS1 and the lack of ability to transfer load an investment was made to purchase a used transformer from a neighbouring utility. The "new" transformer eliminates the priority assigned to the substation and moving forward voltage conversion will address the station over a more extended period of time.

The following table indicates the updated health index scores and prioritizes the investment need for the nine remaining (9) ETPL substations. The scoring assigned to each health index has been based on the 2011 METSCO guidelines and all data is gathered from substation maintenance and oil analysis reports. The priority assigned to each station takes into consideration the health index however also considers available redundancy.

Table 6: Power Transformer & Station Health Index

Distribution Station	STATION CHARACTERISTICS				TRANSFORMER HEALTH INDEX SCORES & WEIGHTING													
	Station Rating	# of Feeders	# of Customers	Redundancy	Age			Loading %			Visual Inspection			Oil Analysis			Health Index	Priority
Clinton MS1	5MVA	4	1494	N	44	2	6	66%	4	4	Excellent	5	2	Poor	2	8	***54***	**1**
Port Stanley MS1	5MVA	3	917	N	36	2		21%	5		Good	4		Fair	3		***64***	**2**
Beachville MS1	3MVA	2	402	N	39	2		40%	5		Excellent	5		Fair	3		***66***	**3**
Aylmer MS2 - TX1	3MVA	4	992	Y	48	2		15%	5		Excellent	5		Fair	3		***66***	MONITOR
Mitchell MS2	3MVA	2	236	N	47	2		9%	5		Fair	3		Good	4		***70***	**4**
Ingersoll MS1	5MVA	3	767	Y	30	3		23%	5		Good	4		Fair	3		***70***	MONITOR
Ingersoll MS3	5MVA	3	436	Y	48	2		21%	5		Excellent	5		Good	4		***74***	MONITOR
Aylmer MS1	5MVA	2	613	N	41	2		46%	5		Excellent	5		Good	4		***74***	MONITOR
Aylmer MS2 - TX2	3MVA	4	992	Y	23	3		30%	5		Excellent	5		Good	4		***80***	MONITOR
Tavistock MS1	5MVA	3	693	N	10	5		38%	5		Excellent	5		Good	4		***92***	MONITOR
Clinton MS2	OUT OF SERVICE & DECOMISSIONED																	

Based solely on age the four (4) stations prioritized for replacement based on the above health index scores are expected to reach their end of useful life in the next 5-10 years, and will be schedule for retirement or investment within that time period.

ETPL Maintenance Program

Inspection & Maintenance Cycles

ETPL currently conducts routine system inspections in line with requirements set out in the Distribution System Code: Appendix C. The following illustrates the currently adopted inspection and maintenance schedules and any issues are attended to in a timely manner as required.

Table 7: Inspection & Maintenance Cycles

INSPECTION & MAINTENANCE CYCLES		
O/H Distribution System	3 year	‣ Visual inspection of all overhead lines, poles, transformers and associated equipment.
U/G Distribution System	3 year	‣ Visual inspection of all padmounted equipment including transformers, switches, cubicles etc.
Distribution Substations (ETPL)	1 month	‣ Visual inspection of all substation equipment including transformers, switches, structures, fence, yard etc. ‣ Temperature and current readings are also recorded for transformers and feeders respectively.
Distribution Substations (Contractor)	6 month	‣ Visual inspection of all substation equipment including transformers, switches, structures, fence, yard etc. by a third party contractor. ‣ Formal report created for review by ETPL. 2015 report attached as Appendix A for reference.
Thermograph Scans	2 year	‣ Infrared inspection completed by a contractor to identify thermal anomaly conditions on distribution system equipment that suggest unwanted conditions and indicate repairs are required. ‣ All anomalies are noted and prioritized based on the temperature rise as compared to the ambient temperature. 2014 report attached as Appendix B for reference.
Substation Transformer Oil Analysis	1 year	‣ Oil samples are taken from all distribution transformers and Dissolved Gas Analysis (DGA) and Chemical Analysis (ASTM/Water) are completed. ‣ Comparisons are made to previous tests and recommendations made based on trends.
Substation Maintenance	5 year	‣ Thorough substation maintenance which includes inspection, cleaning and service of all electrical and mechanical components. Grounding inspection and testing. Transformer testing including insulation resistance, capacitance and dissipation factor, turns ratio and winding resistance tests. ‣ Formal report created for review by ETPL. 2014 report attached as Appendix C for reference.
Tree Trimming	3 year	‣ Tree trimming completed by third party contractor to ETPL specifications.
Pole Testing	9 year	‣ Third party contractor completes “Sound & Selective Bore” testing on poles which includes sounding of the pole (hammer test) and boring as deemed necessary. Poles are then analyzed, assigned a % of remaining strength and prioritized for replacement as required.

ETPL has implemented a detailed pole inspection program to supplement the OEB prescribed visual inspection. The pole inspection is completed by a third party contractor and is set on a nine (9) year cycle with a three (3) "re-test" on any pole that is deemed to have a remaining pole strength less than (<) 80%. This schedule has been developed to align with budgetary requirements however also ensures that poles requiring additional monitoring are inspected on a more frequent basis. Each operating center has been broken into three (3) cycles and the "re-test" schedule aligns with pole testing in that operating center to ensure that testing is accomplished without excessive travel. The schedule moving forward is outlined in the chart below.

Table 8: Pole Testing Schedule

Erie Thames Pole Inspection and Testing Schedule									
	2017	2018	2019	2020	2021	2022	2023	2024	2025
Testing	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Cycle 4**	**Cycle 5**	**Cycle 6**	**Cycle 7**	**Cycle 8**	**Cycle 9**
Clinton	771			Retest < 80%					
Dublin	127								
Mitchell				1046			Retest < 80%		
Tavistock	Retest < 80%						440		
Embro					305			Retest < 80%	
Beachville					371				
Thamesford					365				
Ingersoll 1/2		972			Retest < 80%				
Ingersoll 1/2		Retest < 80%						972	
Otterville			Retest < 80%						355
Burgessville									143
Norwich									525
Belmont						338			Retest < 80%
Aylmer			1157			Retest < 80%			
Port Stanley						726			Retest < 80%
Poles/Test	**898**	**972**	**1157**	**1046**	**1041**	**1064**	**440**	**972**	**1023**
Poles/Inspection	**3027**			**3151**			**2435**		
Total Poles	**8613**								

CAPEX Requirements

Distribution Poles

The replacement costs for overhead line poles vary greatly depending on a number of factors including weather, traffic, environment, access etc. This however can be simplified on a planning basis and poles are generally classified as Primary 3PH, Primary 1PH and Secondary/Support poles. The ETPL system contains the following distribution of poles based on the above noted classifications and the distribution has been applied to develop the yearly CAPEX requirements for pole replacements moving forward.

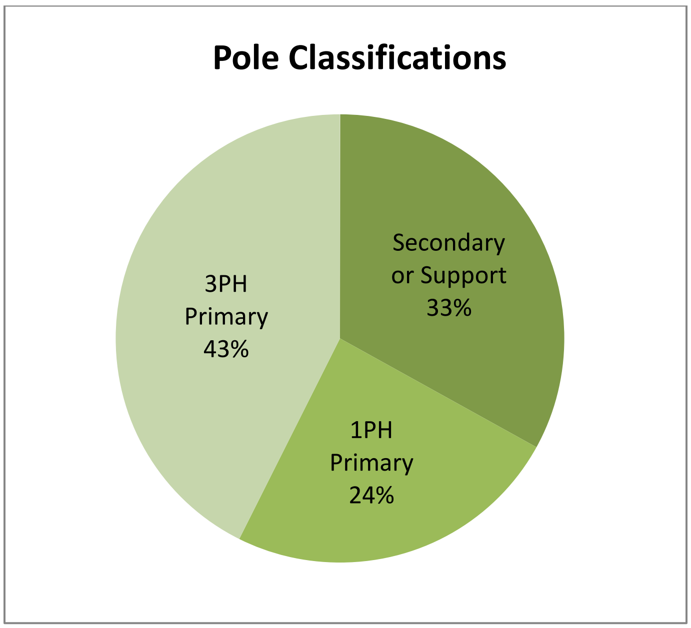


Figure 31: Pole Classifications

Table 9: Distribution Pole Replacement Costs

Pole Classifications	***Quantity***	***Unit Replacement Costs***	***Total Yearly CAPEX Requirements***
3PH Primary	74	$10,000	$736,723.85
1PH Primary	42	$7,500	$316,065.51
Secondary or Support Poles	57	$4,250	$243,038.57
			$1,295,827.94

Distribution Transformers

The replacement costs for distribution transformers vary greatly depending on a number of factors including weather, traffic, environment, access etc. This however can be simplified on a planning basis and transformers are generally classified as Polemount, Single Phase (1PH) Padmount and Three Phase (3PH) Padmount.

Table 10: Distribution Transformer Replacement Costs

Transformer Classification	***Quantity***	***Unit Replacement Costs***	***Yearly CAPEX Requirements***
Polemount	58	$7,500.00	$435,000.00
1PH Padmount	19	$10,000.00	$190,000.00
3PH Padmount	4	$40,000.00	$160,000.00
			$785,000.00

Medium Voltage Underground Circuits

The replacement costs for medium voltage underground cables can be assigned to 3PH and 1PH applications as follows.

Table 11: Medium Voltage UG Cable Replacement Costs

UG Cable Classification	***Quantity (m)***	***Unit Replacement Costs***	***Yearly CAPEX Requirements***
Three Phase (3PH)	364	$ 350	$ 127,400
Single Phase (1PH)	2140	$ 150	$ 321,000
			$ 448,400

Distribution Substations

Ideally voltage conversion moving forward will lead to the removal of all ETPL owned substations avoiding substantial replacement costs within the next 15-20 years. The estimated costs to convert each customer connected to the remaining distribution substations are outlined below, along with information regarding the annual costs to maintain a municipal substation. These are additional pieces of information used to help focus CAPEX investments and justify conversion moving forward.

Table 12: Substation Replacement Costs

Priority	***Distribution Station***	***2011 Estimated Replacement Cost (METSCO Report)***	***2015 Estimated Replacement Costs (1% / year)***	***# of Customers***	***Conversion Costs / Customer***	***Costs to Convert all Customers***
1	Clinton MS1	$800,000	$832,483	1494		$7,359,444
2	Port Stanley MS1	$800,000	$832,483	917		$4,517,142
3	Beachville MS1	$600,000	$624,362	402		$1,980,252
MONITOR	Aylmer MS2	$900,000	$936,543	992		$4,886,592
4	Mitchell MS2	$600,000	$624,362	236	$4,926	$1,162,536
MONITOR	Ingersoll MS1	$800,000	$832,483	767		$3,778,242
MONITOR	Ingersoll MS3	$800,000	$832,483	436		$2,147,736
MONITOR	Aylmer MS1	$660,000	$686,798	613		$3,019,638
MONITOR	Tavistock MS1	$800,000	$832,483	992		$4,886,592
			$7,034,480			**$33,738,174**

Yearly Costs (approximate)	
O&M Expenses	
5 Year Maintenance	$4000 per station x 2 per year = $8000
Bi-Annual Inspections	$558 per station x 9 stations = $5022
Monthly Inspection	$2475 per station x 9 stations = $22,280
Yearly Oil Sample & Analysis	$391 per station x 9 stations = $3520
Lawn Maintenance & Weed Control	$300 per station x 9 stations = $2700
Utilities, Property Taxes & Amortization	$3399 per station x 9 stations = $30,588
Capital Costs	
Miscellaneous Substation Upgrades (Fence repairs, gravel etc.)	$1667 x 9 stations = $15,000
	$87,110 TOTAL / 9 stations = $9679 per station, per year

Beachville MS1 and Mitchell MS2 have both been prioritized for replacement and supply 402 and 236 customers respectively. Within the 5-10 years of expected life remaining voltage conversion will be able to address the customers supplied by these stations and no additional costs are expected as a result of their condition.

There are however, two (2) substations, Clinton MS1 & Port Stanley MS1, that have been prioritized for retirement based on the condition assessment of their transformer and voltage conversion may not realistically address the needs of the station within a sufficient timeframe. ETPL has developed relationships with other utilities and suppliers and will be exploring the possibilities of replacing these transformers if their condition deteriorates. The main driver for the low health index scores of these transformers is the oil analysis that is completed on a yearly basis. Although the results indicate concern with respect to the gasses being produced internally there appears to be no trending to indicate that the condition is getting worse with time. The replacement of the Aylmer MS1 transformer cost approximately $70,000 and if required a similar investment could be expected over the next 5-10 years. If at all possible this will be avoided with voltage conversion and will most likely not drastically effect the CAPEX requirements moving forward.

Summary

The asset condition assessment yields the following replacement levels for fixed distribution assets and do not include distribution substations as no substantial costs are expected.

Table 13: Major Asset Replacement Cost Summary

Fixed Distribution Asset	*Classification*	*Average Yearly Replacement Quantity*	*Unit Replacement Costs*	*Average Yearly CAPEX Requirements*	*TOTAL*
Overhead Line Poles	3PH Primary	74	$10,000	$736,723.85	**$1,295,827.94**
	1PH Primary	42	$7,500	$316,065.51	
	Secondary/Support	57	$4,250	$243,038.57	
Distribution Transformers	Polemount	58	$7,500	$435,000.00	**$785,000.00**
	3PH Padmount	19	$10,000	$190,000.00	
	1PH Padmount	4	$40,000	$160,000.00	
UG Medium Voltage Cable	3PH	364	$350	$127,400	**$ 448,400**
	1PH	2140	$150	$321,000	
				TOTAL	**$2,529,228**

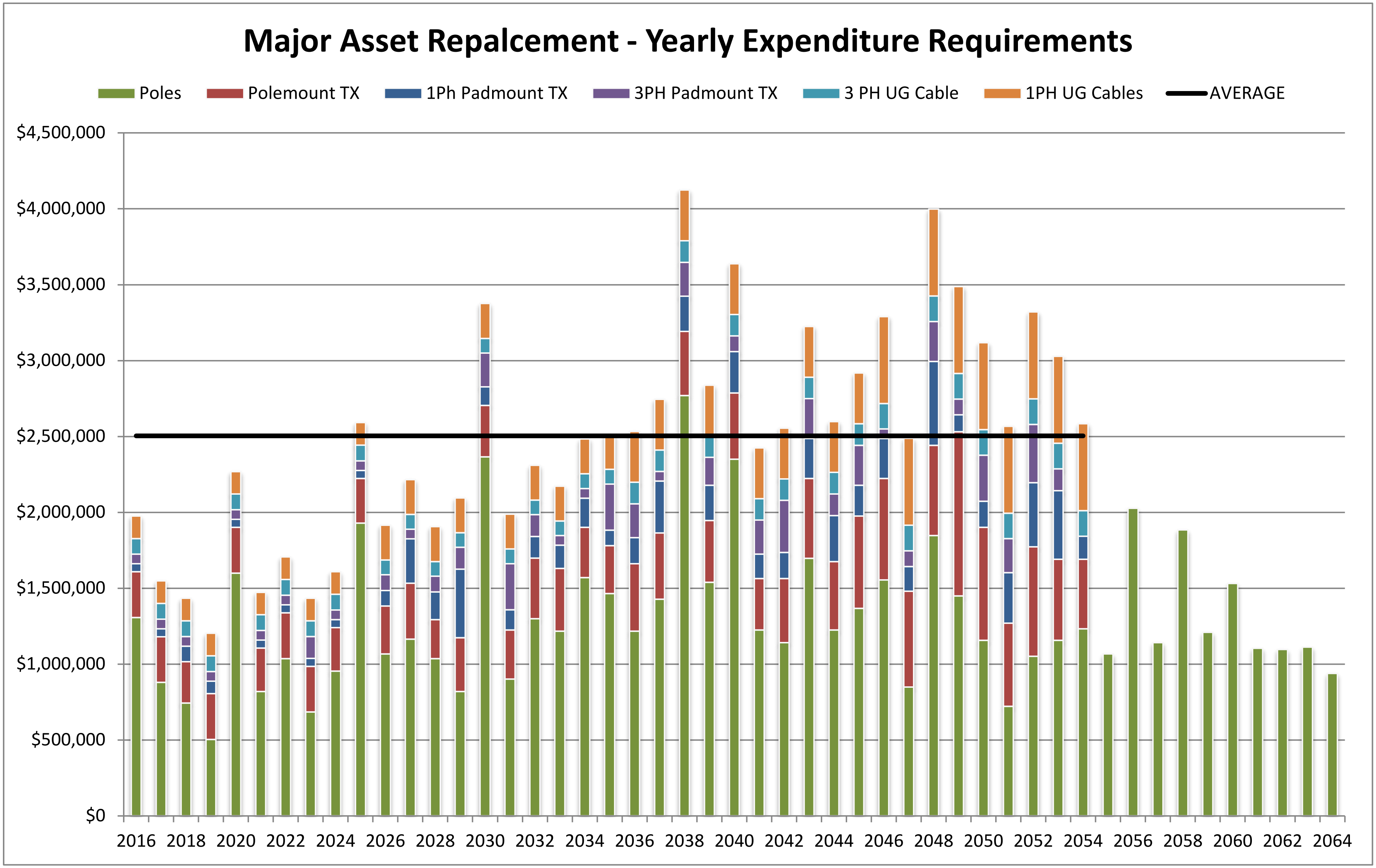


Figure 32: Major Asset Replacement - Yearly Expenditure Requirements

Analysis of Changes between 2011 & 2015 ACA/AMP

- The first notable change from 2011 is that customer input has been formally incorporated as part of the decision framework and risk analysis process moving forward. There are a number of means where customer input is gathered ranging from formal customer surveys, meetings with large customers and informal interactions throughout a given year.
- Since 2011 ETPL has worked to obtain more accurate data with respect to its major assets and the following are comparisons of the age data used in the 2011 report and the 2015 update.

Table 14: Data Accuracy Comparison

Asset Type	2011 Report	2015 Update
	% of Accurate Data	
Poles	83%	94%
Pole Mounted Transformers	0%	44%
Pad Mounted Transformers	0%	72%
Underground Medium Voltage Cable	0%	0% [1]

- Since 2011 ETPL has implemented a formal pole testing program that it intends to repeat on a nine year cycle. It will aim to provide more detailed condition based information for poles and associated hardware and in turn will allow for capital expenditures to be targeted to areas that age related data alone does not identify.

Areas for Improvement

- ETPL will continue to improve the accuracy of data used to make decisions regarding capital spending levels. The goal of using a complete set of condition based evaluations for all major assets will be accomplished with the movement to electronic inspections that are easily compiled and flagged for each asset.
- The implementation of an OMS system and further utilization of smart meter data will allow for a more granular analysis of loading and outage causes.

---

[1] More accurate padmounted transformer data in 2015 led to the age profile for medium voltage cable to be a more accurate representation as padmounted ages were used as a proxy.

Conclusions

In general the number of major assets expected to reach their typical end of life will increase year over year for approximately the next 20-30 years. In order to mitigate a sharp increase in spending from year to year it is sensible to implement an average capital spending level of approximately **$2,529,288** on fixed distribution assets moving forward.

The chart shown below provides a representation of how ETPL's asset base will improve over time provided the recommended spending levels are implemented using poles as the most accurate indicator of overall asset base. This trend does however assume a 100% efficient replacement of end of life assets. (i.e. every dollar spent is for the renewal of an end of life asset.)

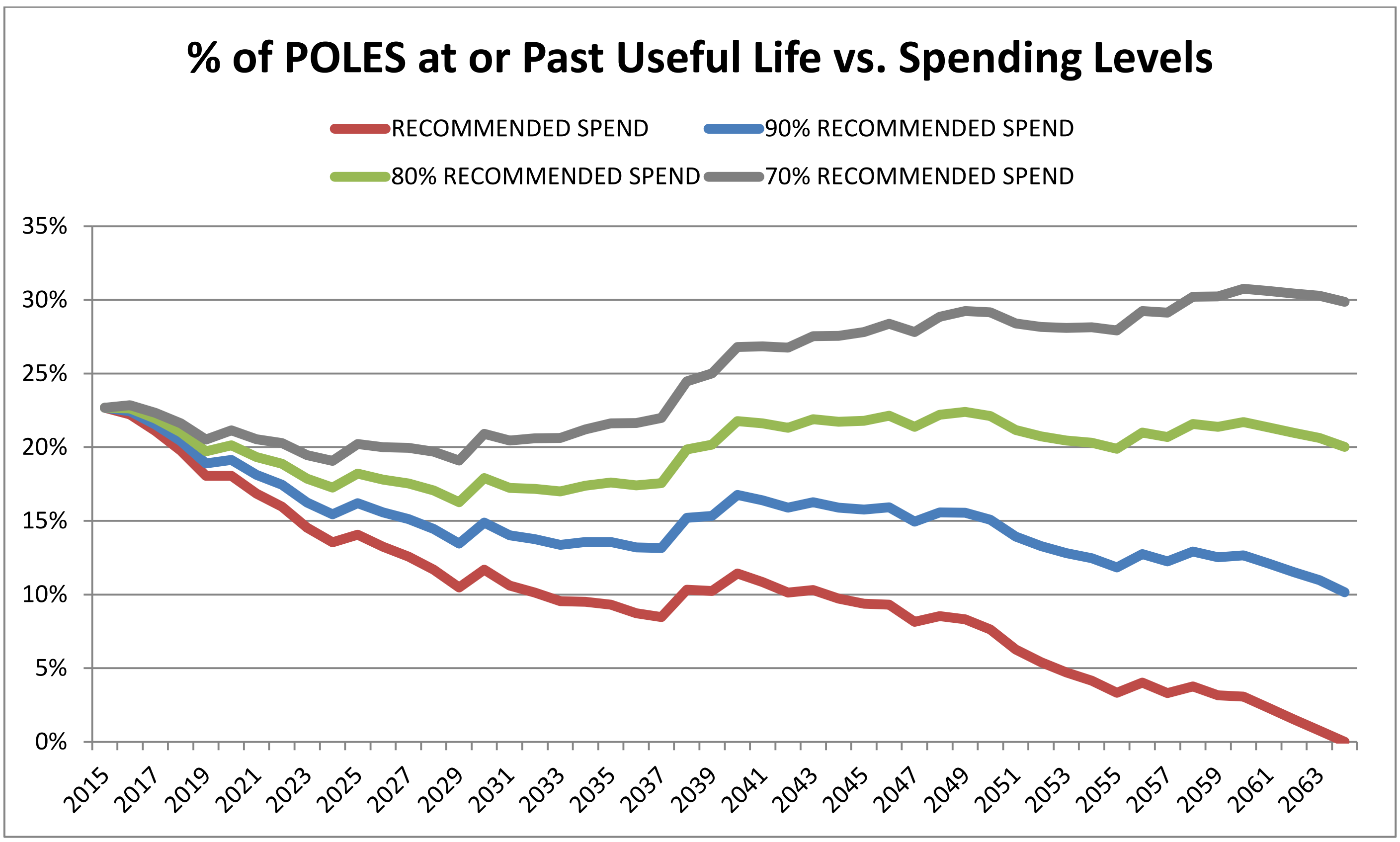


Figure 33: Asset Base Trend - Distribution Poles at End of Life

In reality every capital dollar will not be spent on the replacement of an end of life assets due to the following factors:

- The nature of voltage conversion - some newer 4kV assets are required to be replaced
- Facility relocations - municipal road widening, etc.
- Motor vehicle accidents (MVAs)
- Weather related failures
- Legacy construction issues

From 2013-2015 the average pole replacement age was 35 years; using a 50 year useful life this indicates approximately 70% efficiency targeting end of life assets with capital spending.

In order to maintain or slightly improve the reliability that is currently provided by ETPL's distribution system and with the above noted realities in mind it is prudent for capital spending to follow the recommended level. This will mitigate any sharp increases in spending from year to year and will result in reliability that will slightly improve over time.

Appendix A - Substation Bi-Annual Inspection Report

3E POWER SERVICES LTD.
3E Power Services Ltd.
Web: 3epower.ca
500 HWY #3
P.O. Box 428
Tillsonburg, Ontario
N4G 4H8
Phone: (519) 842-4900
Toll Free: (844) 842-4900
Toll Free Fax: (888) 258-0535
E-Mail: contact@3epower.ca

Dec 11th, 2015

Erie Thames Power Corporation
143 Bell Street
Ingersoll, ON N5C 2N9

Attention: Scott Brooks

Re: Semi-Annual Inspection (Nov.2015) Report - Our Ref: 2015-3E-001

Dear Scott,

Please find the attached report for the spring of 2015 Semi-Annual inspections completed on November 2015.

3E Power Services Ltd. performed the inspections at each substation as required. A summary of the site findings is listed below for your review. The substation at Clinton MS2 has been taken off line; therefore no results were recorded at this bi-annual inspection.

Please find enclosed comments and findings with recommendations to each station. The summary includes priority issues that need addressing and additional concerns.

Substations:	***Beachville***	***MS1***
	Ingersoll	***MS1, MS3***
	Port Stanley	***MS1***
	Tavistock	
	Aylmer-McBrien	***MS2***
	Aylmer-Forest	***MS1***
	Clinton	***MS1***
	Mitchell	***MS2***

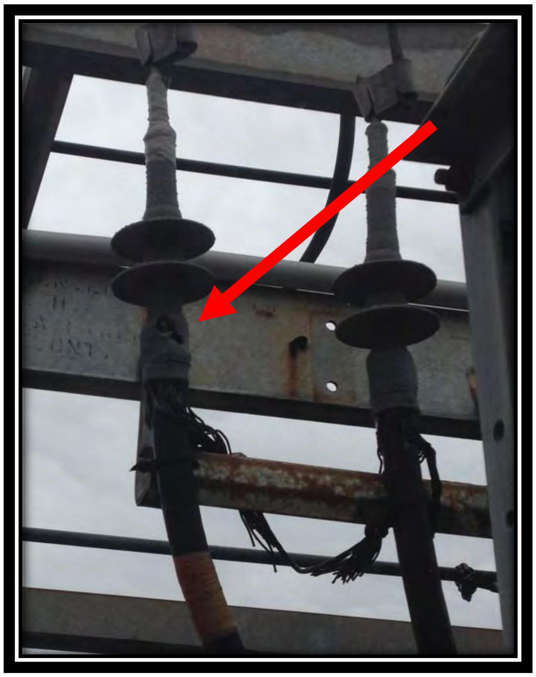
Beachville – MS1

Findings/Repairs:

- Trip Hazard in the driveway near the road outside the property fence gate is a potential hazard – needs to be filled in

- Damaged yard light needs replacement

- Terminations split



- Transformer starting to rust

Recommendations:

- Repair sinkhole by the front gate
- Replace broken pole light
- Repair the split termination
- The Transformer is starting to rust – inspection is needed as there may be moisture inside

Ingersoll – MS1

Findings/Repairs:

- Name Plate is faded

- HV switch on TX paint faded, minor rust spots

- Stairs are rusting

Recommendations:

- Stairs should be painted to slow down rusting further
- Replace nameplate on transformer so it is legible
- Continue with regular bi-annual substation inspections

Ingersoll – MS3

Findings/Repairs:

- Paint is fading/peeling off exterior doors, vandalism present and exterior lights on main building door is missing globes

- Building structure concern with cement cracked

Recommendations:

- Recommend paint all exterior doors on the buildings
- Install new outdoor lights
- Repair cracked building cement
- Some lights in the building need repair – possibly bulbs or ballasts
- Continue with regular bi-annual substation inspection

Port Stanley – MS1


Findings/Repairs:

- Minor oil leak at drain valve on TX

- Possible moisture getting into building

- Bulbs needed for indicating lights on gear

- Station will need cleaning out in spring with leaves present and more leaves to come down off trees.

Recommendations:

- Monitor drain valve leak on transformer
- Monitor possible moisture getting into building
- Gear indicating lights need new bulbs
- Leaves falling and will need to be cleaned out in the spring, if not cleared will cause problems with gravel and addition weed growth
- Continue with regular bi-annual substation inspection

Tavistock

Findings/Repairs:

- Top rail requires repair in North East corner

April 2015

November 2015

- Gravel added to substation during inspection

Before

After

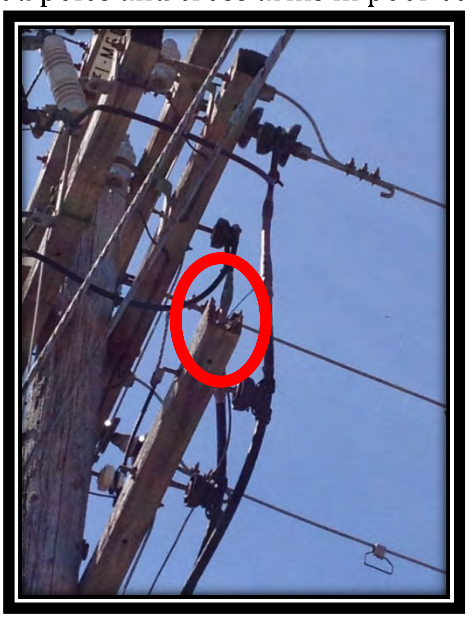
After

- Yard waste is being piled too close to the fence on north side of station and could potentially allow access over fence

April 2015

November 2015

- Wood poles and cross arms in poor condition and require replacement



- Danger High Voltage signs required on cable tray

- Guy Guards in poor condition and require replacement (4 Yellow Guards required)

- Rust appearing on switch gear

- Phase markers faded on 5kV poles – need to be replaced

- Air break tower switch interlocks not in sequence – tower will not open without removing interlock

April 2015

April 2015

November 2015

- Minor rust on TX fins
- Fence is bent in and should be repaired

Recommendations:

- Repair top rail of fence and the mid rail on fence which is bent – bollards may need to be considered to protect fence from vehicle traffic
- Replace wood poles and cross arms
- Replace 4 yellow guy guards
- Touch-up paint needed on rust area's on switch gear and transformer fins
- Replace fading phase markers on 5kV poles
- Remove yard waste from fence area

- Interlock not properly sequenced
- Weed spray program needed in 2016, recommend to spray twice per year (spring/fall)
- Continue with regular bi-annual substation inspection

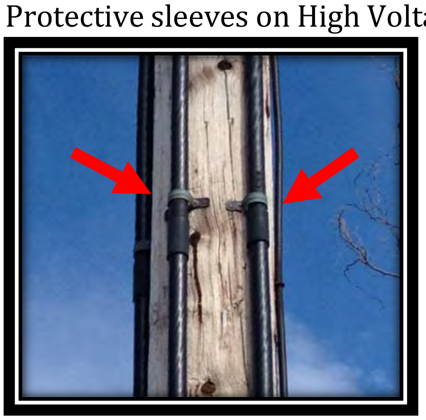
Aylmer – McBrien – MS2


Findings/Repairs:

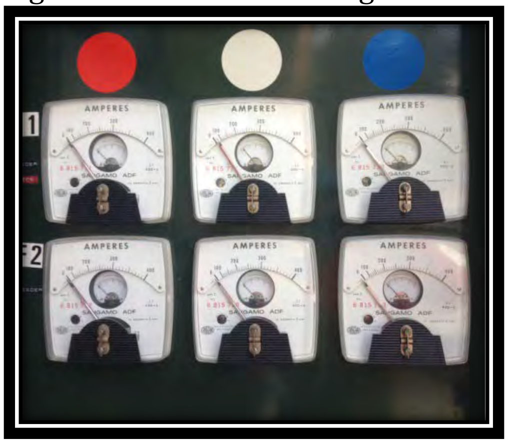
- Vegetation is still present

April 2015 November 2015

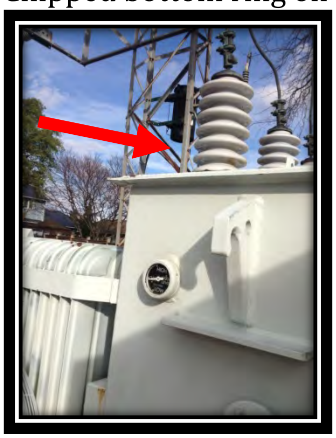

- Protective sleeves on High Voltage cables are not under metal straps



- Light load – is the metering accurate?



- Chipped bottom ring on south transformer



Recommendations:

- Re-install metal straps for protective sleeves on High Voltage cables
- Bring in gravel to replenish outside of fence
- Use primary metering data for over-all station loading
- Implement a weed spray program
- Continue with regular bi-annual substation inspection

Aylmer-Forest – MS1

Findings/Repairs:

- Replacement transformer installed in summer of 2015
- Fencing not complete, still under construction a temporary fence is in place at time of inspection
- New fence not grounded to OESC

- Gravel low under fence-not done at west side of fence during install

- Satellite dish on neighbor's house requires bonding per code regulations. Satellite dish should be relocated so metal dish and station fence cannot be touched at same time by a person.

- Vegetation growth present in April 2015 inspection and heavy growth in November 2015

April 2015

November 2015

Recommendations:

- New transformer installed summer 2015
- Weed spray program is recommended twice a year to control weeds and vegetation growth in substation
- For safety concerns, the neighbors steel satellite dish should be moved away from proximity to station fence
- Gravel level to be reviewed at next inspection following construction and settling, may need additional gravel in Spring 2016
- Grounding of fence to be brought to OESC requirements if required during the spring inspections
- Continue with regular bi-annual substation inspection

Clinton – MS1

Findings/Repairs:

- Gravel brought in to proper level with fence

Before After




- Down spout removed from buildings

- Additional grounding added to meet OESC





- Transformer nameplate is faded, new nameplate is recommended

- Barb wire is rusted and slightly loose in areas around the fence

- Pole repairs completed by 3rd party which was found damaged at last inspection

- Primary concrete pole heavily cracked

- Garbage and leaves cleaned up during inspection

- Barb wire required between fence post and building noted from April 2015 inspections – still needs attention

- Bx cable on exterior of building should be replaced with Teck (front pot lights). Installation does not meet OESC

- Guying needs to be reviewed – some risk where fibre roads are located on this pole

- Phase tape is peeling off and loose on cables on poles

- Wire way labelled

- Man door not bonded

Recommendations:

- Replace transformer nameplate to prevent information from deteriorating further
- Transformer oil DGA tested during inspection – transformer has rising gas levels exceeding recommended levels
- Continue with regular bi-annual substation inspection

Clinton – MS2

- Station Removed – empty lot now

Mitchell – MS2

Findings/Repairs:

- Barb wire is rusty but all intact (slightly loose at Southwest corner)

- Broken middle rail

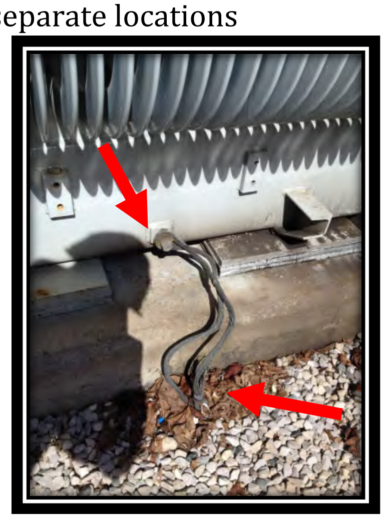
- Transformer rusting & minor oil leaks

- Pole has heavy deterioration, is weak and terminations are old and should be replaced with skirted terminations

- Switch gear and transformer requires paint

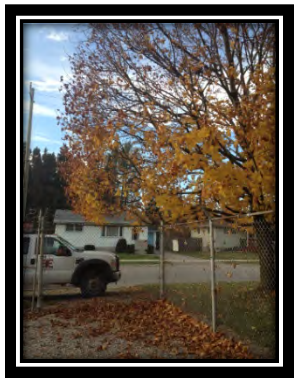
- Minor oil leaks on transformer noted at April 2015 inspections & during November 2015 inspections, continue to monitor

- Transformer is bonded in one place (2-2/0), it is to code to have transformer bonded in two separate locations



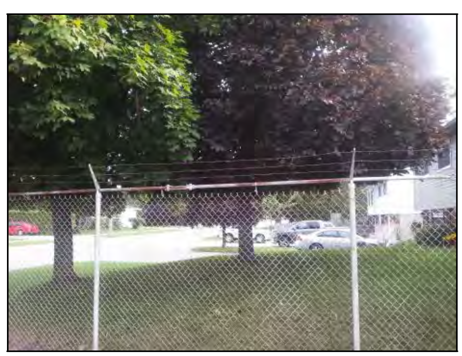
- Tree overhangs fence on North West corner, which could provide access over fence which presents a safety concern needs to be trimmed and leaves will need to be cleaned up in the spring

April 2015 November 2015


- Neighbors trees are getting in proximity of incoming lines, trimming required

- Top rail needs to be lowered to be able to fasten fence fabric properly

- Barb wire needs replacement soon – loose and very rusty

- Feeder 5 open, Feeder 6 closed

Recommendations:

- Adjust top rail on fence to allow fence fabric to be properly fastened
- Paint substation transformer and switchgear recommended
- Tree branches overhanging the fence into substation is a safety concern for easy access into station
- Continue with regular bi-annual substation inspection

Overall Recommendations from all ETPL stations:

- There are NO Single Line Diagrams at any of the stations – this is a safety issue and OESC requirement
- Weed program needed in all stations and should be sprayed in the spring & fall, along with clean out of all debris each spring to help reduce growth of vegetation and extend life of gravel levels.
- Continued bi-annual inspections recommended

All other equipment appears to be in satisfactory condition and is suitable for continued service. Attached you will find the Substation Inspection Report and Meter Readings Summary for each of the substations inspected at this time. The old metering data is questionable on accuracy due to age of requirement.

The stations with over growth were trimmed back and cleaned up at the time of inspection.

Please give us a call should you have any questions or wish for 3E Power Services Ltd to proceed with the recommended repairs listed in this report.

If you have any questions please do not hesitate to contact me anytime. We look forward to working with Erie Thames Powerlines on this ongoing project and future projects.

Regards,

Steve Del Guidice

Steve Del Guidice, ME, EET
Operations Manager
sdelguidice@3epower.ca
3E Power Services Ltd.

3E POWER SERVICES LTD.

500 HWY #3
P.O. BOX 428
TILLSONBURG, ONTARIO
N4G 4H8

PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: BEACHVILLE MS1
Site Address: 434839 ZORRA LINE
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L.EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	30-Apr-14	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	2:15 PM	11:45 AM	3:30 PM	10:00 AM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	YES	YES		
FENCE SPACES	YES	YES	YES	YES		
FENCE BARBED WIRE	YES	YES	YES	YES		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	YES	YES		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	YES	MINOR	NO		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	YES	YES	YES	YES		
BUILDING CONDITIONS	YES	YES	YES	N/A		
BUILDING LIGHTS/FANS/HEAT	YES	YES	YES	N/A		
INDICATING LIGHTS/DEVICES	N/A	N/A	N/A	N/A		
Substation General Comments						
	HOISTING CABLES ON RECLOSURE HAVE RUSTED OFF.		1. NEW SIGNS INSTALLED			
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS		NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS		NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS		NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS		NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS		NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS		NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS		YES	YES		
VEGETATION	NO REPAIRS		NO REPAIRS	NO REPAIRS		
GRAVEL	NO REPAIRS		NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS	NO REPAIRS		NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS		NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS		NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS		NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	10. ° C		16. ° C	15. ° C		
TEMPERATURE PEAK:	55. ° C		45. ° C	50. ° C		
PRESSURE GAUGE READING:	1. PSI		0. PSI	0. PSI		
OIL LEVEL:	25. ° C		25. ° C	25. ° C		
TEMPERATURE CURRENT:	30. ° C		35. ° C	35. ° C		
TEMPERATURE RESET? YES / NO	YES		YES	YES		
SILICA GEL BREATHER:	N/A		N/A	N/A		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED		GOOD - NOTHING REQUIRED	FAIR - MONITOR		

3E POWER SERVICES LTD.

500 HWY #3
P.O. BOX 435
TILLSONBURG, ONTARIO
N4G 4H5

PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: BEACHVILLE MS1
Site Address: 434839 ZORRA LINE
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
			1. NEW SIGNS INSTALLED			
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						

Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: HK PORTER YEAR OF MANUFACTURE: 1976 SERIAL NUMBER: 22515-1 KVA: 3000 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.65 % WEIGHT: 19900 LBS			1. TYPING ERROR CORRECTED TO 5.65% 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. RUSTING NEEDS INVESTIGATING FURTHER, APPEARS TO BE INTERNAL IE: MOISTURE ISSUE 2. SPARE FUSES IN HV SWITCH? TYPICALLY ON DOOR INSIDE 3. VERIFIED TRANSFORMER INFORMATION IS TRUE		
OIL VOLUME: 574 GAL						
TAP SETTING: 2						
TAP POSITION 1: 27600						
TAP POSITION 2: 26910						
TAP POSITION 3: 26220						
TAP POSITION 4: 25530						
TAP POSITION 5: 24840						
FUSE MANUFACTURER : S&C						
FUSE LINK: 125E						
FUSE HOLDER: SM-5						

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500 HWY #3
P.O. BOX 428
TILLSONBURG, ONTARIO
N4G 4H8
PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: INGERSOLL MS1
Site Address: MILL STREET
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L. EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	30-Apr-15	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	1:00PM	1:00 PM	2:00 PM	3:00 PM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	N/A	N/A	N/A	N/A		
FENCE GROUNDING	N/A	N/A	N/A	N/A		
FENCE SPACES	N/A	N/A	N/A	N/A		
FENCE BARBED WIRE	N/A	N/A	N/A	N/A		
GATE LOCKED:	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	N/A	N/A		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	MINOR	MINOR	MINOR		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	N/A	N/A	N/A	N/A		
BUILDING CONDITIONS	YES	YES	N/A	N/A		
BUILDING LIGHTS/FANS/HEAT	YES	YES	YES	YES		
INDICATING LIGHTS/DEVICES	YES	YES	YES	YES		
Substation General Comments						
	BATTERY BANK AT 52vDC (TESTED AT 50.9vDC) HEATER ON IN SWITCH	BATTERY BANK AT 52VDC	1. NEW SIGNS INSTALLED			
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
VEGETATION	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GRAVEL	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	10. ° C	12. ° C		15. ° C		
TEMPERATURE PEAK:	55. ° C	55. ° C	45. ° C	55. ° C		
PRESSURE GAUGE READING:	0.5 PSI	0.5 PSI	1. PSI	1. PSI		
OIL LEVEL:	25. ° C	25. ° C	25. ° C	25. ° C		
TEMPERATURE CURRENT:	35. ° C	35. ° C	40. ° C	35. ° C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	GOOD	GOOD	GOOD	GOOD		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	FAIR - MONITOR	FAIR - MONITOR		

3E POWER SERVICES LTD.
500 HWY #3
P.O. BOX 428
TILLSONBURG, ONTARIO
N4G 4H8
PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: INGERSOLL MS1
Site Address: MILL STREET
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	NAME PLATE FADING - LOSING VECTOR DIAGRAMS	NAME PLATE FADING	1. TX PAINT IS FADING	1. TX PAINT IS FADING 2. SWITCH HAS PAINT OFF 3. STAIRS STILL NEED PAINT		
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						

Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1			1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
MANUFACTURER: FERRANTI PACKARD						
YEAR OF MANUFACTURE: 1985						
SERIAL NUMBER: 0265001001						
KVA: 5000 / 5600						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.10 %						
WEIGHT: 14345 KG						
OIL VOLUME: 3437 L						
TAP SETTING: 4						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK: NA						
FUSE HOLDER: NA						

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500 HWY #3
P.O. BOX 428
TILLSONBURG, ONTARIO
N4G 4H8
PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA
3E Power Services Ltd.
Web: 3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: INGERSOLL MS3
Site Address: MILL STREET
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L.EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	30-Apr-15	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	1:00PM	1:45 PM	2:00 PM	2:00 PM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	N/A	N/A	N/A	N/A		
FENCE GROUNDING	N/A	N/A	N/A	N/A		
FENCE SPACES	N/A	N/A	N/A	N/A		
FENCE BARBED WIRE	N/A	N/A	N/A	N/A		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	N/A	N/A		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR VEGETATION	MINOR VEGETATION	MINOR	MINOR		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	N/A	N/A	N/A	N/A		
BUILDING CONDITIONS	YES	YES	YES	YES		
BUILDING LIGHTS/FANS/HEAT	YES	YES	YES	YES		
INDICATING LIGHTS/DEVICES	YES	YES	YES	YES		
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	BATTERY BANK TESTED AT 50.4vDC - FILLED LEVELS GOOD	BATTERY BANK TESTED AT 50VDC	1. REPLACED SIGNS			
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
VEGETATION	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GRAVEL	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		

Transformer Observations						
AMBIENT TEMPERATURE:	10. ° C	12. ° C	18. ° C	15. ° C		
TEMPERATURE PEAK:	45. ° C	47. ° C	42. ° C	47. ° C		
PRESSURE GAUGE READING:	0. PSI	N/A	0. PSI	N/A		
OIL LEVEL:	25. ° C	>25 ° C	>25 ° C	>25 ° C		
TEMPERATURE CURRENT:	25. ° C	18. ° C	30. ° C	29. ° C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED		
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	RECOMMEND SILICA GEL BREATHER					
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1			1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
MANUFACTURER: FERRANTI PACKARD						
YEAR OF MANUFACTURE: 1967						
SERIAL NUMBER: 1-3059						
KVA: 5000						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.53 %						
WEIGHT: 20240 LBS						
OIL VOLUME: 960 GAL						
TAP SETTING: 1						
TAP POSITION 1: 27600						
TAP POSITION 2: 26910						
TAP POSITION 3: 26220						
TAP POSITION 4: 25530						
TAP POSITION 5: 24840						
FUSE MANUFACTURER : S&C						
FUSE LINK: NA						
FUSE HOLDER: NA						

3E POWER SERVICES LTD.
500 HWY #3
P.O. BOX 405
TILLSONBURG, ONTARIO
N4G 4H3
PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: PORT STANLEY MS1
Site Address: CARLOW ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L. EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	28-Apr-14	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	8:30 AM	8:00 AM	7:30 AM	3:00 PM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	YES	YES		
FENCE SPACES	YES	YES	YES	YES		
FENCE BARBED WIRE	YES	YES	YES	YES		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	YES	YES		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	MINOR	MINOR	MINOR		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	YES	YES	YES	N/A		
BUILDING CONDITIONS	YES	YES	YES	YES		
BUILDING LIGHTS/FANS/HEAT	YES	YES	YES	YES		
INDICATING LIGHTS/DEVICES	YES	YES	YES	YES		
Substation General Comments						
	BATTERY BANK AT 54.3vDC TEST AT 54.4vDC, O.OA OUPUT, MOUSE DIRE AND COBWEBS REMOVED FROM	BATTERY BANK AT 54VDC, CHANGED PANEL INDICATOR BULBS	1. NEW SIGNS INSTALLED 2. TOWER NOT IN USE			
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS	NO REPAIRS	YES	NO REPAIRS		
VEGETATION	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GRAVEL	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	9. ° C	14. ° C	5. ° C	15. ° C		
TEMPERATURE PEAK:	50. ° C	50. ° C	47. ° C	55. ° C		
PRESSURE GAUGE READING:	0.5 PSI	1.0 PSI	0.5 PSI	1. PSI		
OIL LEVEL:	25. ° C	> 25 ° C	> 25 ° C	> 25 ° C		
TEMPERATURE CURRENT:	32. ° C	44. ° C	39. ° C	42. ° C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED		

3E POWER SERVICES LTD.

500 HWY #3
P.O. BOX 405
TILLSONBURG, ONTARIO
N4G 4H5

PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: PORT STANLEY MS1
Site Address: CARLOW ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
			1. NEW SIGNS INSTALLED			
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						
Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: FERRANTI PACKARD YEAR OF MANUFACTURE: 1979 SERIAL NUMBER: 307425 KVA: 5000 / 6650 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.1% @5000 kVA WEIGHT: 25960 LBS			1. CORRECTED kVA to 5000/6650 2. CORRECTED WEIGHT TO BE 25960 LBS 3. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. OVER HANGING TREES MAKING A MESS IN STATION 2. FEEDER 1 BREAKER NOT IN CELL 3.VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
OIL VOLUME: 665 GAL						
TAP SETTING: 3						
TAP POSITION 1: 27600						
TAP POSITION 2: 26910						
TAP POSITION 3: 26220						
TAP POSITION 4: 25530						
TAP POSITION 5: 24840						
FUSE MANUFACTURER :						
FUSE LINK:						
FUSE HOLDER:						

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500 HWY #3
P.O. BOX 428
TILLSONBURG, ONTARIO
N4G 4H8
PHONE: (519) 842-4900
TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: TAVISTOCK
Site Address: 17 DECEW STREET
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L. EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	30-Apr-14	12-Sep-14	15-Apr-15	09-Nov-15		
INSPECTION TIME:	3:00 PM	8:00 AM	1:30 P.M.	9:00 AM		
General Substation Observations ACCEPTABLE YES / NO	**YES**	**YES**	**YES**	**YES**		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	YES	YES		
FENCE SPACES	YES	YES	YES	YES		
FENCE BARBED WIRE	NO	NO	YES	YES		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	YES	YES		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	MINOR	MINOR	MINOR		
GRAVEL	YES	YES	NO	YES		
TOWER CONDITIONS	YES	YES	NO	NO		
BUILDING CONDITIONS	N/A	N/A	N/A	N/A		
BUILDING LIGHTS/GANS/HEAT	N/A	N/A	N/A	N/A		
INDICATING LIGHTS/DEVICES	N/A	N/A	N/A	N/A		
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	TIGHTENED FENCE BARBED WIRE: LARGE 7" GAP UNDER GATE, COULD ALLOW ACCESS.		1. LARGE 7" GAP UNDER GATE, COULD ALLOW ACCESS.	1. NEEDS WEED SPRAY		
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
VEGETATION	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES		
GRAVEL	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	14. ° C	9. ° C	14. ° C	8. ° C		
TEMPERATURE PEAK:	30. ° C	L 40 °C W 40 °C	L 33 °C W 33 °C	L 45 °C W 45-48 °C		
PRESSURE GAUGE READING:	1. PSI	-5. PSI	0. PSI	7.5 PSI		
OIL LEVEL:	25. ° C	25. ° C	24 ° C	< 25 ° C		
TEMPERATURE CURRENT:	30. ° C	L 27 °C W 26 °C	L 23 °C W 23 °C	L 19°C W 19 °C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED		

3E POWER SERVICES LTD.
500 HWY #3
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TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: TAVISTOCK
Site Address: 17 DECEW STREET
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
			1. MINOR RUST ON FINS	1. GRAVEL ADDED TO SUBSTATION DURING INSPECTION & WEEDS REMOVED PRIOR TO ADDING GRAVEL 2. MINOR RUST ON FINS		
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						

Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1			1. CORRECTED kVA TO 5000/6670 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. NO FAN POWER 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
MANUFACTURER: PIONEER						
YEAR OF MANUFACTURE: 2005						
SERIAL NUMBER: G13572-1						
KVA: 5000 / 6670						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 6.74 %						
WEIGHT: 12400 KG						
OIL VOLUME: 3720 L						
TAP SETTING: 3						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK:						
FUSE HOLDER: SM-5						

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3E Power Servces Reference #: 2015-3E-001
Site Designation: AYLMER-MCBRIEN MS2
Transformer Identification: T1
Site Address: 209 CAVERLY ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L.EUBANK	D.BENJAMIN	J.DONCK / C.ARCHER	R.COOPER		
INSPECTION DATE	30-Apr-14	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	12:45 PM	9:15 AM	9:30 AM	2:00 PM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	YES	YES		
FENCE SPACES	YES	YES	YES	YES		
FENCE BARBED WIRE	YES	YES	YES	YES		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	YES	YES		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	YES	MINOR	MINOR		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	YES	YES	YES	YES		
BUILDING CONDITIONS	YES	YES	YES	YES		
BUILDING LIGHTS/FANS/HEAT	N/A	N/A	N/A	N/A		
INDICATING LIGHTS/DEVICES	YES	YES	YES	YES		
Substation General Comments						
	Pull Weeds / Spray, Top up Gravel	RODENTICED OPENED/COMSUMED IN T2 SWITCHGEAR, NO NEST FOUND, CLEANED & REPLACED	1.VEGETATION REQUIRES WEED SPRAY 2. NEW SIGNS INSTALLED	1.VEGETATION REQUIRES WEED SPRAY 2. NEED TO CHANGE SILICA GEL AT NEXT INSPECTION		
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS	NO REPAIRS	YES	NO REPAIRS		
VEGETATION	NO REPAIRS	NO REPAIRS	YES	YES		
GRAVEL	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	14. ° C	11. ° C	10. ° C	15. ° C		
TEMPERATURE PEAK:	45. ° C	42. ° C	39. ° C	45. ° C		
PRESSURE GAUGE READING:	0. PSI	N/A	N/A	N/A		
OIL LEVEL:	25. ° C	25. ° C	25. ° C	25. ° C		
TEMPERATURE CURRENT:	22. ° C	30. ° C	26. ° C	30. ° C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	GEL REPLACED	GEL REPLACED	GEL REPLACED	NO-NEEDS REPLACEMENT		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED		

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N4G 4H8

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TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: AYLMER-MCBRIEN MS2
Transformer Identification: T1
Site Address: 209 CAVERLY ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

Transformer General Comments						
	GRAVEL - SOME DIRT FILLED	GRAVEL - SOME DIRT FILLED	1. REPLACED SILICA GEL ON T1	1. MINOR RUST SPOTS		
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						
Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1			1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
MANUFACTURER: PIONEER ELECTRIC						
YEAR OF MANUFACTURE: 1967						
SERIAL NUMBER: T2993-1						
KVA: 3000						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.86%						
WEIGHT: 22350 LBS						
OIL VOLUME: 739 GAL						
TAP SETTING: 4						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK: NA						
FUSE HOLDER: SM-5						

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3E Power Servces Reference #: 2015-3E-001
Site Designation: AYLMER-MCBRIEN MS2
Transformer Identification: T2
Site Address: 209 CAVERLY ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L.EUBANK	D.BENJAMIN	J.DONCK / C.ARCHER	R.COOPER		
INSPECTION DATE	30-Apr-14	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	12:45 PM	9:15 AM	9:30 AM	2:15 PM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	YES	YES		
FENCE SPACES	YES	YES	YES	YES		
FENCE BARBED WIRE	YES	YES	YES	YES		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	YES	YES		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	YES	MINOR	MINOR		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	YES	YES	YES	YES		
BUILDING CONDITIONS	YES	YES	YES	YES		
BUILDING LIGHTS/FANS/HEAT	N/A	N/A	N/A	N/A		
INDICATING LIGHTS/DEVICES	YES	YES	YES	YES		
Substation General Comments	COMMENTS	COMMENTS	COMMENTS		COMMENTS	COMMENTS
	Pull Weeds / Spray, Top up Gravel	RODENTICED OPENED/COMSUMED IN T2 SWITCHGEAR, NO NEST FOUND, CLEANED & REPLACED	1.VEGETATION REQUIRES WEED SPRAY 2. NEW SIGNS INSTALLED	1.VEGETATION REQUIRES WEED SPRAY		
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS	NO REPAIRS	NO REPAIRS	YES	NO REPAIRS		
VEGETATION	NO REPAIRS	NO REPAIRS	YES	YES		
GRAVEL	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		

INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	14. ° C	11. ° C	10. ° C	15. ° C		
TEMPERATURE PEAK:	45. ° C	42. ° C	39. ° C	52. ° C		
PRESSURE GAUGE READING:	0. PSI	N/A	N/A	0. PSI		
OIL LEVEL:	25. ° C	25. ° C	25. ° C	25. ° C		
TEMPERATURE CURRENT:	22. ° C	30. ° C	26. ° C	45. ° C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED		
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS		COMMENTS	COMMENTS
	GRAVEL - SOME DIRT FILLED	GRAVEL - SOME DIRT FILLED				
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T2			1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
MANUFACTURER: FERRANTI PACKARD						
YEAR OF MANUFACTURE: 1992						
SERIAL NUMBER: 2-305405						
KVA: 3000						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.86%						
WEIGHT: 16575 LBS						
OIL VOLUME: 409 GAL						
TAP SETTING: 4						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK: NA						
FUSE HOLDER: SM-5						

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N4G 4H8 E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: AYLMER-FOREST MS1
Site Address: FOREST & MYRTLE
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L. EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	28-Apr-14	11-Sep-14	16-Apr-15	06-Nov-15		
INSPECTION TIME:	11:30 AM	10:30 AM	11:30 AM	12:00 PM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	YES	YES		
FENCE SPACES	YES	YES	YES	YES		
FENCE BARBED WIRE	YES	YES	YES	YES		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	YES	NO		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	MINOR	MINOR	MINOR		
GRAVEL	YES	YES	YES	YES		
TOWER CONDITIONS	RUSTY	RUSTY	RUSTY	RUSTY		
BUILDING CONDITIONS	YES	YES	YES	YES		
BUILDING LIGHTS/FANS/HEAT	N/A	N/A	N/A	N/A		
INDICATING LIGHTS/DEVICES	N/A	N/A	N/A	N/A		
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
				1. BARB WIRE NOT COMPLETE 2. GRAVEL LOW ON WEST SIDE 3. FENCE STILL BEING WORKED ON		
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO		
FENCE GROUNDING	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO		
FENCE SPACES	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO		
GATE LOCKED	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	YES	NO		
SIGNS	NO REPAIRS	NO REPAIRS	YES	NO		
VEGETATION	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO		
GRAVEL	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	14. ° C	12. ° C	12. ° C	12. ° C		
TEMPERATURE PEAK:	50. ° C	55. ° C	40. ° C	50. ° C		
PRESSURE GAUGE READING:	0. PSI	N/A	0. PSI	1. PSI		
OIL LEVEL:	25. ° C	>25 ° C	25. ° C	25. ° C		
TEMPERATURE CURRENT:	28. ° C	31. ° C	30. ° C	42. ° C		
TEMPERATURE RESET? YES / NO	YES	YES	YES	YES		
SILICA GEL BREATHER:	GOOD	GOOD	GOOD	N/A		

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N4G 4H8
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TOLL FREE FAX: (888) 358-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: AYLMER-FOREST MS1
Site Address: FOREST & MYRTLE
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	POOR - REQUIRES ATTENTION	FAIR - MONITOR		
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	RUST ON TOP AND FINS - RECOMMEND REPAINT	RUST ON TOP OF FINS GETTING REALLY BAD, NEED TO ADDRESS	1.RUSTY FINS 2.TIGHTEND BARB WIRE 3. INSTALLED SIGNS 4.INTERNAL ARCING HEARD FROM TX 5. SILICA GEL NEEDS REPLACEMENT	1. REVIEW STATION DURING NEXT INPECTION FOLLOWING REPAIRS & GROUND SETTLING FROM CONSTRUCTION, GRAVEL MAY BE REQUIRED		
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: WESTINGHOUSE YEAR OF MANUFACTURE: 1974 SERIAL NUMBER: A-35-6273 KVA: 5000 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.81% @ 60 HZ. WEIGHT: 26360 LBS			1. TYPING ERROR CORRECTED MANUFACTURER TO BRUSH 2. CORRECTED kVA TO 3600 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. **REPLACEMENT** TRANSFORMER INSTALLED THE SUMMER OF 2015 - VERIFIED ALL TRANSFORMER INFOMRATION IS TRUE 2. FUSE HOLDERS & STYLE CHANGED DURING TRANSFORMER REPLACEMENT		
OIL VOLUME: 647 GAL						
TAP SETTING: 3						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 226910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK: 100E						
FUSE HOLDER: SM-5						

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P.O. BOX 426
TILLSONBURG, ONTARIO
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TOLL FREE: (844) 842-4900
TOLL FREE FAX: (888) 258-0535
E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: CLINTON MS1
Site Address: 17 PARK LANE, CLINTON
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	L. EUBANK	D.BENJAMIN	J.DONCK	R.COOPER		
INSPECTION DATE	29-Apr-15	12-Sep-14	15-Apr-15	05-Nov-15		
INSPECTION TIME:	8:00 AM	9:30 A.M.	8:50 A.M.	8:45 AM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING	YES	YES	NO	YES		
FENCE SPACES	YES	NO	NO	NO		
FENCE BARBED WIRE	YES	YES	NO	NO		
GATE LOCKED	YES	YES	YES	YES		
GATE BARBED WIRE	YES	YES	NO	YES		
SIGNS	YES	YES	YES	YES		
VEGETATION	MINOR	MINOR	MINOR	MINOR		
GRAVEL	YES	YES	NO	YES		
TOWER CONDITIONS	N/A	N/A	YES	YES		
BUILDING CONDITIONS	YES	YES	YES	YES		
BUILDING LIGHTS/FANS/HEAT	YES	YES	YES	YES		
INDICATING LIGHTS/DEVICES	YES	YES	YES	YES		
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	LITTER CLEANED UP FROM EXTERIOR OF SUBSTATON		1. REFER TO RECOMMENDATIONS IN LETTER	1. GRAVEL ADDED AT INSPECTION 2. STRESS CRACKS IN CEMENT POLE		
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS		
FENCE SPACES	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED	NO REPAIRS	NO REPAIRS	YES	YES		
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS	YES	YES		
SIGNS	NO REPAIRS	NO REPAIRS	YES	YES		
VEGETATION	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GRAVEL	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES		
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
INDICATING LIGHTS/DEVICES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
Transformer Observations						
AMBIENT TEMPERATURE:	5. ° C		10. ° C	20. ° C		
TEMPERATURE PEAK:	36. ° C		39. ° C	52. ° C		
PRESSURE GAUGE READING:	SEE NOTE		0. PSI	1.5 PSI		
OIL LEVEL:	25. ° C		25. ° C	25. ° C		
TEMPERATURE CURRENT:	28. ° C		30. ° C	40. ° C		
TEMPERATURE RESET? YES / NO	YES		YES	YES		
SILICA GEL BREATHER:	N/A		N/A	N/A		
PAINT CONDITIONS:	FAIR - MONITOR		GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED		
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS

3E POWER SERVICES LTD.

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3E Power Servces Reference #: 2015-3E-001
Site Designation: CLINTON MS1
Site Address: 17 PARK LANE, CLINTON
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

	NAMEPLATE VERY FADED - REPLACEMENT RECOMMENDED PRESSURE GAUGE NOT FUNCTIONING, RECOMMEND REPLACEMENT BATTERIES FOR RELAY PROTECTION VERY LOW - TOPPED UP WITH DISTILLED WATER FROM CABINET (BOTTLE IS EMPTY) 56vDC TESTED 55.8vDC		1. REFER TO RECOMMENDATIONS IN LETTER	1. GRAVEL ADDED AT INSPECTION 2. SLIGHT RUST ON HV CABINET		
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						
Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: MS1			1. CORRECTED FUSE HOLDER TO SM-5 (WHITE) 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE		
MANUFACTURER: FERRANTI PACKARD						
YEAR OF MANUFACTURE: 1971						
SERIAL NUMBER:301687						
KVA: 5000 / 7500						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.50 %						
WEIGHT: 27150 LB						
OIL VOLUME: 607 G						
TAP SETTING: 3						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK: 100E						
FUSE HOLDER: SM-5 (WHITE)						

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N4G 4H8
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E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: MITCHELL MS2
Site Address: 187 WELLINGTON STREET, MITCHELL
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:	J.DONCK	R.COOPER				
INSPECTION DATE	15-Apr-15	05-Nov-15				
INSPECTION TIME:	10:00 A.M.	3:30 PM				
General Substation Observations ACCEPTABLE Yes / No	YES	YES				
FENCE GENERAL CONDITION:	YES	YES				
FENCE GROUNDING	YES	YES				
FENCE SPACES	NO	NO				
FENCE BARBED WIRE	NO	NO				
GATE LOCKED	YES	YES				
GATE BARBED WIRE	YES	YES				
SIGNS	YES	YES				
VEGETATION	MINOR	MINOR				
GRAVEL	YES	YES				
TOWER CONDITIONS	YES	YES				
BUILDING CONDITIONS	YES	N/A				
BUILDING LIGHTS/FANS/HEAT	N/A	N/A				
INDICATING LIGHTS/DEVICES	N/A	N/A				
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	1. SIGNS INSTALLED 2. VEGETATION REQUIRES WEED SPRAY	1. BARB WIRE MAY NEED REPLACING NEXT YEAR				
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS				
FENCE GROUNDING	NO REPAIRS	NO REPAIRS				
FENCE SPACES	NO REPAIRS	NO REPAIRS				
FENCE BARBED WIRE	NO REPAIRS	NO REPAIRS				
GATE LOCKED	NO REPAIRS	NO REPAIRS				
GATE BARBED WIRE	NO REPAIRS	NO REPAIRS				
SIGNS	YES	YES				
VEGETATION	NO REPAIRS	NO REPAIRS				
GRAVEL	NO REPAIRS	NO REPAIRS				
TOWER CONDITIONS	NO REPAIRS	NO REPAIRS				
BUILDING CONDITIONS	NO REPAIRS	N/A				
BUILDING LIGHTS/FANS/HEAT	NO REPAIRS	N/A				
INDICATING LIGHTS/DEVICES	NO REPAIRS	N/A				
Transformer Observations						
AMBIENT TEMPERATURE:	10. ° C	18. ° C				
TEMPERATURE PEAK:	36. ° C	48. ° C				
PRESSURE GAUGE READING:	N/A	N/A				
OIL LEVEL:	UNABLE TO READ	UNABLE TO READ				
TEMPERATURE CURRENT:	30. ° C	37. ° C				
TEMPERATURE RESET? YES / NO	YES	YES				
SILICA GEN BREATHER:	GEL REPLACED	GOOD				

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E-MAIL: CONTACT@3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001
Site Designation: MITCHELL MS2
Site Address: 187 WELLINGTON STREET, MITCHELL
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED				
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	1. REPLACED INDICATING SILICA GEL 2. PAINT IS FADING - WILL MONITOR	1. PAINTING RECOMMENDED				
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: MS2		1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE				
MANUFACTURER: GENERAL ELECTRIC						
YEAR OF MANUFACTURE: 1968						
SERIAL NUMBER: 588609						
KVA: 3000						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.99 %						
WEIGHT: 15300 LBS						
OIL VOLUME: 497 GAL						
TAP SETTING: 4						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK:						
FUSE HOLDER: SM-5						

YES
NO
N/A
NO REPAIRS

GEL REPLACED
GOOD

PAINT CONDITIONS
GOOD - NOTHING REQUIRED
FAIR - MONITOR
POOR - REQUIRES ATTENTION

MINOR
MAJOR

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3E Power Services Ltd. Web: 3EPOWER.CA

3E Power Servces Reference #: 2015-3E-001 Site Designation: CLINTON MS2 Site Address: 134 EAST STREET, CLINTON Contact Name: SCOTT BROOKS Contact Number: 519-521-7113	**OFFLINE** **NO INSPECTION COMPLETED**				
TECHICIAN:					
INSPECTION DATE					
INSPECTION TIME:					
General Substation Observations ACCEPTABLE Yes / No					
FENCE GENERAL CONDITION:					
FENCE GROUNDING					
FENCE SPACES					
FENCE BARBED WIRE					
GATE LOCKED					
GATE BARBED WIRE					
SIGNS					
VEGETATION					
GRAVEL					
TOWER CONDITIONS					
BUILDING CONDITIONS					
BUILDING LIGHTS/GANS/HEAT					
INDICATING LIGHTS/DEVICES					
Substation General Comments					
General Substation Repairs					
FENCE GENERAL CONDITION:					
FENCE GROUNDING					
FENCE SPACES					
FENCE BARBED WIRE					
GATE LOCKED					
GATE BARBED WIRE					

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3E Power Servces Reference #: 2015-3E-001 Site Designation: CLINTON MS2 Site Address: 134 EAST STREET, CLINTON Contact Name: SCOTT BROOKS Contact Number: 519-521-7113	**OFFLINE** **NO INSPECTION COMPLETED**				
SIGNS					
VEGETATION					
GRAVEL					
TOWER CONDITIONS					
BUILDING CONDITIONS					
Transformer Observations					
INDICATING LIGHTS/DEVICES					

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3E Power Servces Reference #: 2015-3E-001	**OFFLINE**
Site Designation: CLINTON MS2	
Site Address: 134 EAST STREET, CLINTON	**NO INSPECTION**
Contact Name: SCOTT BROOKS	**COMPLETED**
Contact Number: 519-521-7113	

Transformer Observations					
AMBIENT TEMPERATURE:					
TEMPERATURE PEAK:					
PRESSURE GAUGE READING:					
OIL LEVEL:					
TEMPERATURE CURRENT:					
TEMPERATURE RESET? YES / NO					
SILICA GEL BREATHER:					
PAINT CONDITIONS:					
Transformer General Comments					
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Tranformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESGNATION: RED					
MANUFACTURER:WESTINGHOUSE					
YEAR OF MANUFACTURE: 1928					
SERIAL NUMBER: 650-84, 85, 86					
KVA: 2000 / 3000					

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Web: 3epower.ca

3E Power Servces Reference #: 2015-3E-001 Site Designation: CLINTON MS2 Site Address: 134 EAST STREET, CLINTON Contact Name: SCOTT BROOKS Contact Number: 519-521-7113	**OFFLINE** **NO INSPECTION COMPLETED**

PRIMARY VOLTAGE: 26400 DELTA					
SECONDARY VOLTAGE: 2300 WYE					
IMPEDANCE: 6 %					
WEIGHT: 18100 LB					
OIL VOLUME: 850 GAL					
TAP SETTING: 1					
TAP POSITION 1: 26400					
TAP POSITION 2: 25080					
TAP POSITION 3: 23760					
TAP POSITION 4: N/A					
TAP POSITION 5: N/A					
FUSE MANUFACTURER : S&C					
FUSE LINK: 100E					
FUSE HOLDER: SM-5					

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Site Designation: CLINTON MS2
Site Address: 134 EAST STREET, CLINTON
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHICIAN:				
INSPECTION DATE				
INSPECTION TIME:				
General Substation Observations ACCEPTABLE Yes / No				
FENCE GENERAL CONDITION:				
FENCE GROUNDING				
FENCE SPACES				
FENCE BARBED WIRE				
GATE LOCKED				
GATE BARBED WIRE				
SIGNS				
VEGETATION				
GRAVEL				
TOWER CONDITIONS				
BUILDING CONDITIONS				
BUILDING LIGHTS/GANS/HEAT				
INDICATING LIGHTS/DEVICES				
Substation General Comments				
General Substation Repairs				
FENCE GENERAL CONDITION:				
FENCE GROUNDING				
FENCE SPACES				
FENCE BARBED WIRE				
GATE LOCKED				
GATE BARBED WIRE				

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SIGNS				
VEGETATION				
GRAVEL				
TOWER CONDITIONS				
BUILDING CONDITIONS				
Transformer Observations				
INDICATING LIGHTS/DEVICES				

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Site Designation: CLINTON MS2
Site Address: 134 EAST STREET, CLINTON
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

Transformer Observations				
AMBIENT TEMPERATURE:				
TEMPERATURE PEAK:				
PRESSURE GAUGE READING:				
OIL LEVEL:				
TEMPERATURE CURRENT:				
TEMPERATURE RESET? YES / NO				
SILICA GEL BREATHER:				
PAINT CONDITIONS:				
Transformer General Comments				
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Tranformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESGNATION: RED				
MANUFACTURER:WESTINGHOUSE				
YEAR OF MANUFACTURE: 1928				
SERIAL NUMBER: 650-84, 85, 86				
KVA: 2000 / 3000				

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Site Designation: CLINTON MS2
Site Address: 134 EAST STREET, CLINTON
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

PRIMARY VOLTAGE: 26400 DELTA				
SECONDARY VOLTAGE: 2300 WYE				
IMPEDANCE: 6 %				
WEIGHT: 18100 LB				
OIL VOLUME: 850 GAL				
TAP SETTING: 1				
TAP POSITION 1: 26400				
TAP POSITION 2: 25080				
TAP POSITION 3: 23760				
TAP POSITION 4: N/A				
TAP POSITION 5: N/A				
FUSE MANUFACTURER : S&C				
FUSE LINK: 100E				
FUSE HOLDER: SM-5				

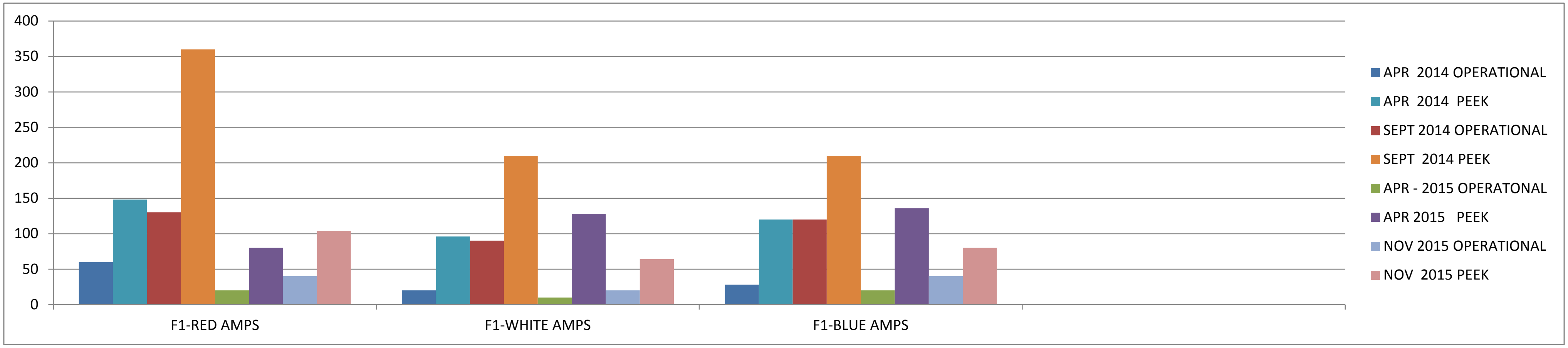
Erie Thames Meter Reading - Summary

Beachville 3000kVA

	APR 2014 OPERATIONAL	APR 2014 PEEK	SEPT 2014 OPERATIONAL	SEPT 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATIONAL	NOV 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK
F1-RED AMPS	60	148	130	360	20	80	40	104		
F1-WHITE AMPS	20	96	90	210	10	128	20	64		
F1-BLUE AMPS	28	120	120	210	20	136	40	80		

NORTH RECLOSURE COUNT OPERATIONS	277	277	277	277	
SOUTH RECLOSUE COUNT OPERATIONS	301	301	301	301	

RED VOLTAGE	2550	2550	2550	2600	
WHITE VOLTAGE	2550	2550	2550	2600	
BLUE VOLTAGE	2550	2550	2550	2600	



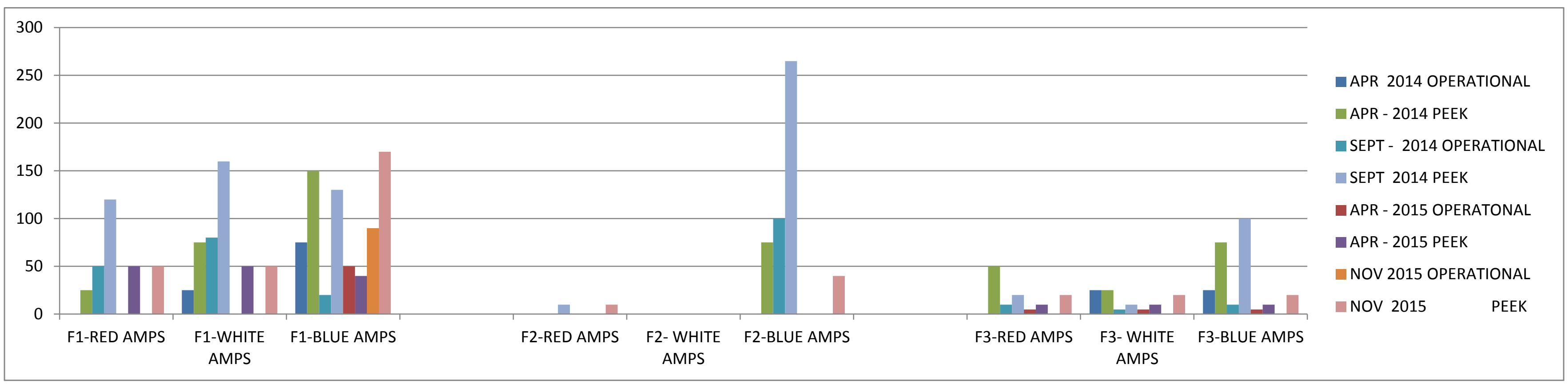
Erie Thames Meter Reading - Summary

Ingersoll MS1 - 5000/6000kVA

	APR 2014 OPERATIONAL	APR - 2014 PEEK	SEPT - 2014 OPERATIONAL	SEPT 2014 PEEK	APR - 2015 OPERATONAL	APR - 2015 PEEK	NOV 2015 OPERATIONAL	NOV 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK
F1-RED AMPS	0	25	50	120	0	50	0	50		
F1-WHITE AMPS	25	75	80	160	0	50	0	50		
F1-BLUE AMPS	75	150	20	130	50	40	90	170		
F2-RED AMPS	0	0	0	10	0	0	0	10		
F2- WHITE AMPS	0	0	0	0	0	0	0	0		
F2-BLUE AMPS	0	75	100	265	0	0	0	40		
F3-RED AMPS	0	50	10	20	5	10	0	20		
F3- WHITE AMPS	25	25	5	10	5	10	0	20		
F3-BLUE AMPS	25	75	10	100	5	10	0	20		

F1-C Operations	99920	99921	99924	99924	
F2-C Operations	99916	99916	99917	99919	
F3-C Operations	99853	99853	99854	99854	

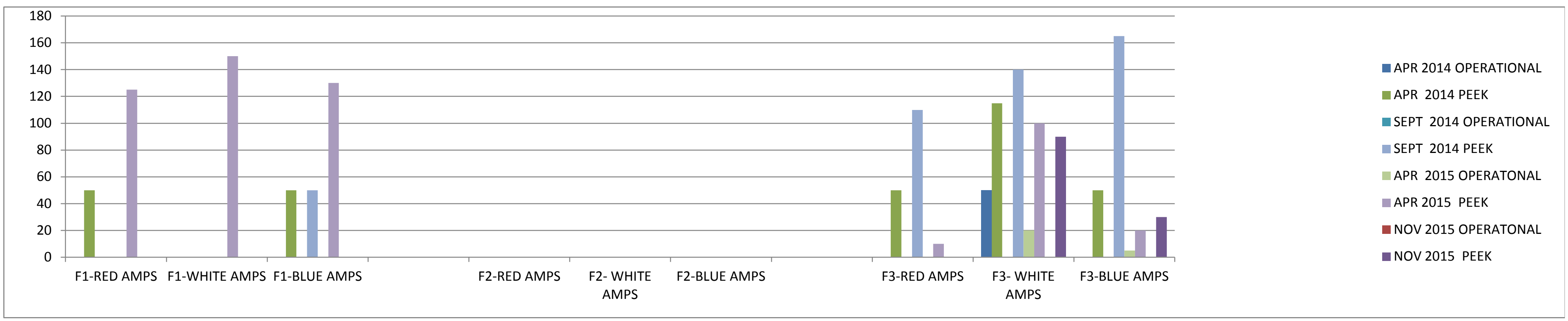
RED VOLTAGE	2500	2490	2500	2500	
WHITE VOLTAGE	2500	2495	2500	2500	
BLUE VOLTAGE	2500	2500	2500	2500	



Erie Thames Meter Reading - Summary
Ingersoll MS3 - 5000/6000kVA

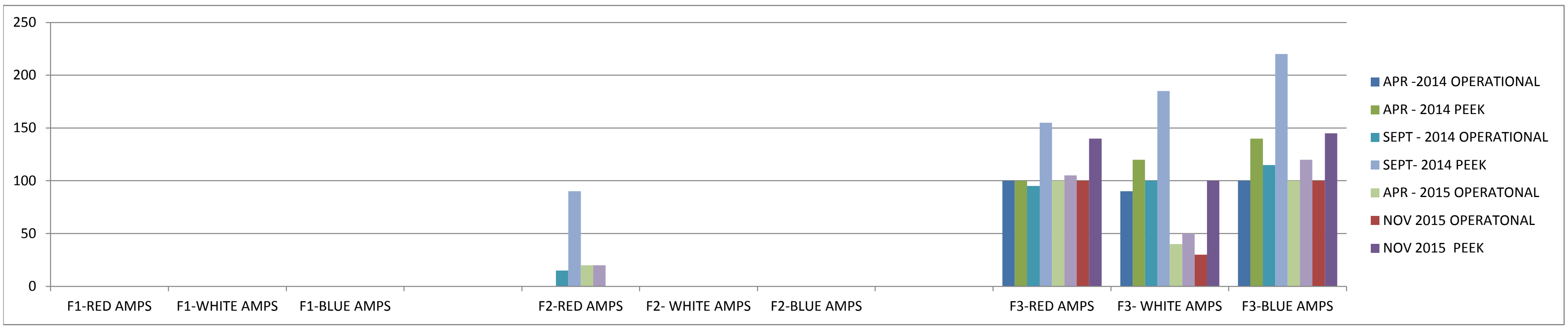
	APR 2014 OPERATIONAL	APR 2014 PEEK	SEPT 2014 OPERATIONAL	SEPT 2014 PEEK	APR 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATONAL	NOV 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK	SEPT 2016 OPERATONAL	SEPT 2016 PEEK
F1-RED AMPS	0	50	0	0	0	125	0	0				
F1-WHITE AMPS	0	0	0	0	0	150	0	0				
F1-BLUE AMPS	0	50	0	50	0	130	0	0				
F2-RED AMPS	0	0	0	0	0	0	0	0				
F2- WHITE AMPS	0	0	0	0	0	0	0	0				
F2-BLUE AMPS	0	0	0	0	0	0	0	0				
F3-RED AMPS	0	50	0	110	0	10	0	0				
F3- WHITE AMPS	50	115	0	140	20	100	0	90				
F3-BLUE AMPS	0	50	0	165	5	20	0	30				

F1-COUNT OPERATIONS	354	355	359	359		
F2-COUNT OPERATIONS	248	248	248	248		
F3-COUNT OPERATIONS	377	378	378	378		
RED VOLTAGE	2500	STATATION OFF	2500	2500		
WHITE VOLTAGE	2500	STATATION OFF	2500	2500		
BLUE VOLTAGE	2500	STATATION OFF	2500	2500		



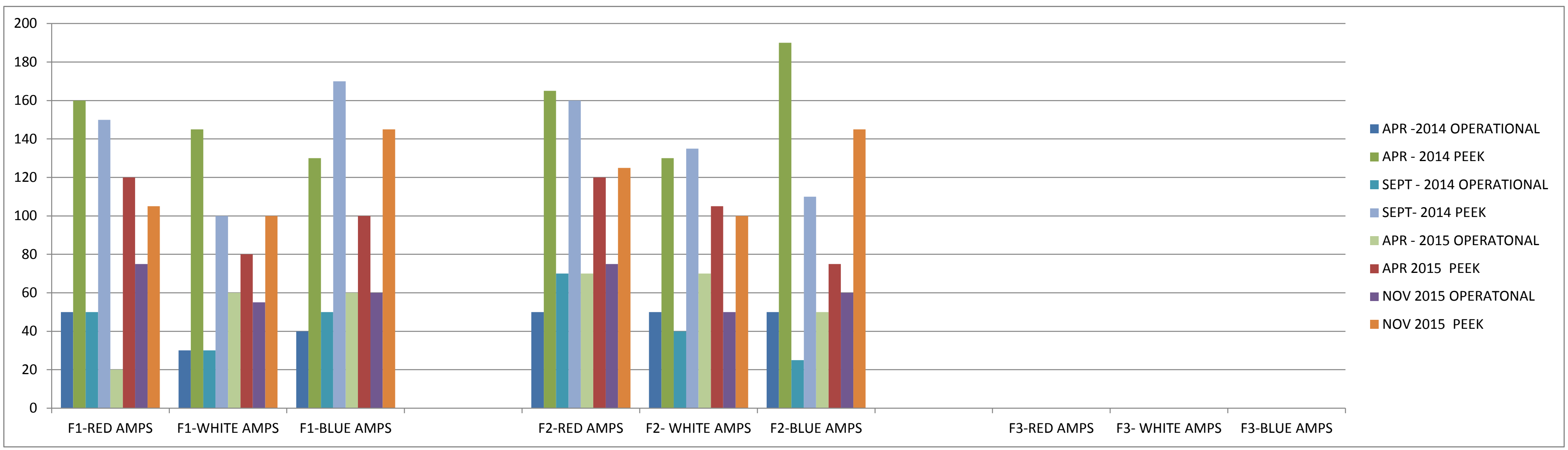
Erie Thames Meter Reading - Summary
Port Stanley 5000 /5600kVA

	APR -2014 OPERATIONAL	APR - 2014 PEEK	SEPT - 2014 OPERATIONAL	SEPT- 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATONAL	NOV 2015 PEEK	APR 2016 OPERATONAL	APR 2016 PEEK	SEPT 2016 OPERATONAL	SEPT 2016 PEEK
F1-RED AMPS	0	0	0	0	0	0	0	NOT SEALED				
F1-WHITE AMPS	0	0	0	0	0	0	0	NOT SEALED				
F1-BLUE AMPS	0	0	0	0	0	0	0	NOT SEALED				
F2-RED AMPS	0	0	15	90	20	20	NOT SEALED	NOT SEALED				
F2- WHITE AMPS	0	0	0	0	0	0	NOT SEALED	NOT SEALED				
F2-BLUE AMPS	0	0	0	0	0	0	NOT SEALED	NOT SEALED				
F3-RED AMPS	100	100	95	155	100	105	100	140				
F3- WHITE AMPS	90	120	100	185	40	50	30	100				
F3-BLUE AMPS	100	140	115	220	100	120	100	145				
F1-C Operations	163		0		163		163					
F2-C Operations	165		165		165		165					
F3-C Operations	205		205		205		205					
RED VOLTAGE	2550		2600		2550		2600					
WHITE VOLTAGE	2600		2650		2550		2600					
BLUE VOLTAGE	2600		2650		2550		2600					



Erie Thames Meter Reading - Summary
Tavistock 5000kVA / 6670kVA

	APR -2014 OPERATIONAL	APR - 2014 PEEK	SEPT - 2014 OPERATIONAL	SEPT- 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATONAL	NOV 2015 PEEK	APR 2016 OPERATONAL	APR 2016 PEEK	SEPT 2016 OPERATONAL	SEPT 2016 PEEK
F1-RED AMPS	50	160	50	150	20	120	75	105				
F1-WHITE AMPS	30	145	30	100	60	80	55	100				
F1-BLUE AMPS	40	130	50	170	60	100	60	145				
F2-RED AMPS	50	165	70	160	70	120	75	125				
F2- WHITE AMPS	50	130	40	135	70	105	50	100				
F2-BLUE AMPS	50	190	25	110	50	75	60	145				
F3-RED AMPS	0	0	0	0	0	0	0	0				
F3- WHITE AMPS	0	0	0	0	0	0	0	0				
F3-BLUE AMPS	0	0	0	0	0	0	0	0				
F1-C Operations	N/A		N/A		N/A		N/A					
F2-C Operations	N/A		N/A		N/A		N/A					
F3-C Operations	N/A		N/A		N/A		N/A					
RED VOLTAGE	4300		4350		4375							
WHITE VOLTAGE	4300		4350		4375							
BLUE VOLTAGE	4300		4350		4375							

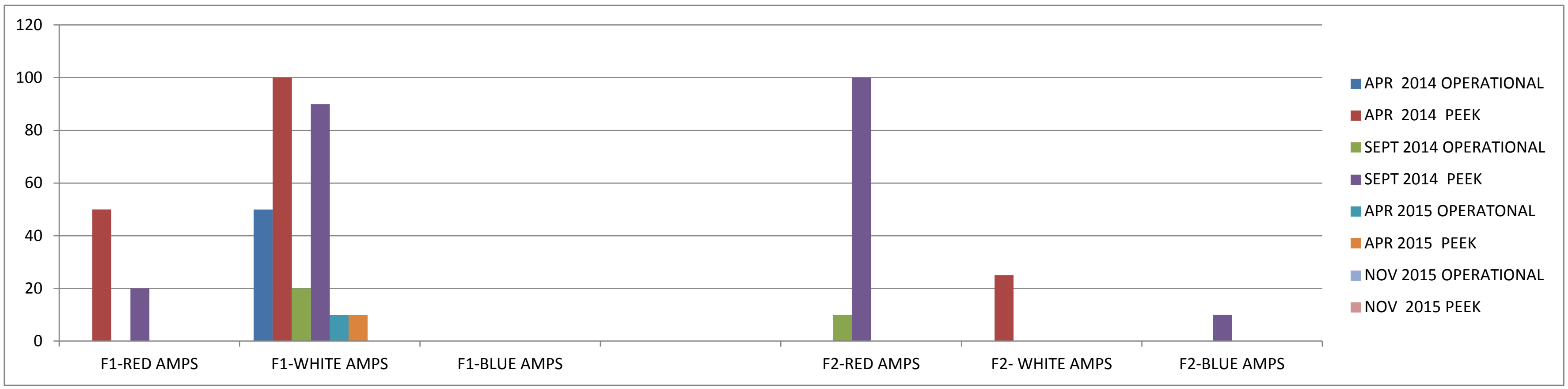


Erie Thames Meter Reading - Summary

Aylmer McBrien T1 - 3000kVA

	APR 2014 OPERATIONAL	APR 2014 PEEK	SEPT 2014 OPERATIONAL	SEPT 2014 PEEK	APR 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATIONAL	NOV 2015 PEEK	APR 2016 OPERATONAL	APR 2016 PEEK
F1-RED AMPS	0	50	0	20	0	0	0	0		
F1-WHITE AMPS	50	100	20	90	10	10	0	50 ?		
F1-BLUE AMPS	0	0	0	0	0	0	0	0		
F2-RED AMPS	0	0	10	100	0	0	0	0		
F2- WHITE AMPS	0	25	0	0	0	0	0	0		
F2-BLUE AMPS	0	0	0	10	0	0	0	0		

RED VOLTAGE	2500	2500	2500	2500	
WHITE VOLTAGE	0	2500	0	0	
BLUE VOLTAGE	2500	2500	2500	2500	

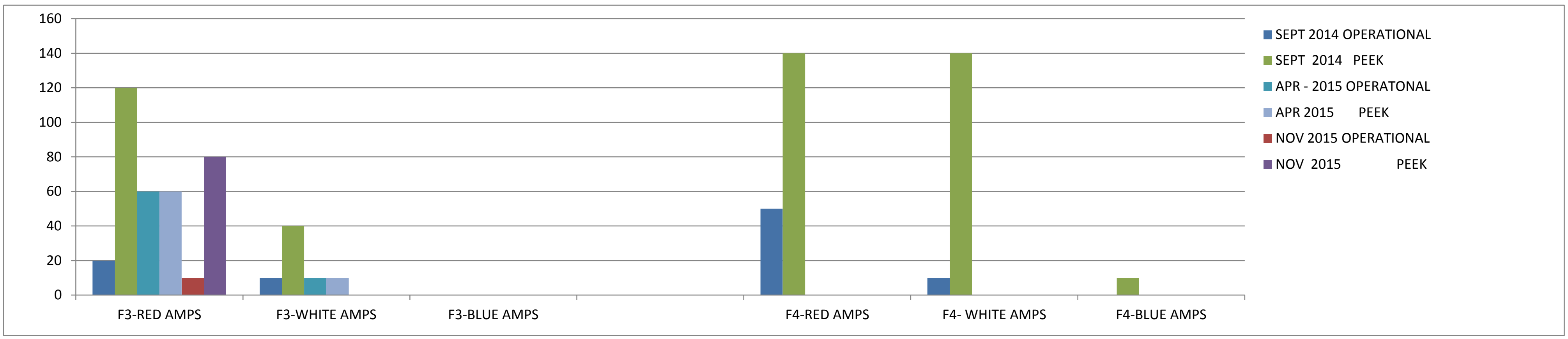


Erie Thames Meter Reading - Summary

Aylmer McBrien T2 - 3000kVA

	APR 2014 OPERATIONAL	APR 2014 PEEK	SEPT 2014 OPERATIONAL	SEPT 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATIONAL	NOV 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK
F3-RED AMPS	50	90	20	120	60	60	10	80		
F3-WHITE AMPS	0	50	10	40	10	10				
F3-BLUE AMPS	0	0	0	0	0	0				
F4-RED AMPS	100	110	50	140	0	0				
F4- WHITE AMPS	0	50	10	140	0	0				
F4-BLUE AMPS	0	0	0	10	0	0				

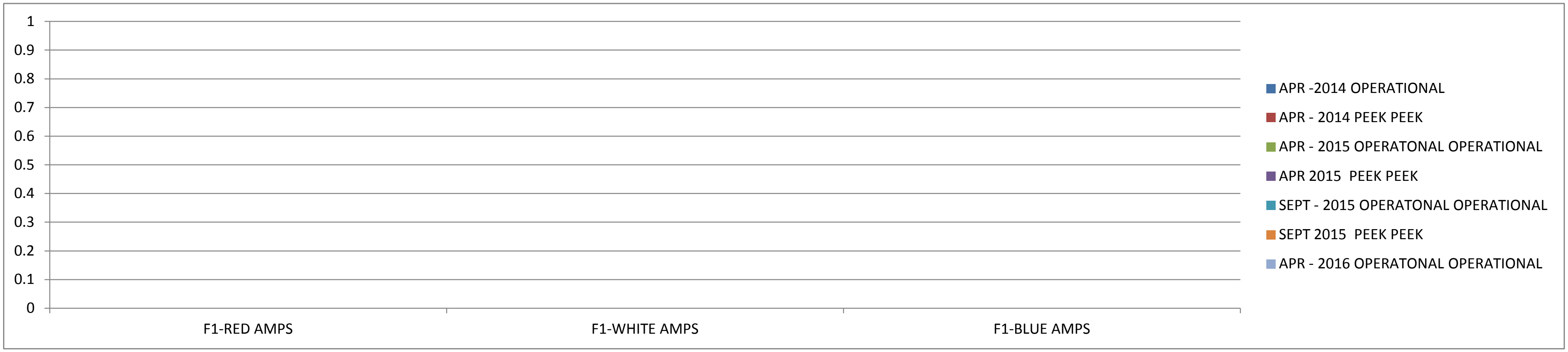
RED VOLTAGE	2550	2510	2550	2550	
WHITE VOLTAGE	0	0	0	0	
BLUE VOLTAGE	2550	2510	2550	2550	



Erie Thames Meter Reading - Summary

Aylmer Forest - 2000 / 3600kVA

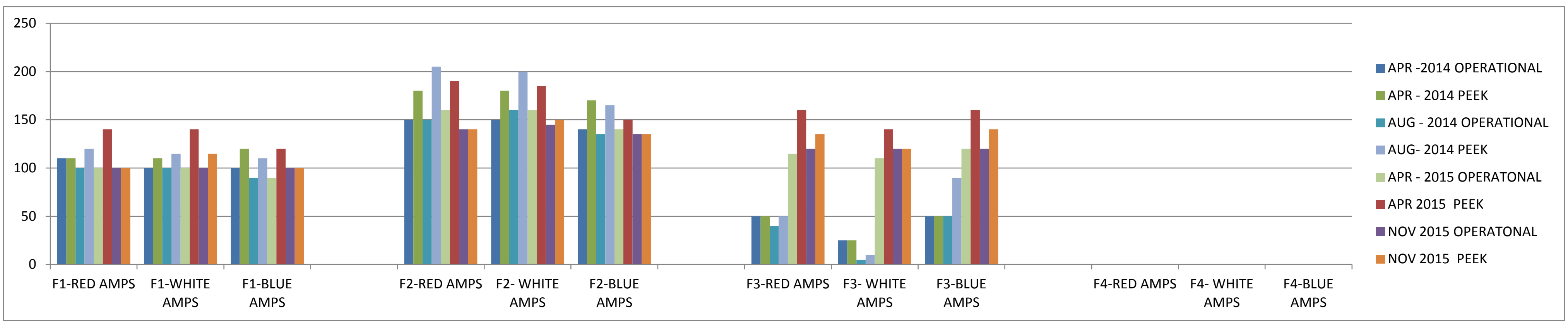
	APR -2014 OPERATIONA	APR - 2014 PEEK	SEPT - 2014 OPERATIONAL	SEPT- 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	SEPT - 2015 OPERATONAL	SEPT 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK
F1-RED AMPS	0	0								
F1-WHITE AMPS	0	0								
F1-BLUE AMPS	0	0								
TOTAL STATION Kva										
% LOAD (ONAN)										
% LOAD (ONAF)										
North Reclosure										
South Reclosure										
RED VOLTAGE	0	0								
WHITE VOLTAGE	0	0								
BLUE VOLTAGE	0	0								



Erie Thames Meter Reading - Summary

Clinton MS1

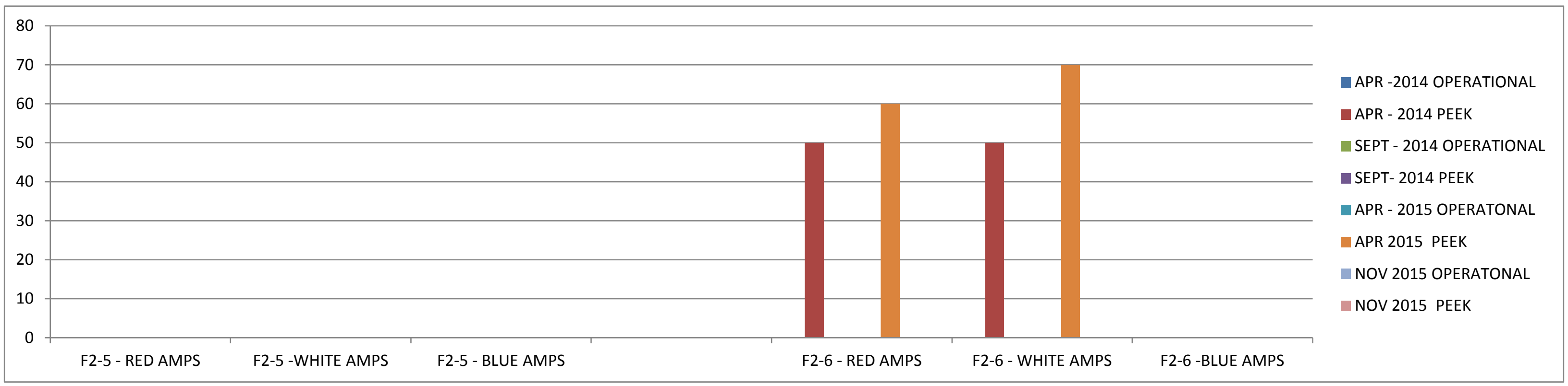
	APR -2014 OPERATIONAL	APR - 2014 PEEK	AUG - 2014 OPERATIONAL	AUG- 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATONAL	NOV 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK	SEPT - 2016 OPERATONAL	SEPT 2016 PEEK
F1-RED AMPS	110	110	100	120	100	140	100	100				
F1-WHITE AMPS	100	110	100	115	100	140	100	115				
F1-BLUE AMPS	100	120	90	110	90	120	100	100				
F2-RED AMPS	150	180	150	205	160	190	140	140				
F2- WHITE AMPS	150	180	160	200	160	185	145	150				
F2-BLUE AMPS	140	170	135	165	140	150	135	135				
F3-RED AMPS	50	50	40	50	115	160	120	135				
F3- WHITE AMPS	25	25	5	10	110	140	120	120				
F3-BLUE AMPS	50	50	50	90	120	160	120	140				
F4-RED AMPS	0	0	0	0	0	0	0	0				
F4- WHITE AMPS	0	0	0	0	0	0	0	0				
F4-BLUE AMPS	0	0	0	0	0	0	0	0				
F1-BREAKER COUNTER	117		117		117		122					
F2-BREAKER COUNTER	999664		999644		99644		999649					
F3-BREAKER COUNTER	999718		99718		999718		999723					
F4-BREAKER COUNTER	999887		999887		999887		999889					



Erie Thames Meter Reading - Summary

Mitchell MS2   3000kVA / 4000kVA

	APR -2014 OPERATIONAL	APR - 2014 PEEK	SEPT - 2014 OPERATIONAL	SEPT- 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 PEEK	NOV 2015 OPERATONAL	NOV 2015 PEEK	APR - 2016 OPERATONAL	APR 2016 PEEK
F2-5 - RED AMPS	0	0			0	0	0	0		
F2-5 -WHITE AMPS	0	0			0	0	0	0		
F2-5 - BLUE AMPS	0	0			0	0	0	0		
F2-6 - RED AMPS	0	50			0	60	0	0		
F2-6 - WHITE AMPS	0	50			0	70	0	0		
F2-6 -BLUE AMPS	0	0			0	0	0	0		
RED VOLTAGE	2400				N/A		N/A			
WHITE VOLTAGE	0				N/A		N/A			
BLUE VOLTAGE	2500				N/A		N/A			

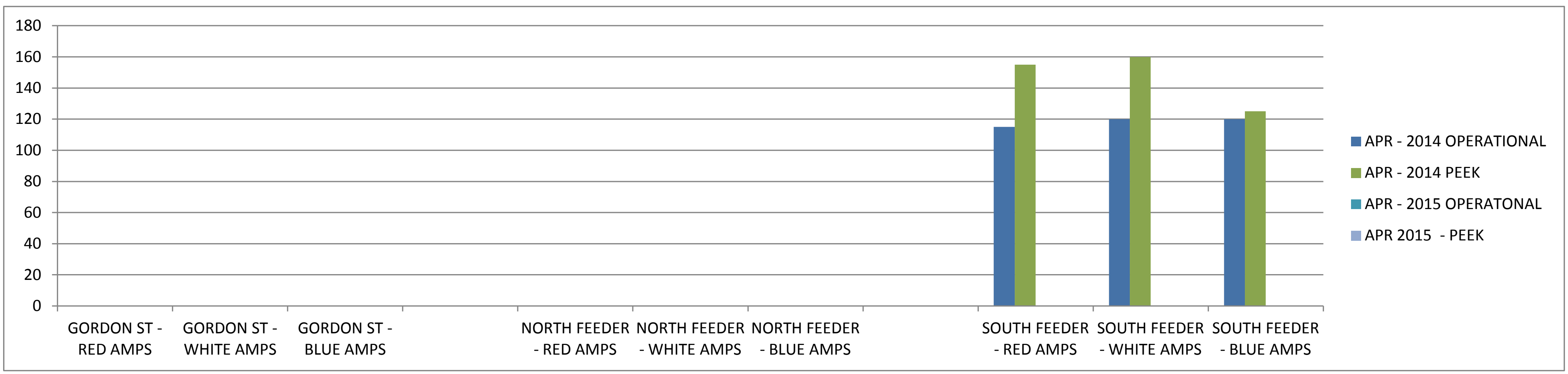


No future inspections/readings to be done here. The substation is scheduled to be removed.

Erie Thames Meter Reading - Summary

Clinton MS2

	APR - 2014 OPERATIONAL	APR - 2014 PEEK	APR - 2015 OPERATONAL	APR 2015 - PEEK	APR - 2016 OPERATONAL	APR 2016 - PEEK	APR - 2017 OPERATONAL	APR 2017 - PEEK	APR - 2018 OPERATONAL	APR 2018 - PEEK
GORDON ST -RED AMPS	0	0	OFF LINE	OFF LINE						
GORDON ST - WHITE AMPS	0	0								
GORDON ST - BLUE AMPS	0	0								
NORTH FEEDER - RED AMPS	0	0								
NORTH FEEDER - WHITE AMPS	0	0								
NORTH FEEDER - BLUE AMPS	0	0								
SOUTH FEEDER - RED AMPS	115	155								
SOUTH FEEDER - WHITE AMPS	120	160								
SOUTH FEEDER - BLUE AMPS	120	125								
GORDON ST COUNTER		OFF								
NORTH FEEDER COUNTER		OFF								
SOUTH FEEDER COUNTER		161								
F1-BREAKER COUNTER	N/A									
F2-BREAKER COUNTER	N/A									
F3-BREAKER COUNTER	N/A									
F4-BREAKER COUNTER	N/A									



Appendix B - Thermograph Scans

Boldstar
Infrared Services Inc.

Infrared Inspection
- Electrical Distribution System -

Erie-Thames Power

Date:

June 17th, 18th & 19th, 2014

Report Completed By:	
Boldstar Infrared Services Inc. 1-888-847-0517 **www.boldstarinfrared.com**	 Certification Stamp

Infrared Report Summary

Purpose: Infrared inspection to identify thermal anomaly conditions on electrical distribution equipment that suggest an unwanted condition exists and repairs are required.
Method: Complete infrared inspection of selected Erie-Thames Powerlines distribution system in towns of Ingersoll, Beachville, Otterville, Norwich, Burgessville, Aylmer, Belmont and Port Stanley. Driving inspection from vehicle. Save infrared images of all noted anomaly conditions. Report on findings.
Conditions: Equipment operating under normal daytime loading conditions.
Inspection Equipment: FLIR model P620 focal plane array scanner, serial # 404001126.

Observations

Note: Boldstar Infrared Services Inc. is in no way responsible for any expenses resulting in actions or repair of reported anomalies. This report is not a warranty or guarantee of any equipment condition or reliability.

Please see the report pages for all of the details on all of the noted suspect conditions.

All anomalies classified as follows:
HIGH Priority: Component temperature over 50 C rise over ambient.
Plan and execute repairs as soon as possible, within the next few days. Do not ignore.
MEDIUM Priority: Component temperature 25 to 50 C rise over ambient.
Plan and execute repairs at the next opportunity, within the next few weeks. Do not ignore.
LOW Priority: Component temperature below 25 C rise over ambient.
Plan and execute repairs at the next convenient opportunity. Do not ignore.
No Problems Noted (N/A): No anomalies noted. Condition good.

All reported condition should be investigated further as soon as possible to verify the reported condition. Use all safety procedures. Electrical hazards exist.

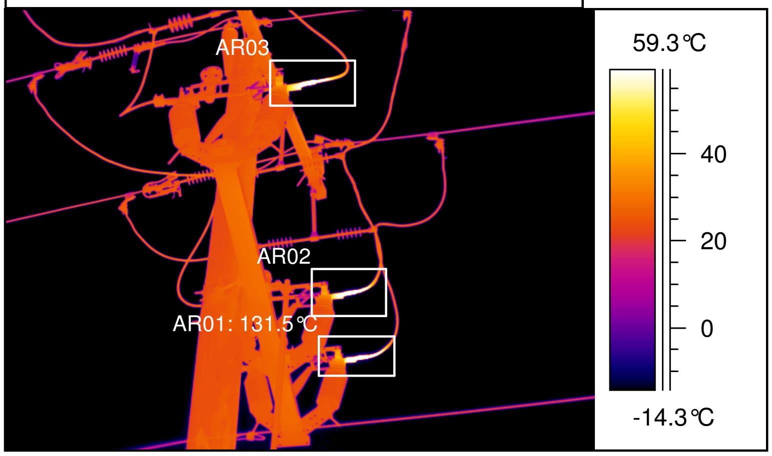
CONTENTS OF REPORT

Priority: ***H= High M= Medium L= Low N/A= Not Applicable***

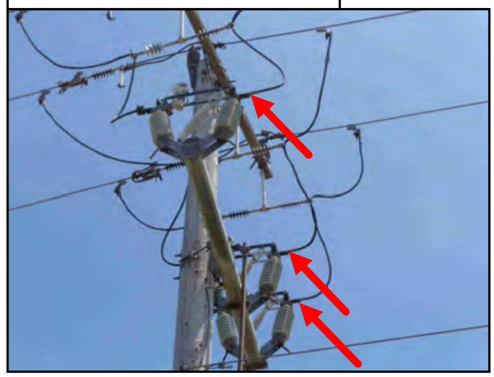
Identification:	DATE
Pole # ETP6985	2014-06-19

Description: **Air brakes**

INFRARED IMAGE



PHOTO



Temperature rise: 109.54 °C
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	22.0°C
Label	**Value**
AR01 : max	131.5°C
AR02 : max	127.0°C
AR03 : max	99.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of air brake switch on pole # ETP6985.
Located across 14401 Belmont Road in Belmont.
Heating noted at the indicated (south side) connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

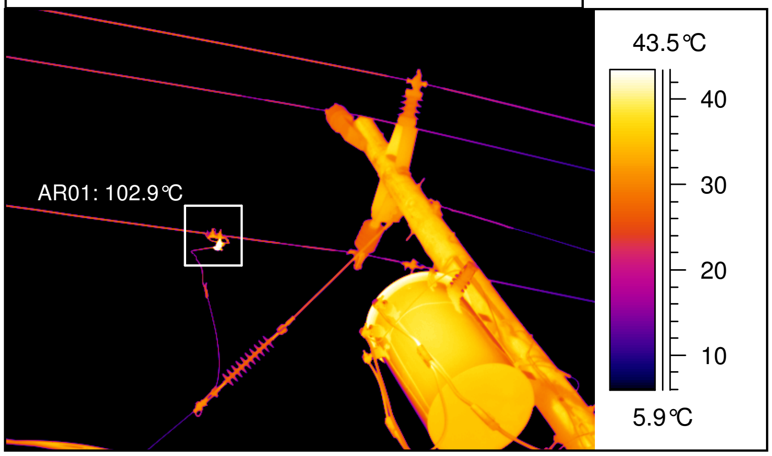
PRIORITY: **High** **Medium** **Low**

ANOMALY: Heating connections

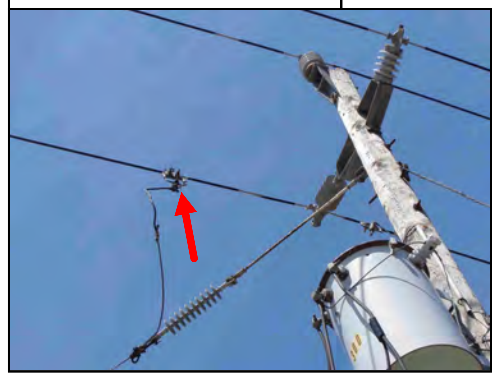
Identification:	DATE
BL27, Pole # ET6896	2014-06-19

Description: Primary connection

INFRARED IMAGE



PHOTO



Temperature rise: (over ambient) 80.95 ℃

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	22.0°C
Label	**Value**
AR01 : max	102.9°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a primary connection (stirrup) on pole # ET6896.
Located at 4028 Belmont Road in Belmont.
Heating noted at the indicated stirrup connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: **High** **Medium** **Low**

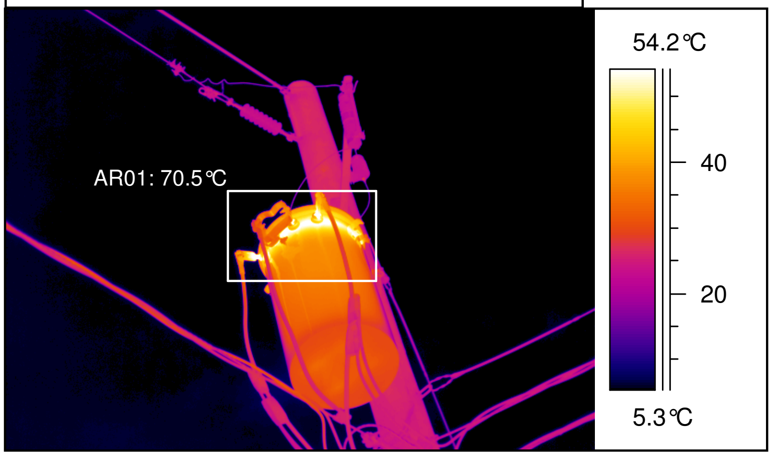
ANOMALY: Heating connection

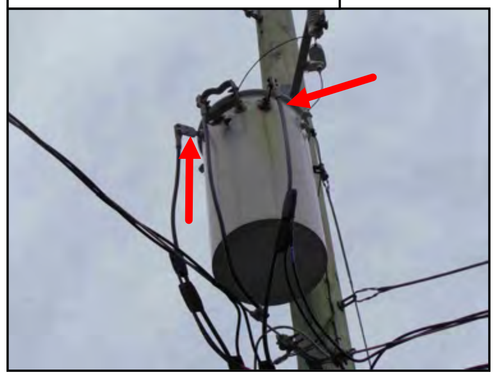
Boldstar Infrared Services Inc.

Identification:	DATE
TX O309, Pole # ET6480	2014-06-18

Description: **Transformer**

INFRARED IMAGE	PHOTO





Temperature rise: (over ambient) 51.51 ℃

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	70.5°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer O309 on pole # ET6480.
Located at intersection of North Street East and York Street in Otterville.
Heating noted at all of the secondary connections and at the top of the transformer can (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: **High** **Medium** **Low**

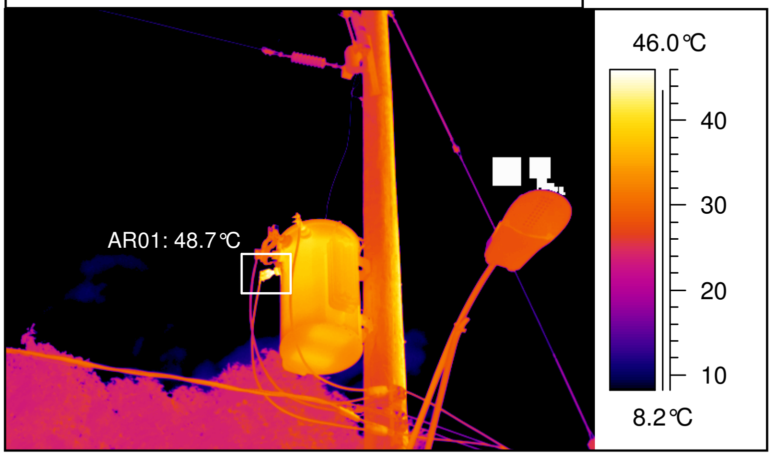
ANOMALY: Heating secondary connections

Boldstar Infrared Services Inc.

Identification:	DATE
Catherine Street	2014-06-17

Description: Transformer

INFRARED IMAGE



PHOTO

Temperature rise: 23.70 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	25.0°C
Label	**Value**
AR01 : max	48.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a transformer.
Located at the intersection of Catherine Street and George Street.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

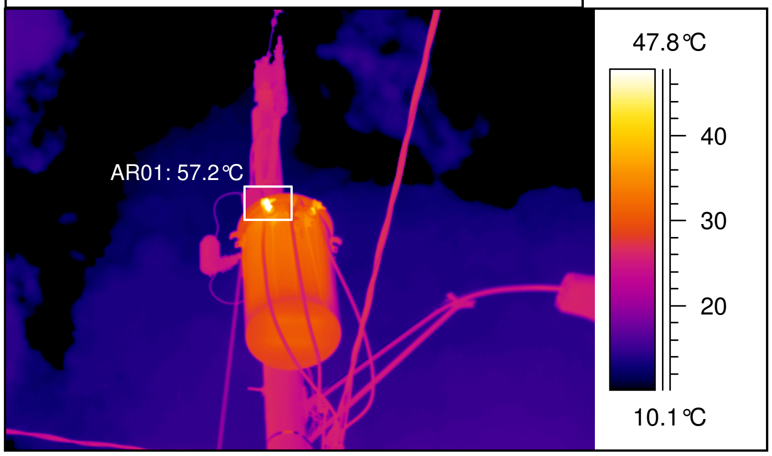
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX 1018, Pole # ET3866	2014-06-17

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 32.23 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	25.0°C
Label	**Value**
AR01 : max	57.2°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 1018 on pole # ET3866.
Located on Kensington Avenue in Ingersoll.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

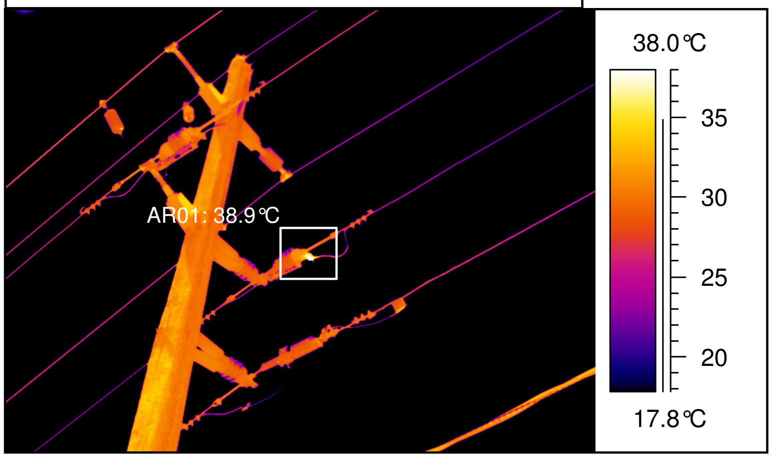
ANOMALY: Heating secondary connections

Boldstar Infrared Services Inc.

Identification:	DATE
Pole # ET3732	2014-06-17

Description: **In-line switches**

INFRARED IMAGE



PHOTO

Temperature rise: 10.93 °C
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	38.9°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the in-line switches on pole # ET3732.
Located at 155 Anne Street in Ingersoll.
Heating noted at the indicated connection on the top road-side switch (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

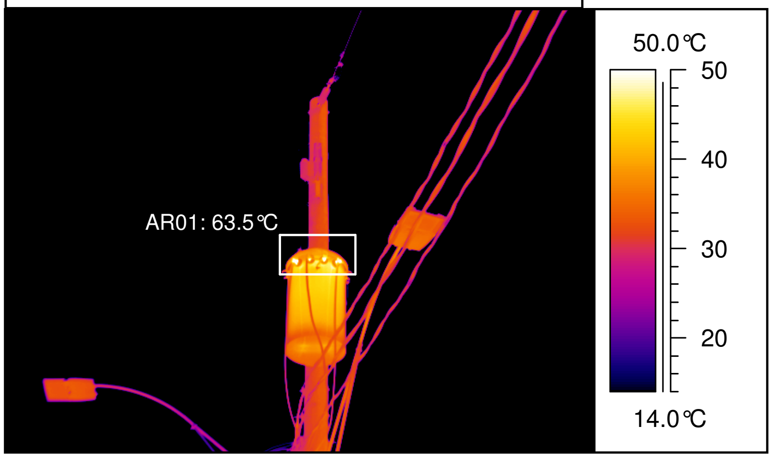
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

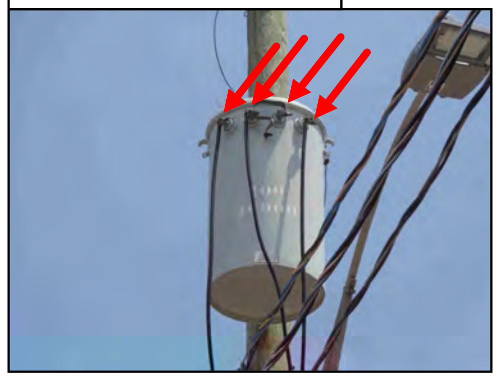
Identification:	DATE
TX 0626, Pole # ET4352	2014-06-17

Description: Transformer

INFRARED IMAGE



PHOTO



Temperature rise: 35.47 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	63.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 0626 on pole # ET4352.
Located on Oxford Street parking, behind King in Ingersoll.
Heating noted at all of the secondary connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

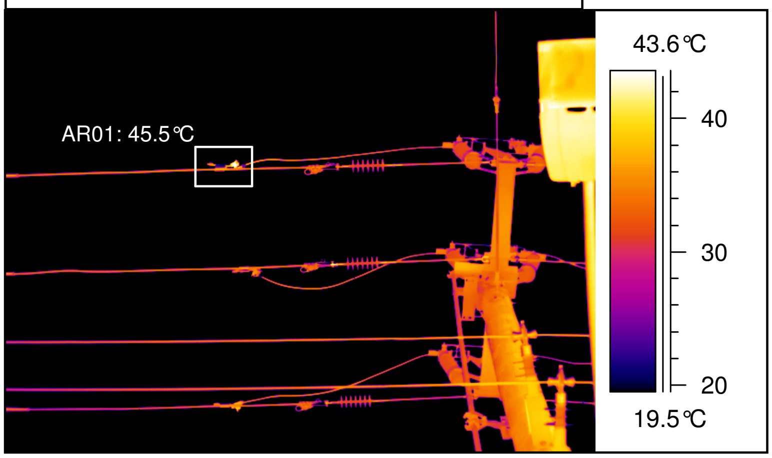
PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

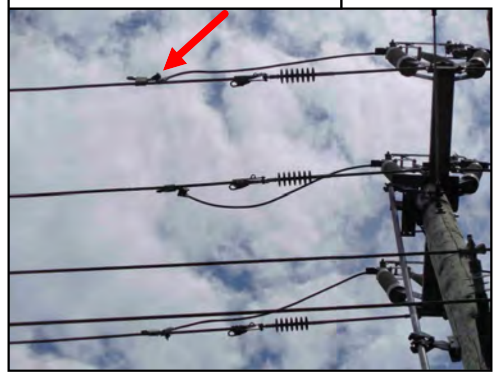
Identification:	DATE
IN 08, Pole # ET8135	2014-06-17

Description: **In-line switches**

INFRARED IMAGE



PHOTO



Temperature rise: 17.50 °C
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	45.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the in-line switches IN08 on pole # ET8135.
Located on Thames Street South in Ingersoll.
Heating noted at the indicated connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

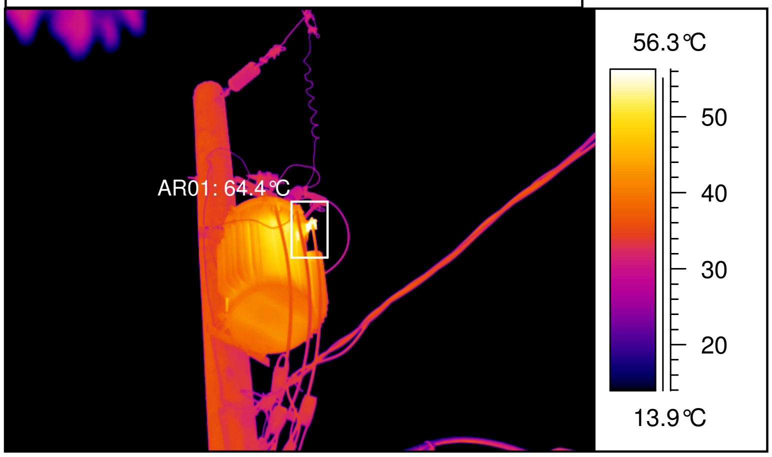
PRIORITY: High Medium **Low**

ANOMALY: Heating connection

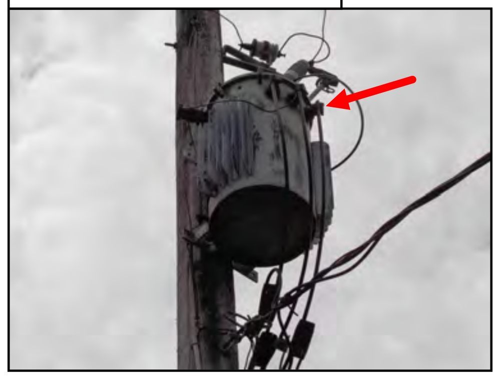
Identification:	DATE
TX 023, Pole # ET8167	2014-06-17

Description: Transformer

INFRARED IMAGE



PHOTO



Temperature rise: 36.43 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	64.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 023 on pole # ET8167.
Located at intersection of Cottage Street and Thames Street South in Ingersoll.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

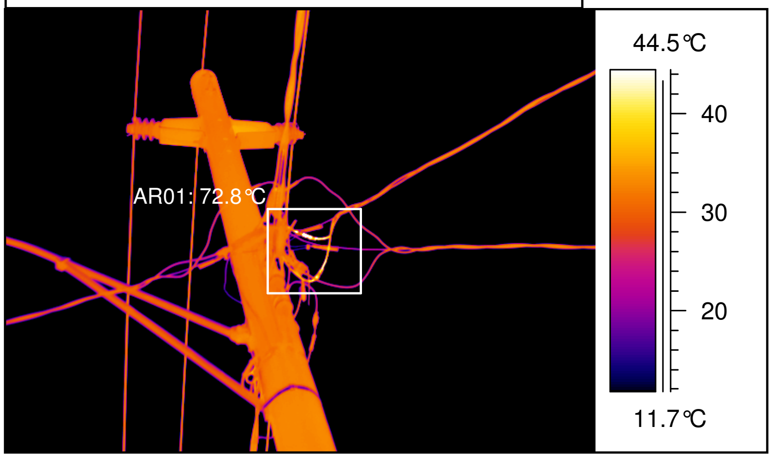
PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

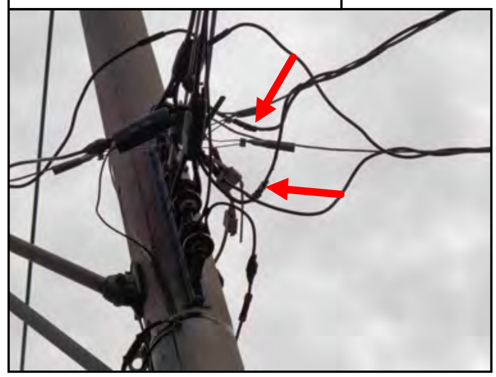
Identification:	DATE
Pole # ET4169	2014-06-17

Description: **Service connections**

INFRARED IMAGE



PHOTO



Temperature rise: 44.78 °C
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	72.8°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of service connections on pole # ET4169.
Located at 148 Caroll Street in Ingersoll.
Heating noted at the indicated service connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

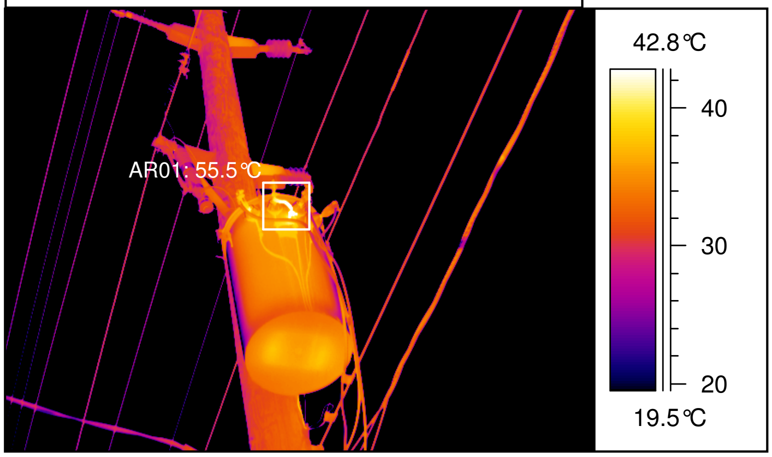
ANOMALY: Heating connections

Boldstar Infrared Services Inc.

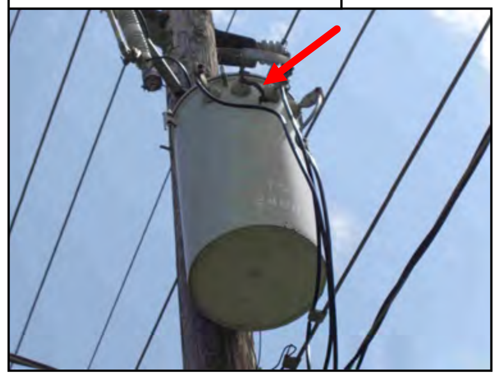
Identification:	DATE
TX 0161, Pole # 4138	2014-06-17

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 27.49 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	55.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 0161 on pole # ET4138.
Located at 272 Harris Street in Ingersoll.
Heating noted at the ground strap connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

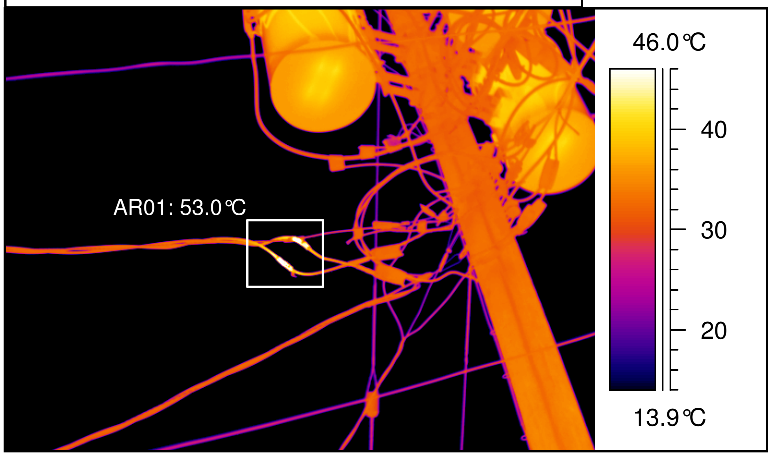
PRIORITY: High **Medium** Low

ANOMALY: Heating ground connection

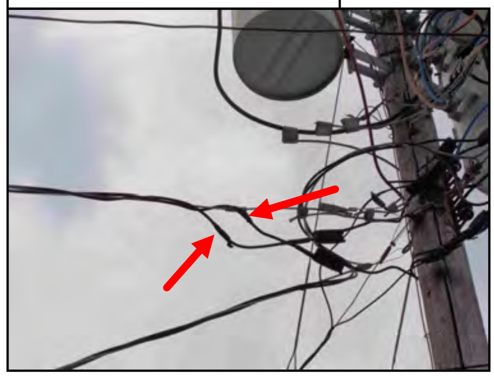
Identification:	DATE
TX 038, Pole # 4939	2014-06-17

Description: **Service connection**

INFRARED IMAGE



PHOTO



Temperature rise: 25.05 °C
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	53.0°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of service connections on pole # ET4939.
Located on Thames Street South behind H&R Block in Ingersoll.
Heating noted at the indicated service connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

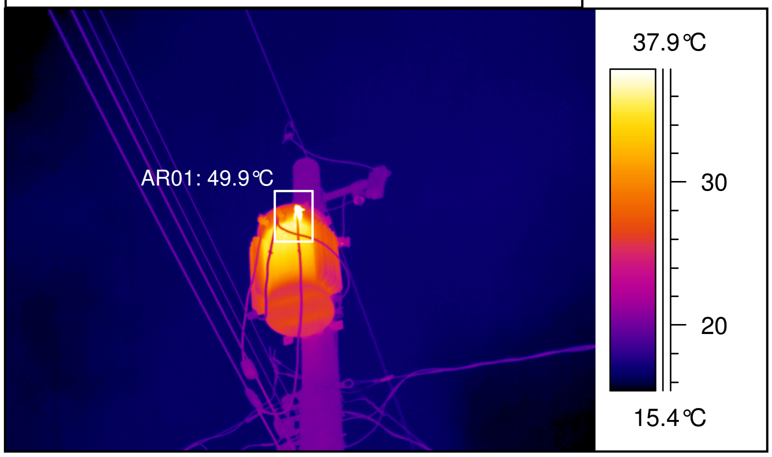
ANOMALY: Heating connections

Boldstar Infrared Services Inc.

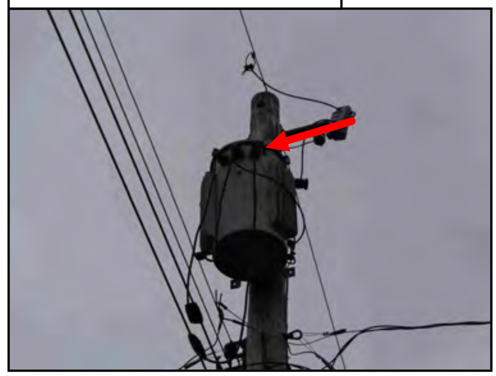
Identification:	DATE
TX B35, Pole # ET 0223	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 31.87 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	49.9°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer B35 on pole # ET0223.
Located at 434849 Zorra Line in Beachville.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High $\boxed{\text{Medium}}$ Low

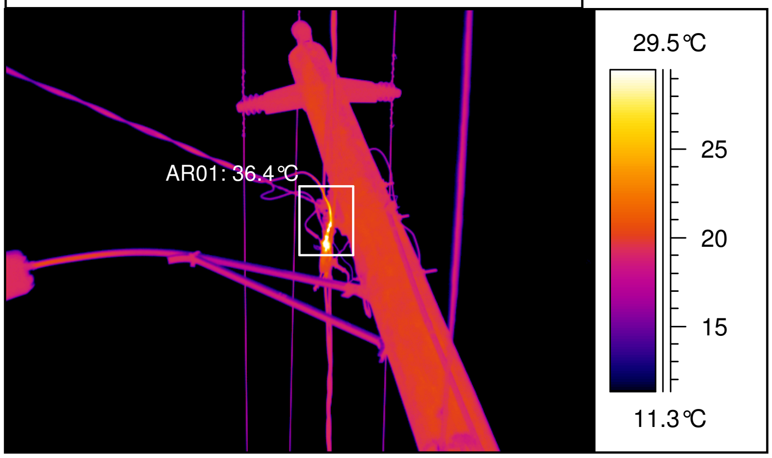
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

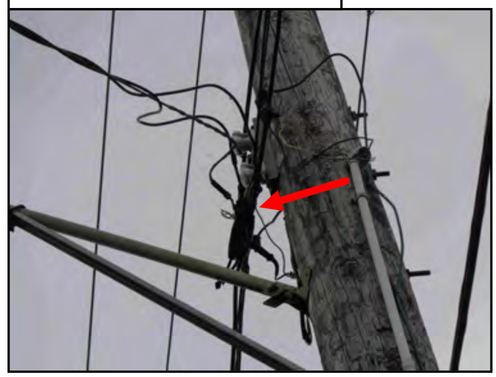
Identification:	DATE
Pole # ET8214	2014-06-18

Description: **Service connection**

INFRARED IMAGE



PHOTO



Temperature rise: 18.42 °C
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	36.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a service connection on pole # ET8214.
Located at 43 Beachville Road East in Beachville.
Heating noted at the indicated service connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: **High** **Medium** **Low**

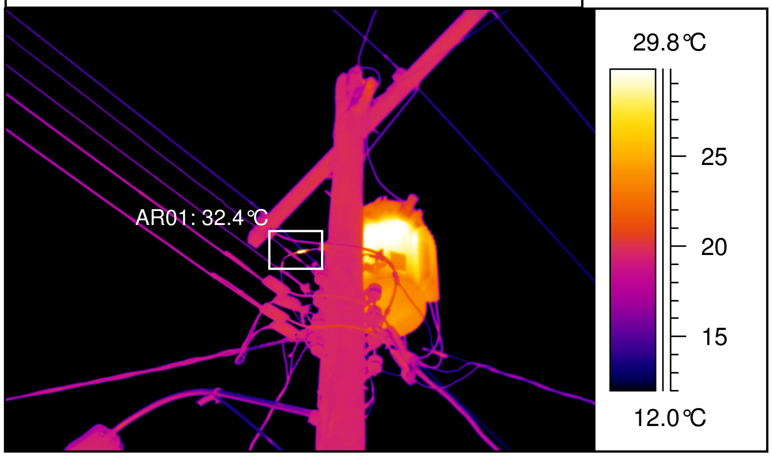
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX B11, Pole # ET8222	2014-06-18

Description: **Service connection**

INFRARED IMAGE



PHOTO

Temperature rise: 14.39 °C
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	32.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a service connection on pole # ET8222.
Located on Beachville Road East near the Library in Beachville.
Heating noted at the indicated service (insulink) connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

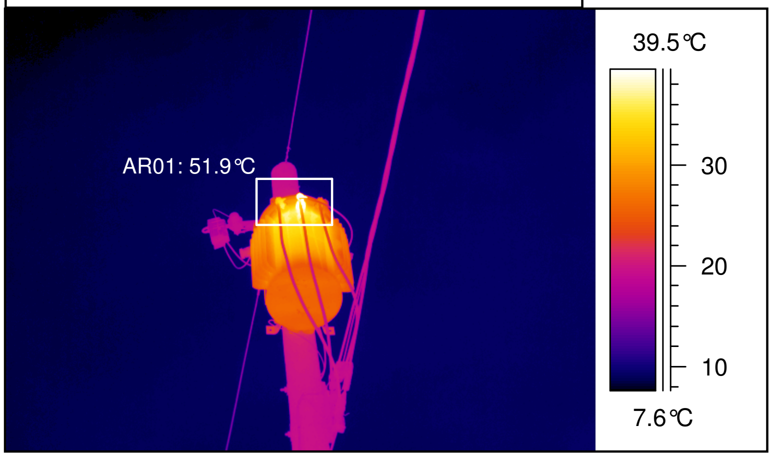
ANOMALY: Heating connection

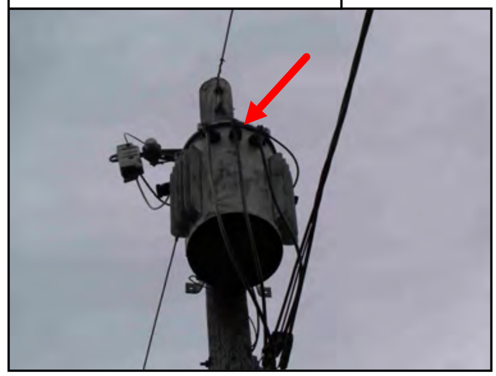
Boldstar Infrared Services Inc.

Identification:	DATE
TX B4, Pole # ET8255	2014-06-18

Description: **Transformer**

INFRARED IMAGE	PHOTO





Temperature rise: 33.86 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	51.9°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer B4 on pole # ET8255.
Located at 584429 Beachville Road West in Beachville.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

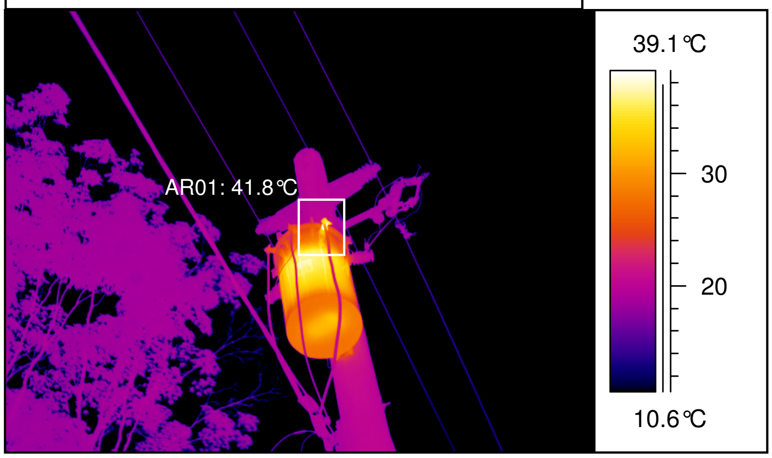
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX B26, Pole # ET1446	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 23.81 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	41.8°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer B26 on pole # ET1446.
Located at 434741 West Mill in Beachville.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

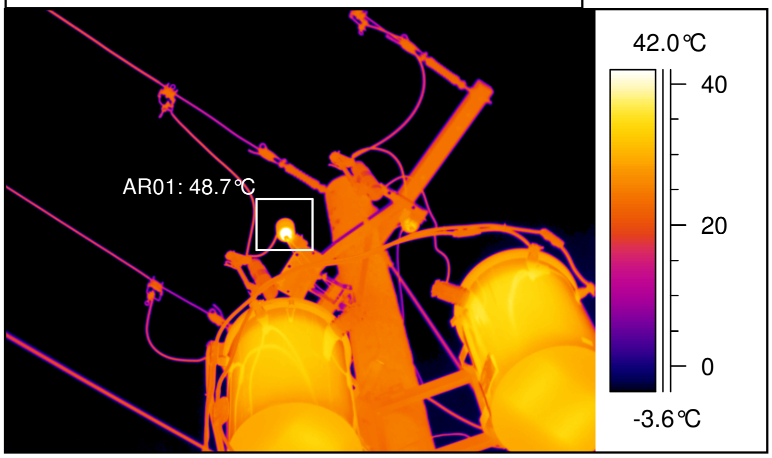
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

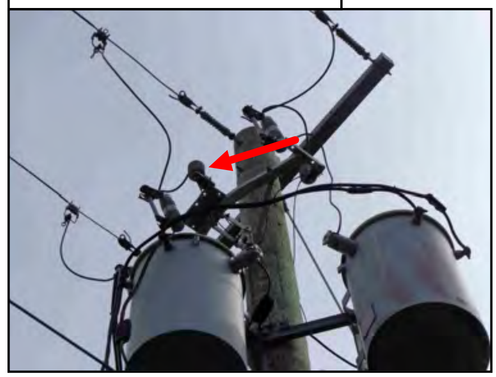
Identification:	DATE
TX O333, Pole # ET6464	2014-06-18

Description: Lightning Arrestor

INFRARED IMAGE



PHOTO



Temperature rise: 30.74 °C
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	48.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformers O333 on pole # ET6464.
Located at intersection of Wellington Street and John Street in Otterville.
Heating noted at the middle arrestor (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

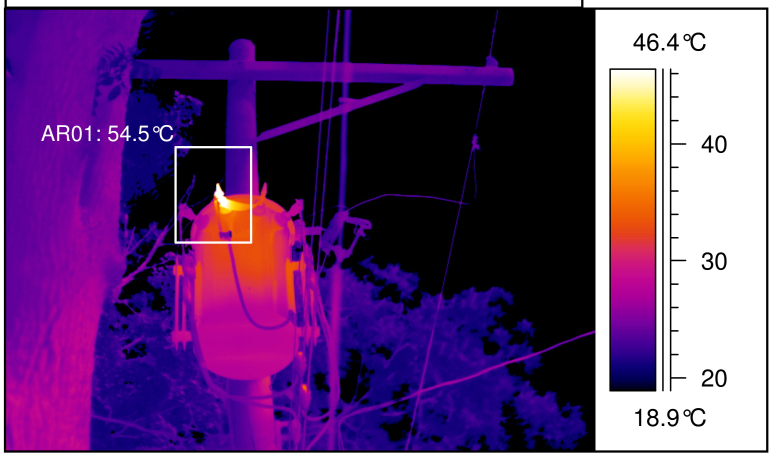
ANOMALY: Heating arrestor connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX O325, Pole # ET5917	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 35.50 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	54.5°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer O325 on pole # ET5917.
Located at 118 John Street South in Otterville.
Heating noted at the indicated neutral strap connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

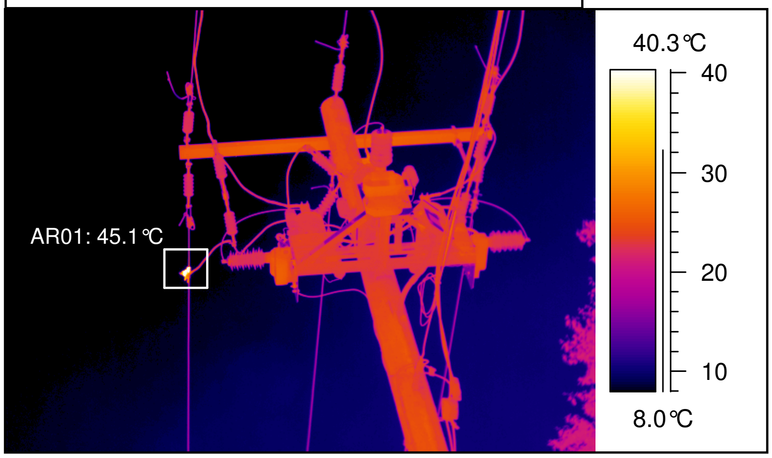
ANOMALY: Heating neutral connection

Boldstar Infrared Services Inc.

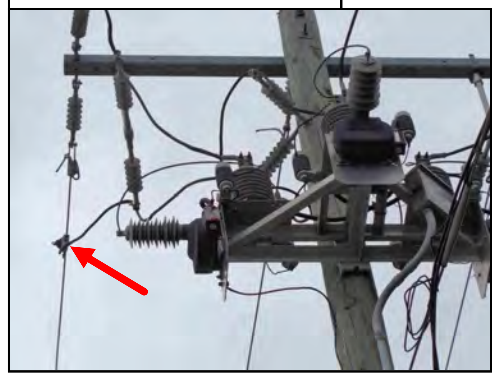
Identification:	DATE
Pole # ET6412	2014-06-18

Description: **In-line switches**

INFRARED IMAGE



PHOTO



Temperature rise: 26.06 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	45.1°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the meter pole # ET6412.
Located at 303 Main Street East in Otterville.
Heating noted at the road-side primary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

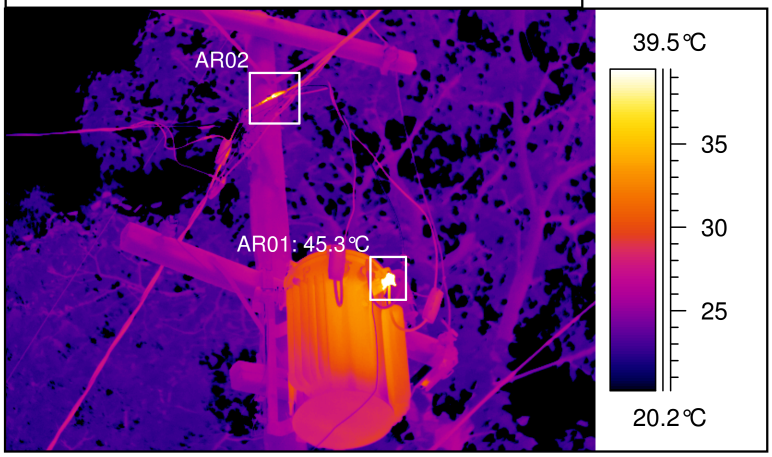
PRIORITY: High **Medium** Low

ANOMALY: Heating primary connection

Identification:	DATE
TX O349, Pole # ET5938	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 26.31 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	45.3°C
AR02 : max	42.6°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer O349 on pole # ET5938.
Located at 71 North Street West in Otterville.
Heating noted at the indicated secondary connection and service connection (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

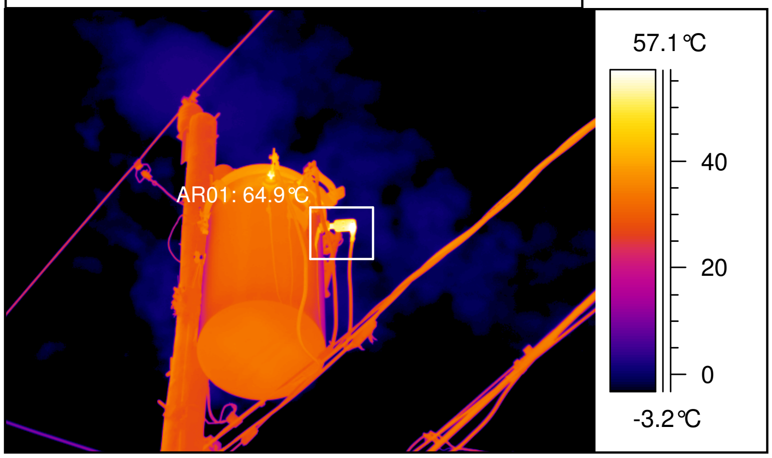
ANOMALY: Heating connections

Boldstar Infrared Services Inc.

Identification:	DATE
TX N40, Pole # ET5702	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 41.91 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	64.9°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N40 on pole # ET5702.
Located at 66 Stover Street in Norwich.
Heating noted at the indicated road side secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

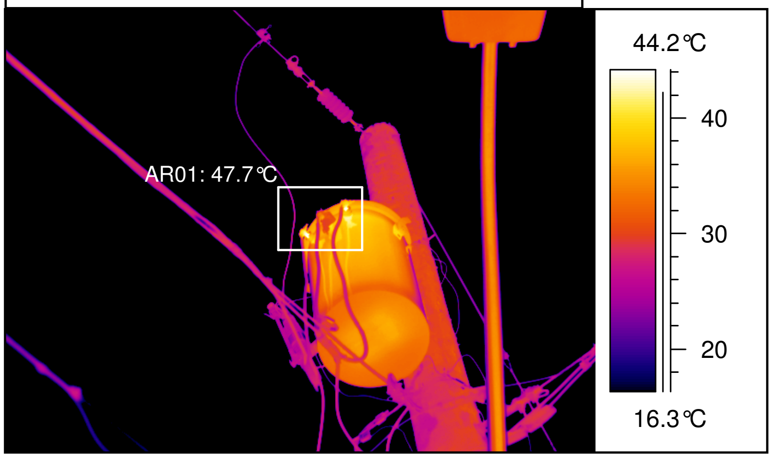
PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

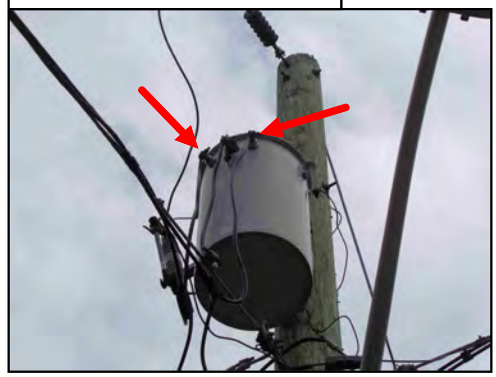
Identification:	DATE
TX N26, Pole # ET5355	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 24.75 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	47.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N26on pole # ET5355.
Located at intersection of Brode Street and John Street in Norwich.
Heating noted at the indicated secondary connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium Low

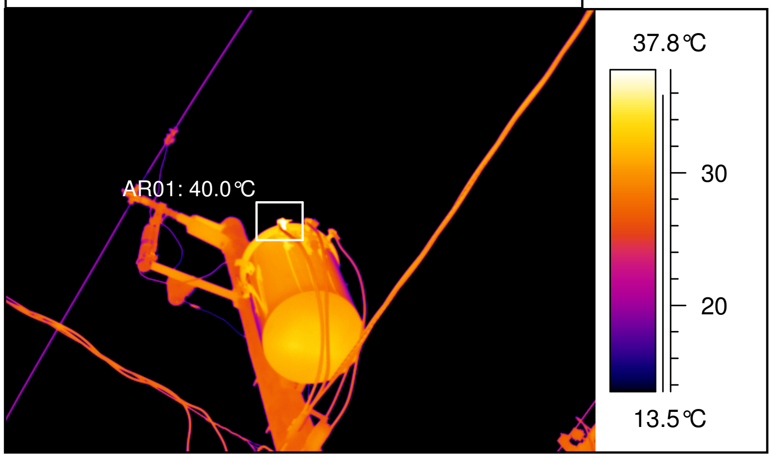
ANOMALY: Heating secondary connections

Boldstar Infrared Services Inc.

Identification:	DATE
TX N24, Pole # ET5361	2014-06-18

Description: Transformer

INFRARED IMAGE



PHOTO

Temperature rise: 16.96 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	40.0°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N24 on pole # ET5361.
Located at 25 John Street in Norwich.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

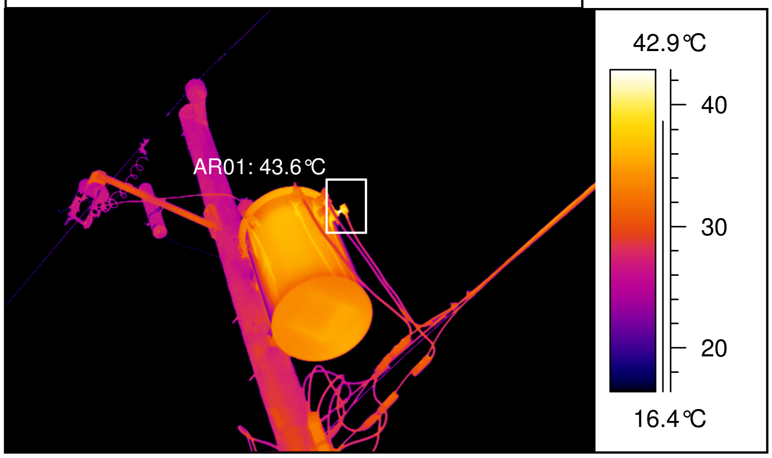
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

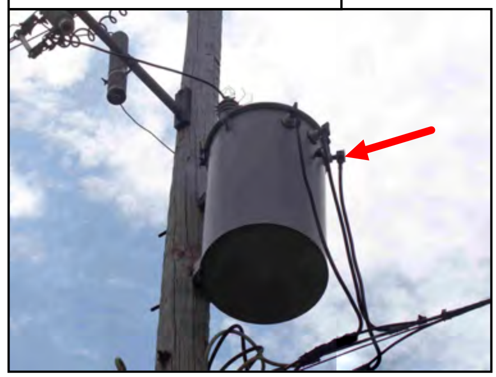
Identification:	DATE
TX N8, Pole # ET5293	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 20.57 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	43.6°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N8 on pole # ET5293.
Located at 27 Centre Street in Norwich.
Heating noted at the indicated field side secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

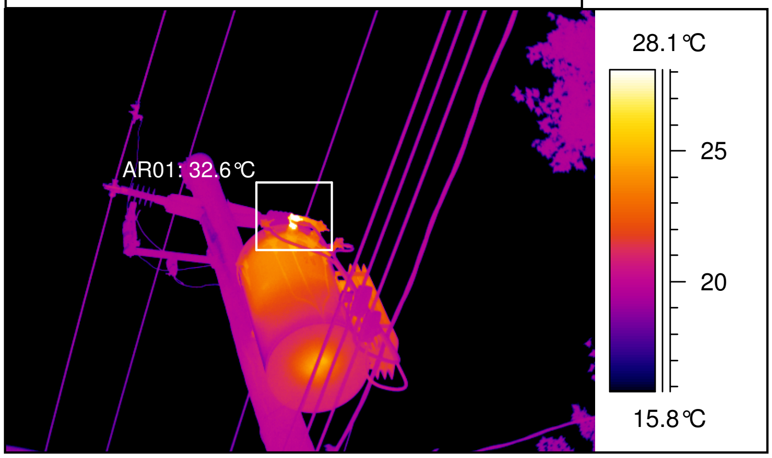
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

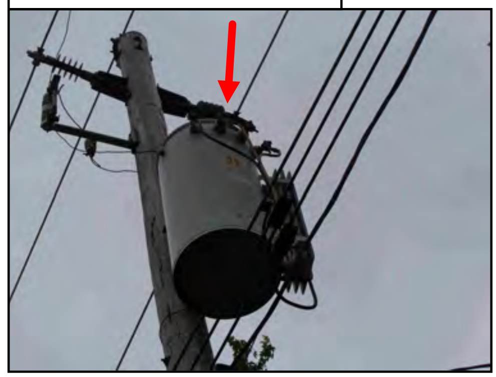
Identification:	DATE
TX A0245, Pole # ET0114	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 14.61 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	32.6°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer A0245 on pole # ET0114.
Located at 11 Forest Street in Aylmer.
Heating noted at the indicated neutral connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

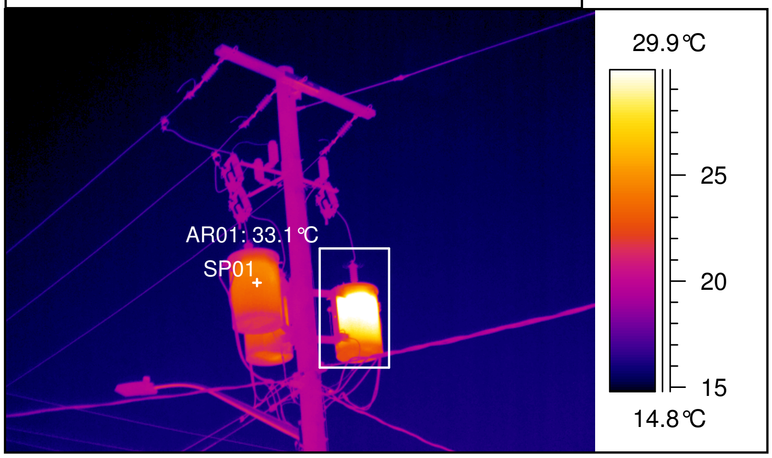
PRIORITY: High Medium **Low**

ANOMALY: Heating secondary connection

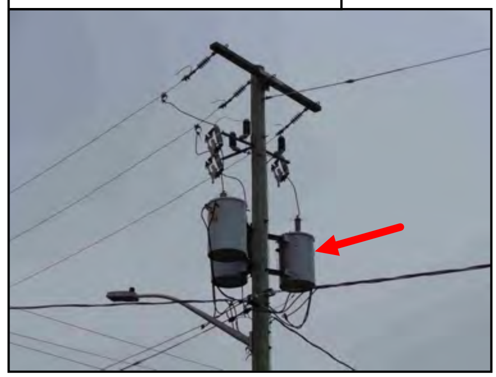
Identification:	DATE
TX A0188, Pole # ET0103	2014-06-19

Description: **Transformers**

INFRARED IMAGE



PHOTO



Temperature rise: 15.07 °C
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
SP01	24.0°C
AR01 : max	33.1°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer A0188 on pole # ET0103.
Located on Spruce Street in Aylmer.
Uneven transformer heating was noted.
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

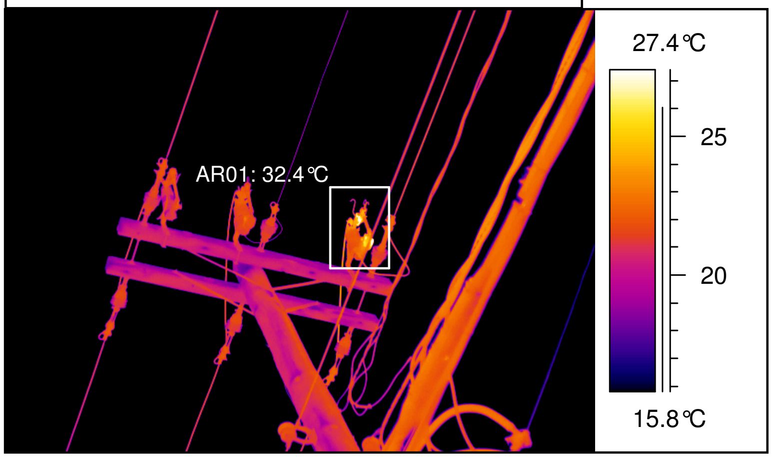
ANOMALY: Uneven heating

Boldstar Infrared Services Inc.

Identification:	DATE
TX AY34, Pole # ET0884	2014-06-19

Description: **Switches**

INFRARED IMAGE



PHOTO

Temperature rise: 13.41 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	32.4°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the cut-out switches AY34 on pole # ET0884.
Located behind Optimist Club in Aylmer.
Heating noted at the top and bottom of the south switch (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

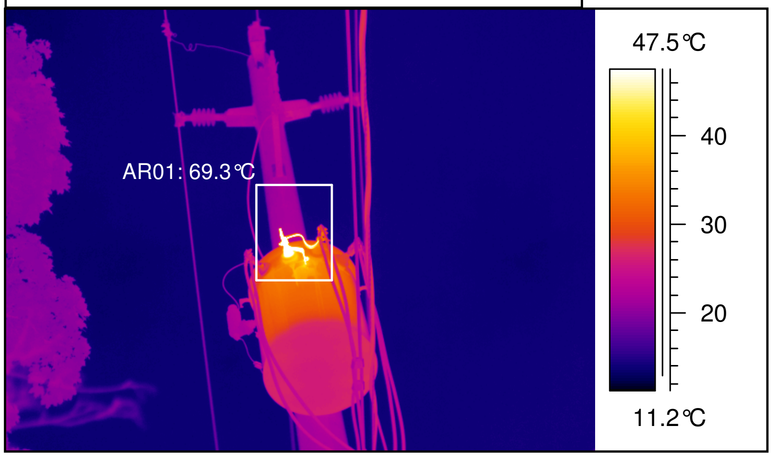
ANOMALY: Heating connections

Boldstar Infrared Services Inc.

Identification:	DATE
TX A0500, Pole # ET2708	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 49.30 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	20.0°C
Label	**Value**
AR01 : max	69.3°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer A0500 on pole # ET2708.
Located at 103 Sydenham Street in Aylmer.
Heating noted at the indicated ground connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

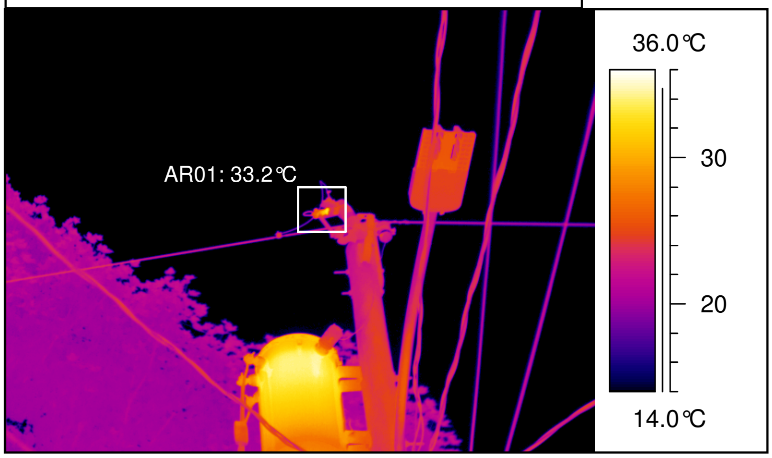
PRIORITY: High **Medium** Low

ANOMALY: Heating ground connection

Identification:	DATE
TX A0112, Pole # ET0477	2014-06-19

Description: **Cut-out switch**

INFRARED IMAGE



PHOTO

Temperature rise: 13.16 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	20.0°C
Label	**Value**
AR01 : max	33.2°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the cut-out switch A0112 on pole # ET0477.
Located across 24 Street George Street in Aylmer.
Heating noted at the switch contacts (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

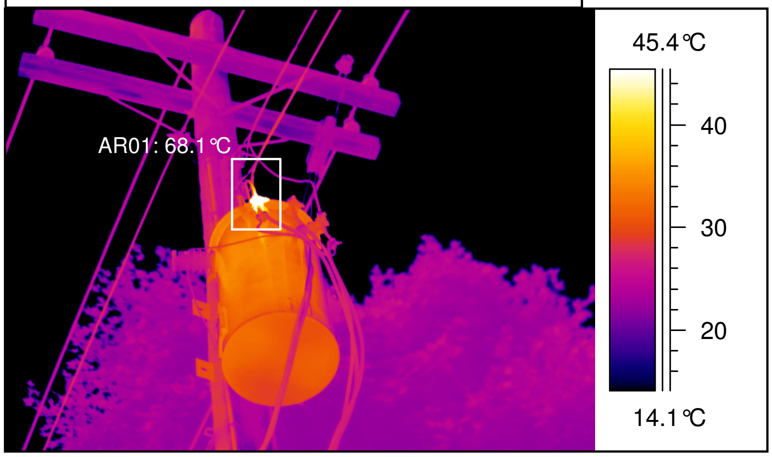
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

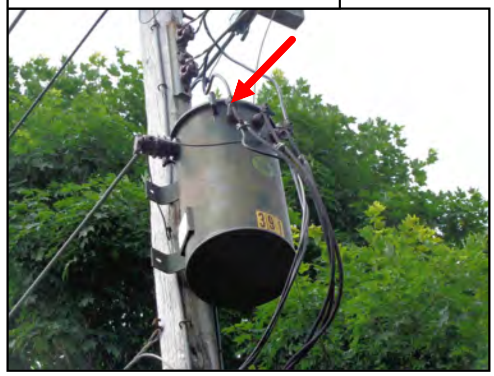
Identification:	DATE
TX A0185, Pole # ET0737	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 47.08 °C
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	21.0°C
Label	**Value**
AR01 : max	68.1°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer A0185 on pole # ET0737.
Located at 120 Fourth Avenue in Aylmer.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

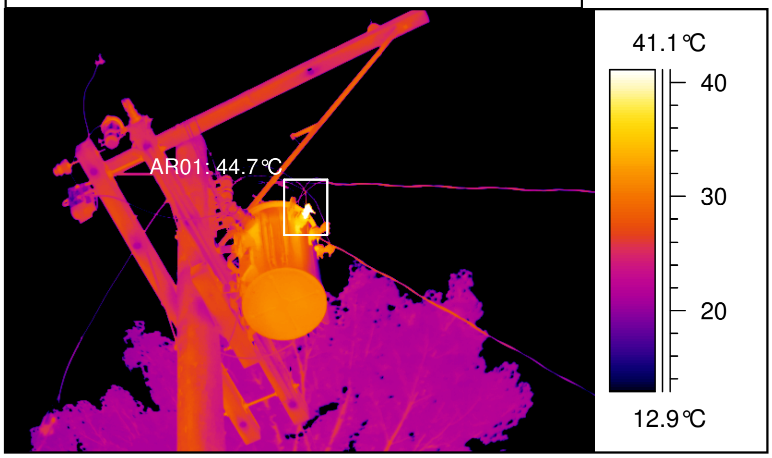
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

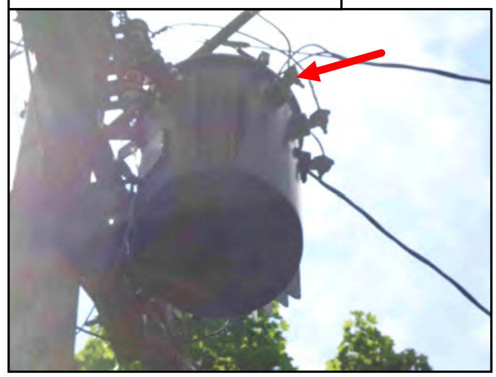
Identification:	DATE
TX PS21	2014-06-19

Description: Transformer

INFRARED IMAGE



PHOTO



Temperature rise: 21.73 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	44.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer PS021.
Located at 453 Front Street in Port Stanley.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

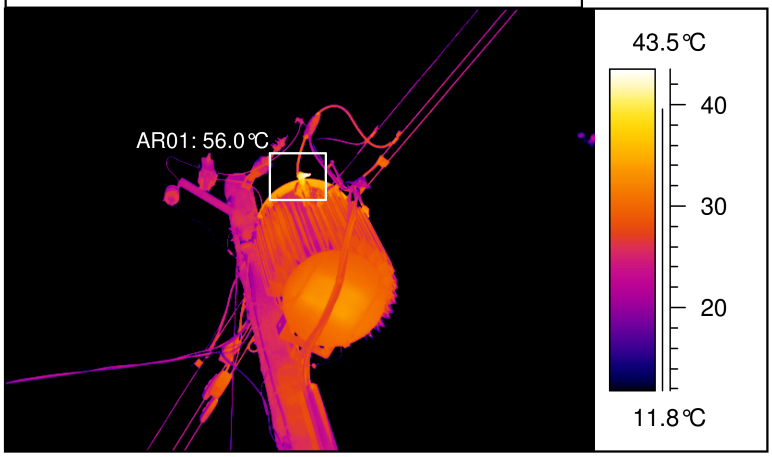
PRIORITY: High Medium **Low**

ANOMALY: Heating secondary connection

Identification:	DATE
TX PS84, Pole # 8542	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 33.00 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	56.0°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer PS084, pole # ET8542.
Located at 214 Cornell Drive in Port Stanley.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

Appendix C - Substation Maintenance Report

November 5, 2014

Erie Thames Powerlines
143 Bell St
Ingersoll, ON
N5C 2N9

Attention: Scott Brooks

Re: Maintenance Inspection Report – Our Ref: 14-11761
Site: McBrien Station – Fath Ave, Aylmer

Dear Scott,

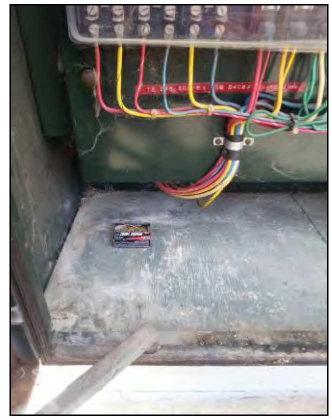
Please find the attached report for the maintenance work and inspections completed September 21, 2014.

Ascent Solutions cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

honesty attitude respect teamwork

Findings:

- Rodent dropping indicate a lot of mice in the switch
  - placed rodent poison inside switches for mice/rodents control



- HV Switch was found seized and difficult to open during maintenance
- Low insulation resistance results for ‘A’ phase lightning arrestor on main tower
- Insulation resistance results were low for HV Switches F3 and F4
- Poor insulation resistance results for *Dielectric Absorption* on both transformers due to high humidity during testing
- All HV Switch Nameplates found very faded and difficult to read

Recommendations:

- Cleanup and seal all switches particularly the bases, to keep moisture and mice out
- Replace lightning arrestor exhibiting low insulation resistance

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all of the recommended repairs listed in this report.

If you have any questions/concerns please do not hesitate to contact us. We look forward to being of continued service to Erie Thames Powerlines.

Sincerely,
ASCENT

Ken Gee
Manager, Maintenance and Service
Tel: (519) 842-6458 x4227
Fax: (519) 842-2496
Cell: (519) 851-2438

Ascent™ Defining Energy Solutions

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

System ID McBRIEN SUB **Device ID** HV SWITCH SOUTH

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION	System Neutral Present	NA
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Switch Mounting	Metal Enclosed [ ]	Pole [ ]	Tower [X]	Other			
Switch Type	Load Break [X]	Air Break [ ]		Other			

Manufacturer	CLM INDUSTRIES	BIL Rating	200 kV
Date Of Manufacture	NA	Feeder ID	McBRIEN SUB #2
Serial #	NA	Feeds To	NORTH / SOUTH TRANSFORMERS
Catalog #	P1712HC1H	Interrupting Rating	600 A
Nom. / Max. Voltage	34.5 / kV	Continuous Ampacity	600 A
Comments	NAMEPLATE FADED		

Lightning Arrestors

Class	Distribution [ ]	Intermediate [X]	Station [ ]
Composition	Ceramic [ ]	Polymer [X]	

Manufacturer	GENERAL ELECTRIC	Max. / MCOV Rating	21.0 / 17.0 kV
Catalog #	9L12PPA0215		
Comments	1 SET FOR BOTH TRANSFORMERS OFF OF MAIN SWITCH		

Protective Device Data

Primary Fuse Holder Data		Primary Fuse Link Data	
Manufacturer	S & C	Manufacturer	S & C
Type	POWER FUSE / HOLDER-OUTDOOR	Type	SM5
Nom. / Max. Voltage	34.5 / 38.0 kV	Link Size	80 A
Holder Max. Fuse Link	300E	TCC #	119-4
Holder Catalog #	86154R2	Link Catalog #	264125R

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes [ ]	No [X]	# of Spares	NA
Spare Location	NA			
Comments				

Interlock

Key Interlock	Yes [ ]	No [X]		
Interlock Type	Electrical [ ]	Mechanical [ ]	Utility Lock [X]	
Devices Interlocked	H.V. Switch [X]	Breaker [ ]	Trans. Encl. [ ]	Other [ ]
Manufacturer	ABUS		Key Interlock #	
Comments				

Load Side Conductor Data

Conductor Type	Cable [X]	Bus Bar [ ]	Conductor Size / Dim.	4/0
Conductor Material	Aluminum [ ]	Copper [X]	Conductors per Phase	1 / Phase
Tape Shield	Aluminum [ ]	Copper [ ]	Bond Size / Dim.	NA
Concentric Neutral	Aluminum [ ]	Copper [ ]	# of Bond Conductors	0
Insulation Voltage	NA		# of Neutral Conductors	0
Insulation Type	NA		Neutral Size / Dim.	NA
Comments				

Recorded By: S. KYLE / J. DUNCAN

Ascent
Defining Energy Solutions

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID McBRIEN SUB **Device ID** HV SWITCH SOUTH

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition		√		FADED
Insulator Condition	√			
Ground Connections	√			
Lightning Arrestors	√			
Arc Suppressors	√			
Key Interlock Operation			√	
Ground Straps & Materials	√			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	√			
Contact Surface Condition	√			
Simultaneous Closure	√			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance NA Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	0.5	Ω
Phase B	0.6	Ω
Phase C	0.6	Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV ☐ 2 kV ☐ 5 kV ☐ 10 kV ☐

	Phase A	Phase B	Phase C
Phase to GND	NA MΩ	NA MΩ	NA MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current 10 A

	Phase A	Phase B	Phase C
Contacts	NA μΩ	NA μΩ	NA μΩ
Fuse	NA μΩ	NA μΩ	NA μΩ
Overall	997 μΩ	987 μΩ	970 μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	NA	MΩ
Phase B to Ground	NA	MΩ
Phase C to Ground	NA	MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ 10000 V DC after 1 minute

Phase A to Ground	735	MΩ
Phase B to Ground	1510	MΩ
Phase C to Ground	3770	MΩ

Comments / Observations

Test Instrument(s)			
	Manufacturer / Model	Megger	Ductor
	Serial #	1132	7293

Tested By: S. KYLE / J. DUNCAN

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

Ascent™ Defining Energy Solutions

System ID McBRIEN T-2993-1 **Device ID** F1

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION	System Neutral Present	NA
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Switch Mounting	Metal Enclosed	X	Pole		Tower		Other
Switch Type	Load Break	X	Air Break				Other

Manufacturer	S & C	BIL Rating	60 kV
Date Of Manufacture		Feeder ID	
Serial #		Feeds To	NA
Catalog #	3456R4	Interrupting Rating	600 A
Nom. / Max. Voltage	4.8 / 5.5 kV	Continuous Ampacity	600 A
Comments	NAMEPLATE VERY FADED		

Lightning Arrestors

Class	Distribution		Intermediate		Station	
Composition	Ceramic		Polymer			

Manufacturer		Max. / MCOV Rating	/ kV
Catalog #			
Comments	NA		

Protective Device Data

Primary Fuse Holder Data		Primary Fuse Link Data	
Manufacturer	S & C	Manufacturer	S & C
Type	SM5-C	Type	
Nom. / Max. Voltage	7.2 / 8.3 kV	Link Size	400 A
Holder Max. Fuse Link		TCC #	119-4
Holder Catalog #		Link Catalog #	261600RW

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes	X	No		# of Spares	2
Spare Location	DOOR					
Comments						

Interlock

Key Interlock	Yes		No	X				
Interlock Type	Electrical		Mechanical		Utility Lock			
Devices Interlocked	H.V. Switch		Breaker		Trans. Encl.		Other	

Manufacturer		Key Interlock #	
Comments			

Load Side Conductor Data

Conductor Type	Cable	X	Bus Bar		Conductor Size / Dim.	300 MCM
Conductor Material	Aluminum		Copper	X	Conductors per Phase	1 / Phase
Tape Shield	Aluminum		Copper		Bond Size / Dim.	2/0
Concentric Neutral	Aluminum		Copper	X	# of Bond Conductors	1
Insulation Voltage	TR XLPE				# of Neutral Conductors	
Insulation Type					Neutral Size / Dim.	NA
Comments						

Recorded By: T. HANSON

Ascent™ Defining Energy Solutions

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID McBRIEN T-2993-1 **Device ID** F1

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition		√		VERY FADED
Insulator Condition	√			
Ground Connections	√			
Lightning Arrestors			√	
Arc Suppressors	√			
Key Interlock Operation			√	
Ground Straps & Materials	√			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	√			
Contact Surface Condition	√			
Simultaneous Closure	√			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance **NA** Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	**0.5**	Ω
Phase B	**0.4**	Ω
Phase C	**0.5**	Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [X] 10 kV [ ]

	Phase A	Phase B	Phase C
Phase to GND	**36** MΩ	**47** MΩ	**86** MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current **10 A**

	Phase A	Phase B	Phase C
Contacts	**100** μΩ	**75** μΩ	**85** μΩ
Fuse	**361** μΩ	**304** μΩ	**296** μΩ
Overall	**456** μΩ	**379** μΩ	**398** μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ ______ **V DC** after 1 minute

Phase A to Ground	**NA**	**MΩ**
Phase B to Ground	**NA**	**MΩ**
Phase C to Ground	**NA**	**MΩ**

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ ______ **V DC** after 1 minute

Phase A to Ground	**NA**	**MΩ**
Phase B to Ground	**NA**	**MΩ**
Phase C to Ground	**NA**	**MΩ**

Comments / Observations

UNABLE TO DO INSULATION RESISTANCE TESTS DUE TO ISOLATION HAVING GROUNDS CONNECTED

Test Instrument(s)			
	Manufacturer / Model	**Megger**	**Ductor**
	Serial #	**2232**	**7293**

Tested By: **T. HANSON**

Ascent™ Defining Energy Solutions

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

System ID McBRIEN T-2993-1 **Device ID** F2

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION	System Neutral Present	NA
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Switch Mounting	Metal Enclosed	X	Pole		Tower		Other
Switch Type	Load Break	X	Air Break				Other

Manufacturer	S & C	BIL Rating	60 kV
Date Of Manufacture	NA	Feeder ID	F2
Serial #	NA	Feeds To	NA
Catalog #	34560R4	Interrupting Rating	600 A
Nom. / Max. Voltage	4.8 / 5.5 kV	Continuous Ampacity	600 A
Comments	NAMEPLATE VERY DIFFICULT TO READ		

Lightning Arrestors

Class	Distribution		Intermediate		Station	
Composition	Ceramic		Polymer			

Manufacturer		Max. / MCOV Rating	/ kV
Catalog #			
Comments	NA		

Protective Device Data

Primary Fuse Holder Data / Primary Fuse Link Data

Manufacturer	S & C	Manufacturer	S & C
Type	SM5-C	Type	
Nom. / Max. Voltage	7.2 / 8.3 kV	Link Size	400 A
Holder Max. Fuse Link		TCC #	119-4
Holder Catalog #		Link Catalog #	261600R4

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes	X	No		# of Spares	2
Spare Location	METERING CABINET					
Comments						

Interlock

Key Interlock	Yes		No	X				
Interlock Type	Electrical		Mechanical		Utility Lock			
Devices Interlocked	H.V. Switch		Breaker		Trans. Encl.		Other	

Manufacturer		Key Interlock #	
Comments			

Load Side Conductor Data

Conductor Type	Cable	X	Bus Bar		Conductor Size / Dim.	300 MCM
Conductor Material	Aluminum		Copper	X	Conductors per Phase	1 / Phase
Tape Shield	Aluminum		Copper		Bond Size / Dim.	
Concentric Neutral	Aluminum		Copper	X	# of Bond Conductors	1

Insulation Voltage	TR XLPE	# of Neutral Conductors	
Insulation Type		Neutral Size / Dim.	NA
Comments			

Recorded By: T. HANSON

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

Ascent
Defining Energy Solutions

System ID McBRIEN T-2993-1 **Device ID** F2

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition		√		UNREADABLE
Insulator Condition	√			
Ground Connections	√			
Lightning Arrestors			√	
Arc Suppressors	√			
Key Interlock Operation			√	
Ground Straps & Materials	√			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	√			
Contact Surface Condition	√			
Simultaneous Closure	√			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance NA Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	0.9 Ω
Phase B	0.6 Ω
Phase C	0.9 Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [X] 10 kV [ ]

	Phase A	Phase B	Phase C
Phase to GND	38 MΩ	49 MΩ	24 MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current 10 A

	Phase A	Phase B	Phase C
Contacts	361 μΩ	96 μΩ	69 μΩ
Fuse	354 μΩ	118 μΩ	290 μΩ
Overall	602 μΩ	613 μΩ	546 μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	NA MΩ
Phase B to Ground	NA MΩ
Phase C to Ground	NA MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	NA MΩ
Phase B to Ground	NA MΩ
Phase C to Ground	NA MΩ

Comments / Observations

UNABLE TO DO INSULATION RESISTANCE TESTS DUE TO ISOLATION HAVING GROUNDS CONNECTED

Test Instrument(s)

Manufacturer / Model	Megger	Ductor
Serial #	2232	7293

Tested By: T. HANSON

TRANSFORMER DATA SHEET (Pg. 1 of 4)

Ascent™ Defining Energy Solutions

System ID	McBRIEN SUB	Device ID	SOUTH TX

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION		
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Transformer Class	Unit Padmount	X	Padmount		Station				Other	
Transformer Cooling	ONAN	X	ONAF	X	LNAN		DRY		Other	ONAN/ONAF
Bushing Configuration	Dead Front		Top - Top		Top - Side	X	Side - Side		Other	

Manufacturer	FERRANTI PACKARD	Core & Windings	8740	kg		lb	X
Date of Manufacture	DEC/1992	Tanks & Fittings	4325	kg		lb	X
Serial #	2-305405	Coolant Volume	3510	L		Gal	X
KVA / Prov. KVA Rating	3000 KVA	Coolant Weight	NA	kg		lb	
Primary Voltage	27600 V	Total Weight	16575	kg		lb	X
Primary Ampacity	15.5 A	Temperature Rise	65	°C	X	°F	
Secondary Voltage	4160 / 2400 V	HV BIL Rating	200	kV			
Secondary Ampacity	416 A	LV BIL Rating	75	kV			
HV Winding Material		Percent Impedance	5.86 %	ONAN	X	ONAF	X
LV Winding Material		Tamper Resistant		YES		NO	
CSA Specification(s)		Transformer Colour	GREY				
Comments							

Visual Inspection

Nameplate Condition	Satisfactory	X	Not Satisfactory		N/A		Comments	
Fan / Pump Operation	Satisfactory	X	Not Satisfactory		N/A		Comments	
Ground Connections	Satisfactory	X	Not Satisfactory		N/A		Comments	
Liquid Levels In Tanks	Satisfactory	X	Not Satisfactory		N/A		Comments	
Interlock Operation	Satisfactory	X	Not Satisfactory		N/A		Comments	
Temp. Gauge Operation	Satisfactory	X	Not Satisfactory		N/A		Comments	

Coolant Temperature	46	°C	X	°F		Max. Coolant Temperature	48	°C	X	°F	

Comments

Oil Conservator

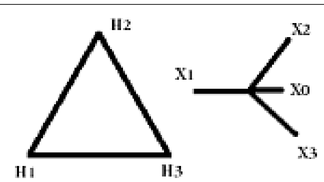
Oil Conservator	Yes		No	X		Conservator Volume		L		Gal
Silica Gel Breather	Yes		No	X		Breather Volume		L		Gal
Silica Gel Colour	Good		Bad		Replaced		N/A	X		

Comments

Tap Changer Data

Position / Designation		Tap Voltages (V)	As Found	As Left
1 / A	105.00%	28980		
2 / B	102.50%	28290		
3 / C	100.00%	27600		
4 / D	97.50%	26910	X	X
5 / E	95.00%	26220		

Vector Diagram: DeltaWye1__5.Dyn1



Primary Vector	X	Secondary Vector	X

Comments:

Tested By: J. NOTHER

Ascent™ Defining Energy Solutions

System ID McBRIEN SUB **Device ID** SOUTH TX

Neutral Grounding Resistor (NGR)

NGR Present	Yes [ ] No [X]		
Manufacturer		NGR Serial #	
NGR Voltage	V	Maximum Current	A
NGR Resistance	Ω	NGR Location	
Comments			

Transformer Lightning Arrestors

Class	Distribution	X	Intermediate	X	Station	
Composition	Ceramic		Polymer	X		

Manufacturer	GENERAL ELECTRIC	Max. / MCOV Rating	21.0 / 17.0 kV
Catalog #	9L72PPA0217		
Comments			

Interlock

Key Interlock	Yes		No	X				
Interlock Type	Elec.		Mech.		Utility Lock	X		
Devices Interlocked	H.V. Switch	X	Breaker		Trans. Encl.		Other	

Manufacturer	ABUS	Key Interlock #	
Comments			

Fans

# of Fans	4	Fan Voltage	115/230
Fan Size		Frame Size	
Horsepower	1/4		
Comments	MAGNETAK		

Transformer Load Side Conductor Data

Conductor Type	Cable		Bus Bar	X	Conductor Size / Dim.	
Conductor Material	Aluminum		Copper		Conductors per Phase	/ Phase
Tape Shield	Aluminum		Copper		Bond Size / Dim.	
Concentric Neutral	Aluminum		Copper		# of Bond Conductors	
Insulation Voltage					# of Neutral Conductors	
Insulation Type					Neutral Size / Dim.	
Comments						

Tested By: J. NOTHER

TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID McBRIEN SUB **Device ID** SOUTH TX

Electrical Tests

Turn Ratio Test

Test Voltage: Automatic [X] Other ____ V

Tap Position / Designation		Tap Voltage V	Calculated Ratio	H 1 To H 2 / X 0 To X 2	H 2 To H 3 / X 0 To X 3	H 3 To H 1 / X 0 To X 1
1 / A	105.00%	28980	12.066	12.071	12.069	12.071
2 / B	102.50%	28290	11.779	11.789	11.789	11.789
3 / C	100.00%	27600	11.491	11.495	11.493	11.492
4 / D	97.50%	26910	11.204	11.210 / 11.213	11.207 / 11.212	11.210 / 11.209
5 / E	95.00%	26220	10.917	10.930	10.920	10.926

		Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
Tap Position As Found	4	0.500 mA	0.060 %	0.380 mA	0.030 %	0.470 mA	0.050 %
Tap Position As Left	4	0.520 mA	0.080 %	0.390 mA	0.070 %	0.500 mA	0.040 %

Primary Winding Resistance

Resistance in ohms at 0.5 A after 1 minute

H0 - H1	NA Ω	H1 - H2	1.101 Ω
H0 - H2	NA Ω	H2 - H3	1.091 Ω
H0 - H3	NA Ω	H3 - H1	1.090 Ω

Stabilization Time > 1 Minute

Secondary Winding Resistance

Resistance in milli-ohms at 5 A after 1 minute

X0 - X1	6.820 mΩ	X1 - X2	13.650 mΩ
X0 - X2	6.880 mΩ	X2 - X3	13.620 mΩ
X0 - X3	6.840 mΩ	X3 - X1	13.650 mΩ

Stabilization Time > 1 Minute

Capacitance Test

	Low - Ground	Low - Guard	UST (High - Low)	High - Guard	High - Ground
Capacitance in pico-farads	6564 pF	2453 pF	4117 pF	6527 pF	10641 pF
Uncorrected D.F. (%)	0.840 %	0.790 %	0.840 %	1.110 %	1.010 %
Corrected to 20 °C (%)	0.277 %	0.261 %	0.277 %	0.366 %	0.333 %

Temp. Correction Factor 0.33

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @ 10000 V DC after 1 minute

Phase A to Ground	735 MΩ
Phase B to Ground	1510 MΩ
Phase C to Ground	3770 MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @ ____ V DC after 1 minute

Phase A to Ground	NA MΩ	Phase A to Phase B	NA MΩ
Phase B to Ground	NA MΩ	Phase B to Phase C	NA MΩ
Phase C to Ground	NA MΩ	Phase C to Phase A	NA MΩ

Comments / Observations

'A' PHASE LIGHTNING ARRESTOR SHOULD BE REPLACED AS SOON
'B' PHASE LIGHTNING ARRESTOR SHOULD BE MONITORED ON NEXT MAINTENANCE

Test Instrument(s)		Ratio	Winding	Cap Bridge	Megger
	Manufacturer / Model				
	Serial #	10605	50999	5374	1134

Tested By: **J. NOTHER**

TRANSFORMER TEST SHEET (Pg. 4 of 4)

Ascent™ Defining Energy Solutions

System ID	McBRIEN SUB	Device ID	SOUTH TX

Dielectric Absorption Test (Insulation Resistance)

Time	High to Low & Gnd		Low to High & Gnd		High & Low to Gnd	
	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
15 sec	**475** MΩ	**2280** MΩ	**365** MΩ	**1752** MΩ	**554** MΩ	**2659** MΩ
30 sec	**539** MΩ	**2587** MΩ	**491** MΩ	**2357** MΩ	**703** MΩ	**3374** MΩ
45 sec	**571** MΩ	**2741** MΩ	**593** MΩ	**2846** MΩ	**820** MΩ	**3936** MΩ
1 min	**581** MΩ	**2789** MΩ	**665** MΩ	**3192** MΩ	**901** MΩ	**4325** MΩ
2 min	**603** MΩ	**2894** MΩ	**836** MΩ	**4013** MΩ	**1010** MΩ	**4848** MΩ
3 min	**626** MΩ	**3005** MΩ	**982** MΩ	**4714** MΩ	**1120** MΩ	**5376** MΩ
4 min	**636** MΩ	**3053** MΩ	**1190** MΩ	**5712** MΩ	**1200** MΩ	**5760** MΩ
5 min	**646** MΩ	**3101** MΩ	**1260** MΩ	**6048** MΩ	**1250** MΩ	**6000** MΩ
6 min	**650** MΩ	**3120** MΩ	**1340** MΩ	**6432** MΩ	**1260** MΩ	**6048** MΩ
7 min	**690** MΩ	**3312** MΩ	**1460** MΩ	**7008** MΩ	**1300** MΩ	**6240** MΩ
8 min	**702** MΩ	**3370** MΩ	**1490** MΩ	**7152** MΩ	**1350** MΩ	**6480** MΩ
9 min	**712** MΩ	**3418** MΩ	**1490** MΩ	**7152** MΩ	**1350** MΩ	**6480** MΩ
10 min	**757** MΩ	**3634** MΩ	**1450** MΩ	**6960** MΩ	**1390** MΩ	**6672** MΩ
Test Voltage	10000 V		1000 V		1000 V	
Multiplier	1		1		1	
Polarization Index	**1.30**		**2.18**		**1.54**	
TCC **4.80**	Insulation Resistance Readings Corrected to 20 °C					

Insulation Resistance

Resistance in meg-ohms after 1 minute.

High to Low & Ground	**2789**	MΩ @	**10000**	V
Low to High & Ground	**3192**	MΩ @	**1000**	V
High & Low to Ground	**4325**	MΩ @	**1000**	V

Core Ground Insulation Resistance

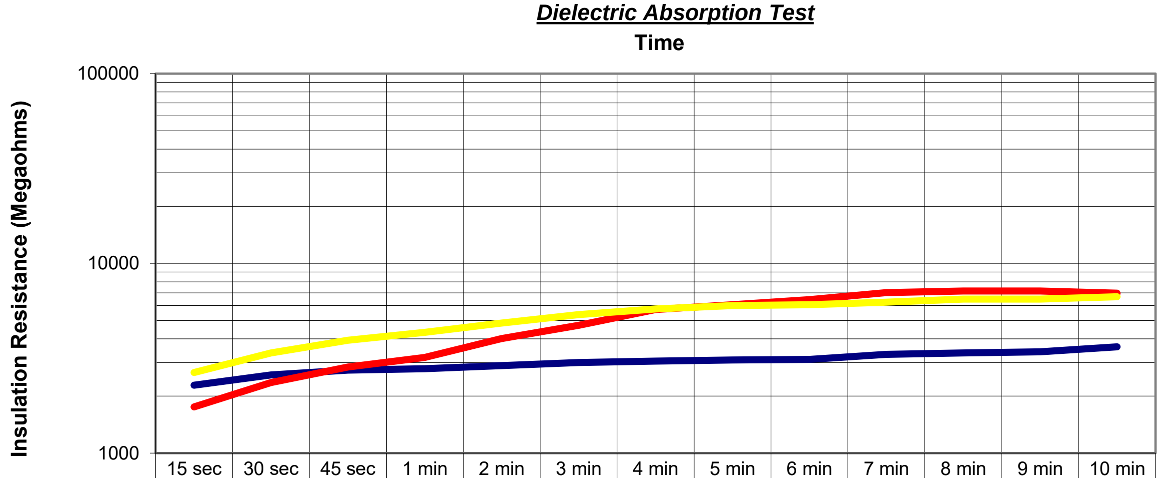
Resistance in meg-ohms after 1 minute.

Core Ground Accessible Yes ☐ No ☐

Test Voltage ______ V

Core Ground Resistance ______ MΩ

Dielectric Absorption Test



	15 sec	30 sec	45 sec	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
High to Low & Gnd	2280	2587	2741	2789	2894	3005	3053	3101	3120	3312	3370	3418	3634
Low to High & Gnd	1752	2357	2846	3192	4013	4714	5712	6048	6432	7008	7152	7152	6960
High & Low to Gnd	2659	3374	3936	4325	4848	5376	5760	6000	6048	6240	6480	6480	6672

Test Instrument(s) Manufacturer / Model **Megger**

Serial # **1134**

Comments: ______

Tested By: **J. NOTHER**

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

Ascent™ Defining Energy Solutions

System ID McBRIEN SUB **Device ID** HV SWITCH NORTH

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION	System Neutral Present	NA
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Switch Mounting	Metal Enclosed	[ ]	Pole	[ ]	Tower	X	Other
Switch Type	Load Break	X	Air Break	[ ]			Other

Manufacturer	CLM INDUSTRIES	BIL Rating	200 kV
Date Of Manufacture	NA	Feeder ID	#2
Serial #	NA	Feeds To	NORTH / SOUTH TRANSFORMERS
Catalog #	PH12HC14	Interrupting Rating	600 A
Nom. / Max. Voltage	34.5 / kV	Continuous Ampacity	600 A
Comments	NAMEPLATE FADED		

Lightning Arrestors

Class	Distribution	[ ]	Intermediate	X	Station	[ ]
Composition	Ceramic	[ ]	Polymer	X		

Manufacturer	GENERAL ELECTRIC	Max. / MCOV Rating	21.0 / 17.0 kV
Catalog #	9L72PPA0215		
Comments	1 SET FOR BOTH TRANSFORMERS OFF OF MAIN SWITCH		

Protective Device Data

Primary Fuse Holder Data

Manufacturer	S & C
Type	POWER FUSE / HOLDER-OUTDOOR
Nom. / Max. Voltage	34.5 / 38.0 kV
Holder Max. Fuse Link	300E
Holder Catalog #	86154R2

Primary Fuse Link Data

Manufacturer	S & C
Type	SM5
Link Size	125 A
TCC #	153-4
Link Catalog #	134/200R4

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes	[ ]	No	X	# of Spares	NA
Spare Location	NA					
Comments						

Interlock

Key Interlock	Yes	[ ]	No	X				
Interlock Type	Electrical	[ ]	Mechanical	[ ]	Utility Lock	X		
Devices Interlocked	H.V. Switch	X	Breaker	[ ]	Trans. Encl.	[ ]	Other	[ ]
Manufacturer	ABUS				Key Interlock #			
Comments								

Load Side Conductor Data

Conductor Type	Cable	X	Bus Bar	[ ]	Conductor Size / Dim.	4/0
Conductor Material	Aluminum	[ ]	Copper	X	Conductors per Phase	1 / Phase
Tape Shield	Aluminum	[ ]	Copper	[ ]	Bond Size / Dim.	NA
Concentric Neutral	Aluminum	[ ]	Copper	[ ]	# of Bond Conductors	NA
Insulation Voltage	NA				# of Neutral Conductors	NA
Insulation Type	NA				Neutral Size / Dim.	NA
Comments						

Recorded By: S. KYLE / J. DUNCAN

Ascent™
Defining Energy Solutions

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID McBRIEN SUB **Device ID** HV SWITCH NORTH

Visual Inspection / Mechanical Tests

Item	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition		√		VERY FADED
Insulator Condition	√			
Ground Connections	√			
Lightning Arrestors		√		LOW TEST RESULTS
Arc Suppressors	√			
Key Interlock Operation				
Ground Straps & Materials	√			

Switch Condition / Operation

Item	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	√			
Contact Surface Condition	√			
Simultaneous Closure	√			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance NA Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	0.5 Ω
Phase B	0.6 Ω
Phase C	0.6 Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV ☐ 2 kV ☐ 5 kV ☐ 10 kV ☐

	Phase A	Phase B	Phase C
Phase to GND	NA MΩ	NA MΩ	NA MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current 10 A

	Phase A	Phase B	Phase C
Contacts	NA μΩ	NA μΩ	NA μΩ
Fuse	NA μΩ	NA μΩ	NA μΩ
Overall	825 μΩ	832 μΩ	831 μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	NA MΩ
Phase B to Ground	NA MΩ
Phase C to Ground	NA MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ 10000 V DC after 1 minute

Phase A to Ground	735 MΩ
Phase B to Ground	1510 MΩ
Phase C to Ground	3770 MΩ

Comments / Observations

Test Instrument(s)			
	Manufacturer / Model	Megger	Ductor
	Serial #	1132	7293

Tested By: S. KYLE / J. DUNCAN

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

Ascent™ Defining Energy Solutions

System ID	McBRIEN T-2993-1	Device ID	F3

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION	System Neutral Present	NA
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Switch Mounting	Metal Enclosed	X	Pole		Tower		Other	
Switch Type	Load Break	X	Air Break				Other	

Manufacturer	S & C	BIL Rating	60 kV
Date Of Manufacture	NA	Feeder ID	F3
Serial #	NA	Feeds To	
Catalog #	34560R5	Interrupting Rating	A
Nom. / Max. Voltage	4.8 / 5.5 kV	Continuous Ampacity	600 A
Comments	NAMEPLATE VERY FADED		

Lightning Arrestors

Class	Distribution		Intermediate		Station	
Composition	Ceramic		Polymer			

Manufacturer		Max. / MCOV Rating	/ kV
Catalog #			
Comments	NA		

Protective Device Data

Primary Fuse Holder Data / Primary Fuse Link Data

Manufacturer	S & C	Manufacturer	S & C
Type	SM5	Type	SM5
Nom. / Max. Voltage	7.2 / 8.3 kV	Link Size	400E A
Holder Max. Fuse Link	400E	TCC #	119-4
Holder Catalog #	86641R1	Link Catalog #	261600R4

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes	X	No		# of Spares	1

Spare Location	IN DOOR
Comments	

Interlock

Key Interlock	Yes		No	X				
Interlock Type	Electrical		Mechanical		Utility Lock			
Devices Interlocked	H.V. Switch		Breaker		Trans. Encl.		Other	

Manufacturer		Key Interlock #	
Comments			

Load Side Conductor Data

Conductor Type	Cable	X	Bus Bar		Conductor Size / Dim.	300 MCM
Conductor Material	Aluminum		Copper	X	Conductors per Phase	1 / Phase
Tape Shield	Aluminum		Copper		Bond Size / Dim.	2/0
Concentric Neutral	Aluminum		Copper	X	# of Bond Coductors	1

Insulation Voltage	15 kV	# of Neutral Conductors	NA
Insulation Type	XLPE	Neutral Size / Dim.	NA
Comments			

Recorded By: C. CARON

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

Ascent
Defining Energy Solutions

System ID McBRIEN T-2993-1 **Device ID** F3

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition		√		VERY FADED
Insulator Condition	√			
Ground Connections	√			
Lightning Arrestors			√	
Arc Suppressors	√			
Key Interlock Operation			√	
Ground Straps & Materials	√			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	√			
Contact Surface Condition	√			
Simultaneous Closure	√			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance NA Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	0.6	Ω
Phase B	0.7	Ω
Phase C	0.6	Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [X] 10 kV [ ]

	Phase A	Phase B	Phase C
Phase to GND	6.6 MΩ	6.35 MΩ	7.27 MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current 10 A

	Phase A	Phase B	Phase C
Contacts	45 μΩ	44 μΩ	53 μΩ
Fuse	248 μΩ	262 μΩ	234 μΩ
Overall	347 μΩ	445 μΩ	337 μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	NA	MΩ
Phase B to Ground	NA	MΩ
Phase C to Ground	NA	MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	NA	MΩ
Phase B to Ground	NA	MΩ
Phase C to Ground	NA	MΩ

Comments / Observations

LOW INSULTATION RESISTANCE RESULTS

Test Instrument(s)			
	Manufacturer / Model	Megger	Ductor
	Serial #	1134	3155

Tested By: C. CARON

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

Ascent™ Defining Energy Solutions

System ID McBRIEN T-2993-1 **Device ID** F4

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION	System Neutral Present	NA
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Switch Mounting	Metal Enclosed [X]	Pole [ ]	Tower [ ]	Other		
Switch Type	Load Break [X]	Air Break [ ]		Other		

Manufacturer	S & C	BIL Rating	60 kV
Date Of Manufacture	NA	Feeder ID	F4
Serial #	NA	Feeds To	
Catalog #	34560R5	Interrupting Rating	40000 A
Nom. / Max. Voltage	4.8 / 5.5 kV	Continuous Ampacity	600 A
Comments	NAMEPLATE FADED		

Lightning Arrestors

Class	Distribution [ ]	Intermediate [ ]	Station [ ]
Composition	Ceramic [ ]	Polymer [ ]	

Manufacturer		Max. / MCOV Rating	/ kV
Catalog #			
Comments	NA		

Protective Device Data

Primary Fuse Holder Data

Manufacturer	S & C
Type	SM5
Nom. / Max. Voltage	7.2 / 8.3 kV
Holder Max. Fuse Link	400E
Holder Catalog #	86641R1

Primary Fuse Link Data

Manufacturer	S & C
Type	SM5
Link Size	400E A
TCC #	199-4
Link Catalog #	261600R4

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes [X]	No [ ]	# of Spares 2
Spare Location	DOOR		
Comments			

Interlock

Key Interlock	Yes [ ]	No [X]		
Interlock Type	Electrical [ ]	Mechanical [ ]	Utility Lock [ ]	
Devices Interlocked	H.V. Switch [ ]	Breaker [ ]	Trans. Encl. [ ]	Other [ ]

Manufacturer		Key Interlock #	
Comments			

Load Side Conductor Data

Conductor Type	Cable [X]	Bus Bar [ ]	Conductor Size / Dim.	300 MCM
Conductor Material	Aluminum [ ]	Copper [ ]	Conductors per Phase	1 / Phase
Tape Shield	Aluminum [ ]	Copper [ ]	Bond Size / Dim.	2/0
Concentric Neutral	Aluminum [ ]	Copper [ ]	# of Bond Coductors	1
Insulation Voltage	15 kV		# of Neutral Conductors	NA
Insulation Type	XLPE		Neutral Size / Dim.	NA
Comments				

Recorded By: C. CARON

Ascent™
Defining Energy Solutions

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID McBRIEN T-2993-1 **Device ID** F4

Visual Inspection / Mechanical Tests

Item	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition		√		VERY FADED
Insulator Condition	√			
Ground Connections	√			
Lightning Arrestors			√	
Arc Suppressors	√			
Key Interlock Operation			√	
Ground Straps & Materials	√			

Switch Condition / Operation

Item	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	√			
Contact Surface Condition	√			
Simultaneous Closure	√			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance NA Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	0.7 Ω
Phase B	0.7 Ω
Phase C	0.7 Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [X] 10 kV [ ]

	Phase A	Phase B	Phase C
Phase to GND	6.16 MΩ	6.35 MΩ	7.27 MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current 10 A

	Phase A	Phase B	Phase C
Contacts	48 µΩ	50 µΩ	45 µΩ
Fuse	350 µΩ	320 µΩ	290 µΩ
Overall	424 µΩ	407 µΩ	364 µΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ V DC after 1 minute

Phase A to Ground	NA MΩ
Phase B to Ground	NA MΩ
Phase C to Ground	NA MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ V DC after 1 minute

Phase A to Ground	NA MΩ
Phase B to Ground	NA MΩ
Phase C to Ground	NA MΩ

Comments / Observations

VERY LOW INSULTATION RESISTANCE RESULTS

Test Instrument(s)

Manufacturer / Model	Megger	Ductor
Serial #	1134	7293

Tested By: **C. CARON**

Ascent™
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TRANSFORMER DATA SHEET (Pg. 1 of 4)

System ID McBRIEN SUB **Device ID** NORTH TX

Customer	ERIE THAMES POWERLINES	Date	September 21, 2014
Customer Address	143 BELL ST., AYLMER	Job #	14-11761
Site	MCBRIEN SUBSTATION		
Site Address	179 FATH AVE., AYLMER		

Nameplate Data

Transformer Class	Unit Padmount	X	Padmount		Station				Other	
Transformer Cooling	ONAN	X	ONAF		LNAN		DRY		Other	
Bushing Configuration	Dead Front		Top - Top	X	Top - Side		Side - Side		Other	

Manufacturer	PIONEER ELECTRIC	
Date of Manufacture	1967	
Serial #	T2993-1	
KVA / Prov. KVA Rating	3000	KVA
Primary Voltage	27600	V
Primary Ampacity	62.7	A
Secondary Voltage	4160 / 2400	V
Secondary Ampacity		A
HV Winding Material		
LV Winding Material		
CSA Specification(s)	NA	
Comments		

Core & Windings	9800	kg	X	lb	
Tanks & Fittings	6000	kg	X	lb	
Coolant Volume	6350	L		Gal	X
Coolant Weight	739	kg	X	lb	
Total Weight	22350	kg	X	lb	
Temperature Rise	55	°C	X	°F	
HV BIL Rating	200	kV			
LV BIL Rating	75	kV			
Percent Impedance	5.86 %	ONAN		ONAF	
Tamper Resistant		YES	X	NO	
Transformer Colour	GREY				

Visual Inspection

Nameplate Condition	Satisfactory	X	Not Satisfactory		N/A		Comments
Fan / Pump Operation	Satisfactory	X	Not Satisfactory		N/A		Comments
Ground Connections	Satisfactory	X	Not Satisfactory		N/A		Comments
Liquid Levels In Tanks	Satisfactory	X	Not Satisfactory		N/A		Comments
Interlock Operation	Satisfactory		Not Satisfactory		N/A	X	Comments
Temp. Gauge Operation	Satisfactory	X	Not Satisfactory		N/A		Comments

Coolant Temperature	30	°C	X	°F		Max. Coolant Temperature	30	°C	X	°F

Comments

Oil Conservator

Oil Conservator	Yes	X	No			
Silica Gel Breather	Yes	X	No			
Silica Gel Colour	Good	X	Bad		Replaced	

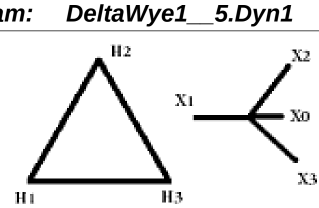
Conservator Volume		L		Gal	
Breather Volume		L		Gal	
N/A					

Comments

Tap Changer Data

Position / Designation		Tap Voltages (V)	As Found	As Left
1 / A	105.00%	28980		
2 / B	102.50%	28290		
3 / C	100.00%	27600		
4 / D	97.50%	26910	X	X
5 / E	95.00%	26220		

Vector Diagram: ***DeltaWye1__5.Dyn1***



Primary Vector X Secondary Vector X

Comments:

TAP WAS NOT CHANGED DURING TESTING DUE TO ITS AGE AND CONDITION

Tested By: S. KYLE / J. DUNCAN

TRANSFORMER DATA SHEET (Pg. 2 of 4)

System ID: **McBRIEN SUB** Device ID: **NORTH TX**

Neutral Grounding Resistor (NGR)

NGR Present: Yes [ ] No [X]

Manufacturer		NGR Serial #	
NGR Voltage	V	Maximum Current	A
NGR Resistance	Ω	NGR Location	
Comments			

Transformer Lightning Arrestors

Class: Distribution [ ] Intermediate [ ] Station [ ]

Composition: Ceramic [ ] Polymer [ ]

Manufacturer		Max. / MCOV Rating	/ kV
Catalog #			
Comments	NA		

Interlock

Key Interlock: Yes [ ] No [ ]

Interlock Type: Elec. [ ] Mech. [ ] Utility Lock [ ]

Devices Interlocked: H.V. Switch [ ] Breaker [ ] Trans. Encl. [ ] Other [ ] ______

Manufacturer		Key Interlock #	
Comments	NA		

Fans

# of Fans	NA	Fan Voltage	
Fan Size		Frame Size	
Horsepower			
Comments			

Transformer Load Side Conductor Data

Conductor Type: Cable [ ] Bus Bar [X]

Conductor Material: Aluminum [ ] Copper [X]

Tape Shield: Aluminum [ ] Copper [ ]

Concentric Neutral: Aluminum [ ] Copper [ ]

Conductor Size / Dim.		Conductors per Phase	/ Phase
Bond Size / Dim.		# of Bond Conductors	
Insulation Voltage		# of Neutral Conductors	
Insulation Type		Neutral Size / Dim.	
Comments			

Tested By: **S. KYLE / J. DUNCAN**

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TRANSFORMER TEST SHEET (Pg. 3 of 4)

Electrical Tests

Turn Ratio Test

Test Voltage: Automatic [X] Other ____ V

Tap Position / Designation		Tap Voltage V	Calculated Ratio	H 1 To H 2 / X 0 To X 2	H 2 To H 3 / X 0 To X 3	H 3 To H 1 / X 0 To X 1
1 / A	105.00%	28980				
2 / B	102.50%	28290				
3 / C	100.00%	27600				
4 / D	97.50%	26910	11.204	11.216	11.206	11.218
5 / E	95.00%	26220				

		Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
Tap Position As Found	4	0.630 mA	0.110 %	0.450 mA	0.010 %	0.560 mA	0.120 %
Tap Position As Left	4	0.640 mA	0.120 %	0.460 mA	0.020 %	0.580 mA	0.100 %

Primary Winding Resistance

Resistance in ohms at 0.5 A after 1 minute

H0 - H1	NA Ω	H1 - H2	1.482 Ω
H0 - H2	NA Ω	H2 - H3	1.473 Ω
H0 - H3	NA Ω	H3 - H1	1.472 Ω

Stabilization Time > 1 Minute

Secondary Winding Resistance

Resistance in milli-ohms at 5 A after 1 minute

X0 - X1	14.530 mΩ	X1 - X2	28.800 mΩ
X0 - X2	14.480 mΩ	X2 - X3	28.800 mΩ
X0 - X3	14.530 mΩ	X3 - X1	28.900 mΩ

Stabilization Time > 1 Minute

Capacitance Test

	Low - Ground	Low - Guard	UST (High - Low)	High - Guard	High - Ground
Capacitance in pico-farads	5617 pF	1945 pF	3678 pF	4757 pF	8434 pF
Uncorrected D.F. (%)	0.821 %	1.310 %	0.574 %	0.622 %	0.603 %
Corrected to 20 °C (%)	0.517 %	0.825 %	0.362 %	0.392 %	0.380 %

Temp. Correction Factor 0.63

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @ ____ V DC after 1 minute

Phase A to Ground	NA MΩ
Phase B to Ground	NA MΩ
Phase C to Ground	NA MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @ ____ V DC after 1 minute

Phase A to Ground	NA MΩ	Phase A to Phase B	NA MΩ
Phase B to Ground	NA MΩ	Phase B to Phase C	NA MΩ
Phase C to Ground	NA MΩ	Phase C to Phase A	NA MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	10605	50999	5374	2232

Tested By: S. KYLE / J. DUNCAN

TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID McBRIEN SUB **Device ID** NORTH TX

Dielectric Absorption Test (Insulation Resistance)

Time	High to Low & Gnd		Low to High & Gnd		High & Low to Gnd	
	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
15 sec	**193 MΩ**	**347 MΩ**	**1950 MΩ**	**3510 MΩ**	**179 MΩ**	**322 MΩ**
30 sec	**192 MΩ**	**346 MΩ**	**2100 MΩ**	**3780 MΩ**	**179 MΩ**	**322 MΩ**
45 sec	**192 MΩ**	**346 MΩ**	**2260 MΩ**	**4068 MΩ**	**180 MΩ**	**324 MΩ**
1 min	**192 MΩ**	**346 MΩ**	**2270 MΩ**	**4086 MΩ**	**181 MΩ**	**326 MΩ**
2 min	**193 MΩ**	**347 MΩ**	**2410 MΩ**	**4338 MΩ**	**181 MΩ**	**326 MΩ**
3 min	**192 MΩ**	**346 MΩ**	**2510 MΩ**	**4518 MΩ**	**183 MΩ**	**329 MΩ**
4 min	**192 MΩ**	**346 MΩ**	**2560 MΩ**	**4608 MΩ**	**183 MΩ**	**329 MΩ**
5 min	**193 MΩ**	**347 MΩ**	**2560 MΩ**	**4608 MΩ**	**184 MΩ**	**331 MΩ**
6 min	**194 MΩ**	**349 MΩ**	**2570 MΩ**	**4626 MΩ**	**185 MΩ**	**333 MΩ**
7 min	**194 MΩ**	**349 MΩ**	**2540 MΩ**	**4572 MΩ**	**186 MΩ**	**335 MΩ**
8 min	**195 MΩ**	**351 MΩ**	**2560 MΩ**	**4608 MΩ**	**187 MΩ**	**337 MΩ**
9 min	**195 MΩ**	**351 MΩ**	**2580 MΩ**	**4644 MΩ**	**188 MΩ**	**338 MΩ**
10 min	**196 MΩ**	**353 MΩ**	**2610 MΩ**	**4698 MΩ**	**189 MΩ**	**340 MΩ**
Test Voltage	10000 **V**		5000 **V**		5000 **V**	
Multiplier	1		1		1	
Polarization Index	**1.02**		**1.15**		**1.04**	
TCC **1.80**	Insulation Resistance Readings Corrected to 20 °C					

Insulation Resistance

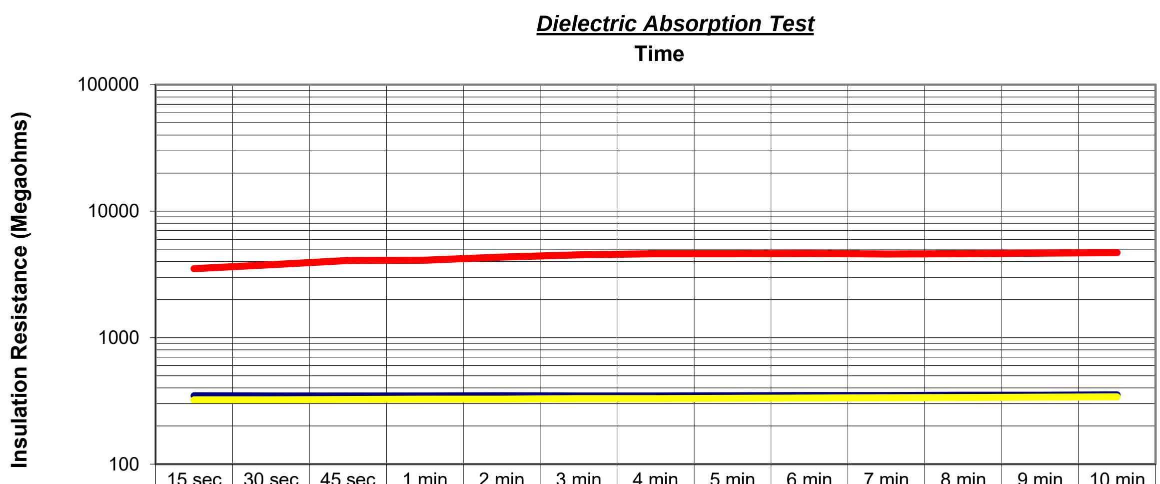
Resistance in meg-ohms after 1 minute.

High to Low & Ground	**346**	**MΩ @**	**10000 V**
Low to High & Ground	**4086**	**MΩ @**	**5000 V**
High & Low to Ground	**326**	**MΩ @**	**5000 V**

Core Ground Insulation Resistance

Resistance in meg-ohms after 1 minute.

Core Ground Accessible	Yes ☐ No ☐
Test Voltage	**V**
Core Ground Resistance	**MΩ**



	15 sec	30 sec	45 sec	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
High to Low & Gnd	347	346	346	346	347	346	346	347	349	349	351	351	353
Low to High & Gnd	3510	3780	4068	4086	4338	4518	4608	4608	4626	4572	4608	4644	4698
High & Low to Gnd	322	322	324	326	326	329	329	331	333	335	337	338	340

Test Instrument(s) Manufacturer / Model **Megger**

Serial # **2232**

Comments: **VERY POOR (FLAT) RESULTS DUE TO HIGH HUMIDITY DURING TESTING**

Tested By: **S. KYLE / J. DUNCAN**

Substation Maintenance Condition Report Bulletin

Ascent™ — Defining Energy Solutions

Electrical Safety Authority — For Your Safety

- Please e-mail the completed form to substation.reports@electricalsafety.on.ca within 14 days of the shutdown.
- Include the site name & address, and ESA Notification # in the subject line of the e-mail.
- This form must be completed in its entirety for all substation maintenance jobs and all situations where equipment replacements (equivalent rating/characteristics) are completed under ACP even if a full PM is not done.

Request for Final Inspection [X] Emailed to ESA [X] Date Ready **October 7, 2014**

Customer Name **MCBRIEN SUBSTATION**
Customer Location **179 FATH AVE., AYLMER** City **AYLMER** Postal Code
Station Location **SAME**
Station / Transformer # **SOUTH TX / NORTH TX** Date of Outage **September 21, 2014**
Customer Contact Name **SCOTT BROOKS** Customer Contact Phone # **519-521-7928**

Transformer Type Dry [ ] Liquid Filled [X]
Transformer kVA **3000 / 3000** Transformer % Impedance **5.86 / 5.86**
Primary Voltage **27600 / 27600** Secondary Voltage **4160/2400 / 4160/2400**

Reason for Outage Scheduled Maintenance [X] Emergency Repairs [ ]
ASCENT Project # **14-11761** ACP# **WSB1601** ESA Notification # **HV 14594243**

NOTE:
- If deficiency represents a Life and/or Property situation and requires immediate repair DO NOT RE-ENERGIZE. Advise ESA immediately by calling 1-877-ESASAFE (1-877-372-7233); record actions below under column heading “Action Taken / Required - Immediately”.
- If deficiency represents a safety concern that needs to be corrected within 30 days, advise the ESA Plan Review office via email (plan.review@electricalsafety.on.ca) or phone (1-800-746-6480) no later than the next business day. Record information below under column heading “Action Taken / Required - Immediately”.
- Low risk defects that represent no immediate safety concern are to be recorded under the column heading “Action Taken / Required - Next Outage”.
- Condition N/A (not applicable) means item does not exist at this substation

ITEMS TO BE CHECKED	YES / NO NA / NIC [1]	ACTION TAKEN REQUIRED IMMEDIATELY (Ref. Note 3)	ACTION TAKEN REQUIRED NEXT OUTAGE (Ref. Note 1 / Note 2)
Station fence / enclosure meets code, prevents unauthorized access and is in adequate condition. ***OESC Rule #26-300, 26-010***	YES		
Barbed wire is in place and in good condition. ***OESC Rule # 26-306***	YES		
Is fence and barbwire grounding in place and secure? ***OESC Rule # 36-312***	YES		
Required warning signs are in place and legible. ***OESC Rule # 36-006***	YES		
Is vegetation present within fenced area? ***OESC Rule # 36-304 (5)***	NO		
Do trees within close proximity of the substation, electrical equipment or power lines create a situation that is dangerous and require trimming or removal? ***OESC Rule 2-120, 75-712***	NO		
Are existing steel bollards in good condition and grounded? ***OESC Rule # 2-200***	NA		
To prevent damage, are bollards required around the fence and/or electrical equipment? ***OESC Rule # 2-200, 36-308, Bul. 36-10*-, Bul. 36-6-****	NA		
Bottom of fence fabric is within 50mm of ground. ***OESC Rule # 26-312(3)***	YES		
Is equipment grounding and bonding in place and secure? ***OESC Rule # 36-308***	YES		
Is a ground gradient mat in place and grounded? ***OESC Rule # 36-310 (2)***	YES		
Are enclosures rust free and properly sealed to prevent water entry? ***OESC Rule # 2-112, 2-300, 2-400***	YES		
Do any unused openings exist in the enclosures or switchboards? ***OESC Rule # 12-3024***	NO		
Are interlocks in place, properly sequenced and operational? ***OESC Rule # 36-204, 36-208***	NA		

[1] 'NA' INDICATES 'NOT APPLICABLE', 'NIC' INDICATES 'NOT IN CONTRACT'.

ITEMS TO BE CHECKED	YES / NO NA / NIC 1	ACTION TAKEN REQUIRED NEXT OUTAGE (Ref. Note 3)	ACTION TAKEN REQUIRED IMMEDIATELY (Ref. Note 1 / Note 2)
During maintenance, were alterations made to any equipment? ***OESC Rule # 2-004***	**NO**		
Are there objects or structures adjacent to the station creating a potential access or touch voltage hazard, or fire hazard. ***OESC Rule # 2-200, 2-318***	**NO**		
Single Line Diagram (current & legible) ***OESC Rule # 36-006 4(b), 5(a)***	**NA**		
Equipment Identified/ Labelled (in accordance to single line diagram) ***OESC Rule # 36-006***	**NA**		
Other			
1 'NA' INDICATES 'NOT APPLICABLE', 'NIC' INDICATES 'NOT IN CONTRACT'.			

Comments:

Contractor: **ASCENT R.R. #3 - 14719 BAYHAM DRIVE TILLSONBURG, ONTARIO N4G 4G8**

Report completed by: **RUUD WOUTERS** Phone Number: **(519) 842-6458**

Authorized signature: **RUUD WOUTERS**

NOTE1: If deficiency represents a Life and /or Property situation and requires immediate repair - <u>DO NOT ENERGIZE</u> - advise ESA immediately by calling 1-877-ESASAFE (1-877-372-7233) - also, identify these under column heading "Action Required / Immediately"

NOTE2: If deficiency represents a safety concern that needs to be corrected within 30 days, Contractor to advice ESA Inspector via email or phone no later than the next regular business day - identify these under column heading "Action Required / Immediately"

NOTE3: Low risk defects that represent no safety concern, identify these under column heading "Action Required / Next Outage"

NOTE: This report is required by Rule 2-012 of the Ontario Electrical Safety Code and must be emailed to the applicable inspector <u>within fourteen days</u> of the reconnection.

NOTE: If deficiency requires immediate repair, Contractor to advise ESA Inspector via email or phone no later than the next regular business day.

Note: Should the Substation Maintenance work be cancelled, the Contractor must contact the CSC at 1-877-ESA-SAFE, to have the connection authorization cancelled. When the maintenance work has been rescheduled, the Contractor needs to advise the CSC accordingly.

Upon completion of this form and within the requested fourteen day time frame, pleaase email to the applicable inspector

APPENDIX I - AYLMER TS BUSINESS PLAN

Business Case: Second Feeder at Aylmer Transformer Station
prepared September 2015[1]

Opportunity: Improve Distribution Supply to Customers in Aylmer

Current State:

The Town of Aylmer is presently supplied by two (2) separate 27.6 kV distribution feeders owned and operated by Hydro One.

The 34M1 feeder is sourced from the Aylmer Transformer Station (located within Aylmer) and is dedicated to serving only Erie Thames customers within Aylmer. There are approximately 2500 Erie Thames customers and 15 MW of load on this feeder. Approximately one third of these customers are supplied via a 27.6 kV to 4 kV distribution station (MS#1 - owned by Erie Thames).

The 27M4 feeder is sourced from the Edgeware Transformer Station (located in St Thomas) and is a shared feeder with Hydro One. The Edgeware Transformer Station is approximately 20km west of Aylmer, and the 27M4 feeder supplies the Hydro One rural area in the corridor from St Thomas to Aylmer. Erie Thames has approximately 1000 customers and 3 MW of load on this feeder, most of which is supplied via a 27.6 kV to 4 kV distribution station (MS#2 - owned by Erie Thames).

Erie Thames does not have the capability of transferring load between the two 27.6 kV feeders within Aylmer. Outside of Aylmer, Hydro One has the ability to transfer some of the load between the two feeders via a tie point within the Hydro One distribution system. However, during peak periods, the entire 34M1 load cannot be supplied by the 27M4 feeder, and the entire 27M4 load cannot be supplied via the 34M1 feeder. Any load transfers between the two feeders requires extensive manual switching by Hydro One, coordination with Erie Thames, and the installation of temporary recording ammeters. Following the load transfer, a manual true-up calculation is required to determine the amount of energy used by the respective distributor during the temporary load transfer. Due to the complexity of transferring load, it is only done during extended outages (planned or unplanned).

Erie Thames has a long range plan (approximately 15 years) to convert all the 4 kV load within Aylmer to 27.6 kV. This will be done over several years as portions of the 4 kV system reach end of life. This conversion will eventually eliminate the two 27.6 kV to 4 kV distribution stations, and provide multiple tie points on the 27.6 kV system within Aylmer.

Hydro One has initiated a project to upgrade the Aylmer Transformer Station as it is approaching end of life. This provides the opportunity for Erie Thames to purchase a second breaker position at the TS at an incremental cost to be included in the overall design, rather than have an additional breaker position added at a later date (the cost of retrofitting an additional breaker in the future would be more than the cost of including it within the current design).

[1] This document has been prepared for the Cost of Service Rate Filing, and is a summary of various discussions and decisions that led to the signing of the mini-CCRA with Hydro One in December 2014 which committed Erie Thames to compensating Hydro One for the new breaker position at the Aylmer Transformer Station. Erie Thames relied on the customer survey results conducted earlier to support the decision to proceed with the purchase of a second breaker position from Hydro One.

Erie Thames conducted a customer survey in 2014 that indicated customers are most concerned with total price (62%) and reliability (31%). The survey respondents were primarily residential customers (96%). Knowing that customers valued both price and reliability, Erie Thames entered into an agreement with Hydro One (mini-CCRA) in December 2014 to secure the additional breaker position within the station as it was assumed a second feeder would eventually be required to supply Aylmer, including the breaker position within the current design process would be less costly than retrofitting it later, and customers would benefit from improved reliability sooner.

Issues with Current State:

There are three (3) on-going issues with the existing supply arrangement: restricted operating flexibility, power quality, and reliability. All three issues are related to the 27M4 feeder supplied out of the Edgeware TS.

Restricted Operating Flexibility

With the existing supply arrangement, the amount of load that can be transferred between the 34M1 (Aylmer TS) feeder and the 27M4 (Edgeware TS) feeder is restricted by the capacity of the 27M4 feeder, the need for extensive manual switching, and the requirement to install temporary metering. Due to limitations on the 27M4 feeder (voltage drop due to long distance and ampacity) the entire 34M1 feeder could not be placed on the 27M4 during high load periods. Without an adequate backup supply for either feeder, unplanned outages are extended in length and planning an outage for maintenance or repair work is difficult. Plans to improve outage restoration time (via distribution automation) are on hold until an alternate supply point is available. The long range plan to convert the 4 kV areas to 27.6 kV is impacted by restrictions on the 27M4. With essentially a single source of 27.6 kV, the 4 kV conversion needs to follow a path from the Aylmer TS (source of the 34M1) east, then south, then back north. This means that some areas of 4 kV may need to be converted earlier than necessary, while some areas will need to remain as 4 kV longer than expected.

Power Quality

The Erie Thames customers connected to the 27M4 feeder experience more frequent and more severe voltage disturbances than the customers supplied by the 34M1 feeder. The routing of the 20 km 27M4 feeder is through a primarily rural area, exposing the line to a greater risk of momentary outages related to weather, lightning, tree contacts, animal contacts, and motor vehicle accidents. These momentary outages cause voltage dips which impact customers in Aylmer. Over the past five years, the 27M4 feeder had 76 momentary outages while the 34M1 had 16.

Reliability

In addition to the momentary outages, the 27M4 feeder is prone to more frequent and longer sustained outages, for the same reasons as momentary outages. During the past five years, there were five extended outages on this feeder (longer than 1 hour) due to issues with Hydro One, including one at 13 hours. For the same time period, the 34M1 had only one extended outage at just over 1 hour. This results in the south portion of Aylmer having significantly worse reliability than the rest of Aylmer, due to circumstances beyond the control of Erie Thames.

Improvement Options:

Status Quo

Erie Thames could continue with the existing supply arrangement with the expectation that the existing issues will not be addressed. Opportunities for smart grid development (particularly distribution automation) will be limited without an adequate alternate supply. The customers in Aylmer will experience sub-par reliability, especially those customers supplied by the Edgeware feeder. This could impact economic development in Aylmer as new commercial and industrial customers may consider the level of reliability unacceptable, and existing customers may re-locate to other areas to secure a more stable electrical supply. As the 4 kV conversion continues, eventually all load could be migrated to the more reliable Aylmer feeder, however the total Aylmer load is expected to eventually exceed the capacity of the 34M1 feeder (present total Aylmer load is around 18 MW and 20 MW is generally considered the maximum load for a 27.6 kV feeder). The 27M4 feeder could supply some, but not all of this load which would mean that if the 34M1 feeder is not available, some customers in Aylmer will be without power until the 34M1 is returned to service. To avoid this, it would be logical to eventually source a second feeder from the Aylmer transformer station that is capable of supplying all the Aylmer load in the event the 34M1 is not available.

Non-Distribution Alternatives

The existing load on the 34M1 feeder is around 15 MW. The only non-distribution alternative that could replace 100% of this load continuously is a generator[2]. The Aylmer TS is currently restricted by transmission constraints which prevent the connection of a generation point of this magnitude. Even if sufficient generation could be connected to the Aylmer TS, it would only address the issues related to power quality and reliability. The operating flexibility would be limited unless additional investments were made within the distribution system.

New Transformer Station

A new, separate transformer station could be constructed to bring additional feeders to Aylmer. This could be owned by Erie Thames or Hydro One. The additional feeders would alleviate all the issues with the current state and provide ample capacity to supply new load for the foreseeable future. A new TS with connection to the transmission system would cost a minimum of $10M, with $15M to $20M as more typical costs. As load is moved off the 27M4 feeder, there will be a slight decrease in the cost of power to Erie Thames customers as the 27M4 feeder is a distribution supply point and incurs additional charges for supply. In addition to the capital cost to construct a new transformer station, there will be on-going costs for operating and maintenance, which would be collected through connection charges to Hydro One (if Hydro One owns the station) or increased distribution charges (if Erie Thames owns the station).

[2] Aggressive conservation and demand management programs could reduce the total load, but not to the level needed to allow the Edgeware feeder to supply the entire community if the Aylmer feeder is unavailable.

Second 27.6 kV Feeder from Aylmer TS

Hydro One is actively planning to upgrade the Aylmer TS as part of their sustainment program (they have identified Aylmer TS as reaching end of life and exceeding the 10 day LTR[3]). They have offered a second feeder breaker position to Erie Thames. A second feeder from the Aylmer TS would alleviate all the issues with the current state and provide ample capacity to supply new load for the foreseeable future. The cost to Erie Thames for the additional feeder is estimated to be $1.2M (this includes the capital contribution to Hydro One, feeder egress, and new wholesale metering point). As load is moved off the 27M4 feeder, there will be a slight decrease in the cost of power to Erie Thames customers as the 27M4 feeder is a distribution supply point and incurs additional charges for supply.

Evaluation of Alternatives:

The four alternatives have been evaluated by reviewing how they address the issues, how they fit within the Distribution System Plan Framework (OEB Chapter 5 Section 5.0.3), and how they address the Performance Outcomes (OEB Chapter 5 Section 5.0.4).

Assessment of Issues Resolved

	Operating Flexibility	**Power Quality**	**Reliability**
Status Quo	No	No	No
Generation (non-distribution alternative)	No	Yes	Yes
New Transformer Station	Yes	Yes	Yes
Additional Feeder	Yes	Yes	Yes

The only alternatives that address all issues are the new transformer station and the additional feeder from the existing Aylmer TS.

Operating Flexibility:

Constructing a new transformer station or getting an additional feeder from the existing Aylmer transformer station will improve operating flexibility by providing a fully redundant supply point capable of supporting the entire Aylmer load in the event one feeder is not available.

Depending on the connection location, a generation point could provide some limited flexibility by supplying Aylmer should the feeder from the Aylmer TS not be available, but this assumes the generator is connected to the Aylmer distribution system which would imply it is likely much smaller than 20 MW – the size needed to supply the entire Aylmer load. Thus this option is not considered a great improvement to the operating flexibility.

Power Quality:

Constructing a new transformer station or getting an additional feeder from the existing Aylmer transformer station will improve power quality by eliminating the exposure of the 20 km long

[3] Hydro One – Needs Assessment Report, Region: London, Dated April 2, 2015

feeder from Edgeware. The shorter feeders will have fewer momentary outages and a more stable voltage.

A generation point will improve power quality by stabilizing the voltage and eliminating the need for the Edgeware feeder.

Reliability:

Similar to power quality, the options of a new transformer station and the additional feeder will also improve reliability by eliminating the exposure of the Edgeware feeder and by providing an alternate supply point capable of supplying the entire Aylmer load. The provision of an alternate supply permits smart grid technology such as distribution automation which will also lead to improvements in reliability.

A generation point will provide similar benefits to reliability by eliminating the exposure of the Edgeware feeder, but it will not permit additional improvements through distribution automation unless a new feeder is constructed.

Assessment of Alignment with DSP Framework

	Integrated Planning	Longer Term Planning Horizon	Regional Considerations	Smart Grid Development & Implementation
Status Quo	No	No	No	No
Generation (non-distribution alternative)	No	Yes	No	No
New Transformer Station	No	Yes	No	Yes
Additional Feeder	Yes	Yes	Yes	Yes

The only option that fully aligns with the DSP Framework[4] is the Additional Feeder.

Integrated Planning:

The additional feeder option fully aligns with the integrated planning approach, as it permits more options for system renewal (allowing 4 kV conversion to target assets at end of life vs sequentially), and provides an additional source of 27.6 kV that is more reliable which should encourage growth and open up more locations for renewable connections. Adding a feeder will facilitate smart grid development by allowing for distribution automation, which is not practical with the limited capacity on the Edgeware feeder. The additional feeder also represents a collaboration between Hydro One and Erie Thames to come up with the best, long term solution for the region which is the upgrading of the existing Aylmer TS[5] and the inclusion of an additional feeder for Aylmer.

While a new transformer station would also provide additional feeder(s) and have similar benefits as the second feeder from the existing transformer station, it is contrary to regional

[4] OEB Chapter 5 Consolidated Distribution System Plan Filing Requirements, section 5.0.3
[5] The Aylmer TS rebuild project is noted in the Regional Plan for London Region – Needs Assessment Report, April 2, 2015.

planning initiatives and would be difficult to justify given Hydro One's plans to upgrade the existing Aylmer TS.

The generation option does not provide a similar level of practical benefits (unless a new feeder is also constructed) and it is also contrary to regional planning initiatives.

Longer Term Planning Horizon:

The new transformer station and additional feeder options align with a longer term approach to system planning as they both provide solutions that extend well beyond a five year planning horizon. However, the additional feeder option is better aligned with the aspects of regional planning, cost effectiveness, and managing rate impacts.

While the generation option has a long term aspect to it (long life), it does not fully address all the issues on its own, and it lacks alignment with the aspects of integrated regional planning, cost effectiveness, and managing rate impacts.

Regional Considerations:

The additional feeder option is the only option that is in complete alignment with regional planning, as it represents a collaboration between Hydro One (transmission and distribution), the IESO, and Erie Thames.

Both the new transformer station option and the generation option would be a departure from the agreed upon Regional Plan for this area.

Smart Grid Development & Implementation:

Both the new transformer station option and additional feeder option will facilitate smart grid development by allowing for the implementation distribution automation. Typically at least two feeders with full backup capacity are required to begin the implementation of smart switches that can reconfigure the system in the event of an outage to minimize the number of affected customers and isolate the faulted area.

Since the generation option does not introduce another feeder, it will not allow for the implementation of distribution automation.

Assessment of Alignment with DSP Outcomes

	Customer Focus	Operational Effectiveness	Public Policy Responsiveness	Financial Performance
Status Quo	No	No	No	No
Generation (non-distribution alternative)	No	No	Yes	No
New Transformer Station	No	Yes	Yes	No
Additional Feeder	Yes	Yes	Yes	Yes

Only the Additional Feeder option aligns with all four DSP Outcomes[6].

[6] OEB Chapter 5 Consolidated Distribution System Plan Filing Requirements, section 5.0.4

Customer Focus:

Erie Thames customers have indicated (through a survey conducted in 2014) that they value low cost, and reliable electricity. This feedback was used to support the decision by Erie Thames to enter into an agreement with Hydro One for the second breaker position in the upgraded Aylmer Transformer Station design. The additional feeder is the lowest cost option that is expected to provide long term benefits to customers through improvements in reliability and reduced power quality issues.

The new transformer station option provides similar benefits as the additional feeder option, but at a much higher cost.

The generation option provides fewer benefits and the cost could be much higher than the other options.

Operational Effectiveness:

A second feeder will allow Erie Thames to have full redundancy regarding feeders. Reliability is expected to improve by eliminating the line exposure of the Edgeware Feeder (which covers the rural area between St Thomas and Aylmer). The second feeder enables the use of distribution automation, which can automatically reconfigure the system to isolate outages and restore power to as many customers as possible. The second feeder also gives Erie Thames the flexibility to transfer load between the two feeders for planned work, without the need to involve Hydro One line crews. Coupled with the 4 kV conversion to 27.6 kV, the second feeder will reduce system losses by using shorter feeders at a higher voltage.

Public Policy Responsiveness:

All options except status quo will allow Erie Thames to deliver on mandated obligations. The status quo option does not address reliability concerns expressed by customers, and will eventually not permit the connection of new customers (when load exceeds allocated capacity).

Financial Performance:

The additional feeder option is the lowest cost option that addresses the known issues, and provides capacity and potential savings in the future. A summary of the expected costs by year is shown below.

	2014	**2015**	**2016**	**2017**
Capital Cost	$50k	$163k	$135k	$858k
O&M Cost				$6k

The total Capital Cost of $1.2M includes Capital Contributions to Hydro One ($730,305), a new wholesale meter point ($75,000), and feeder egress ($400,000). The O&M cost is the incremental cost of adding a new wholesale meter point in Aylmer for the new feeder. This will eventually be offset by an equal savings when the wholesale meter for the 27M4 is removed from service (in approximately 2022).

Incremental savings are expected in the cost of power as load is moved from a Hydro One embedded distribution point (27M4 feeder) to a transmission point (Aylmer TS) over an estimated five year period starting in 2017. These savings will continue indefinitely into the future.

In contrast, the Capital Cost of a new Transformer Station would be at least $10M, with annual O&M costs of at least $50,000.

Recommendation:

The option of getting an additional feeder from the Aylmer Transformer Station is the best evaluated alternative that addresses the known issues with the supply to Aylmer, and provides the best value to customers.

APPENDIX J - MAINTENANCE REPORTS

Substation Bi-Yearly Inspection

Substation Maintenance Report

Infrared Scans

ERTH CORPORATION

Sept. 13, 2016

Erie Thames Power Corporation

143 Bell Street Ingersoll,

ON N5C 2N9

Attention: Scott Brooks

Re: Semi-Annual Inspection (August. 2016) Report - ERTH Ref: T-16-255

Please find the attached report for the last of the 2016 Semi-Annual inspections completed and the first I have performed with ERTH. Also during this inspection a number of DGA oil samples were taken to better trend the gas levels in many of the station transformers in each area. The only transformers in the system not to have follow up DGA testing was Mitchell MS2 and Aylmer McBrien MS2 (T1) and Tavistock (newest transformer). The DGA samples taken from the rest of the transformers was recommended due to slight gas rises in previous samples and to better trend these concerns. The results from the lab have been compared to the previous levels. Previously concerns were with Clinton MS1, it is remaining fairly steady with marginal drops in Carbon Dioxide and Carbon Monoxide which are the highest gas levels. Minor concern exists with continued rise in Carbon Dioxide and Monoxide in the Beachville and Port Stanley Station transformers with all other combustible gas remaining fairly constant. The greatest concern is with the replacement unit installed at Forest station in Aylmer. This Westinghouse unit is showing rising levels of both Carbon Dioxide and Carbon Monoxide along with slight increase in Hydrogen and Methane. Historically Westinghouse has the highest levels of Carbon Dioxide and Monoxide I have seen over the years due to its core design I am told. I do believe we should keep an eye on this unit and resample this fall again to better trend. We should also consider resampling Beachville as well as it would be my next concern. The lab reports are attached in a separate report. All but one of the stations recommends resampling at earliest opportunity to establish a gas generation rate; this is due to no history from previous samples. This we can have further discussion on but for now I believe we should follow up Beachville and Forest only.

Please find enclosed the inspection check list as well as pictures from each station with points of interest observed at each station.

Steve Del Guidice, ME, EET

Manager, High Voltage & Substations Services

Mitchell MS2

-Tree growing over fence gives easy access and should be considered to be trimmed.

-Transformer continues to have small leak, appears to be from the top lid possibly gasket.

-Liquid gage on conservator tank shows low, level should be confirmed and adding oil to tank should be considered to ensure oil level does not become critically low.

-Silica gel needs to be changed during the next inspection.

Mitchell MS2 – continue

-Feeder meters indicate very light loading on station, peak demand reset

Clinton MS1

-Transformer fans running initially, resetting peak on temperature gage and fans shut off contacts in gage may be sticking, will need to monitor

-minor rusting around top of junction box, rest of new paint looks fine

Clinton MS1 – continue

-Battery bank found critically low on a number of cells for second time in a row

-5 litres of distilled water added to bank!

-follow up inspection and testing recommended, prior to replacement considerations

-Pole guying, fibre rods on some guys questionable on spacing

Clinton MS#1 – continue

-Note, if the peak demand meter indicators for each circuit are all measured at the same time of day then the transformer is operating near full load, combined with imbalanced load could be the reason for gas levels seen recently in transformer oil

-max demand on B phase on all 3 circuits is approx. 600 Amps

-Volt meter on gear has been disconnected

-Peak demand load settings all reset for each circuit

Tavistock

-Another ground wire found stolen from station fence, replacement to be scheduled, 3 spots on fabric are now missing

-fence company should be notified to repair fence fabric

-Open vault should be covered

-Interlock to be removed, missing one key and cannot be operated without removing

Tavistock – continued

-Meters indicate light loading, peak load demand settings reset

Beachville MS1

-Termination that has been split for some time does not appear to have deteriorated from previous inspection

-PT and CT in tower should be removed as they appear to be in rough condition

-Feeder identification missing off reclosures

-Reclosures questionable, operation counters difficult to read, south feeder over tracks counter 300? And north feeder 37_?

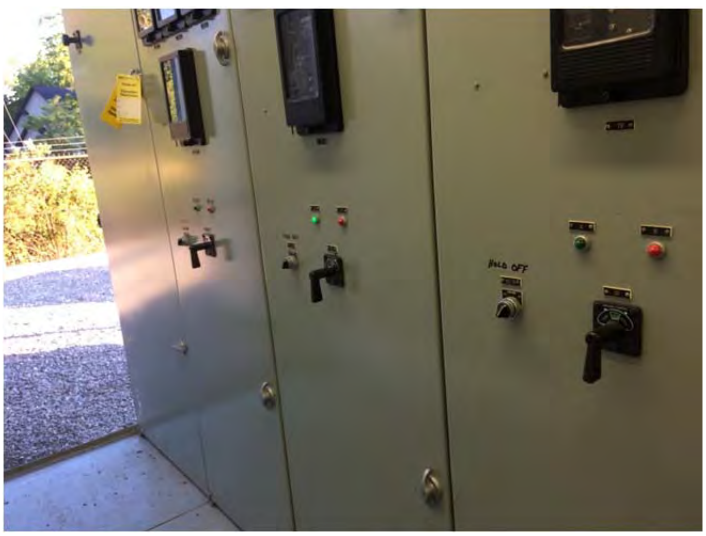
-Tree needs trimming/removing as it is growing over and through fence

Beachville MS1 - continue

-Max load points not indicating a balanced loading, may contribute to transformer oil gasing situation

-Peak load demand settings reset

Port Stanley MS1



-open/closed indicator lights changed on feeders 2 & 3

-evidence of rodent and bug infestation in building, screen should be added to intake vent.

Port Stanley MS1 – continued

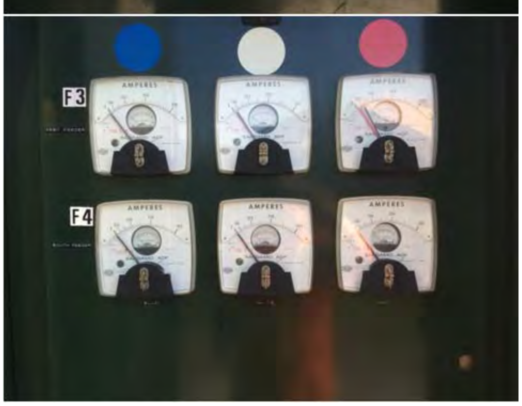
- Peak load demand 325 amps
- Very imbalanced loading
- Reset peak load demand settings

Feeder 2 light loading

Aylmer McBrien MS2

-Fans on south (T2) transformer turned on automatically at 50 C while performing inspections

-Wasp nests forming in south transformer meter cabinet on end, spray needed



-F1 and F2 on North (T1) and F3 and F4 on the South (T2)

-Both lightly loaded

-Reset peak load demand settings

Aylmer McBrien MS2 - continued

-drive way to station becoming overgrown with trees, tree trimming needed

Aylmer Forest MS1

-Weeds need spraying

-Gravel low around perimeter of station

-Gravel needed to level and fill low spots

-Gap below fabric greater than 50 mm in many spots

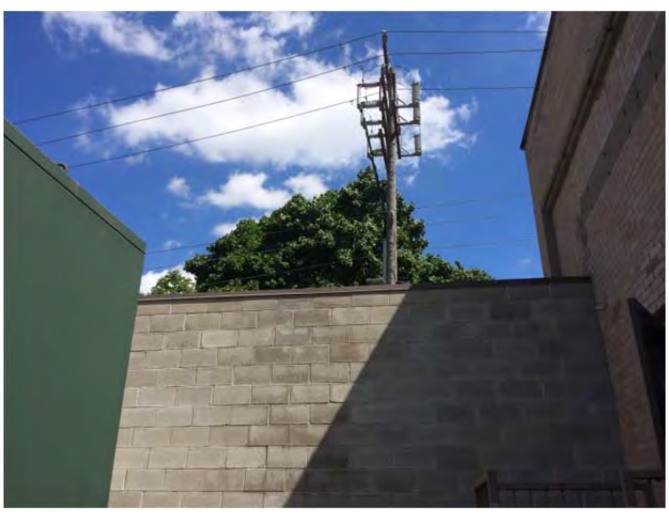
-gap below fence fabric

Aylmer Forest MS1 continue

-Spare duct should be better sealed

-Additional stone needed around big O or cable guards should be lower to provide better protection of duct, Thin wall DB II not permitted above grade either should big O

Ingersoll MS1



-Pole load break switch should consider replacing porcelain lightning arresters to polymer style due to the risk if a porcelain takes a direct lightning hit and fails violently.

-Building structural condition?

Ingersoll MS1 - continued

-Battery bank liquid levels okay

-Batteries should be serviced, tested and corrosion removed

-Feeders lightly loaded

-Reset peak load demand settings

Ingersoll MS3

-Building maintenance needed, roof, front door and garage door need painting

Ingersoll MS3 - continued

-Transformer showing signs of small leak on primary bushings, oily on bottom of primary throat of transformer

-monitor for now, future investigation may be warranted!

-very light loading

-battery bank liquid levels okay, future inspection recommended

-Reset peak load demand settings

ERTH Corporation Reference #: T-16-255
Site Designation:MITCHELL MS2
Site Address: 185 WELLINGTON STREET
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHNICIAN:	J.DONCK	R.COOPER	R. COOPER	S.DELGUIDICE		
INSPECTION DATE:	15-04-15	5-11-15	15-03-16	23-08-2016		
INSPECTION TIME:	10:00 A.M.	3:30 PM	10:00 AM	8:00 AM		
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES		
FENCE GENERAL CONDITION:	YES	YES	YES	YES		
FENCE GROUNDING:	YES	YES	YES	YES		
FENCE SPACES:	NO	NO	NO	NO		
FENCE BARBED WIRE:	NO	NO	YES	YES		
GATE LOCKED:	YES	YES	YES	YES		
GATE BARBED WIRE:	YES	YES	YES	YES		
SIGNS:	YES	YES	YES	YES		
VEGETATION:	MINOR	MINOR	MINOR	NO		
GRAVEL:	YES	YES	YES	YES		
TOWER CONDITIONS:	YES	YES	YES	YES		
BUILDING CONDITIONS:	YES	N/A	N/A	N/A		
BUILDING LIGHTS/FANS/HEAT:	N/A	N/A	N/A	N/A		
INDICATING LIGHTS/DEVICES:	N/A	N/A	N/A	N/A		
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMI
	1. SIGNS INSTALLED 2. VEGETATION REQUIRES WEED SPRAY	1. BARB WIRE MAY NEED REPLACING NEXT YEAR	1. SPACE AT TOP OF FENCE BETWEEN THE FABRIC & TOP RAIL	1. SPACE AT TOP OF FENCE BETWEEN THE FABRIC & TOP RAIL		
General Substation Repairs						
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
SIGNS:	YES	YES	NO REPAIRS	NO REPAIRS		
VEGETATION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
GRAVEL:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS		
BUILDING CONDITIONS:	NO REPAIRS	N/A	N/A	N/A		
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	N/A	N/A	N/A		
INDICATING LIGHTS/DEVICES:	NO REPAIRS	N/A	N/A	N/A		
Transformer Observations						
AMBIENT TEMPERATURE:	10. ° C	18. ° C	4. ° C	16. ° C		
TEMPERATURE PEAK:	36. ° C	48. ° C	32. ° C	35. ° C		
PRESSURE GAUGE READING:	N/A	N/A	N/A	N/A		
OIL LEVEL:	UNABLE TO READ	UNABLE TO READ	UNABLE TO READ	LOW		
TEMPERATURE CURRENT:	30. ° C	37. ° C	25. ° C	35. ° C		
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES		
SILICA GEN BREATHER:	GEL REPLACED	GOOD	GOOD	NEEDS REPLACING		
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	FAIR		
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMI
	1. REPLACED INDICATING SILICA GEL 2. PAINT IS FADING - WILL MONITOR	1. PAINTING RECOMMENDED	1. BONDING AS NOTED 2. OIL LEAK, OIL LEVELS-HARD TO READ OIL LEVEL GAUGE 3. CANNOT READ TAP CHANGER 4. 1/2 BLUE SILICA GEL - SHOULD BE REPLACE AT NEXT	1. TRANSFORMER CONTINUES TO LEAK, TOPPING UP CONSERVATOR RECOMMENDED		
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.						
Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMI
DESIGNATION: MS2		1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE 2. OPEN-5, CLOSED-6	1. VERIFIED ALL NAMEPLATE INFORMATION		
MANUFACTURER: GENERAL ELECTRIC						
YEAR OF MANUFACTURE: 1968						
SERIAL NUMBER: 588609						
KVA: 3000						
PRIMARY VOLTAGE: 27600 DELTA						
SECONDARY VOLTAGE: 4160 / 2400 WYE						
IMPEDANCE: 5.99 %						
WEIGHT: 15300 LBS						
OIL VOLUME: 497 GAL						
TAP SETTING: 4						
TAP POSITION 1: 28980						
TAP POSITION 2: 28290						
TAP POSITION 3: 27600						
TAP POSITION 4: 26910						
TAP POSITION 5: 26220						
FUSE MANUFACTURER : S&C						
FUSE LINK:						
FUSE HOLDER: SM-5						

ERTH Corporation Reference #: T-16-255
Site Designation: CLINTON MS1
Site Address: 17 PARK LANE
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHNICIAN:	D.BENJAMIN	J.DONCK	R.COOPER	R.COOPER	S.DELGUIDICE
INSPECTION DATE:	12-09-14	15-04-15	5-11-15	15-03-16	23-08-2016
INSPECTION TIME:	9:30 AM	8:50 A.M.	8:45 AM	8:30 AM	7:30 AM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	YES	YES	YES	YES	YES
FENCE GROUNDING:	YES	NO	YES	YES	YES
FENCE SPACES:	NO	NO	NO	YES	YES
FENCE BARBED WIRE:	YES	NO	NO	YES	YES
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	NO	YES	YES	YES
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	MINOR	MINOR	MINOR	MINOR	MINOR
GRAVEL:	YES	NO	YES	YES	YES
TOWER CONDITIONS:	N/A	YES	YES	N/A	N/A
BUILDING CONDITIONS:	YES	YES	YES	YES	YES
BUILDING LIGHTS/FANS/HEAT:	YES	YES	YES	YES	YES
INDICATING LIGHTS/DEVICES:	YES	YES	YES	YES	YES
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
		1. REFER TO RECOMMENDATIONS IN LETTER	1. GRAVEL ADDED AT INSPECTION 2. STRESS CRACKS IN CEMENT POLE	1. STRESS CRACKS IN CEMENT POLE	1. SMALL STRESS CRACKS PRESSENT ON POLE IN STATION
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	YES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	YES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	YES	YES	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	YES	YES	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	YES	YES	NO REPAIRS	NO REPAIRS
VEGETATION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GRAVEL:	NO REPAIRS	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	N/A	N/A
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES	YES
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES	YES
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	YES	YES
Transformer Observations					
AMBIENT TEMPERATURE:		10. ° C	20. ° C	5. ° C	19. ° C
TEMPERATURE PEAK:		39. ° C	52. ° C	38. ° C	52. ° C
PRESSURE GAUGE READING:		0. PSI	1.5 PSI	> 0 PSI	> 0 PSI
OIL LEVEL:		25. ° C	25. ° C	< 25 ° C	< 25 ° C
TEMPERATURE CURRENT:		30. ° C	40. ° C	31. ° C	35. ° C
TEMPERATURE RESET? YES/NO		YES	YES	YES	YES
SILICA GEL BREATHER:		N/A	N/A	N/A	N/A
PAINT CONDITIONS:		GOOD - NOTHING	GOOD - NOTHING	GOOD - NOTHING	GOOD
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
		1. REFER TO RECOMMENDATIONS IN LETTER	1. GRAVEL ADDED AT INSPECTION 2. SLIGHT RUST ON HV CABINET	1. SLIGHT RUST ON HV CABINET 2. CABLE TRAY DAMAGED 3. SINGLE LINE NOT POSTED 4. BATTERY BANK WATER LEVELS FOUND LOW - WATER ADDED	1. BATTERY BANK VERY LOW ON FLUID, OVER 5 LITRES OF DISTILLED WATER USED, FURTHER INSPECTION RECOMMENDED

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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: MS1 MANUFACTURER: FERRANTI PACKARD YEAR OF MANUFACTURE: 1971 SERIAL NUMBER:301687 KVA: 5000 / 7500 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.50 %		1. CORRECTED FUSE HOLDER TO SM-5 (WHITE) 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. NAMEPLATE VERIFIED, TRANSFORMER FANS RUNNING BEYOND SET TEMP POINT, GAGE - MONITOR

WEIGHT: 27150 LB
OIL VOLUME: 607 G
TAP SETTING: 3
TAP POSITION 1: 28980
TAP POSITION 2: 28290
TAP POSITION 3: 27600
TAP POSITION 4: 26910
TAP POSITION 5: 26220
FUSE MANUFACTURER : S&C
FUSE LINK: 100E
FUSE HOLDER: SM-5 (WHITE)

ERTH Corporation Reference #: T-16-255 Site Designation:TAVISTOCK Site Address: 17 DECEW STREET Contact Name: SCOTT BROOKS Contact Number: 519-521-7113					
TECHNICIAN:	D.BENJAMIN	J.DONCK	R.COOPER	R.COOPER	S.DELGUIDICE
INSPECTION DATE:	12-09-14	15-04-15	9-11-15	15-03-16	23-08-2016
INSPECTION TIME:	8:00 AM	1:30 P.M.	9:00 AM	12:00 PM	3:00 PM
General Substation Observations ACCEPTABLE YES / NO	**YES**	**YES**	**YES**	**YES**	**YES**
FENCE GENERAL CONDITION:	YES	YES	YES	YES	NO
FENCE GROUNDING:	YES	YES	YES	YES	NO
FENCE SPACES:	YES	YES	YES	YES	YES
FENCE BARBED WIRE:	NO	YES	YES	YES	YES
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	YES	YES	YES	YES
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	MINOR	MINOR	MINOR	MINOR	MINOR
GRAVEL:	YES	NO	YES	YES	YES
TOWER CONDITIONS:	YES	NO	NO	NO	NO
BUILDING CONDITIONS:	N/A	N/A	N/A	N/A	N/A
BUILDING LIGHTS/FANS/HEAT:	N/A	N/A	N/A	N/A	N/A
INDICATING LIGHTS/DEVICES:	N/A	N/A	N/A	N/A	N/A
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
		1. LARGE 7" GAP UNDER GATE, COULD ALLOW ACCESS.	1. NEEDS WEED SPRAY	1. NEEDS WEED SPRAY 2. SOME FENCE DAMAGE - SEE PICTURES	1. FENCE GROUNDS CUT AND FENCE FABRICE DAMAGED IN THREE LOCATIONS
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
VEGETATION:	NO REPAIRS	NO REPAIRS	YES	MINOR	MINOR
GRAVEL:	NO REPAIRS	NO REPAIRS	YES	YES	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	REMOVE INTERLOCK
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	N/A	N/A
Transformer Observations					
AMBIENT TEMPERATURE:	9. ° C	14. ° C	8. ° C	5. ° C	22. ° C
TEMPERATURE PEAK:	L 40 °C W 40 °C	L 33 °C W 33 °C	L 45 °C W 45-48 °C	L 26 °C W 25 °C	L 47 °C W 47 °C
PRESSURE GAUGE READING:	-5. PSI	0. PSI	7.5 PSI	0. PSI	0.5. PSI
OIL LEVEL:	25. ° C	24 ° C	< 25 ° C	< 25 ° C	25 ° C
TEMPERATURE CURRENT:	L 27 °C W 26 °C	L 23 °C W 23 °C	L 19°C W 19 °C	L 22°C W 22 °C	L 34°C W 34 °C
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES	YES
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A	N/A
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
		1. MINOR RUST ON FINS	1. GRAVEL ADDED TO SUBSTATION DURING INSPECTION & WEEDS REMOVED PRIOR TO ADDING GRAVEL 2. MINOR RUST ON FINS	1. MINOR RUST ON TRANSFORMER AND SWITHGEAR	1. THREE SPOTS WITH CUT AND REMOVED GROUND WIRE ON FENCE AND FENCE FABRIC DAMAGED, FENCE NEEDS REPAIR
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Transformer Information	COMMENTS COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: PIONEER YEAR OF MANUFACTURE: 2005 SERIAL NUMBER: G13572-1 KVA: 5000 / 6670 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 6.74 % WEIGHT: 12400 KG		1. CORRECTED kVA TO 5000/6670 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. NO FAN POWER 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. NO FAN POWER 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. NO FAN POWER, NAMPLATE VERIFIED, MAJAR FIND IS FENCE
OIL VOLUME: 3720 L					
TAP SETTING: 3					
TAP POSITION 1: 28980					
TAP POSITION 2: 28290					
TAP POSITION 3: 27600					
TAP POSITION 4: 26910					
TAP POSITION 5: 26220					
FUSE MANUFACTURER : S&C					
FUSE LINK:					
FUSE HOLDER: SM-5					

ERTH Corporation Reference #: T-16-255
Site Designation: BEACHVILLE MS1
Site Address: 434839 ZORRA LINE
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHNICIAN:	D.BENJAMIN	J.DONCK	R.COOPER	R.COOPER	S.DELGUIDICE
INSPECTION DATE:	11-09-14	16-04-15	6-11-15	15-03-16	24-08-2016
INSPECTION TIME:	11:45 AM	3:30 PM	10:00 AM	1:45 PM	3:00 PM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	YES	YES	YES	YES	YES
FENCE GROUNDING:	YES	YES	YES	YES	YES
FENCE SPACES:	YES	YES	YES	YES	YES
FENCE BARBED WIRE:	YES	YES	YES	YES	YES
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	YES	YES	YES	YES
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	YES	MINOR	NO	NO	SOME
GRAVEL:	YES	YES	YES	YES	YES
TOWER CONDITIONS:	YES	YES	YES	YES	YES
BUILDING CONDITIONS:	YES	YES	N/A	YES	YES
BUILDING LIGHTS/FANS/HEAT:	YES	YES	N/A	N/A	N/A
INDICATING LIGHTS/DEVICES:	N/A	N/A	N/A	N/A	N/A
Substation General Comments					
		1. NEW SIGNS INSTALLED	1. LITTLE CHANGE FROM SPRING 2015 INSPECTIONS	1. LITTLE CHANGE FROM FALL 2015 INSPECTIONS 2. DAMAGE ON THE PERIMETER OF FENCE (SEE PICTURES)	1. LITTLE CHANGE
General Substation Repairs					
FENCE GENERAL CONDITION:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:		YES	YES	YES	YES
VEGETATION:		NO REPAIRS	NO REPAIRS	NO REPAIRS	PRESENT SEE PI(
GRAVEL:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING CONDITIONS:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING LIGHTS/FANS/HEAT:		NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:		NO REPAIRS	NO REPAIRS	N/A	N/A
Transformer Observations					
AMBIENT TEMPERATURE:		16. ° C	15. ° C	9. ° C	24. C
TEMPERATURE PEAK:		45. ° C	50. ° C	50. ° C	52. C
PRESSURE GAUGE READING:		0. PSI	0. PSI	1. PSI	1. PSI
OIL LEVEL:		25. ° C	25. ° C	25. ° C	25. ° C
TEMPERATURE CURRENT:		35. ° C	35. ° C	32. ° C	45. C
TEMPERATURE RESET? YES/NO		YES	YES	YES	YES
SILICA GEL BREATHER:		N/A	N/A	N/A	N/A
PAINT CONDITIONS:		GOOD - NOTHING REQUIRED	FAIR - MONITOR	FAIR - MONITOR	FAIR
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
		1. NEW SIGNS INSTALLED		1.MINOR RUST ON HV COVER	
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: HK PORTER YEAR OF MANUFACTURE: 1976 SERIAL NUMBER: 22515-1 KVA: 3000 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.65 % WEIGHT: 19900 LBS		1. TYPING ERROR CORRECTED TO 5.65% 2. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. RUSTING NEEDS INVESTIGATING FURTHER, APPEARS TO BE INTERNAL IE: MOISTURE ISSUE 2. SPARE FUSES IN HV SWITCH? TYPICALLY ON DOOR INSIDE 3. VERIFIED TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORM IS TRUE
OIL VOLUME: 574 GAL					
TAP SETTING: 2					
TAP POSITION 1: 27600					
TAP POSITION 2: 26910					
TAP POSITION 3: 26220					
TAP POSITION 4: 25530					
TAP POSITION 5: 24840					
FUSE MANUFACTURER : S&C					
FUSE LINK: 125E					
FUSE HOLDER: SM-5					

ERTH Corporation Reference #: T-16-255
Site Designation: PORT STANLEY MS1
Site Address: CARLOW ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHNICIAN:	D.BENJAMIN	J.DONCK	R.COOPER	S.DELGUIDICE	S.DELGUIDICE
INSPECTION DATE:	11-09-14	16-04-15	6-11-15	22-03-16	24-08-2016
INSPECTION TIME:	8:00 AM	7:30 AM	3:00 PM	12:45 PM	7:00 AM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	YES	YES	YES	YES	YES
FENCE GROUNDING:	YES	YES	YES	YES	YES
FENCE SPACES:	YES	YES	YES	YES	YES
FENCE BARBED WIRE:	YES	YES	YES	YES	YES
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	YES	YES	YES	YES
SIGNS:	YES	YES	YES	NO	NO
VEGETATION:	MINOR	MINOR	MINOR	MINOR	NONE
GRAVEL:	YES	YES	YES	YES	YES
TOWER CONDITIONS:	YES	YES	N/A	N/A	N/A
BUILDING CONDITIONS:	YES	YES	YES	YES	see notes
BUILDING LIGHTS/FANS/HEAT:	YES	YES	YES	YES	YES
INDICATING LIGHTS/DEVICES:	YES	YES	YES	NO	REPLACED
Substation General Comments					
	BATTERY BANK AT 54VDC, CHANGED PANEL INDICATOR BULBS	1. NEW SIGNS INSTALLED 2. TOWER NOT IN USE	1. LITTLE CHANGE SINCE SPRING 2015 INSPECTION	1. MISSING DANGER SIGN ON BACKSIDE OF STATION 2.BULBS FOR INDICATOR LIGHTS NEEDED 3. BUILDING CLEANED OUT	MANY DEAD INSECTS AND EVIDENCE OF RODENTS ON FLOOR OF BUILDING
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	YES	NO REPAIRS	NO	NO REPAIRS
VEGETATION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	MINOR	NO REPAIRS
GRAVEL:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO	YES
Transformer Observations					
AMBIENT TEMPERATURE:	14. ° C	5. ° C	15. ° C	5. ° C	17. ° C
TEMPERATURE PEAK:	50. ° C	47. ° C	55. ° C	45. ° C	54. ° C
PRESSURE GAUGE READING:	1.0 PSI	0.5 PSI	1. PSI	1. PSI	0.5. PSI
OIL LEVEL:	> 25 ° C	> 25 ° C	> 25 ° C	> 25 ° C	> 25 ° C
TEMPERATURE CURRENT:	44. ° C	39. ° C	42. ° C	37. ° C	45. ° C
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES	YES
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A	N/A
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	FAIR - MONITOR	FAIR - MONITOR
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
		1. NEW SIGNS INSTALLED		1.MISSING DANGER SIGN ON BACKSIDE OF STATION 2. BULBS FOR INDICATING LIGHTS NEEDED 3. TOP IS STARTING TO RUST 4. FAN OPERATION VERIFIED	1.MISSING DANGER SIGN ON BACKSIDE OF STATION 2. BULBS FOR INDICATING LIGHTS REPLACED
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.					LOADING NOT BALANCED
Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: FERRANTI PACKARD YEAR OF MANUFACTURE: 1979 SERIAL NUMBER: 307425 KVA: 5000 / 6650 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.1% @5000 kVA WEIGHT: 25960 LBS		1. CORRECTED kVA to 5000/6650 2. CORRECTED WEIGHT TO BE 25960 LBS 3. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. OVER HANGING TREES MAKING A MESS IN STATION 2. FEEDER 1 BREAKER NOT IN CELL 3.VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1.VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. FANS FOUND RUNNING WITH TEMP. AT 45 C

OIL VOLUME: 665 GAL
TAP SETTING: 3
TAP POSITION 1: 27600
TAP POSITION 2: 26910
TAP POSITION 3: 26220
TAP POSITION 4: 25530
TAP POSITION 5: 24840
FUSE MANUFACTURER :
FUSE LINK:
FUSE HOLDER:

ERTH Corporation Reference #: T-16-255
Site Designation:AYLMER - McBRIEN MS2 - T1
Site Address: 209 CAVERLY ROAD
Contact Name: SCOTT BROOKS
Contact Number: 519-521-7113

TECHNICIAN:	D.BENJAMIN	J.DONCK / C.ARCHER	R.COOPER	S.DELGUIDICE	S.DELGUIDICE
INSPECTION DATE:	11-09-14	16-04-15	6-11-15	22-03-16	24-08-2016
INSPECTION TIME:	9:15 AM	9:30 AM	2:00 PM	10:45 AM	9:00 AM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	YES	YES	YES	YES	YES
FENCE GROUNDING:	YES	YES	YES	YES	YES
FENCE SPACES:	YES	YES	YES	YES	YES
FENCE BARBED WIRE:	YES	YES	YES	YES	YES
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	YES	YES	YES	YES
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	YES	MINOR	MINOR	MINOR	NO
GRAVEL:	YES	YES	YES	NO	SEE NOTES
TOWER CONDITIONS:	YES	YES	YES	YES	YES
BUILDING CONDITIONS:	YES	YES	YES	N/A	N/A
BUILDING LIGHTS/FANS/HEAT:	N/A	N/A	N/A	N/A	N/A
INDICATING LIGHTS/DEVICES:	YES	YES	YES	YES	N/A
Substation General Comments					
	RODENTICED OPENED/COMSUMED IN T2 SWITCHGEAR, NO NEST FOUND, CLEANED & REPLACED	1.VEGETATION REQUIRES WEED SPRAY 2. NEW SIGNS INSTALLED	1.VEGETATION REQUIRES WEED SPRAY 2. NEED TO CHANGE SILICA GEL AT NEXT INSPECTION	1. RAIL DAMAGE ON FENCE 2.BARBED WIRE IS RUSTY 3. VEGITATION REQUIRES WEED SPRAY 4.FANS OPERATIONS VERIFIED 5.GRAVEL LOW OUTSIDE OF FENCE (1 METER)	1. STATION GRAVEL FINE, LOW OUTSIDE FENCE, FANS OPERATION VERIFIED, SILICA GEL NEEDS CHANGING
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS	NO REPAIRS
VEGETATION:	NO REPAIRS	YES	YES	YES	NO REPAIRS
GRAVEL:	YES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	N/A	N/A
Transformer Observations					
AMBIENT TEMPERATURE:	11. ° C	10. ° C	15. ° C	0. ° C	19. ° C
TEMPERATURE PEAK:	42. ° C	39. ° C	45. ° C	35. ° C	45. ° C
PRESSURE GAUGE READING:	N/A	N/A	N/A	N/A	N/A
OIL LEVEL:	25. ° C	25. ° C	25. ° C	< 25 °C	25 °C
TEMPERATURE CURRENT:	30. ° C	26. ° C	30. ° C	20. ° C	36 ° C
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES	YES
SILICA GEL BREATHER:	GEL REPLACED	GEL REPLACED	NO-NEEDS REPLACEMENT	GEL REPLACED	NEEDS REPLACING
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	FAIR - MONITOR	FAIR - MONITOR
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	GRAVEL - SOME DIRT FILLED	1. REPLACED SILICA GEL ON T1	1. MINOR RUST SPOTS	1. FADED & RUST SPOTS	1. CHANGE GEL NEXT INSPECTION
This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. This report only reflects the conditions as they existed at the time of inspection. If you have any questions on this report, or other servies we offer, please contact our office.					
Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1		1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE 2. SLIGHTLY LOW CONSERVATOR LEVEL 3. FAN OPERATION VERIFIED	1. INFORMATION ALL VERIFIED, FANS OPERATION ALSO VERIFIED
MANUFACTURER: PIONEER ELECTRIC					
YEAR OF MANUFACTURE: 1967					
SERIAL NUMBER: T2993-1					
KVA: 3000					
PRIMARY VOLTAGE: 27600 DELTA					
SECONDARY VOLTAGE: 4160 / 2400 WYE					
IMPEDANCE: 5.86%					
WEIGHT: 22350 LBS					
OIL VOLUME: 739 GAL					
TAP SETTING: 4					
TAP POSITION 1: 28980					
TAP POSITION 2: 28290					
TAP POSITION 3: 27600					
TAP POSITION 4: 26910					
TAP POSITION 5: 26220					
FUSE MANUFACTURER : S&C					
FUSE LINK: NA					
FUSE HOLDER: SM-5					

ERTH Corporation Reference #: T-16-255 Site Designation: AYLMER - MCBRIEN MS2 - T2 Site Address: 209 CAVERLY ROAD Contact Name: SCOTT BROOKS Contact Number: 519-521-7113					
TECHNICIAN:	D.BENJAMIN	J.DONCK / C.ARCHER	R.COOPER	S.DELGUIDICE	S.DELGUIDICE
INSPECTION DATE:	11-09-14	16-04-15	6-11-15	22-03-16	24-08-2016
INSPECTION TIME:	9:15 AM	9:30 AM	2:15 PM	10:55 AM	9:00 AM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	YES	YES	YES	YES	YES
FENCE GROUNDING:	YES	YES	YES	YES	YES
FENCE SPACES:	YES	YES	YES	YES	YES
FENCE BARBED WIRE:	YES	YES	YES	YES	YES
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	YES	YES	YES	YES
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	YES	MINOR	MINOR	MINOR	NO
GRAVEL:	YES	YES	YES	YES	YES
TOWER CONDITIONS:	YES	YES	YES	YES	YES
BUILDING CONDITIONS:	YES	YES	YES	N/A	N/A
BUILDING LIGHTS/FANS/HEAT:	N/A	N/A	N/A	N/A	N/A
INDICATING LIGHTS/DEVICES:	YES	YES	YES	YES	N/A
Substation General Comments	COMMENTS	COMMENTS			COMMENTS
	RODENTICED OPENED/COMSUMED IN T2 SWITCHGEAR, NO NEST FOUND, CLEANED & REPLACED	1.VEGETATION REQUIRES WEED SPRAY 2. NEW SIGNS INSTALLED	1.VEGETATION REQUIRES WEED SPRAY	1.VEGETATION REQUIRES WEED SPRAY 2. NO BUILDING ON SITE, HOWEVEVER LIGHTS & FAN OPERATION VERIFIED	
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	YES	NO REPAIRS	NO REPAIRS	NO REPAIRS
VEGETATION:	NO REPAIRS	YES	YES	YES	NO REPAIRS
GRAVEL:	YES	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
Transformer Observations					
AMBIENT TEMPERATURE:	11. ° C	10. ° C	15. ° C	0. ° C	19. ° C
TEMPERATURE PEAK:	42. ° C	39. ° C	52. ° C	48. ° C	55. ° C
PRESSURE GAUGE READING:	N/A	N/A	0. PSI	-5. PSI	1. PSI
OIL LEVEL:	25. ° C	25. ° C	25. ° C	< 25 °C	25 °C
TEMPERATURE CURRENT:	30. ° C	26. ° C	45. ° C	30. ° C	50. ° C
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES	YES
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A	N/A
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING	GOOD
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	GRAVEL - SOME DIRT FILLED			1. PATCHES OF GRASS	
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T2 MANUFACTURER: FERRANTI PACKARD YEAR OF MANUFACTURE: 1992 SERIAL NUMBER: 2-305405 KVA: 3000 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.86% WEIGHT: 16575 LBS		1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE 2. PRESSURE RELIEVED	VERIFIED ALL TRANS. INFORMATION, FANS TURNED ON AUTOMATICALLY AT 50 C WHILE DOING INSPECTION
OIL VOLUME: 409 GAL					
TAP SETTING: 4					
TAP POSITION 1: 28980					
TAP POSITION 2: 28290					
TAP POSITION 3: 27600					
TAP POSITION 4: 26910					
TAP POSITION 5: 26220					
FUSE MANUFACTURER : S&C					
FUSE LINK: NA					
FUSE HOLDER: SM-5					

ERTH Corporation Reference #: T-16-255 Site Designation: INGERSOLL MS1 Site Address: MILL STREET Contact Name: SCOTT BROOKS Contact Number: 519-521-7113					
TECHNICIAN:	D.BENJAMIN	J.DONCK	R.COOPER	R.COOPER	S.DELGUIDICE
INSPECTION DATE:	11-09-14	16-04-15	6-11-15	15-03-16	24-08-2016
INSPECTION TIME:	1:00 PM	2:00 PM	3:00 PM	2:45 PM	1:00 PM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	N/A	N/A	N/A	N/A	N/A
FENCE GROUNDING:	N/A	N/A	N/A	N/A	N/A
FENCE SPACES:	N/A	N/A	N/A	N/A	N/A
FENCE BARBED WIRE:	N/A	N/A	N/A	N/A	N/A
GATE LOCKED:	YES	YES	YES	N/A	N/A
GATE BARBED WIRE:	YES	N/A	N/A	N/A	N/A
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	MINOR	MINOR	MINOR	MINOR	NONE
GRAVEL:	YES	YES	YES	YES	YES
TOWER CONDITIONS:	N/A	N/A	N/A	N/A	N/A
BUILDING CONDITIONS:	YES	N/A	N/A	YES	see notes
BUILDING LIGHTS/FANS/HEAT:	YES	YES	YES	YES	YES
INDICATING LIGHTS/DEVICES:	YES	YES	YES	YES	YES
Substation General Comments					
	BATTERY BANK AT 52VDC	1. NEW SIGNS INSTALLED	1. LITTLE CHANGE FROM SPRING 2015 INSPECTIONS	1. LITTLE CHANGE FROM FALL 2015 INSPECTIONS	BUILDING STRUCTUALLY
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
VEGETATION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GRAVEL:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
Transformer Observations					
AMBIENT TEMPERATURE:	12. ° C		15. ° C	10. ° C	26. C
TEMPERATURE PEAK:	55. ° C	45. ° C	55. ° C	40. ° C	55. C
PRESSURE GAUGE READING:	0.5 PSI	1. PSI	1. PSI	1. PSI	1.5 PSI
OIL LEVEL:	25. ° C	25. ° C	25. ° C	25 ° C	25 C
TEMPERATURE CURRENT:	35. ° C	40. ° C	35. ° C	30. ° C	47. C
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES	YES
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A	N/A
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	FAIR - MONITOR	FAIR - MONITOR	FAIR - MONITOR	FAIR
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	NAME PLATE FADING	1. TX PAINT IS FADING	1. TX PAINT IS FADING 2. SWITCH HAS PAINT OFF 3. STAIRS STILL NEED PAINT	1. SINGLE LINE NOT POSTED 2. BATTERY BANK WATER LEVELS CHECKED, LOTS OF CORROSION - REQUIRES SERVICE	BATTERY BANK NEEDS SERVICING
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: FERRANTI PACKARD YEAR OF MANUFACTURE: 1985 SERIAL NUMBER: 0265001001 KVA: 5000 / 5600 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.10 % WEIGHT: 14345 KG		1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	
OIL VOLUME: 3437 L					
TAP SETTING: 4					
TAP POSITION 1: 28980					
TAP POSITION 2: 28290					
TAP POSITION 3: 27600					
TAP POSITION 4: 26910					
TAP POSITION 5: 26220					
FUSE MANUFACTURER : S&C					
FUSE LINK: NA					
FUSE HOLDER: NA					

ERTH Corporation Reference #: T-16-255 Site Designation: INGERSOLL MS3 Site Address: 90 HOLCROFT STREET Contact Name: SCOTT BROOKS Contact Number: 519-521-7113					
TECHNICIAN:	D.BENJAMIN	J.DONCK	R.COOPER	R.COOPER	S.DELGUIDICE
INSPECTION DATE:	11-09-14	16-04-15	6-11-15	15-03-16	24-08-2016
INSPECTION TIME:	1:45 PM	2:00 PM	2:00 PM	3:15 PM	3:00 PM
General Substation Observations ACCEPTABLE Yes / No	YES	YES	YES	YES	YES
FENCE GENERAL CONDITION:	N/A	N/A	N/A	N/A	N/A
FENCE GROUNDING:	N/A	N/A	N/A	N/A	N/A
FENCE SPACES:	N/A	N/A	N/A	N/A	N/A
FENCE BARBED WIRE:	N/A	N/A	N/A	N/A	N/A
GATE LOCKED:	YES	YES	YES	YES	YES
GATE BARBED WIRE:	YES	N/A	N/A	N/A	N/A
SIGNS:	YES	YES	YES	YES	YES
VEGETATION:	MINOR VEGETATION	MINOR	MINOR	MINOR	MINOR
GRAVEL:	YES	YES	YES	YES	YES
TOWER CONDITIONS:	N/A	N/A	N/A	N/A	N/A
BUILDING CONDITIONS:	YES	YES	YES	NO	NO
BUILDING LIGHTS/FANS/HEAT:	YES	YES	YES	YES	YES
INDICATING LIGHTS/DEVICES:	YES	YES	YES	YES	YES
Substation General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
	BATTERY BANK TESTED AT 50VDC	1. REPLACED SIGNS	1. LITTLE CHANGE FROM THE 2015 FALL INSPECTIONS	1. BONDING AT DOOR & STAIRS GOOD 2. SOME CORROSION ON BATTERY BANK 3. LOOSE SHINGLES ON ROOF ON WEST SIDE OF BUILDING	ROOF SHINGLES, PAINTING OF DOORS
General Substation Repairs					
FENCE GENERAL CONDITION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE GROUNDING:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE SPACES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
FENCE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE LOCKED:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GATE BARBED WIRE:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
SIGNS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
VEGETATION:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
GRAVEL:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
TOWER CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
BUILDING CONDITIONS:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NEEDED
BUILDING LIGHTS/FANS/HEAT:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
INDICATING LIGHTS/DEVICES:	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS	NO REPAIRS
Transformer Observations					
AMBIENT TEMPERATURE:	12. ° C	18. ° C	15. ° C	10. ° C	26. ° C
TEMPERATURE PEAK:	47. ° C	42. ° C	47. ° C	30. ° C	48 ° C
PRESSURE GAUGE READING:	N/A	0. PSI	N/A	N/A	N/A
OIL LEVEL:	>25 ° C	>25 ° C	>25 ° C	25. ° C	25. ° C
TEMPERATURE CURRENT:	18. ° C	30. ° C	29. ° C	25. ° C	42. ° C
TEMPERATURE RESET? YES/NO	YES	YES	YES	YES	YES
SILICA GEL BREATHER:	N/A	N/A	N/A	N/A	N/A
PAINT CONDITIONS:	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING REQUIRED	GOOD - NOTHING
Transformer General Comments	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
			1. LITTLE CHANGE FROM THE 2015 SPRING INSPECTIONS	1. SINGLE LINE NOT POSTED	MONITOR PRIMARY JB FOR OIL LEAK
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Transformer Information	COMMENTS	COMMENTS	COMMENTS	COMMENTS	COMMENTS
DESIGNATION: T1 MANUFACTURER: FERRANTI PACKARD YEAR OF MANUFACTURE: 1967 SERIAL NUMBER: 1-3059 KVA: 5000 PRIMARY VOLTAGE: 27600 DELTA SECONDARY VOLTAGE: 4160 / 2400 WYE IMPEDANCE: 5.53 % WEIGHT: 20240 LBS		1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. VERIFIED ALL TRANSFORMER INFORMATION IS TRUE	1. EVIDENCE OF SLIGHT LEAK ON PRIMARY OF TRANSFORMER
OIL VOLUME: 960 GAL					
TAP SETTING: 1					
TAP POSITION 1: 27600					
TAP POSITION 2: 26910					
TAP POSITION 3: 26220					
TAP POSITION 4: 25530					
TAP POSITION 5: 24840					
FUSE MANUFACTURER : S&C					
FUSE LINK: NA					
FUSE HOLDER: NA					

ERTH CORPORATION

December 20, 2016

Erie Thames Power

143 Bell St

Ingersoll, ON

N5C 3K5

Attention: Scott Brooks

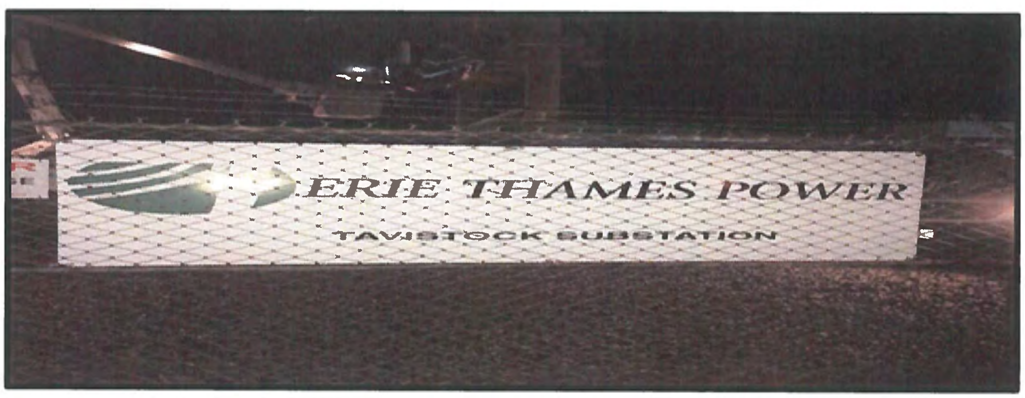
Re: Maintenance Inspection Report - Our Ref: 16-007

Site: MS # 1 – DECEW ST TAVISTOCK

Dear Scott Brooks

Please find the attached report for the maintenance work and inspections completed Nov 26, 2016.

Erth Corp cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and the International Electrical Testing Association (NETA).



Findings:

- Transformer tower fuses SMU are only a 75E link which is less then rating of transformer – at 5000kVA full load the transformer draws 104 amps, therefore this smaller fuse limits the output of this transformer, possibly it was a coordination issue with upstream devices, Typically a larger fuse would be installed ie. 150E

- Fairly dirty High voltage row up switch gear due to geographic location (high traffic / feed mill debris)

- All fence bonding repairs completed as per code **OESC rule # 36-312**
  Fabric repair outstanding
- 3 key interlock system removed from main 27.6 KV tower air break operating handle (802T1-L) due to missing kirk key for proper sequencing / operating. Although required by code **OESC Rule #36-204, 36-208** the overall consensus (ERTH / ETP) was to have the kirk key assemble removed due to safety concerns of quick operation in the event of emergency. Under a planned outage ETP would create a switching order which would prevent the air break being opened under load as the switching order would remove load prior to opening tower air break per the reason for mention OESC code

- Due to poor weather conditions (wet / snowing) some insulation resistance testing results were negatively affected and do not necessarily reflect the actual results of station equipment. Specifically the results for the 5 kV metal clad switch gear / secondary transformer cables

- Following the inspection the new F3 Feeder was phase rotated tested and put into service on Dec. 6/16. Spare feeder circuit fuses (400 amp) left in meter cell of gear.

Recommendations:

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Sincerely;

ERTH Corporation,

Steve DelGuidice, **ME, EET**

Steve DelGuidice

Manager, High Voltage & Substation Services

T : 519-485-6038 Ext:317
TF: 888-304-5558
M : 226-980-5265

ERTH CORPORATION

TRANSFORMER DATA SHEET (Pg. 1 of 4)

System ID: 802T1-L | Device ID: MAIN XFMR

Customer	ERIE THAMES POWER	Date	November 26, 2016
Customer Address	143 BELL ST, INGERSOLL	Job #	16-007
Site	MS#1		
Site Address	17 DECEW ST TAVISTOCK		

Nameplate Data

Transformer Class	Unit Padmount		Padmount		Station	X			Other	
Transformer Cooling	ONAN		ONAF	X	LNAN		DRY		Other	
Bushing Configuration	Dead Front		Top - Top		Top - Side		Side - Side	X	Other	

Manufacturer	PIONEER		Core & Windings	4985	kg	X	lb	
Date of Manufacture	2005/07		Tanks & Fittings	4210	kg	X	lb	
Serial #	G1S572-1		Coolant Volume	3720	L	X	Gal	
KVA / Prov. KVA Rating	5000/6670	KVA	Coolant Weight	3205	kg	X	lb	
Primary Voltage	27600	V	Total Weight	12400	kg	X	lb	
Primary Ampacity	139	A	Temperature Rise	65	°C	X	°F	
Secondary Voltage	4160/2400	V	HV BIL Rating	170	kV			
Secondary Ampacity	926	A	LV BIL Rating	60	kV			
HV Winding Material	COPPER		Percent Impedance	6.74 %	ONAN	X	ONAF	
LV Winding Material	COPPER		Tamper Resistant		YES		NO	X
CSA Specification(s)			Transformer Colour	GREY				
Comments								

Visual Inspection

Nameplate Condition	Satisfactory	X	Not Satisfactory		N/A		Comments
Fan / Pump Operation	Satisfactory	X	Not Satisfactory		N/A		Comments
Ground Connections	Satisfactory	X	Not Satisfactory		N/A		Comments
Liquid Levels In Tanks	Satisfactory	X	Not Satisfactory		N/A		Comments
Interlock Operation	Satisfactory	X	Not Satisfactory		N/A		Comments
Temp. Gauge Operation	Satisfactory	X	Not Satisfactory		N/A		Comments

Coolant Temperature 20 °C X °F | Max. Coolant Temperature 45 °C X °F

Comments

Oil Conservator

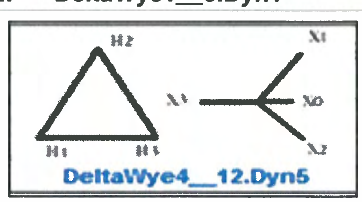
Oil Conservator	Yes		No	X	Conservator Volume		L		Gal	
Silica Gel Breather	Yes		No		Breather Volume		L		Gal	
Silica Gel Colour	Good		Bad		Replaced		N/A			

Comments

Tap Changer Data

Position / Designation		Tap Voltages (V)	As Found	As Left
1 / A	105.00%	28980		
2 / B	102.50%	28290		
3 / C	100.00%	27600	X	X
4 / D	97.50%	26910		
5 / E	95.00%	26220		

Vector Diagram: DeltaWye1__5.Dyn1



Primary Vector X | Secondary Vector X

Comments:

Tested By: M.GALECKAS

Rev Date (05/23/12)

Revised 2016-12-20

ERTH CORPORATION

TRANSFORMER DATA SHEET (Pg. 2 of 4)

System ID 802T1-L **Device ID** MAIN XFMR

Neutral Grounding Resistor (NGR)

NGR Present	Yes [ ] No [X]		
Manufacturer		NGR Serial #	
NGR Voltage	V	Maximum Current	A
NGR Resistance	Ω	NGR Location	
Comments			

Transformer Lightning Arrestors

Class	Distribution [ ] Intermediate [X] Station [ ]		
Composition	Ceramic [ ] Polymer [X]		
Manufacturer	**TRANQUELL**	Max. / MCOV Rating	**17.0 / 21.0 kV**
Catalog #	**9L12PPE0215**		
Comments			

Interlock

Key Interlock	Yes [ ] No [X]		
Interlock Type	Elec. [ ] Mech. [ ] Utility Lock [ ]		
Devices Interlocked	H.V. Switch [ ] Breaker [ ] Trans. Encl. [ ] Other [ ]		
Manufacturer		Key Interlock #	
Comments			

Fans

# of Fans	**2**	Fan Voltage	**115**
Fan Size	**24"**	Frame Size	**L48Z**
Horsepower	**1/2**		
Comments			

Transformer Load Side Conductor Data

Conductor Type	Cable [X] Bus Bar [ ]	Conductor Size / Dim.	**500 MCM**
Conductor Material	Aluminum [ ] Copper [X]	Conductors per Phase	**2** / Phase
Tape Shield	Aluminum [ ] Copper [ ]	Bond Size / Dim.	**#3 APPROX**
Concentric Neutral	Aluminum [ ] Copper [ ]	# of Bond Conductors	**2**
Insulation Voltage	**5KV**	# of Neutral Conductors	**1**
Insulation Type	**N/A**	Neutral Size / Dim.	**500MCM**
Comments			

Tested By: **M.GALECKAS**

ERTH CORPORATION

TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID	802T1-L	Device ID	MAIN XFMR

Electrical Tests

Turn Ratio Test

Test Voltage: Automatic ☐ Other ____ V

Tap Position / Designation		Tap Voltage V	Calculated Ratio	H 1 To H 2 / X 0 To X 1	H 2 To H 3 / X 0 To X 2	H 3 To H 1 / X 0 To X 3
1 / A	105.00%	28980				
2 / B	102.50%	28290				
3 / C	100.00%	27600	11.491	11.490	11.490	11.490
4 / D	97.50%	26910				
5 / E	95.00%	26220				

		Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
Tap Position As Found	3	0.700 mA	0.010 %	0.600 mA	0.010 %	0.600 mA	0.010 %
Tap Position As Left		mA	%	mA	%	mA	%

Primary Winding Resistance

Resistance in ohms at 1 A after 1 minute

H0 - H1	Ω	H1 - H2	1.088 Ω
H0 - H2	Ω	H2 - H3	0.739 Ω
H0 - H3	Ω	H3 - H1	0.737 Ω

Stabilization Time > ____ Minute

Secondary Winding Resistance

Resistance in milli-ohms at 5 A after 1 minute

X0 - X1	6.076	X1 - X2	12.045 mΩ
X0 - X2	6.072	X2 - X3	12.048 mΩ
X0 - X3	6.124	X3 - X1	12.072 mΩ

Stabilization Time > ____ Minute

Capacitance Test

	Low - Ground	Low - Guard	UST (High - Low)	High - Guard	High - Ground
Capacitance in pico-farads	8434 pF	1687 pF	6748 pF	6308 pF	13052 pF
Uncorrected D.F. (%)	0.679 %	0.410 %	0.738 %	0.363 %	0.526 %
Corrected to 20 °C (%)	0.679 %	0.410 %	0.738 %	0.363 %	0.526 %

Temp. Correction Factor 1

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @ 10 000 V DC after 1 minute

Phase A to Ground	47000 MΩ
Phase B to Ground	17780 MΩ
Phase C to Ground	28900 MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @ 10000 V DC after 1 minute

Phase A to Ground	209 MΩ	Phase A to Phase B	2400 MΩ
Phase B to Ground	2870 MΩ	Phase B to Phase C	2500 MΩ
Phase C to Ground	370 MΩ	Phase C to Phase A	562 MΩ

Comments / Observations

SECONDARY CABLES MEGGERED WITH BUS OF SWITCH GEAR , WET / SNOWING DURING TESTING

Test Instrument(s)	Ratio	Winding	Cap Bridge	Megger	
Manufacturer / Model					
Serial #	185	119	716	282	

Tested By: M.GALECKAS

ERTH
CORPORATION

TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID 802T1-L **Device ID** MAIN XFMR

Dielectric Absorption Test (Insulation Resistance)

Time	High to Low & Gnd		Low to High & Gnd		High & Low to Gnd	
	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
15 sec	12000 MΩ	12000 MΩ	11600 MΩ	11600 MΩ	6300 MΩ	6300 MΩ
30 sec	20900 MΩ	20900 MΩ	22200 MΩ	22200 MΩ	9400 MΩ	9400 MΩ
45 sec	25600 MΩ	25600 MΩ	24900 MΩ	24900 MΩ	12000 MΩ	12000 MΩ
1 min	29500 MΩ	29500 MΩ	27300 MΩ	27300 MΩ	14000 MΩ	14000 MΩ
2 min	36900 MΩ	36900 MΩ	35000 MΩ	35000 MΩ	18300 MΩ	18300 MΩ
3 min	43100 MΩ	43100 MΩ	39700 MΩ	39700 MΩ	22900 MΩ	22900 MΩ
4 min	50000 MΩ	50000 MΩ	43700 MΩ	43700 MΩ	25800 MΩ	25800 MΩ
5 min	56200 MΩ	56200 MΩ	44800 MΩ	44800 MΩ	27000 MΩ	27000 MΩ
6 min	60000 MΩ	60000 MΩ	45300 MΩ	45300 MΩ	29200 MΩ	29200 MΩ
7 min	63300 MΩ	63300 MΩ	46900 MΩ	46900 MΩ	30600 MΩ	30600 MΩ
8 min	65900 MΩ	65900 MΩ	48500 MΩ	48500 MΩ	32000 MΩ	32000 MΩ
9 min	67000 MΩ	67000 MΩ	53000 MΩ	53000 MΩ	33300 MΩ	33300 MΩ
10 min	69300 MΩ	69300 MΩ	54900 MΩ	54900 MΩ	34500 MΩ	34500 MΩ
Test Voltage	10000 V		5000 V		5000 V	
Multiplier	1		1		1	
Polarization Index	2.35		2.01		2.46	
TCC 1.00	Insulation Resistance Readings Corrected to 20 °C					

Insulation Resistance

Resistance in meg-ohms after 1 minute.

High to Low & Ground	29500	MΩ @	10000	V
Low to High & Ground	27300	MΩ @	5000	V
High & Low to Ground	14000	MΩ @	5000	V

Core Ground Insulation Resistance

Resistance in meg-ohms after 1 minute.

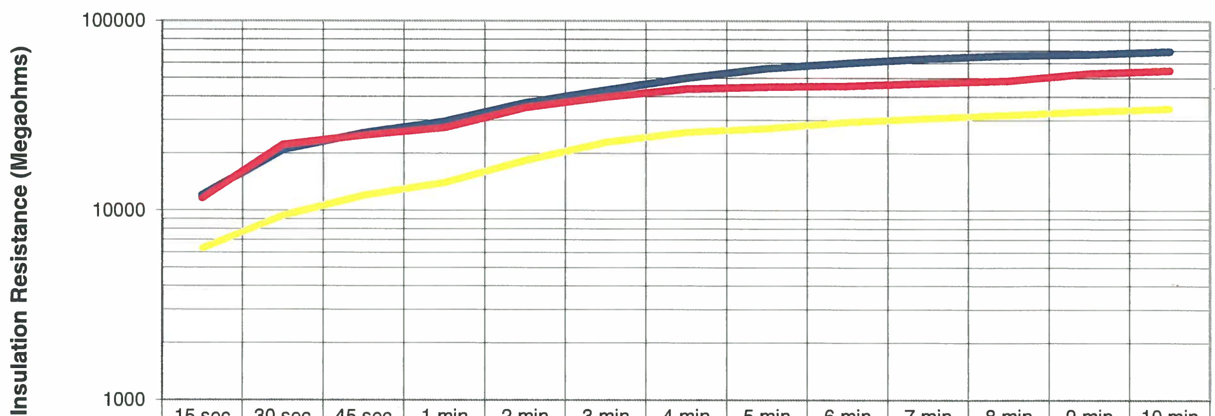
Core Ground Accessible Yes ☐ No ☐

Test Voltage ______ V

Core Ground Resistance ______ MΩ

Dielectric Absorption Test

Time



	15 sec	30 sec	45 sec	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min
High to Low & Gnd	12000	20900	25600	29500	36900	43100	50000	56200	60000	63300	65900	67000	69300
Low to High & Gnd	11600	22200	24900	27300	35000	39700	43700	44800	45300	46900	48500	53000	54900
High & Low to Gnd	6300	9400	12000	14000	18300	22900	25800	27000	29200	30600	32000	33300	34500

Test Instrument(s)	Manufacturer / Model	Megger				
	Serial #	282				

Comments:

Tested By: **M.GALECKAS**

ERTH CORPORATION

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

System ID 27.6KV INCOMING **Device ID** 802T1L-X

Customer	ERIE THAMES POWER	Date	November 26, 2016
Customer Address	143 BELL ST, INGERSOLL	Job #	16-007
Site	MS#1	System Neutral Present	0
Site Address	17 DECEW ST TAVISTOCK		

Nameplate Data

Switch Mounting	Metal Enclosed [ ]	Pole [ ]	Tower [X]	Other			
Switch Type	Load Break [ ]	Air Break [X]		Other			

Manufacturer	DOMINION	BIL Rating	200 kV
Date Of Manufacture	N/A	Feeder ID	802T1L-X
Serial #	N/A	Feeds To	MAIN POWER XFMR
Catalog #	88938	Interrupting Rating	40 000 A
Nom. / Max. Voltage	40 / 68.0 kV	Continuous Ampacity	600 A
Comments			

Lightning Arrestors

Class	Distribution [ ]	Intermediate [X]	Station [ ]
Composition	Ceramic [ ]	Polymer [X]	

Manufacturer	OHIO BRASS	Max. / MCOV Rating	17.0 / 21.0 kV
Catalog #	300017		
Comments			

Protective Device Data

Primary Fuse Holder Data / Primary Fuse Link Data

Primary Fuse Holder Data		Primary Fuse Link Data	
Manufacturer	S&C	Manufacturer	S&C
Type	SMU-5	Type	SMU-5
Nom. / Max. Voltage	34.5 / 38.0 kV	Link Size	75E A
Holder Max. Fuse Link	300E	TCC #	153-4
Holder Catalog #	86154R2	Link Catalog #	134275R4

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes [X]	No [ ]	# of Spares 3
Spare Location	METERING CABINET		
Comments			

Interlock

Key Interlock	Yes [X]	No [ ]		
Interlock Type	Elec. [ ]	Mech. [X]	Utility Lock [ ]	
Devices Interlocked	H.V. Switch [X]	Breaker [ ]	Trans. Encl. [ ]	Other [ ]

Manufacturer	KIRK	Key Interlock #	N/A
Comments	REMOVED FROM HV SW 802T1L-X DUE TO MISSING KEY		

Load Side Conductor Data

Conductor Type	Cable [X]	Bus Bar [ ]	Conductor Size / Dim.	2/0.
Conductor Material	Aluminum [X]	Copper [ ]	Conductors per Phase	1 / Phase
Tape Shield	Aluminum [ ]	Copper [ ]	Bond Size / Dim.	2/0.
Concentric Neutral	Aluminum [ ]	Copper [X]	# of Bond Coductors	2
Insulation Voltage	28KV		# of Neutral Conductors	N/A
Insulation Type	TRXLPE 28KV		Neutral Size / Dim.	N/A
Comments				

Recorded By: M.GALECKAS

ERTH CORPORATION

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID 27.6KV INCOMING **Device ID** 802T1L-X

Visual Inspection / Mechanical Tests

Item	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition	X			
Insulator Condition	X			
Ground Connections	X			
Lightning Arrestors	X			
Arc Suppressors			X	
Key Interlock Operation		X	X	REMOVED
Ground Straps & Materials	X			

Switch Condition / Operation

Item	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	X			
Contact Surface Condition	X			
Simultaneous Closure				

Electrical Tests

Earth Resistance (3-Point Test)

~~Earth Resistance in Ohms.~~

~~Earth Resistance ______ Ω~~

Arc Suppressor Contact Resistance

~~Arc Suppressor Contact Resistance in Ohms.~~

~~Phase A~~		Ω
Phase B		Ω
Phase C		Ω

Switch Insulation Resistance

~~**Resistance in Meg-Ohms after 1 minute.**~~

~~Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [ ] 10 kV [ ]~~

	Phase A	Phase B	Phase C
Phase to GND	MΩ	MΩ	MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current **10A**

	Phase A	Phase B	Phase C
Contacts	**58** μΩ	**51** μΩ	**55.7** μΩ
Fuse	**644** μΩ	**637** μΩ	**617** μΩ
Overall	**N/A** μΩ	**N/A** μΩ	**N/A** μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ **5000** V DC after 1 minute

Phase A to Ground	**3570**	MΩ
Phase B to Ground	**5150**	MΩ
Phase C to Ground	**6360**	MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ **5000** V DC after 1 minute

Phase A to Ground	**45000**	MΩ
Phase B to Ground	**43400**	MΩ
Phase C to Ground	**77500**	MΩ

Comments / Observations

Test Instrument(s)

Manufacturer / Model	**Megger**	**Ductor**			
Serial #	**282**	**262**			

Tested By: **M.GALECKAS**

ERTH CORPORATION

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

System ID 802T1L-X **Device ID** FEEDER #1

Customer	ERIE THAMES POWER	Date	November 26, 2016
Customer Address	143 BELL ST, INGERSOLL	Job #	16-007
Site	MS#1	System Neutral Present	0
Site Address	17 DECEW ST TAVISTOCK		

Nameplate Data

Switch Mounting	Metal Enclosed [X]	Pole [ ]	Tower [ ]	Other		
Switch Type	Load Break [X]	Air Break [ ]		Other		

Manufacturer	BBC	BIL Rating	60 kV
Date Of Manufacture	N/A	Feeder ID	FEEDER #1
Serial #	67549-01	Feeds To	FEEDER #1 POLE
Catalog #	HPL-C	Interrupting Rating	40 000 A
Nom. / Max. Voltage	/ 5.5 kV	Continuous Ampacity	600 A
Comments			

Lightning Arrestors

Class	Distribution [ ]	Intermediate [ ]	Station [ ]
Composition	Ceramic [ ]	Polymer [ ]	
Manufacturer		Max. / MCOV Rating	/ kV
Catalog #			
Comments			

Protective Device Data

Primary Fuse Holder Data

Manufacturer	GOULD SHAWMUT
Type	CL-14 SERIES
Nom. / Max. Voltage	/ 5.5 kV
Holder Max. Fuse Link	400E
Holder Catalog #	2250-007-952

Primary Fuse Link Data

Manufacturer	GOULD SHAWMUT
Type	CL-14 SERIES
Link Size	400 E A
TCC #	N/A
Link Catalog #	N/A

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes [X]	No [ ]	# of Spares 1
Spare Location	METERING CABINET 1 SPARE TOTAL		
Comments			

Interlock

Key Interlock	Yes [X]	No [ ]		
Interlock Type	Elec. [ ]	Mech. [X]	Utility Lock [ ]	
Devices Interlocked	H.V. Switch [X]	Breaker [ ]	Trans. Encl. [ ]	Other [X] TOWER (802TIL-X)
Manufacturer	KIRK		Key Interlock #	RE12015
Comments				

Load Side Conductor Data

Conductor Type	Cable [X]	Bus Bar [ ]	Conductor Size / Dim.	3/0 (APPROX)
Conductor Material	Aluminum [ ]	Copper [X]	Conductors per Phase	1 / Phase
Tape Shield	Aluminum [ ]	Copper [ ]	Bond Size / Dim.	2/0.
Concentric Neutral	Aluminum [ ]	Copper [X]	# of Bond Coductors	2
Insulation Voltage	5KV		# of Neutral Conductors	1
Insulation Type			Neutral Size / Dim.	2/0.
Comments	NO CABLE IDENTIFICATION VISIBLE			

Recorded By: M.GALECKAS

ERTH CORPORATION

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID 27.6KV INCOMING **Device ID** FEEDER#1

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition	X			
Insulator Condition	X			
Ground Connections	X			
Lightning Arrestors			X	
Arc Suppressors			X	
Key Interlock Operation	X			
Ground Straps & Materials	X			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	X			
Contact Surface Condition	X			
Simultaneous Closure	X			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance ______ Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A		Ω
Phase B		Ω
Phase C		Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [X] 10 kV [ ]

	Phase A		Phase B		Phase C	
Phase to GND	209	MΩ	2870	MΩ	370	MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current 10

	Phase A		Phase B		Phase C	
Contacts	42	µΩ	46	µΩ	48	µΩ
Fuse	970	µΩ	930	µΩ	1012	µΩ
Overall	990	µΩ	979	µΩ	1077	µΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ 5000 V DC after 1 minute

Phase A to Ground	4160	MΩ
Phase B to Ground	4480	MΩ
Phase C to Ground	6160	MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground		MΩ
Phase B to Ground		MΩ
Phase C to Ground		MΩ

Comments / Observations

SWITCH INSULATION RESISTANCE INCLUDES SECONDARY CABLES OF XFMR, AND HV SWITCH GEAR BUS

Test Instrument(s)						
	Manufacturer / Model	Megger	Ductor			
	Serial #	282	268			

Tested By: M.GALECKAS

ERTH CORPORATION

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

System ID 802T1L-X **Device ID** FEEDER # 2

Customer	ERIE THAMES POWER	Date	November 26, 2016
Customer Address	143 BELL ST, INGERSOLL	Job #	16-007
Site	MS#1	System Neutral Present	0
Site Address	17 DECEW ST TAVISTOCK		

Nameplate Data

Switch Mounting	Metal Enclosed [X]	Pole [ ]	Tower [ ]	Other		
Switch Type	Load Break [X]	Air Break [ ]		Other		

Manufacturer	BBC	BIL Rating	60 kV
Date Of Manufacture	N/A	Feeder ID	FEEDER # 2
Serial #	67549-1	Feeds To	FEEDER #2 POLE
Catalog #	HPL-C	Interrupting Rating	40 000 A
Nom. / Max. Voltage	/ 5.5 kV	Continuous Ampacity	600 A
Comments			

~~Lightning Arrestors~~

Class	Distribution [ ]	Intermediate [ ]	Station [ ]		
Composition	Ceramic [ ]	Polymer [ ]			
Manufacturer		Max. / MCOV Rating	/ kV		
Catalog #					
Comments					

Protective Device Data

Primary Fuse Holder Data

Manufacturer	GOULD SHAWMUT
Type	CL-14 SERIES
Nom. / Max. Voltage	/ 5.5 kV
Holder Max. Fuse Link	400E
Holder Catalog #	2250-007-952

Primary Fuse Link Data

Manufacturer	GOULD SHAWMUT
Type	CL-14 SERIES
Link Size	400E A
TCC #	N/A
Link Catalog #	N/A

Primary Fuse Link Spares / Location

Spare Primary Fuses	Yes [X]	No [ ]	# of Spares	1
Spare Location	METERING CABINET 1 SPARE TOTAL			
Comments				

Interlock

Key Interlock	Yes [X]	No [ ]			
Interlock Type	Elec. [ ]	Mech. [X]	Utility Lock [ ]		
Devices Interlocked	H.V. Switch [X]	Breaker [ ]	Trans. Encl. [ ]	Other [X]	TOWER (802TIL-X)
Manufacturer	KIRK		Key Interlock #	RE12009	
Comments					

Load Side Conductor Data

Conductor Type	Cable [X]	Bus Bar [ ]	Conductor Size / Dim.	500 MCM (APPROX)
Conductor Material	Aluminum [ ]	Copper [X]	Conductors per Phase	1 / Phase
Tape Shield	Aluminum [ ]	Copper [ ]	Bond Size / Dim.	2/0.
Concentric Neutral	Aluminum [ ]	Copper [X]	# of Bond Coductors	2
Insulation Voltage	5 KV		# of Neutral Conductors	1
Insulation Type			Neutral Size / Dim.	2/0.
Comments	NO CABLE IDENTIFICATION VISIBLE			

Recorded By: M.GALECKAS

ERTH CORPORATION

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID 802T1L-X **Device ID** FEEDER#2

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition	X			
Insulator Condition	X			
Ground Connections	X			
Lightning Arrestors			X	
Arc Suppressors			X	
Key Interlock Operation	X			
Ground Straps & Materials	X			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	X			
Contact Surface Condition	X			
Simultaneous Closure	X			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance ______ Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	Ω
Phase B	Ω
Phase C	Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV ☐ 2 kV ☐ 5 kV ☐ 10 kV ☐

	Phase A	Phase B	Phase C
Phase to GND	MΩ	MΩ	MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current **10A**

	Phase A	Phase B	Phase C
Contacts	44 μΩ	55.8 μΩ	46 μΩ
Fuse	962 μΩ	960 μΩ	821 μΩ
Overall	1001 μΩ	990 μΩ	869 μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ **5000** V DC after 1 minute

Phase A to Ground	16700 MΩ
Phase B to Ground	15460 MΩ
Phase C to Ground	5000 MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	MΩ
Phase B to Ground	MΩ
Phase C to Ground	MΩ

Comments / Observations

SWITCH INSULATION RESISTANCE INCLUDES SECONDARY CABLES OF XFMR, AND HV SWITCH GEAR BUS

Test Instrument(s)						
	Manufacturer / Model	Megger	Ductor			
	Serial #	282	262			

Tested By: M.GALECKAS

ERTH CORPORATION

HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

System ID 802TIL-X **Device ID** FEEDER # 3

Customer	ERIE THAMES POWER	Date	November 26, 2016
Customer Address	143 BELL ST, INGERSOLL	Job #	16-007
Site	MS#1	System Neutral Present	0
Site Address	17 DECEW ST TAVISTOCK		

Nameplate Data

Switch Mounting: Metal Enclosed [X] Pole [ ] Tower [ ] Other

Switch Type: Load Break [ ] Air Break [ ] Other

Manufacturer	BBC	BIL Rating	60 kV
Date Of Manufacture	N/A	Feeder ID	FEEDER # 3
Serial #	67549-01	Feeds To	FEEDER POLE # 3
Catalog #	HPL-C	Interrupting Rating	40 000 A
Nom. / Max. Voltage	/ 5.5 kV	Continuous Ampacity	600 A
Comments			

~~Lightning Arrestors~~

Class: Distribution [ ] Intermediate [ ] Station [ ]

Composition: Ceramic [ ] Polymer [ ]

Manufacturer — Max. / MCOV Rating / kV

Catalog #

Comments

Protective Device Data

Primary Fuse Holder Data

Manufacturer

Type

Nom. / Max. Voltage / kV

Holder Max. Fuse Link

Holder Catalog #

Primary Fuse Link Data

Manufacturer

Type

Link Size A

TCC #

Link Catalog #

Primary Fuse Link Spares / Location

Spare Primary Fuses: Yes [ ] No [ ] # of Spares

Spare Location

Comments NO FUSES AT TIME OF MAINTENANCE

Interlock

Key Interlock: Yes [X] No [ ]

Interlock Type: Elec. [ ] Mech. [X] Utility Lock [ ]

Devices Interlocked: H.V. Switch [X] Breaker [ ] Trans. Encl. [ ] Other [X] TOWER (802TIL-X)

Manufacturer KIRK — Key Interlock # RE12079

Comments

Load Side Conductor Data

Conductor Type: Cable [X] Bus Bar [ ]

Conductor Material: Aluminum [X] Copper [ ]

Tape Shield: Aluminum [ ] Copper [ ]

Concentric Neutral: Aluminum [ ] Copper [X]

Insulation Voltage 15 KV

Insulation Type TRXLPE

Conductor Size / Dim.	750 MCM
Conductors per Phase	1 / Phase
Bond Size / Dim.	2/0.
# of Bond Coductors	N/A
# of Neutral Conductors	N/A
Neutral Size / Dim.	

Comments

NEW INSTALL

Recorded By: M.GALECKAS

ERTH CORPORATION

HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

System ID: 802TIL-X | Device ID: FEEDER # 3

Visual Inspection / Mechanical Tests

	Satisfactory	Not Satisfactory	N/A	Comments
Nameplate Condition	X			
Insulator Condition	X			
Ground Connections	X			
Lightning Arrestors			X	
Arc Suppressors				
Key Interlock Operation	X			
Ground Straps & Materials	X			

Switch Condition / Operation

	Satisfactory	Not Satisfactory	N/A	Comments
Switch Operation As Left	X			
Contact Surface Condition	X			
Simultaneous Closure	X			

Electrical Tests

Earth Resistance (3-Point Test)

Earth Resistance in Ohms.

Earth Resistance ______ Ω

Arc Suppressor Contact Resistance

Arc Suppressor Contact Resistance in Ohms.

Phase A	Ω
Phase B	Ω
Phase C	Ω

Switch Insulation Resistance

Resistance in Meg-Ohms after 1 minute.

Test Voltage 1 kV [ ] 2 kV [ ] 5 kV [X] 10 kV [ ]

	Phase A	Phase B	Phase C
Phase to GND	**209** MΩ	**2870** MΩ	**370** MΩ

Switch / Fuse Contact Resistance

Resistance in micro-Ohms after 1 minute.

Test Current ______

	Phase A	Phase B	Phase C
Contacts	**83** μΩ	**76** μΩ	**73** μΩ
Fuse	**N/A** μΩ	**N/A** μΩ	**N/A** μΩ
Overall	**N/A** μΩ	**N/A** μΩ	**N/A** μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	MΩ
Phase B to Ground	MΩ
Phase C to Ground	MΩ

Lightning Arrestor Insulation Resistance

Resistance in Meg-Ohms @ ______ V DC after 1 minute

Phase A to Ground	MΩ
Phase B to Ground	MΩ
Phase C to Ground	MΩ

Comments / Observations

NEW INSTALL, CABLE HI POTTING COMPLETED PREVIOUS TO MAINTANENCE
SWITCH INSULTATION RESISITANCE INCLUDES SECONDARY CABLES OF MAIN XFMR, AND SWITCH GEAR BUS

Test Instrument(s)

Manufacturer / Model	**Megger**	**Ductor**			
Serial #	**282**	**262**			

Tested By: **M.GALECKAS**

Boldstar
Infrared Services Inc.

Infrared Inspection
- Electrical Distribution System -

Erie-Thames Power

Date:

June 17th, 18th & 19th, 2014

Report Completed By:

Boldstar Infrared Services Inc.
1-888-847-0517
www.boldstarinfrared.com

Certification Stamp

Infrared Report Summary

Purpose: Infrared inspection to identify thermal anomaly conditions on electrical distribution equipment that suggest an unwanted condition exists and repairs are required.
Method: Complete infrared inspection of selected Erie-Thames Powerlines distribution system in towns of Ingersoll, Beachville, Otterville, Norwich, Burgessville, Aylmer, Belmont and Port Stanley. Driving inspection from vehicle. Save infrared images of all noted anomaly conditions. Report on findings.
Conditions: Equipment operating under normal daytime loading conditions.
Inspection Equipment: FLIR model P620 focal plane array scanner, serial # 404001126.

Observations

Note: Boldstar Infrared Services Inc. is in no way responsible for any expenses resulting in actions or repair of reported anomalies. This report is not a warranty or guarantee of any equipment condition or reliability.

Please see the report pages for all of the details on all of the noted suspect conditions.

All anomalies classified as follows:
HIGH Priority: Component temperature over 50 C rise over ambient.
Plan and execute repairs as soon as possible, within the next few days. Do not ignore.
MEDIUM Priority: Component temperature 25 to 50 C rise over ambient.
Plan and execute repairs at the next opportunity, within the next few weeks. Do not ignore.
LOW Priority: Component temperature below 25 C rise over ambient.
Plan and execute repairs at the next convenient opportunity. Do not ignore.
No Problems Noted (N/A): No anomalies noted. Condition good.

All reported condition should be investigated further as soon as possible to verify the reported condition. Use all safety procedures. Electrical hazards exist.

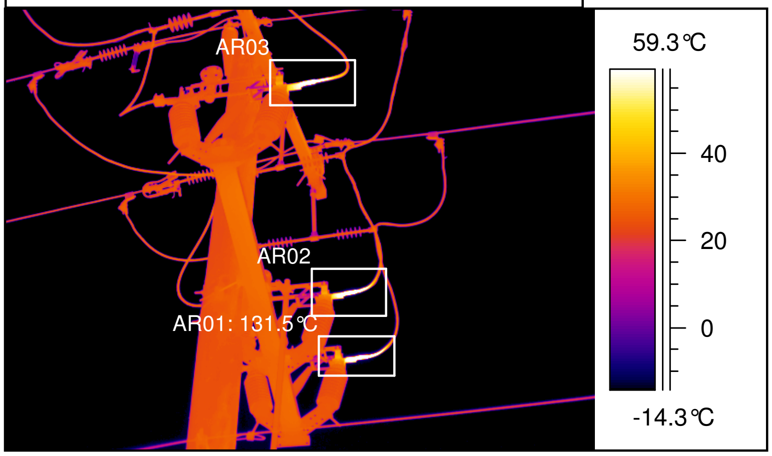
CONTENTS OF REPORT

Priority: ***H= High M= Medium L= Low N/A= Not Applicable***

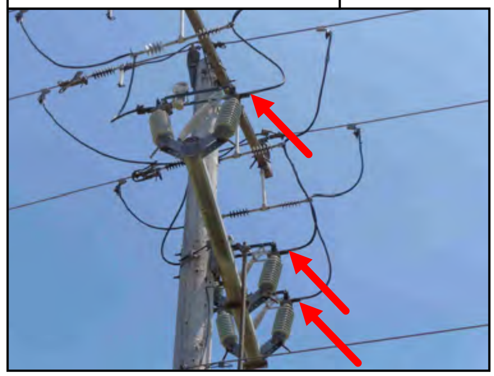
Identification:	DATE
Pole # ETP6985	**2014-06-19**

Description: **Air brakes**

INFRARED IMAGE



PHOTO



Temperature rise: 109.54 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	22.0°C
Label	**Value**
AR01 : max	131.5°C
AR02 : max	127.0°C
AR03 : max	99.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of air brake switch on pole # ETP6985.
Located across 14401 Belmont Road in Belmont.
Heating noted at the indicated (south side) connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

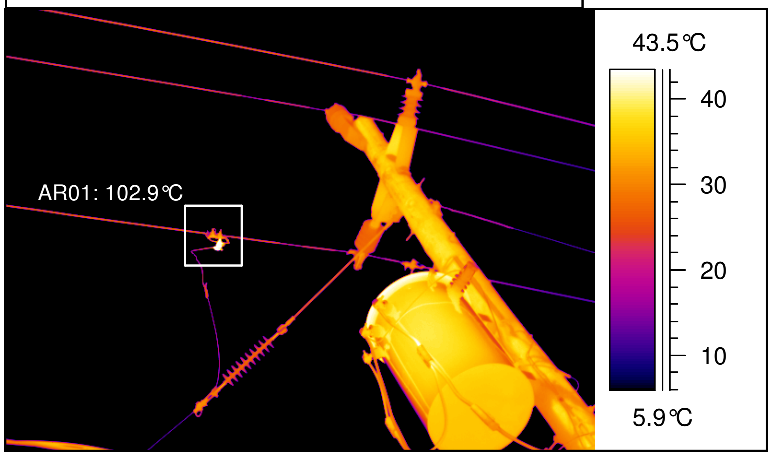
PRIORITY: **High** **Medium** **Low**

ANOMALY: Heating connections

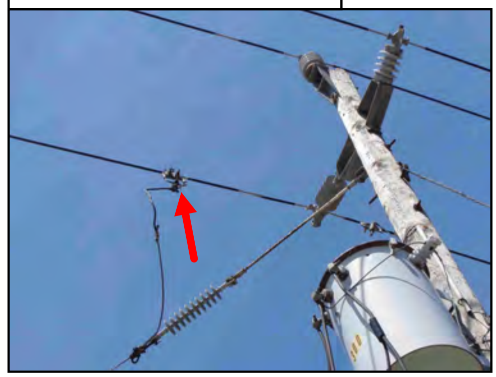
Identification:	DATE
BL27, Pole # ET6896	2014-06-19

Description: **Primary connection**

INFRARED IMAGE



PHOTO



Temperature rise: 80.95 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	22.0°C
Label	**Value**
AR01 : max	102.9°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a primary connection (stirrup) on pole # ET6896.
Located at 4028 Belmont Road in Belmont.
Heating noted at the indicated stirrup connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

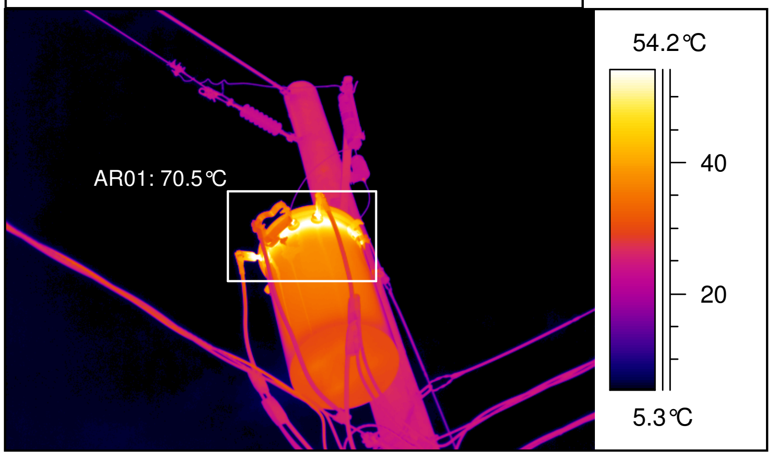
PRIORITY: **High** **Medium** **Low**

ANOMALY: Heating connection

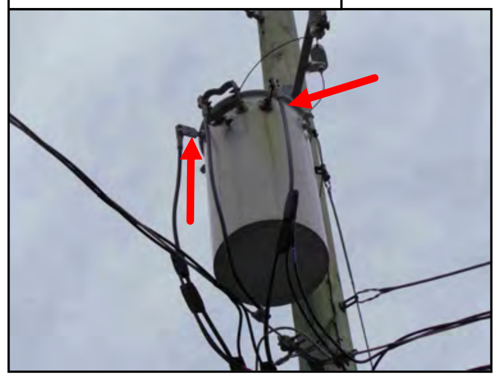
Identification:	DATE
TX O309, Pole # ET6480	**2014-06-18**

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 51.51 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	70.5°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer O309 on pole # ET6480.
Located at intersection of North Street East and York Street in Otterville.
Heating noted at all of the secondary connections and at the top of the transformer can (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

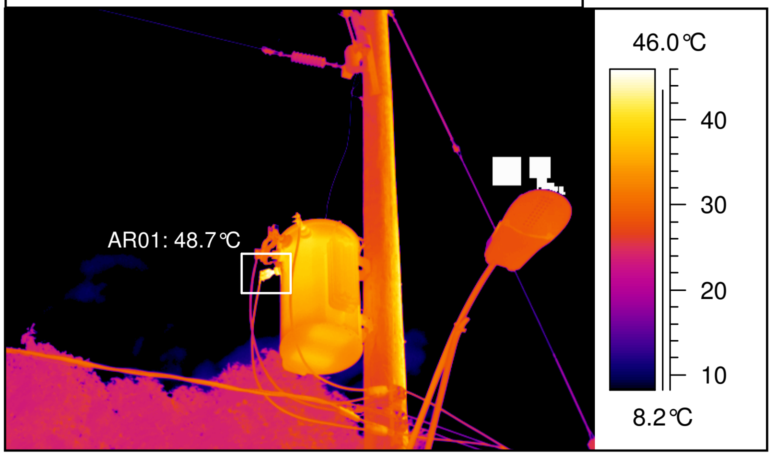
PRIORITY: **High** **Medium** **Low**

ANOMALY: Heating secondary connections

Identification:	DATE
Catherine Street	2014-06-17

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 23.70 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	25.0°C
Label	**Value**
AR01 : max	48.7°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of a transformer.
Located at the intersection of Catherine Street and George Street.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

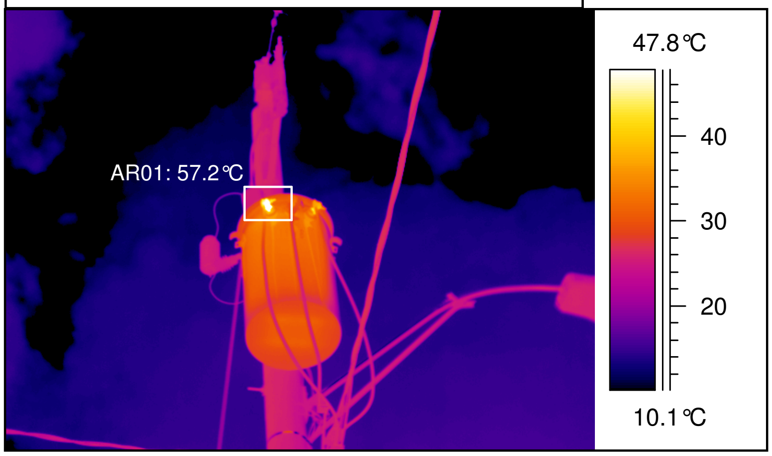
PRIORITY: High Medium **Low**

ANOMALY: Heating secondary connection

Identification:	DATE
TX 1018, Pole # ET3866	2014-06-17

Description: **Transformer**

INFRARED IMAGE	PHOTO



Temperature rise: 32.23 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	25.0°C
Label	**Value**
AR01 : max	57.2°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer 1018 on pole # ET3866.
Located on Kensington Avenue in Ingersoll.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

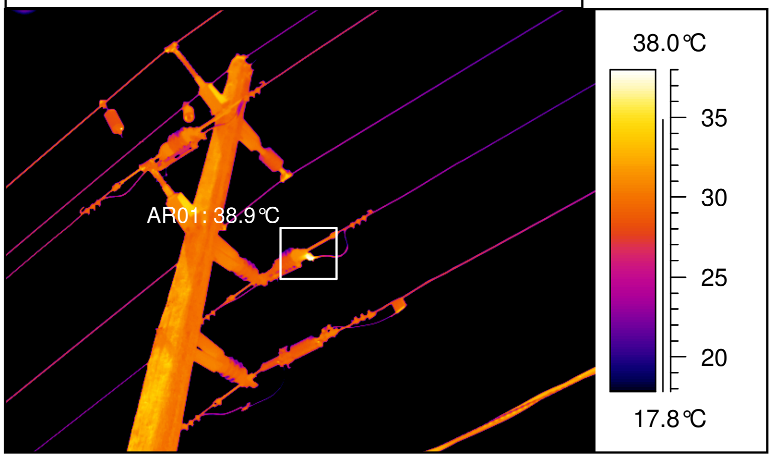
PRIORITY: High $\boxed{\text{Medium}}$ Low

ANOMALY: Heating secondary connections

Identification:	DATE
Pole # ET3732	2014-06-17

Description: **In-line switches**

INFRARED IMAGE



PHOTO

Temperature rise: 10.93 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	38.9°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the in-line switches on pole # ET3732.
Located at 155 Anne Street in Ingersoll.
Heating noted at the indicated connection on the top road-side switch (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

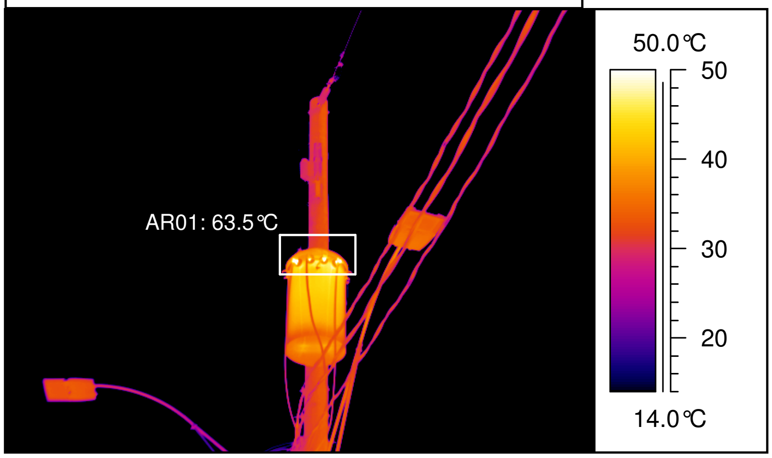
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

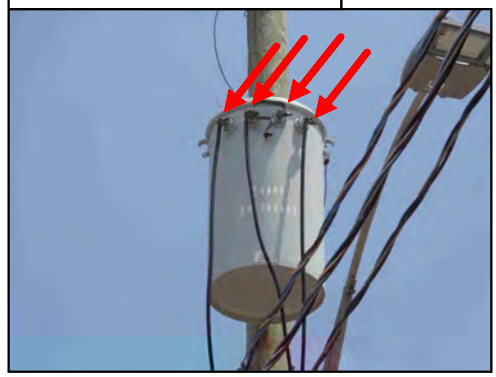
Identification:	DATE
TX 0626, Pole # ET4352	2014-06-17

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 35.47 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	63.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 0626 on pole # ET4352.
Located on Oxford Street parking, behind King in Ingersoll.
Heating noted at all of the secondary connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

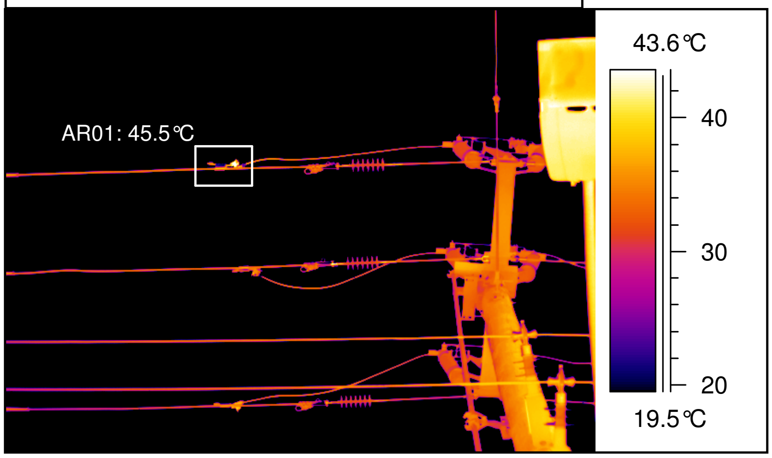
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

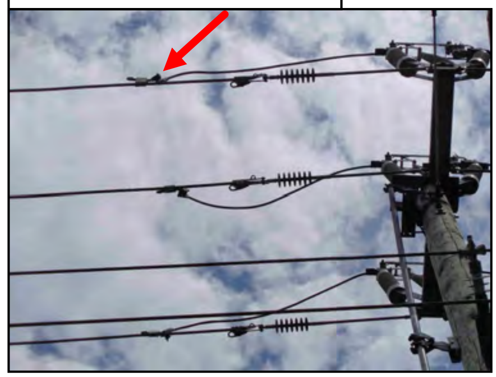
Identification:	DATE
IN 08, Pole # ET8135	2014-06-17

Description: **In-line switches**

INFRARED IMAGE



PHOTO



Temperature rise: 17.50 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	45.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the in-line switches IN08 on pole # ET8135.
Located on Thames Street South in Ingersoll.
Heating noted at the indicated connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

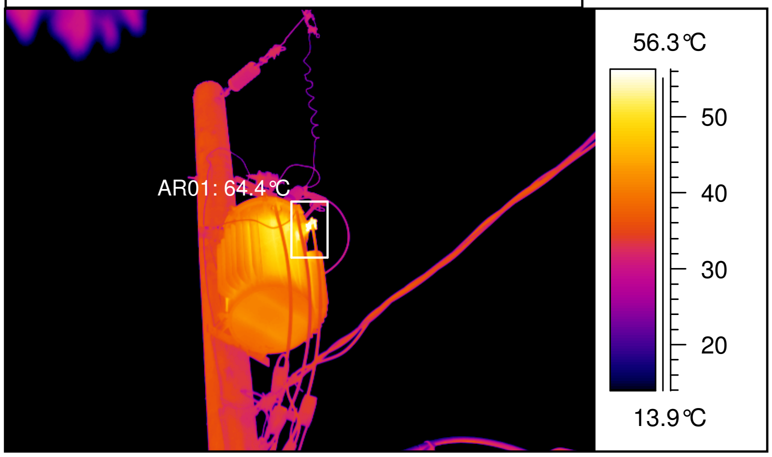
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

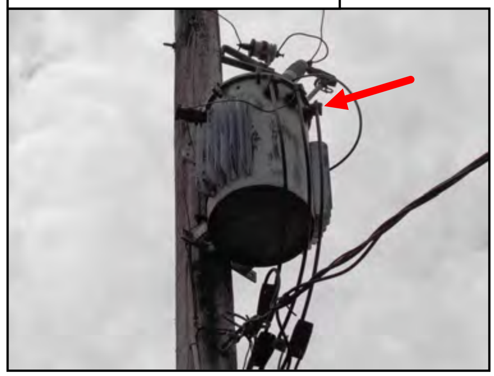
Identification:	DATE
TX 023, Pole # ET8167	2014-06-17

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 36.43 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	64.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 023 on pole # ET8167.
Located at intersection of Cottage Street and Thames Street South in Ingersoll.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

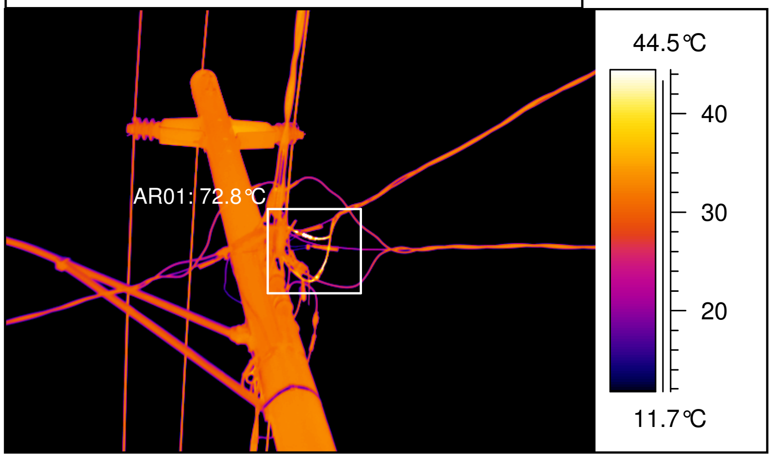
PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

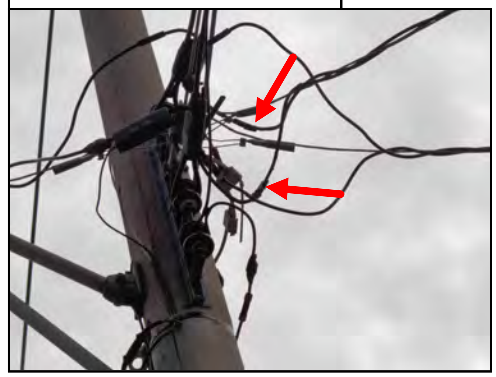
Identification:	DATE
Pole # ET4169	2014-06-17

Description: Service connections

INFRARED IMAGE



PHOTO



Temperature rise: 44.78 °C
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	72.8°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of service connections on pole # ET4169.
Located at 148 Caroll Street in Ingersoll.
Heating noted at the indicated service connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

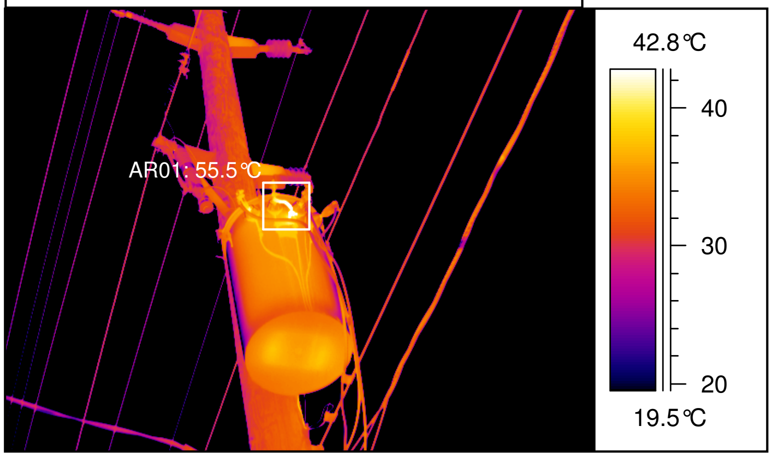
PRIORITY: High **Medium** Low

ANOMALY: Heating connections

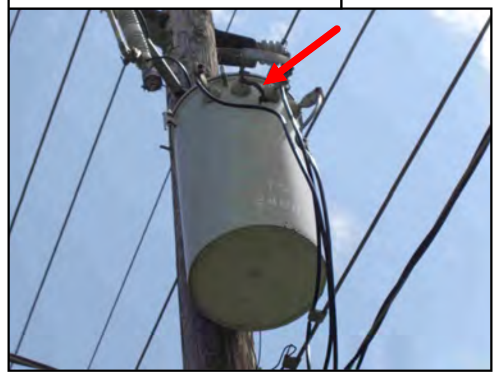
Identification:	DATE
TX 0161, Pole # 4138	2014-06-17

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 27.49 °C
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	55.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer 0161 on pole # ET4138.
Located at 272 Harris Street in Ingersoll.
Heating noted at the ground strap connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

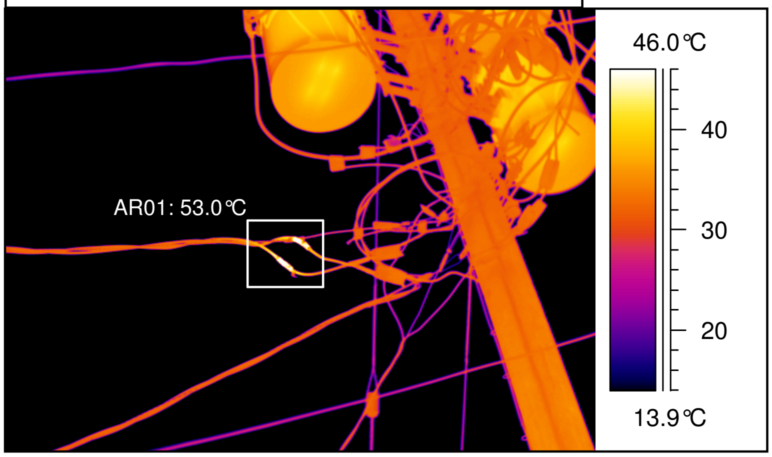
ANOMALY: Heating ground connection

Boldstar Infrared Services Inc.

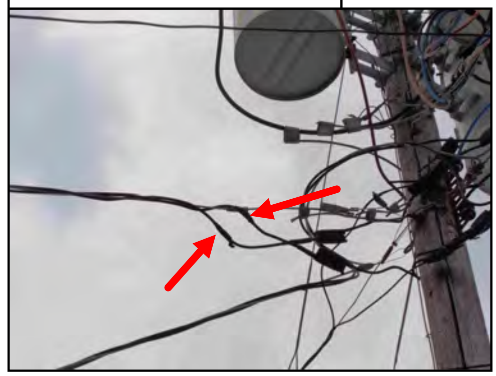
Identification:	DATE
TX 038, Pole # 4939	2014-06-17

Description: **Service connection**

INFRARED IMAGE



PHOTO



Temperature rise: 25.05 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-17
Object parameter	**Value**
Ambient temperature	28.0°C
Label	**Value**
AR01 : max	53.0°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of service connections on pole # ET4939.
Located on Thames Street South behind H&R Block in Ingersoll.
Heating noted at the indicated service connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

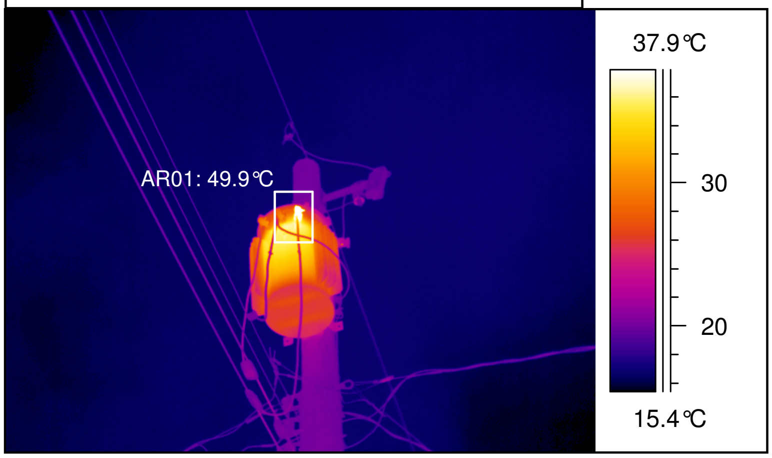
PRIORITY: High **Medium** Low

ANOMALY: Heating connections

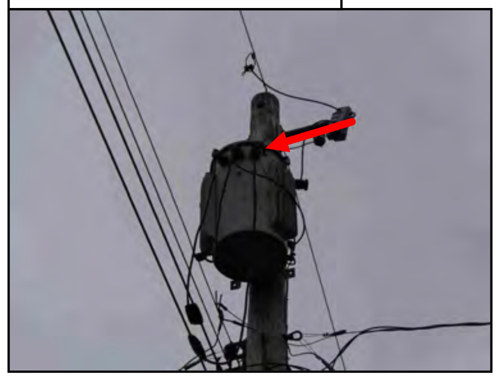
Identification:	DATE
TX B35, Pole # ET 0223	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 31.87 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	49.9°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer B35 on pole # ET0223.
Located at 434849 Zorra Line in Beachville.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

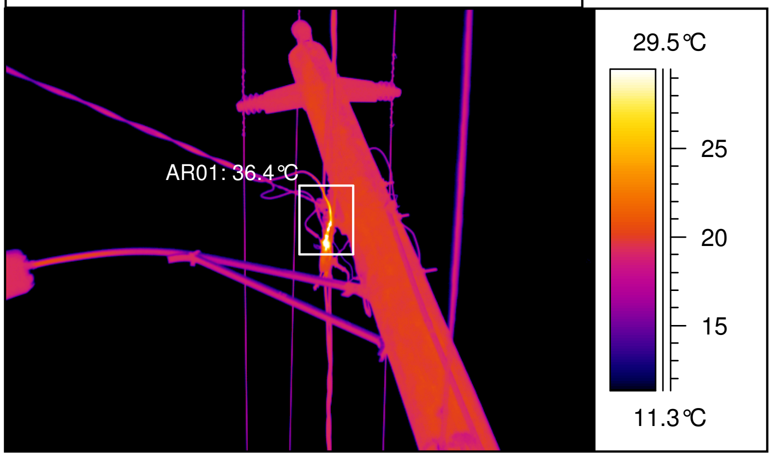
PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

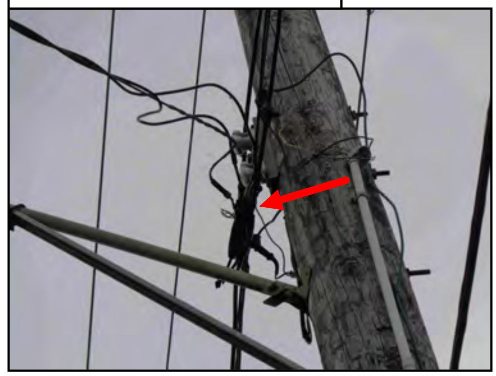
Identification:	DATE
Pole # ET8214	2014-06-18

Description: Service connection

INFRARED IMAGE



PHOTO



Temperature rise: 18.42 °C
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	36.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a service connection on pole # ET8214.
Located at 43 Beachville Road East in Beachville.
Heating noted at the indicated service connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

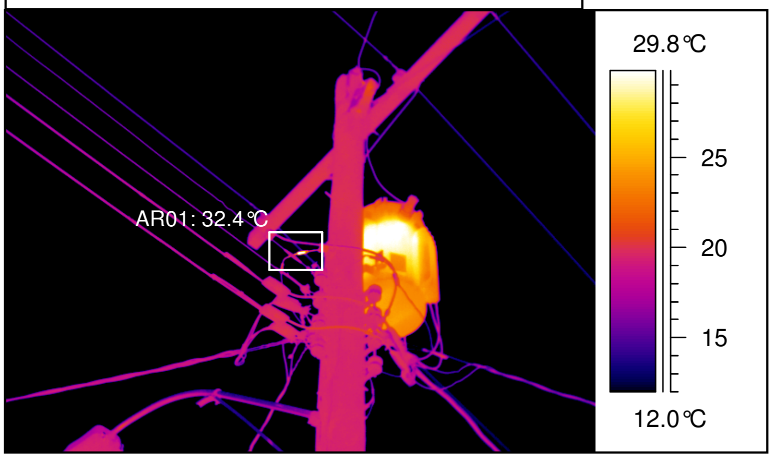
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX B11, Pole # ET8222	2014-06-18

Description: Service connection

INFRARED IMAGE



PHOTO

Temperature rise: 14.39 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	32.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of a service connection on pole # ET8222.
Located on Beachville Road East near the Library in Beachville.
Heating noted at the indicated service (insulink) connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

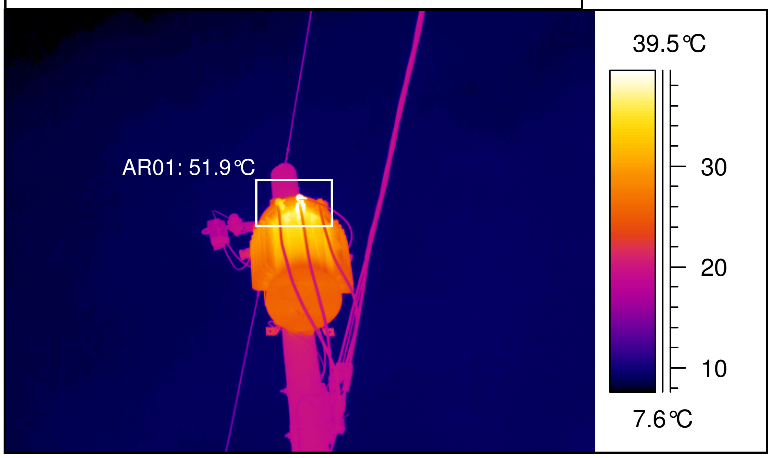
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

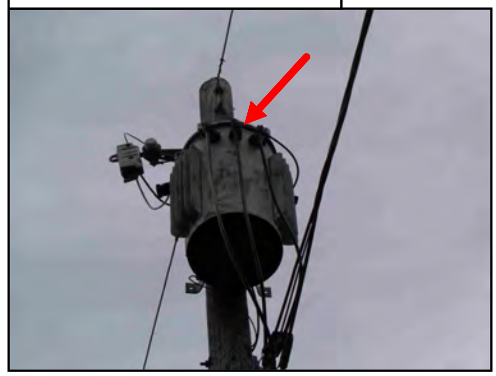
Identification:	DATE
TX B4, Pole # ET8255	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 33.86 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	51.9°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer B4 on pole # ET8255.
Located at 584429 Beachville Road West in Beachville.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

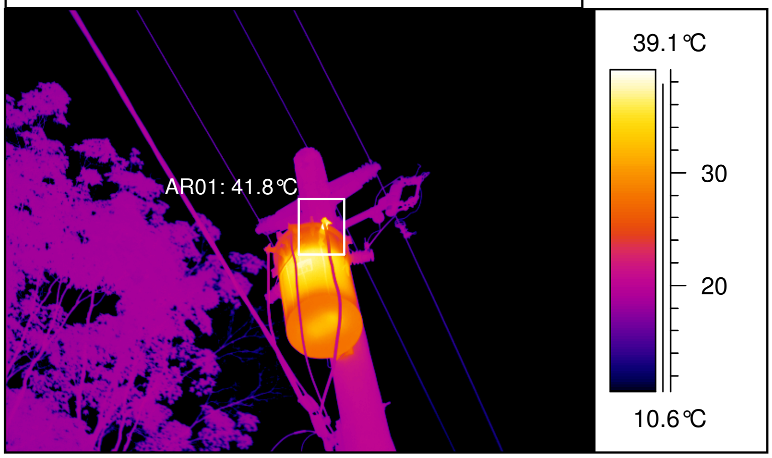
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

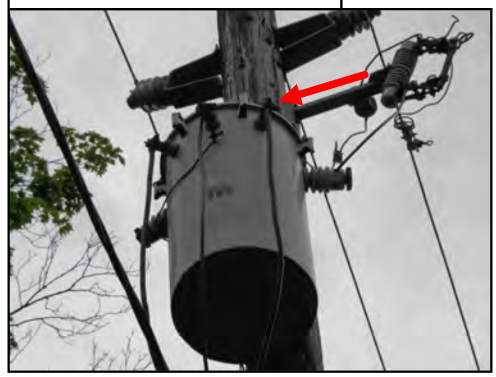
Identification:	DATE
TX B26, Pole # ET1446	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 23.81 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	41.8°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer B26 on pole # ET1446.
Located at 434741 West Mill in Beachville.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

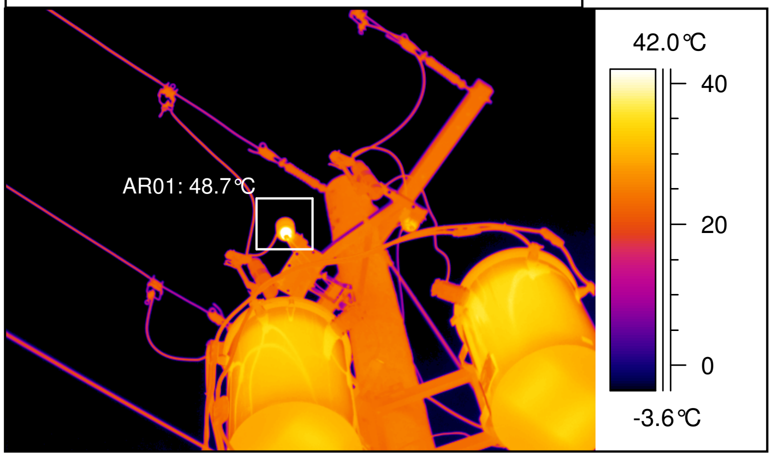
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

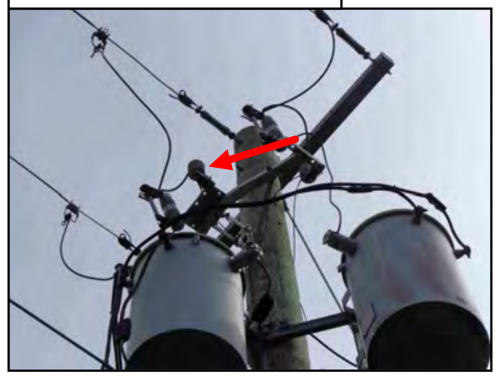
Identification:	DATE
TX O333, Pole # ET6464	2014-06-18

Description: **Lightning Arrestor**

INFRARED IMAGE



PHOTO



Temperature rise: 30.74 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	48.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformers O333 on pole # ET6464.
Located at intersection of Wellington Street and John Street in Otterville.
Heating noted at the middle arrestor (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

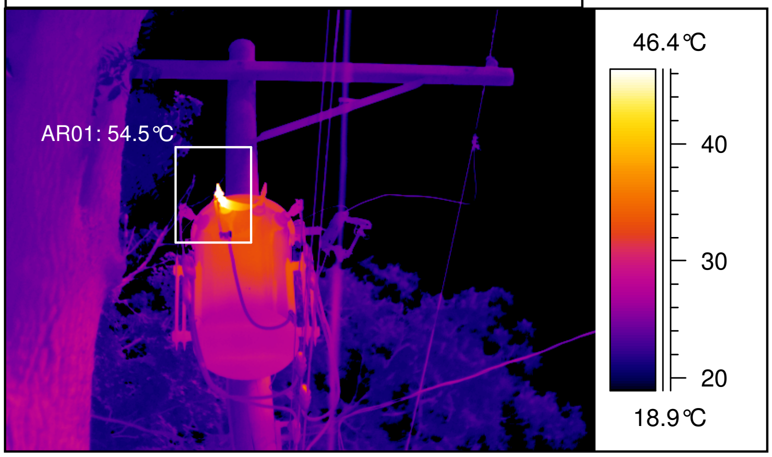
ANOMALY: Heating arrestor connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX O325, Pole # ET5917	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 35.50 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	54.5°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer O325 on pole # ET5917.
Located at 118 John Street South in Otterville.
Heating noted at the indicated neutral strap connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

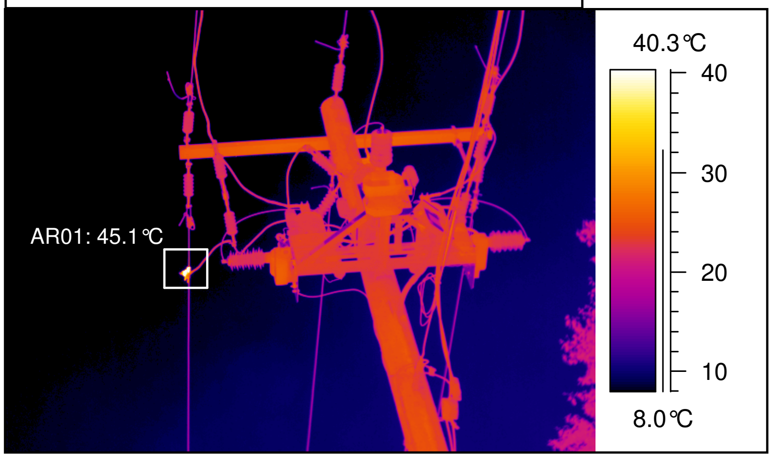
ANOMALY: Heating neutral connection

Boldstar Infrared Services Inc.

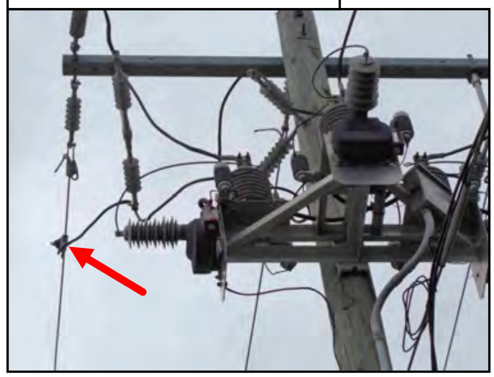
Identification:	DATE
Pole # ET6412	2014-06-18

Description: **In-line switches**

INFRARED IMAGE



PHOTO



Temperature rise: 26.06 °C
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	45.1°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the meter pole # ET6412.
Located at 303 Main Street East in Otterville.
Heating noted at the road-side primary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

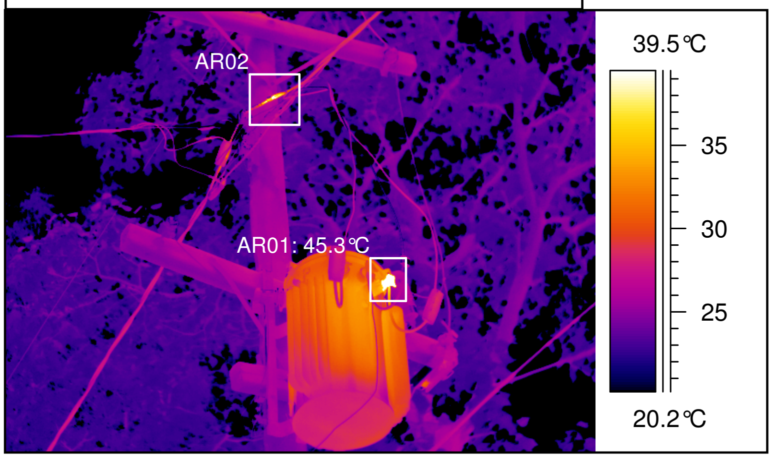
PRIORITY: High **Medium** Low

ANOMALY: Heating primary connection

Identification:	DATE
TX O349, Pole # ET5938	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 26.31 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	45.3°C
AR02 : max	42.6°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer O349 on pole # ET5938.
Located at 71 North Street West in Otterville.
Heating noted at the indicated secondary connection and service connection (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

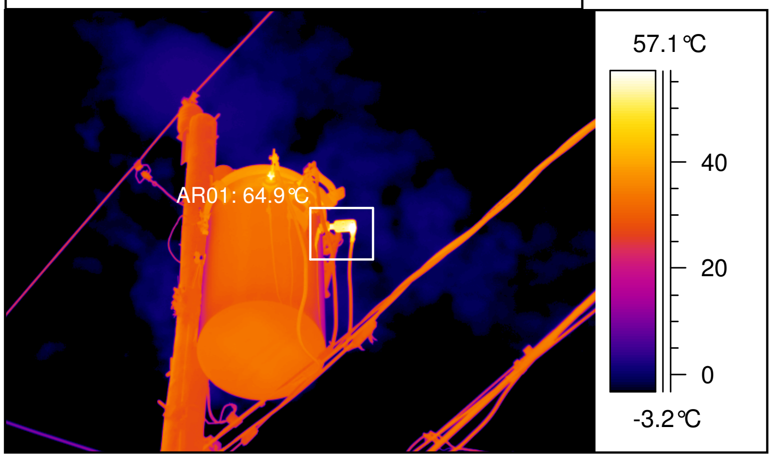
ANOMALY: Heating connections

Boldstar
Infrared Services Inc.

Identification:	DATE
TX N40, Pole # ET5702	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 41.91 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	64.9°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer N40 on pole # ET5702.
Located at 66 Stover Street in Norwich.
Heating noted at the indicated road side secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

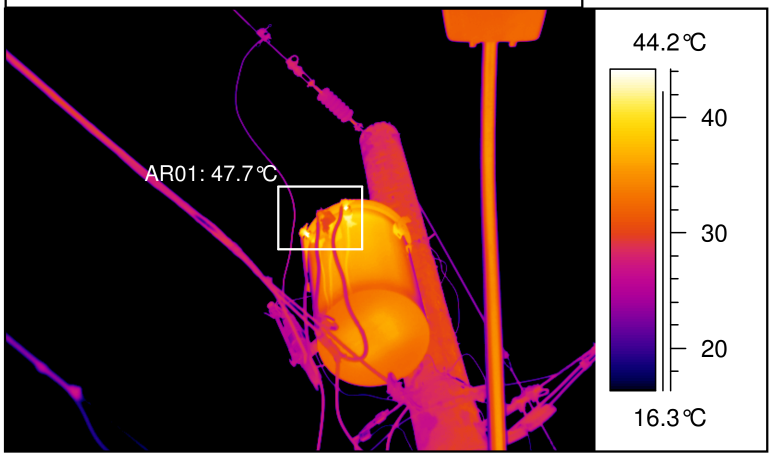
PRIORITY: High $\boxed{\text{Medium}}$ Low

ANOMALY: Heating secondary connection

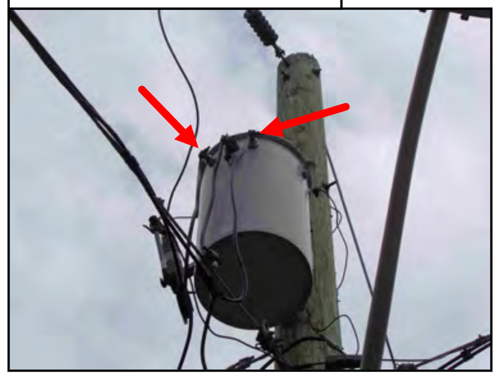
Identification:	DATE
TX N26, Pole # ET5355	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 24.75 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	47.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N26on pole # ET5355.
Located at intersection of Brode Street and John Street in Norwich.
Heating noted at the indicated secondary connections (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

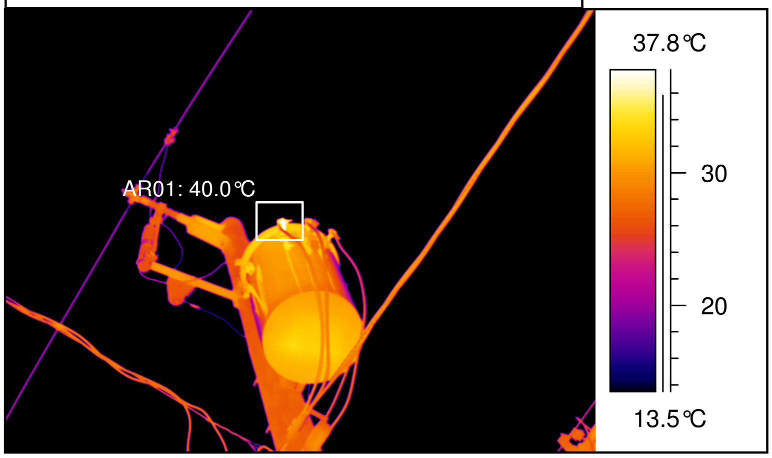
ANOMALY: Heating secondary connections

Boldstar Infrared Services Inc.

Identification:	DATE
TX N24, Pole # ET5361	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 16.96 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	40.0°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N24 on pole # ET5361.
Located at 25 John Street in Norwich.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

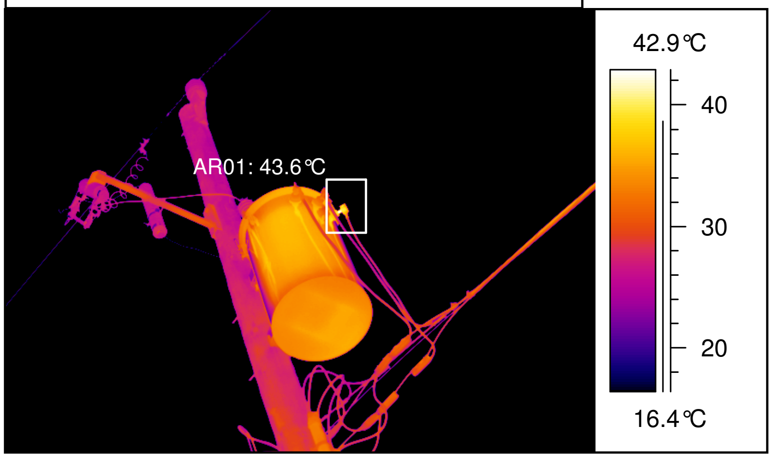
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

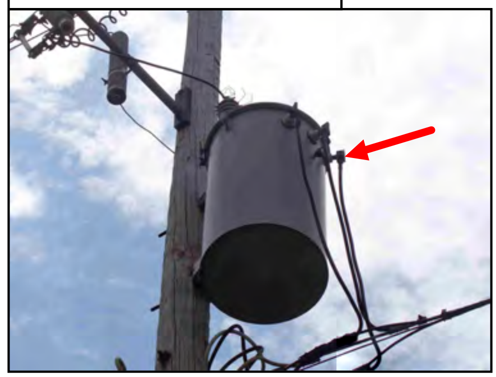
Identification:	DATE
TX N8, Pole # ET5293	2014-06-18

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 20.57 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-18
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	43.6°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer N8 on pole # ET5293.
Located at 27 Centre Street in Norwich.
Heating noted at the indicated field side secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

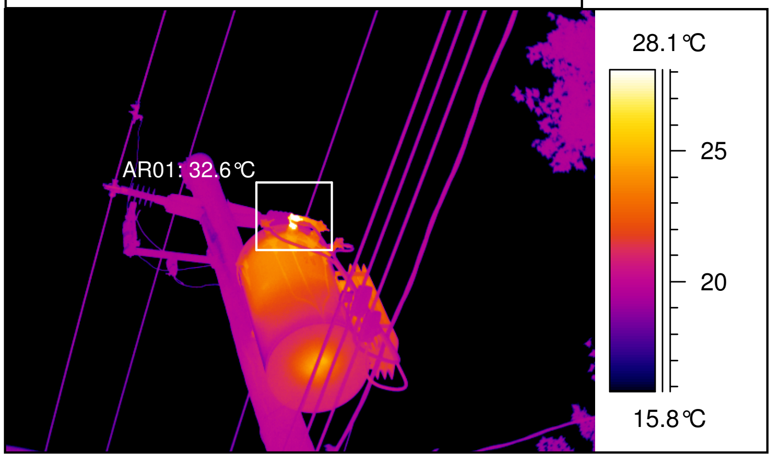
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

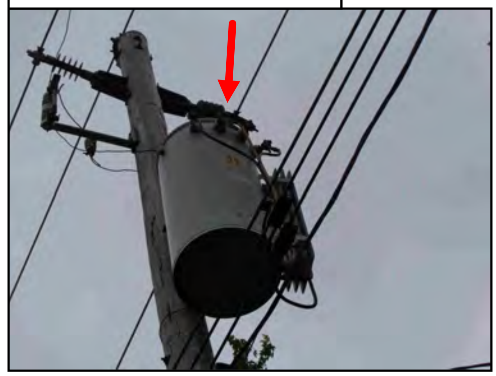
Identification:	DATE
TX A0245, Pole # ET0114	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 14.61 °C
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
AR01 : max	32.6°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer A0245 on pole # ET0114.
Located at 11 Forest Street in Aylmer.
Heating noted at the indicated neutral connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: **High** **Medium** **Low**

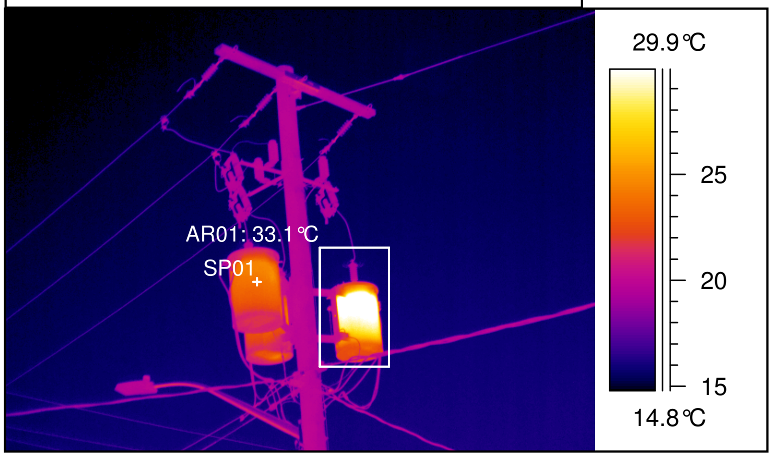
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

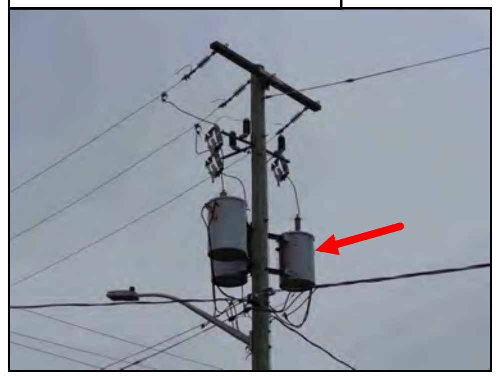
Identification:	DATE
TX A0188, Pole # ET0103	2014-06-19

Description: **Transformers**

INFRARED IMAGE



PHOTO



Temperature rise: 15.07 °C
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	18.0°C
Label	**Value**
SP01	24.0°C
AR01 : max	33.1°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer A0188 on pole # ET0103.
Located on Spruce Street in Aylmer.
Uneven transformer heating was noted.
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: **High** **Medium** **Low**

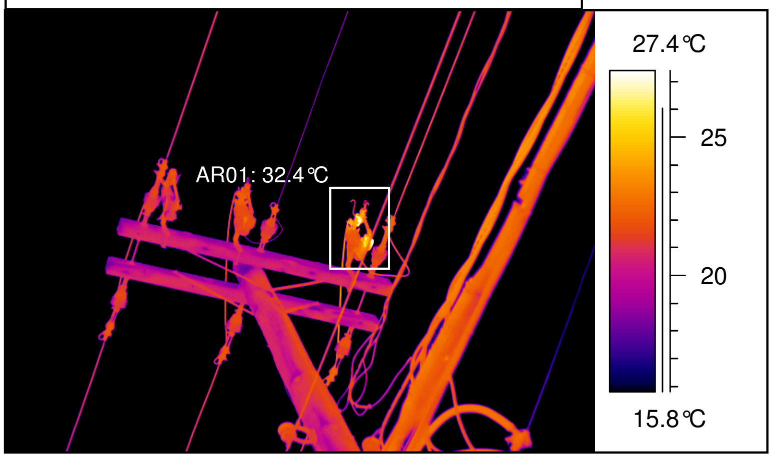
ANOMALY: Uneven heating

Boldstar Infrared Services Inc.

Identification:	DATE
TX AY34, Pole # ET0884	2014-06-19

Description: **Switches**

INFRARED IMAGE



PHOTO

Temperature rise: 13.41 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	19.0°C
Label	**Value**
AR01 : max	32.4°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the cut-out switches AY34 on pole # ET0884.
Located behind Optimist Club in Aylmer.
Heating noted at the top and bottom of the south switch (at arrows in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

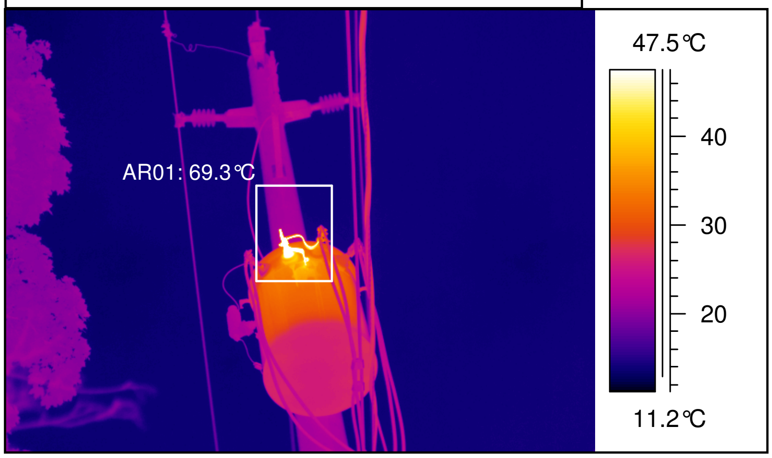
ANOMALY: Heating connections

Boldstar Infrared Services Inc.

Identification:	DATE
TX A0500, Pole # ET2708	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 49.30 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	20.0°C
Label	**Value**
AR01 : max	69.3°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer A0500 on pole # ET2708.
Located at 103 Sydenham Street in Aylmer.
Heating noted at the indicated ground connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

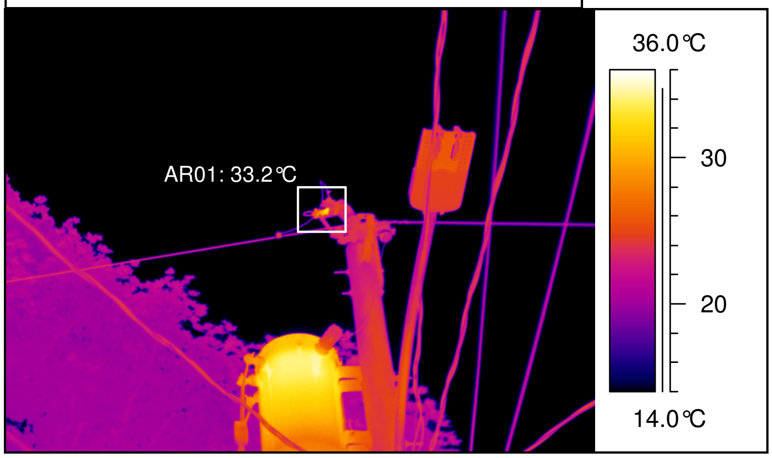
PRIORITY: High **Medium** Low

ANOMALY: Heating ground connection

Identification:	DATE
TX A0112, Pole # ET0477	2014-06-19

Description: **Cut-out switch**

INFRARED IMAGE



PHOTO

Temperature rise: 13.16 °C
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	20.0°C
Label	**Value**
AR01 : max	33.2°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the cut-out switch A0112 on pole # ET0477.
Located across 24 Street George Street in Aylmer.
Heating noted at the switch contacts (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

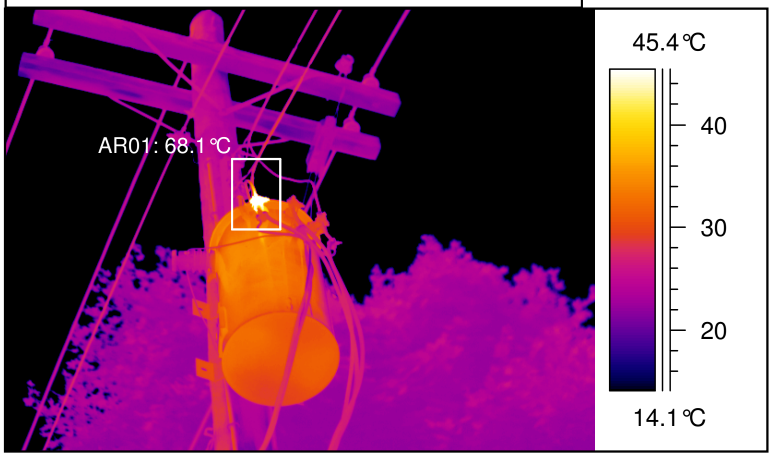
ANOMALY: Heating connection

Boldstar Infrared Services Inc.

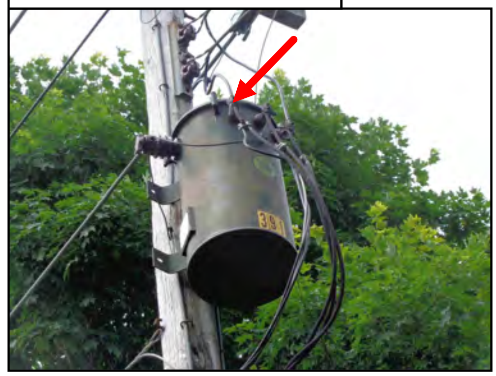
Identification:	DATE
TX A0185, Pole # ET0737	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 47.08 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	21.0°C
Label	**Value**
AR01 : max	68.1°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer A0185 on pole # ET0737.
Located at 120 Fourth Avenue in Aylmer.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

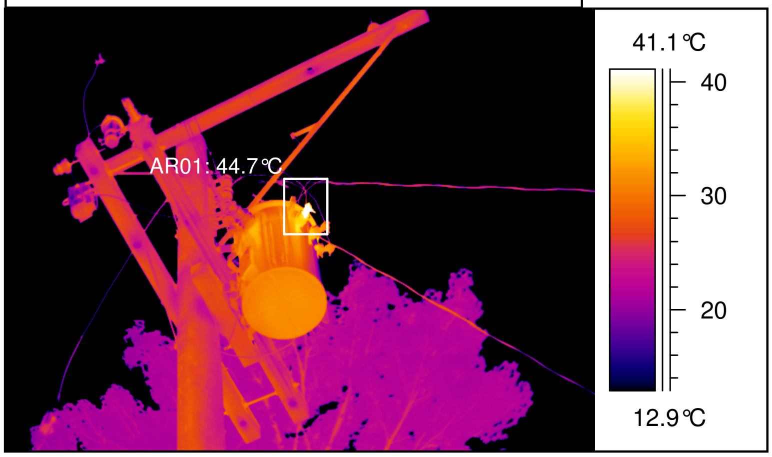
PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

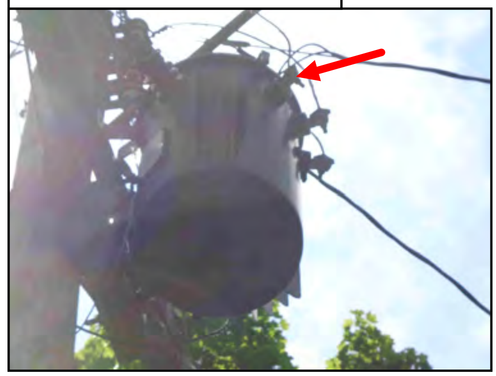
Identification:	DATE
TX PS21	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO



Temperature rise: 21.73 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	44.7°C

Status:

Repaired Date:

Notes:

INFORMATION:

Infrared image of the transformer PS021.
Located at 453 Front Street in Port Stanley.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High Medium **Low**

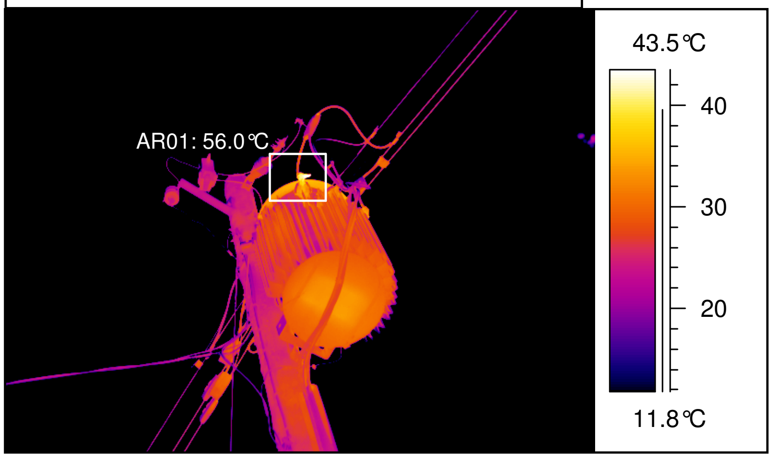
ANOMALY: Heating secondary connection

Boldstar Infrared Services Inc.

Identification:	DATE
TX PS84, Pole # 8542	2014-06-19

Description: **Transformer**

INFRARED IMAGE



PHOTO

Temperature rise: 33.00 ℃
(over ambient)

IR information	Value
Date of creation	2014-06-19
Object parameter	**Value**
Ambient temperature	23.0°C
Label	**Value**
AR01 : max	56.0°C

Status:
Repaired Date: Notes:

INFORMATION:

Infrared image of the transformer PS084, pole # ET8542.
Located at 214 Cornell Drive in Port Stanley.
Heating noted at the indicated secondary connection (at arrow in photo).
See IR information chart above for maximum temperature inside area box (AR01).

PRIORITY: High **Medium** Low

ANOMALY: Heating secondary connection

APPENDIX K - FLEET PLAN

Fleet Sustainment Plan

The following document has been created to examine Renewable Energy Generation within ETPL's service territories, identify any constraints limiting new connections and discuss expected investments as a result.

UPDATED:
May 2017

Contents

Executive Summary

ETPL currently has 10 large vehicles consisting of 7 bucket trucks and 3 RBD's, 16 small vehicles consisting of engineering, operations and metering vans, SUV's and pickup trucks along with 13 trailers and 2 forklifts.

ETPL uses vehicle age as the primary method for creating long term spending projections and then prioritizes replacements on a yearly basis based on condition, maintenance costs, failure risks, and utilization. The following illustrates the guidelines used to projecting replacements and is compared to the planned replacement age over the next 20 years.

	ETPL Replacement Guidelines	Planned Average Replacement Age
Large Vehicles:	12-15 years	**19.7**
Small Vehicles:	6-8 years	**10.8**
Trailers & Forklifts:	20 years	**29.7**

In general ETPL plans to replace one (1) large vehicle every two (2) years, approximately one (1) small vehicle every year, and approximately one (trailer) every three (3) years. This will result in an average fleet budget of $198,333 and will result in the following average ages as compared to the average age currently.

	Current Average Age	Planned Average Age
Large Vehicles:	8.3	**10.6**
Small Vehicles:	5.7	**7**
Trailers & Forklifts:	17.5	**17.4**

ETPL is satisfied with the current performance of our fleet and as a result are planning to slightly reduce the average yearly budget. This will result in a moderate increase in the average vehicle age across all classes however this is not anticipated to have an adverse effect on our ability to operate and maintain the distribution system.

Background

In 2010 the Ontario Energy Board (OEB) commissioned Kinetrics to analyze and study the useful life of Local Distribution Companies' assets. Findings from this report revealed that the useful life range for large utility trucks/bucket trucks are 5-15 years and pickups/vans are 5-10 years taking into account utilization and daily conditions under which the equipment operates.

ETPL first created a fleet sustainment plan in 2010 which created a road map for long term planning ensuring that we are able to provide safe, reliable hydro service to our customers. Erie Thames Powerlines service territory creates unique challenges with regards to fleet management due to the large geographic area that our communities span. Due to this fact, we operate three (3) operations centers with a driving distance of approximately one (1) hour between centers and two (2) hours from end to end. This makes sharing of fleet resources challenging and ETPL must own and maintain additional vehicles as compared to a contiguous LDC with a similar customer base. In addition, ETPL vehicles typically experience an increased number of kilometers, again due to the physical separation of each of our communities.

Optimal Large Vehicle Fleet

INGERSOLL	AYLMER	MITCHELL
65' Bucket	50' Bucket Truck	50' Bucket Truck
50' Bucket	36' Bucket Truck	42' Bucket Truck
42' Bucket	4047 Single Axle RBD With Bucket	4047 Single Axle RBD With Bucket
5048 Tandem Axle RBD	-	-

Existing Vehicle List

LARGE VEHICLES		
AYLMER		
05-07	47' single bucket mat.	2007
08-07	RBD single axle	2007
09-16	50' Double Bucket	2016
MITCHELL		
15-09	50' Double Buck Posi	2010
16-09	Terex 40-47 RBD	2009
17-07	42' single bucket	2007
INGERSOLL		
21-16	50' Double Bucket	2016
22-06	RBD Ing tandem axle	2006
23-05	42' single bucket	2005
28-14	65' Double Bucket	2014

SMALL VEHICLES		
AYLMER		
06-11	CHEV Silverado Pickup	2011
MITCHELL		
10-11	GMC Sierra Pickup	2011
12-14	2014 Silverado	2014
13-08	Dodge Ram 4X4	2008
14-10	Ford Pickup	2009
INGERSOLL		
01-12	Ford Escape	2012
03-02	1500 Yard Truck	2002
24-17	Metering Compact Van	2007
26-12	Ford Escape Hybrid	2012
29-11	GMC Sierra Pickup	2011
30-16	Chev Colorado	2016
31-11	GMC Terrain	2011
36-08	2500 4X4	2008
40-14	Cadillac SUV	2014
41-09	VUE Hybrid	2009
42-09	Nissan Murano	2009

TRAILERS		
AYLMER		
UT51	Utility Trailer - REEL	1991
PT53	Utility Trailer - POLE	1991
DT55	Dump Trailer	2007
52-01	Clark - FORKLIFT	2001
MITCHELL		
UT60	HMDE	1993
PT61-12	J&J - POLE TRAILER	2012
UT62	NA	1993
INGERSOLL		
TT52	York - TENSION TRAILER	1988
PT54	Utility Trailer - POLE UTEQ	2002
TT56	Timberland Tension - **New Engine 2017**	1993
TT58	Timberland Tension - **Painted 2017**	1989
TT59	Puller	1996
DT57	MISK-DMP	2014
50-09	CASE - BACKHOE	2009
51-14	Heli - FORKLIFT	2014

Long Term Fleet Plan

The large vehicles that are currently in service align with the optimal fleet for each operations center and therefore both small and large vehicles are simply in "maintenance" mode and are scheduled for replacement based on their end of life.

In order to complete long term planning, vehicle age is used as the primary indicator of replacement requirements. This allows ETPL to determine suitable spending requirements over a long period of time ensuring that we are able to create a relatively level investment schedule and avoid large increases and decreases year over year. With that being said, when prioritizing vehicles for replacement on a yearly basis we consider condition, maintenance costs, failure risks, and utilization (i.e. the oldest vehicles are not always replaced solely based on vehicle age.)

A snapshot of the current vehicle age is shown below:

	Average Age
Large Vehicles:	8.3
Small Vehicles:	5.7
Trailers & Forklifts:	17.5

The following indicates ETPL's current guidelines for vehicle useful life and indicates the average replacement age based on the long term replacement schedule. The guidelines used are within the range provided by Kinetrics in the Asset Depreciation Study for the Ontario Energy Board. Erie Thames planned replacement age will typically be older than the guideline in an attempt to keep spending as low as possible while still maintaining a fleet capable of efficiently managing the distribution system.

	ETPL Replacement Guidelines	**Planned Average Replacement Age**
Large Vehicles:	12-15 years	**19.7**
Small Vehicles:	6-8 years	**10.8**
Trailers & Forklifts:	20 years	**29.7**

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LARGE VEHICLE Replacement Schedule

#	VEHICLE DESCRIPTION	Year	Age	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
05-07	AYL - 47' single bucket mat.	2007	11	12	13	14	15	16	17	18	19	20	21	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1
08-07	AYL - RBD single axle	2007	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3
09-16	AYL - 50' Double Bucket	2016	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	1	2	3	4	5	6	7	8	9	10	11
15-09	MIT - 50' Double Buck Posi	2010	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
16-09	MIT - Terex 40-47 RBD	2009	9	10	11	12	13	14	15	16	17	18	19	20	21	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
17-07	MIT - 42' single bucket	2007	11	12	13	14	15	16	17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5
21-16	ING - 50' Double Bucket	2016	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13
22-06	ING - RBD Ing tandem axle	2006	12	13	14	15	16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7
23-05	ING - 42' single bucket	2005	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9
28-14	ING - 65' Double Bucket	2014	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		AVERAGE	**8.3**	**9.3**	**10.3**	**9.8**	**10.8**	**10.2**	**11.2**	**10.5**	**11.5**	**10.6**	**11.6**	**10.5**	**11.5**	**10.4**	**11.4**	**10.2**	**11.2**	**10.2**	**11.2**	**10.2**	**11.2**	**10.0**	**11.0**	**10.0**	**11.0**	**10.0**	**11.0**	**10.0**	**11.0**	**10.0**	**11.0**	**10.0**

Average Replacement Age: **19.7**

30 Year Average Age: **10.6**

SMALL VEHICLE Replacement Schedule

#	VEHICLE DESCRIPTION	Year	Age	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
01-12	Ford Escape	2012	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11
03-02	1500 Yard Truck	2002	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7
06-11	CHEV Silverado Pickup	2011	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
10-11	GMC Sierra Pickup	2011	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
12-14	2014 Silverado	2014	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11
13-08	Dodge Ram 4X4	2008	10	11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5
14-10	Ford Pickup	2009	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3
24-17	Metering Compact Van	2017	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
26-12	Ford Escape Hybrid	2012	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	1
29-11	GMC Sierra Pickup	2011	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	1
30-16	Chev Colorado	2016	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9
31-11	GMC Terrain	2011	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13
36-08	2500 4X4 (stores)	2008	10	11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5
40-14	Cadillac SUV	2014	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11
41-09	VUE Hybrid (Engineering)	2009	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
42-09	NISSAN MURANO	2009	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7
		AVERAGE	**5.7**	**6.7**	**6.3**	**7.3**	**6.8**	**7.8**	**7.3**	**8.3**	**6.8**	**7.8**	**6.2**	**7.2**	**6.6**	**7.6**	**6.9**	**7.9**	**6.4**	**7.4**	**6.0**	**7.0**	**6.5**

Average Replacement Age **10.8**

20 Year Average Age **7.0**

TRAILER Replacement Schedule

#	VEHICLE DESCRIPTION	Year	Age	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
UT51	Utility Trailer - REEL	1991	26	27	28	29	30	31	32	33	34	35	1	2	3	4	5	6
TT52	York - TENSION TRAILER	1988	29	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PT53	Utility Trailer - POLE	1991	26	27	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PT54	Utility Trailer - POLE UTEQ	2002	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
DT55	Dump Trailer	2007	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TT56	Timberland Tension - **New Engine 2017**	1993	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
TT58	Timberland Tension - **Painted 2017**	1989	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
TT59	Puller	1996	21	22	23	24	25	26	27	28	29	30	31	32	33	34	1	2
UT60	HMDE	1993	24	25	26	27	1	2	3	4	5	6	7	8	9	10	11	12
PT61-12	J&J - POLE TRAILER	2012	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
UT62	NA	1993	24	25	26	27	28	29	1	2	3	4	5	6	7	8	9	10
DT57	MISK-DMP	2014	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
50-09	CASE - BACKHOE	2009	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
51-14	Heli - FORKLIFT	2014	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
52-01	Clark - FORKLIFT	2001	16	17	18	19	20	21	22	23	24	25	26	27	1	2	3	4
			17.5	**16.5**	**15.7**	**16.7**	**15.9**	**16.9**	**16.0**	**17.0**	**18.0**	**19.0**	**17.7**	**18.7**	**17.9**	**18.9**	**17.6**	**18.6**

Average Replacement Age	**29.7**
15 Year Average Age	**17.4**

Financial Projections

The fleet replacement schedule has been aligned large and small vehicles and trailers to create a level spending requirement as outlined below.

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Large Vehicles	-	-	$275,000	-	$400,000	-	$275,000	-	$330,000	-	$330,000	-	$330,000	-	$335,000
Small Vehicles	-	$70,000	-	$70,000	-	$70,000	-	$105,000	-	$105,000	-	$70,000	-	$70,000	-
Trailers	$20,000	$20,000	-	$20,000	-	$20,000	-	-	-	$20,000	-	$20,000	-	$20,000	-
Total	**$20,000**	**$90,000**	**$275,000**	**$90,000**	**$400,000**	**$90,000**	**$275,000**	**$105,000**	**$330,000**	**$125,000**	**$330,000**	**$90,000**	**$330,000**	**$90,000**	**$335,000**

Average	$198,333

APPENDIX L - RENEWABLE ENERGY GENERATION (REG) PLAN

Renewable Energy Generation (REG) Plan

The following document has been created to examine Renewable Energy Generation within ETPL's service territories, identify any constraints limiting new connections and discuss expected investments as a result.

UPDATED:
July 13, 2017

Contents

Executive Summary

The following document has been created to examine Renewable Energy Generation (REG) within ETPL's service territories, identify any constraints limiting new connections and discuss expected investments as a result. ETPL has currently[1] connected 22.644475 MW of renewable energy generation as detailed below in **Table 1.**

Table 1: REG Summary

Status	Number of Generators	Total Generation MW (kW)	Technology
microFIT (<=10kW)			
Connected	81	0.751475 (751.475)	Solar
Pending	2	0.01592 (15.92)	Solar
Declined	7	0.0634 (63.4)	Solar
FIT (>10kW <=500kW)			
Connected	7	1.863	Solar
Pending	4	1.050	Solar
Declined	7	1.88	Solar
RESOP			
Connected	2	20	Solar
Pending	-	-	-
Declined	0	0	-
NET Metering			
Connected	1	30	Solar
Pending	1	10	Solar
Declined	0	0	-

It is expected that both NET metering and CHP uptake will increase within the next 5 years however is difficult to forecast at this time.

Existing constraints affect the ability to connect REG in Belmont as a result of upstream capacity constraints at the Buchanan TS. The F2 feeder from the Constance DS which supplies a portion of Clinton is also constrained as a result of the existing amount of generation connected within the ETPL service territory.

No financial investments are expected as a result of the constraints.

[1] Renewable Energy Connections (REG) updated as of July 13, 2017.

System Overview

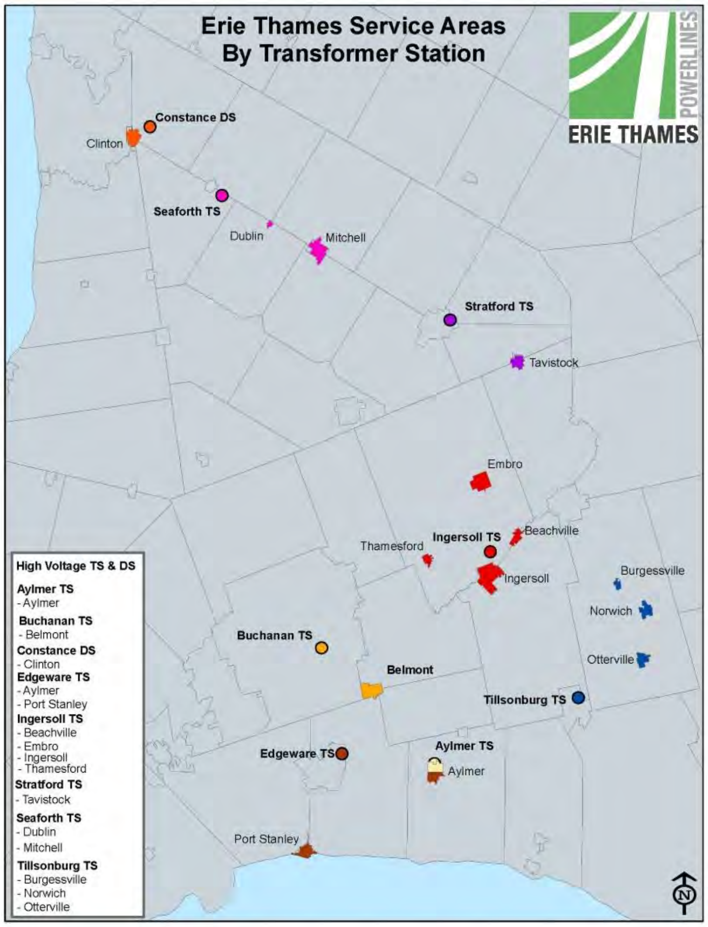
Each of ETPL's fourteen (14) municipalities are embedded and supplied from various Hydro One distribution circuit(s) with the Town of Aylmer having the only TX connected supply point. ETPL is supplied by seven (7) Transmission Stations, one (1) high voltage Distribution Station, and three (3) Distribution Stations owned and operated by Hydro One as detailed below.

Table 2: ETPL Supply Configuration

Municipality	Hydro One Supply Station	Feeder ID	Supply Voltage (kV)	Connection Level
Aylmer	Aylmer TS	M1	27.6Y/16	***TX***
	Aylmer TS	*Future - 2017*	*27.6Y/16*	*TX*
	Edgeware TS	M4	27.6Y/16	DX
Beachville	Ingersoll TS	M44	27.6Y/16	DX
Belmont	Buchanan TS	M21	27.6Y/16	DX
Burgessville	North Norwich DS (supplied by Tillsonburg TS)	F2 (Tillsonburg M3)	8.32Y/4.8	DX
Clinton	Constance DS	F2	27.6Y/16	DX
	Constance DS	F4	27.6Y/16	DX
Dublin	Dublin DS (supplied by Seaforth TS)	F1 (Seaforth M2)	8.32Y/4.8	DX
Embro	Ingersoll TS	M46	27.6Y/16	DX
Ingersoll	Ingersoll TS	M49	27.6Y/16	DX
	Ingersoll TS	M50	27.6Y/16	DX
	Ingersoll TS	M51	27.6Y/16	DX (dedicated to GM-CAMI)
	Ingersoll TS	M52	27.6Y/16	DX (dedicated to GM-CAMI)
Mitchell	Seaforth TS	M2	27.6Y/16	DX
Norwich	Tillsonburg TS	M3	27.6Y/16	DX
Otterville	Tillsonburg TS	M1	27.6Y/16	DX
	Otterville DS (supplied by Tillsonburg TS)	F1 (Tillsonburg M1)	8.32Y/4.8	DX
Port Stanley	Edgeware TS	M3	27.6Y/16	DX
Tavistock	Stratford TS	M7	27.6Y/16	DX
Thamesford	Ingersoll TS	M43	27.6Y/16	DS
	Ingersoll TS	M45	27.6Y/16	DS

Figure 1 below shows the location of each municipality relative to the respective Hydro One owned supply station.

Figure 1: ETPL Municipality Supply Stations



Each municipality has its own unique supply configuration with certain advantages and drawbacks with regards to voltage conversion, the ability to leverage smart grid technology and available supply options. ETPL owns and operates nine (9) municipal 4kV substations as listed below.

Table 3: Municipal Substations

Municipality	Station ID	# of Feeders
Aylmer	MS1	2
	MS2	4
Beachville	MS1	2
Clinton	MS1	3
Ingersoll	MS1	3
	MS3	3
Mitchell	MS1	1
Port Stanley	MS1	3
Tavistock	MS1	3

Existing REG Overview

ETPL has currently[2] connected 22.644475MW of renewable energy generation all of which is either ground or roof mounted solar, consisting of 81 microFIT, 7 FIT, 2 RESOP and 1 NET metering generators. To date ETPL has declined 14 generators due to Hydro One capacity constraints for a total of 1.9434MW.

Status	Number of Generators	Total Generation MW (kW)	Technology
microFIT (<=10kW)			
Connected	81	0.751475 (751.475)	Solar
Pending	2	0.01592 (15.92)	Solar
Declined	7	0.0634 (63.4)	Solar
FIT (>10kW <=500kW)			
Connected	7	1.863	Solar
Pending	4	1.050	Solar
Declined	7	1.88	Solar
RESOP			
Connected	2	20	Solar
Pending	-	-	-
Declined	0	0	-
NET Metering			
Connected	1	30	Solar
Pending	1	10	Solar
Declined	0	0	-

Table 4: REG Summary

* ETPL has also connected a 3800kW CHP load displacement generator.

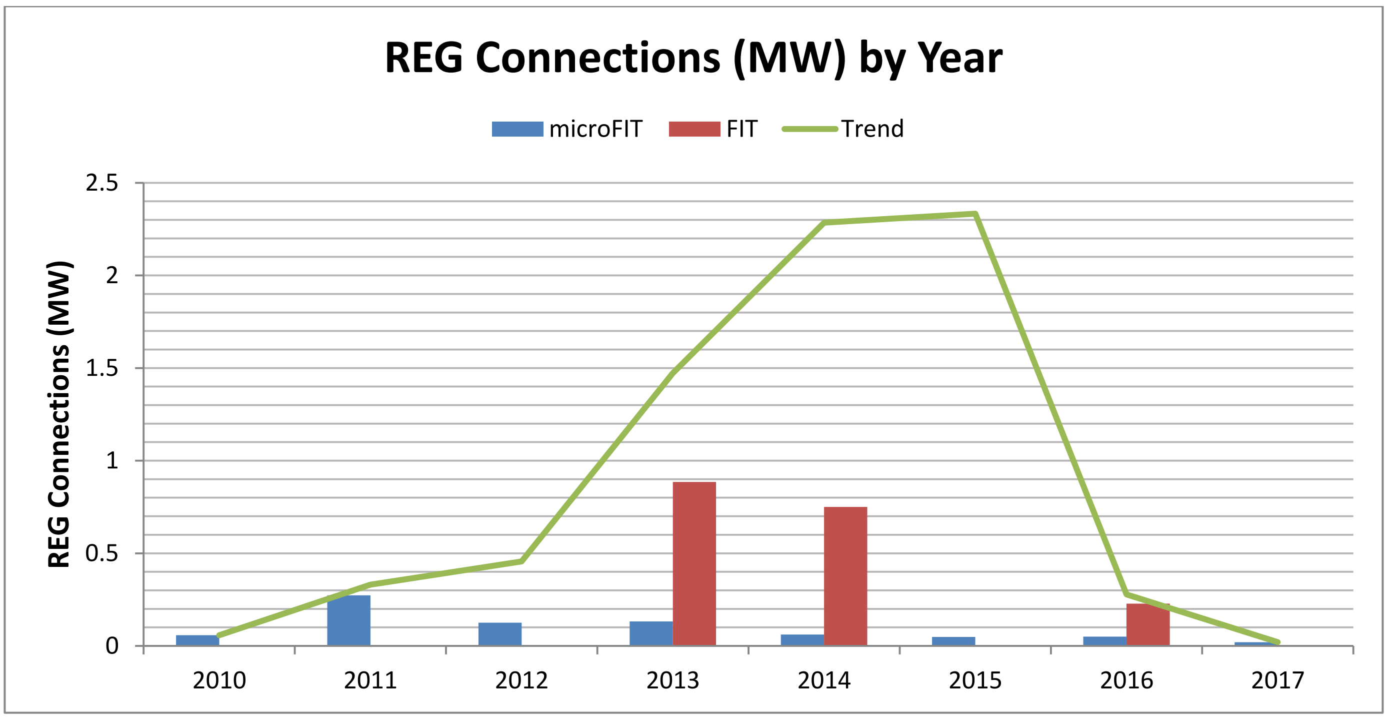
[2] Renewable Energy Connections (REG) updated as of July 13, 2017.

REG Forecast

ETPL connected the largest number of microFIT customers in 2011with 29 connections and has averaged approximately 9 connections per year since. This has however dropped drastically over the past two years with only a few new connections, which is expected to continue for the next number of years as behind the meter generation uptake increases.

Approximately 2-3 FIT generators were connected in both 2013 & 2014 with none connected in 2015. There are currently 4 applications totalling 1.050MW that have passed the pre-screening check and are expected to move forward.

Figure 2: REG Connections by Year



ETPL connected 2 - RESOP generators each totalling 10MW in 2012 & 2013 at a solar farm in Belmont. Currently ETPL is not aware of any other generation connections of this scale.

It is expected that both NET metering and CHP installations will become more common moving forward however at this point it is difficult to forecast both the volume and timing of these types of projects.

REG Capacity Considerations

Overview

There are a number of factors to take into consideration when evaluating the distribution systems ability to connect renewable energy generation (REG). These primarily include limits on the acceptable levels of short circuit contribution from generators and limits with respect to reverse power flows.

The first check that is typically completed looks at the capacity limits of the proposed Hydro One supply station which evaluates the Short Circuit Capacity and Thermal Capacity of the station. The Short Circuit Capacity is the maximum amount of short circuit contribution that a generator can add to a station bus before short circuit limits are exceeded. The Thermal Capacity is the estimated amount of generation that can be connected to a bus before exceeding the reverse flow limits.[3] A summary of the station capacity affecting ETPL is shown below:

Table 5: Upstream Constraints

Station	Feeder	Voltage (kV)	Minimum Load (MW)	Short Circuit Capacity (MVA)	Thermal Capacity (MW)
Aylmer TS	M1	27.6	3.2	397.4	23.2
Edgeware TS	M3	27.6	13.6	164.5	13.6
	M4	27.6	20.1	165.7	20.1
Ingersoll TS	M43, M49, M51	27.6	14.5	107.2	30.5
	M44, M46, M50, M52	27.6	12.2	107.6	28.2
* Buchanan TS	M21	27.6	24.4	111.5	49.4
Seaforth TS	M2	27.6	11.8	178.2	31.8
Tillsonburg TS	M1, M3	27.6	26.4	414.7	66.4
Stratford TS	M7	27.6	36.0	42.6	76.0
Constance DS	F2, F4	27.6	4.1	224.7	16.1
Norwich DS	F2	8.32	1.0	N/A	3.4
Dublin DS	F1	8.32	1.0	N/A	2.4
Otterville DS	F1	8.32	0.9	N/A	3.3

*When evaluating 10kW of solar generation on the M21 feeder using the HONI capacity calculator the project fails indicating a capacity constraint.

On a distribution level (i.e. feeder) any connection larger than 10kW requires a Connection Impact Assessment (CIA) which evaluates the effects on the distribution system. For a microFIT (<10kW) generator an embedded LDC must limit connections to 7% and 10% of the peak load of both 'F' and 'M' class feeders respectively.

ETPL also implements capacity limits for its 4kV stations based on a maximum loading of 200A per feeder; ETPL will reserve 25% of the maximum feeder capacity to be renewable generation. Therefore the maximum renewable generation allowed on each feeder will be a balanced 360kW.

[3] "Hydro One List of Station Capacity." Hydro One, accessed July 13, 2017, http://www.hydroone.com/Generators/Documents/HONI_LSC.PDF

Each service territory has its own unique supply configurations which determine the ability to connect renewable generation in each municipality. A summary of the connected DG and available capacity in each municipality has been detailed below.

Town of Aylmer

The Town of Aylmer currently has two (2) 28kV feeders; the M1 from the Aylmer TS (the only TX connected supply point) and the M4 from the Edgeware TS. The M1 comes into the north end of Aylmer and supplies the Erie Thames owned 4kV municipal station MS1, along with a number of customers directly connected to the 28kV system. The M4 feeder enters the south end of Aylmer and supplies the Erie Thames owned 4kV municipal station MS2 and also has customers connected directly to the 27.6kV system.

Table 6: Aylmer TS M1 - Connections & Capacity

Aylmer TS M1	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Aylmer TS - M1 (28kV)			397.4	23.2	NO Constraints	N/A
microFIT	1	0.01 (10kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F1 (4kV - Forest)						NO Constraints
microFIT	2	0.01836 (18.36kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F2 (4kV - Forest)						NO Constraints
microFIT	2	0.01989 (19.89kW)				
FIT	0	0				
RESOP	0	0				

Table 7: Edgeware TS M4 - Connections & Capacity

Edgeware TS M4	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Edgeware TS M4 (28kV)			165.7	20.1	NO Constraints	N/A
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS2 - F1 (4kV - McBrien)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS2 - F2 (4kV - McBrien)						NO Constraints
microFIT	0	0				

FIT	0	0				
RESOP	0	0				
MS2 - F3 (4kV - McBrien)						NO Constraints
microFIT	2	0.019 (19.9kW)				
FIT	0	0				
RESOP	0	0				
MS2 - F4 (4kV - McBrien)						NO Constraints
microFIT	1	0.01 (10kW)				
FIT	0	0				
RESOP	0	0				

Beachville

The town of Beachville is supplied from an ETPL owned 4kV substation which is supplied by the Hydro One Ingersoll TS M44 feeder.

Table 8: Ingersoll TS M44 - Connections & Capacity

Ingersoll TS M44	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
MS1 - F1 (4kV)			107.6	28.2	NO Constraints	NO Constraints
microFIT	1	0.0988 (9.88kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F2 (4kV)						NO Constraints
microFIT	1	0.01 (10kW)				
FIT	0	0				
RESOP	0	0				

Belmont

The town of Belmont is supplied from the Hydro One owned Buchanan M21 feeder at 28kV. The feeder enters from the north end of town with approximately 50% of customers connected directly to the 28kV system. The other half are supplied by the Hydro One owned 8kV Belmont DS at the south end of town which is supplied by the M21 feeder. The town also has a 20MW solar farm connected to the M21 feeder.

Table 9: Buchanan TS M21 - Connections & Capacity

Buchanan TS M21	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Buchanan TS - M21 (28kV)			108.2	28.2	NO Constraints	N/A
microFIT	2	0.013 (13kW)				
FIT	0	0				
RESOP	2	20				

Belmont DS - F1 (8kV)			111.5	49.4		N/A
microFIT	0	0				
FIT	0	0				
RESOP	0	0				

Burgessville

Burgessville is supplied with a single 8kV feeder from the Hydro One owned Norwich DS.

Table 10: Norwich DS F2 - Connections & Capacity

Norwich DS F2	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Norwich DS - F2 (8kV)			N/A	3.4	NO Constraints	N/A
microFIT	0	0				
FIT	0	0				
RESOP	0	0				

Clinton

The town of Clinton is supplied by two (2) 28kV feeders from the Hydro One Constance DS. The F2 feeder enters the north end of town and supplies the ETPL owned 4kV substation MS1, along with a number of customers directly connected to the 28kV feeder. The F4 feeder enters the south end of town and has a number of customers directly connected to the feeder at 28kV.

Table 11: Constance DS - Connections & Capacity

Constance DS	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Constance DS - F2 (28kV)			224.7	16.1	CONSTRAINED	N/A
microFIT	0	0				
FIT	2	0.5 (500kW)				
RESOP	0	0				
MS1 - F1 (4kV)						NO Constraints
microFIT	1	0.01 (10kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F2 (4kV)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS1 - F3 (4kV)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				

Constance DS - F4 (28kV)						
microFIT	10	0.1 (100kW)	224.7	16.1	NO Constraints	N/A
FIT	0	0				
RESOP	0	0				

Dublin

Dublin is supplied with a single 8kV feeder from the Hydro One owned Dublin DS.

Table 12: Dublin DS - Connections & Capacity

Dublin DS F1	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Dublin DS - F1 (8kV)						
microFIT	0	0	N/A	2.4	NO Constraints	N/A
FIT	0	0				
RESOP	0	0				

Embro

Embro is supplied from the Ingersoll TS M46 feeder at 28kV.

Table 13: Ingersoll TS M46 - Connections & Capacity

Ingersoll TS M46	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Ingersoll TS - M46 (28kV)						
microFIT	8	0.0729 (72.9kW)	107.6	28.2	NO Constraints	N/A
FIT	0	0				
RESOP	0	0				

Town of Ingersoll

The Town of Ingersoll is supplied with four (4) 28kV feeders from the Hydro One Ingersoll TS. The M49 and M50 feeders supply the town while the M51 & M52 are dedicated to the GM-CAMI facility. ETPL has two (2) 4kV municipal stations, MS1 and MS3, which are tied and able to provide redundancy to each other.

Table 14: Ingersoll TS M50 - Connections & Capacity

Ingersoll TS M50	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Ingersoll TS M50 (28kV)			107.6	28.2	NO Constraints	N/A
microFIT	6	0.05342 (53.42kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F1 (4kV - Mill)						NO Constraints
microFIT	2	0.019675 (19.675kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F2 (4kV - Mill)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS1 - F3 (4kV - Mill)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS2 - F1 (4kV - Holcroft)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS2 - F2 (4kV - Holcroft)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS2 - F3 (4kV - Holcroft)						NO Constraints
microFIT	2	0.01264 (12.64kW)				
FIT	0	0				
RESOP	0	0				

Table 15: Ingersoll TS M49 - Connections & Capacity

Ingersoll TS M49	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Ingersoll TS - M49 (28kV)			107.2	30.5	NO Constraints	N/A

microFIT	18	0.15811 (158.11kW)				
FIT	4	1.188				
RESOP	0	0				

Mitchell

Mitchell is supplied by the M2 feeder from the Hydro One Seaforth TS at 28kV. The majority of the town is connected to the 28kV system, however a small portion remains connected to the 4kV system supplied from the ETPL owned MS2.

Table 16: Seaforth TS M2 - Connections & Capacity

Seaforth TS M2	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Seaforth TS - M2 (28kV)			178.2	31.8	NO Constraints	N/A
microFIT	6	0.0598 (59.8kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F1 (4kV)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				

Norwich

Norwich is currently supplied with the 28kV - M3 feeder originating from the Hydro One Tillsonburg TS. ETPL does not have a municipal station in the town.

Table 17: Tillsonburg TS M3 - Connections & Capacity

Tillsonburg TS M3	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Tillsonburg TS - M3 (28kV)			414.7	66.4	NO Constraints	N/A
microFIT	3	0.03 (30kW)				
FIT	0	0				
RESOP	0	0				

Otterville

Otterville is supplied primarily from the Hydro One owned Otterville DS via an 8kV feeder. A small portion of town is supplied from the 28kV M1 orginating from the Hydro One Tillsonburg TS and voltage conversion will continue from this supply point eventually eliminating all 8kV connected customers.

Table 18: Tillsonburg TS M1 - Connections & Capacity

Tillsonburg TS M1	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Tillsonburg TS - M1 (28kV)			414.7	66.4	NO Constraints	N/A
microFIT	0	0				
FIT	0	0				
RESOP	0	0				

Table 19: Otterville DS F1 - Connections & Capacity

Otterville DS F1	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Otterville DS - F1 (8kV)			N/A	3.3	NO Constraints	N/A
microFIT	0	0				
FIT	0	0				
RESOP	0	0				

Port Stanley

Port Stanley is supplied from the M3 feeder from the Edgeware TS at 28kV. ETPL owns and operates a 4kV substation, MS1, within the town which is supplied from the M3 feeder. Approximately half of the town has been converted and is supplied from the 28kV system.

Table 20: Edgeware TS M3 - Connections & Capacity

Edgeware TS M3	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Edgeware TS M3 (28kV)			164.5	13.6	NO Constraints	N/A
microFIT	2	0.02 (20kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F1 (4kV)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS1 - F2 (4kV)						NO Constraints
microFIT	1	0.0057 (5.7kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F3 (4kV)						NO

microFIT	0	0				Constraints
FIT	0	0				
RESOP	0	0				

Tavistock

Tavistock is supplied from the M7 feeder originating from the Stratford TS at 28kV. ETPL owns and operates a 4kV substation, MS1, in the town which is supplied from the M7 feeder. Approximately half of the town has been converted and is supplied from the 28kV system.

Table 21: Stratford TS M7 - Connections & Capacity

Stratford TS M7	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Stratford TS M7 (28kV)			42.6	76.0	NO Constraints	N/A
microFIT	4	0.03848 (38.48kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F1 (4kV)						NO Constraints
microFIT	0	0				
FIT	0	0				
RESOP	0	0				
MS1 - F2 (4kV)						NO Constraints
microFIT	1	0.00984 (9.84kW)				
FIT	0	0				
RESOP	0	0				
MS1 - F3 (4kV)						NO Constraints
microFIT	1	0.01 (10kW)				
FIT	0	0				
RESOP	0	0				

Thamesford

Thamesford is supplied from the Ingersoll TS M43 feeder at 28kV. ETPL does not have a municipal substation and therefore all customers are connected to the 28kV system.

Table 22: Ingersoll TS M43 - Connections & Capacity

Ingersoll TS M43	Number of Generators	Connected Generation (MW)	Hydro One TX Station Capacity		Hydro One DX Feeder Capacity	ETPL Station Capacity
			Short Circuit Capacity (MVA)	Thermal Capacity (MW)	microFIT 7% & 10% Rule	
Ingersoll TS - M43 (28kV)			107.2	30.5	NO Constraints	N/A
microFIT	2	0.01987 (19.87kW)				
FIT	0	0				
RESOP	0	0				

Constraints & Investment Expectations

As detailed above there are a number of system constraints that limit REG connections in certain service territories for ETPL customers. The following service territories are constrained as a result of Hydro One station capacity limits:

- Belmont

As per OEB requirements ETPL actively participates in the Regional Planning process and has identified concerns regarding the constraints at both the Aylmer TS and Tillsonburg TS. The Regional Infrastructure Plan for the region has recently commenced and options will be discussed moving forward; ETPL does not expect any capital expenditure as a result.

ETPL has also exceeded 7% of the peak loading requirement for microFIT connections in Clinton on the F2 feeder from the Constance DS. This will result in ETPL not being able to connect microFIT generation to the feeder moving forward. Due to the nature of this constraint ETPL again does not expect any capital expenditure into the system as a result.

APPENDIX M - 2018 CAPITAL PROJECT SUMMARIES

2018 - Project Assessment Form

Project Name	ALL-AUTOMATION-System Automation	Municipality	ALL
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description	This project represents costs associated with various smart grid initiatives aiming to improve distribution system automation. This includes the implementation of remotely operated automated switches at strategic locations throughout the service territory, remotely monitored fault indicators, and communications equipment used to connect these devices to the existing SCADA system. In 2018 Erie Thames plans to continue to scale back its System Automation budget from previous years as a result of now having both the SCADA and OMS systems implemented. We now intend to continue to implement smaller scale improvements such as automated switches, fault indicators and bringing more information into SCADA from wholesale metering points.	
Investment Category	System Service	
Capital Investment	Gross Capital	$90,000
	Customer Contribution	$0
	Net Capital	$90,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	ALL
	Customer Load (if available)	ALL
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	20%
	Q2	30%
	Q3	30%
	Q4	20%
Risks and Mitigation	There are minimal risks associated with these types of projects however system automation type projects are relatively new to ETPL and often times do not fall under standardized practices. As a result it is extremely important that the proper due diligence is completed prior to choosing and implementing system automation solutions ensuring that benefits to customers are maximized.	
Comparative Information	Due to the variability and early stages of system automation type projects it is difficult to compare with previous projects. ETPL has previously implemented fault indicators and has a good understanding of the costs, and resource requirements.	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

<u>Efficiency, Customer Value & Reliability</u>

Project Drivers	The primary driver for all system automation type projects is to maximize operational and reliability benefits leveraging advances in distribution technology. Ultimately it will lead to reduced outage frequency and duration and will drive operational efficiency allowing the system to be monitored and controlled remotely. ETPL operates the distribution system spanning a large geographical area; implementation of system automation will provide real

	time feedback and control of the system to utilize resources more efficiently.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP.
Project Alternatives	On a high level the alternative to investing in system automation is to do nothing and maintain the status quo. This alternative will lead to a decrease in customer satisfaction resulting in more frequent and longer outages for customers who value reliability as a top priority moving forward. On a more granular level each type of system automation solution, whether it is automated switches, or fault indicators have alternative manufacturers, varying capabilities and varying costs. Each solution is evaluated based on these criteria and implemented to maximize the benefits to the distribution system in line with customer preferences.
Operational Benefits	Automating the distribution system will allow for remote operation of strategic switching points allowing staff to be directed quickly to system issues rather than switching procedures. The installation of remotely monitored fault indicators will provide data to ETPL to help identify issues and provide the ability to focus resources directly to the issue; resulting in less time patrolling lines to find issues.
Reliability Benefits	System automation will result in reduced outage duration through quicker load transfers and the ability to better sectionalize the system. It will also result in customers experiencing a momentary outage as opposed to a sustained outage that would be seen with a manually operated system.
Customer Benefits	Customers will experience shorter and fewer sustained outages as a result of the system being able to “self-heal” and sectionalize to affect the smallest number of customers. It will also provide more data to staff allowing for more detailed and timely communication to customers.
<u>Safety</u>	System automation type projects do not look to address specific safety issues however remotely operated switches will result in less exposure to manual switching operations which is most often done in less than favourable outage scenarios (i.e. storm & fault conditions)
<u>Cyber-Security, Privacy</u>	Various security and privacy measure will be implemented; ETPL is involved in industry working groups and will look to implement and maintain cyber security measures as they evolve within the industry.
<u>Co-ordination, Interoperability</u>	ETPL is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ETPL also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power. System automation projects typically require very little coordination with third parties and distribution infrastructure changes (poles, lines etc.) are minimal.
<u>Economic Development</u>	This project does not directly relate to any economic growth however with a growing community ETPL has considered the additional benefits to its distribution system which will be more capable of connecting future customers with higher reliability.
<u>Environmental Benefits</u>	

Minimal environmental benefits are expected as a result of this project.

Category Specific Requirements

System Service Project

Assessment of the Benefits to Customers	Automated switches will result in customers experiencing shorter and fewer sustained outages as a result of the system being able to "self-heal" and sectionalize to affect the smallest number of customers. It will also provide more data to staff allowing for more detailed and timely communication to customers. Certain system automation projects will focus on improving reliability to large industrial facilities that are extremely sensitive to down time due to the financial implications.
Information Related to Regional Planning	Planned system automation type projects will not be applicable to the regional planning process.
Integration of Advanced Technology	All system automation projects will include the implementation of more advanced technology including switches, reclosers & fault indicators capable of remote monitoring and control through the SCADA system.
System Benefits to Reliability, Efficiency and Safety	System automation will result in reduced outage duration through quicker load transfers and the ability to better sectionalize the system. It will also result in customers experiencing a momentary outage as opposed to a sustained outage that would be seen with a manually operated system. Automating the distribution system will allow for remote operation of strategic switching points allowing staff to be directed quickly to system issues rather than switching procedures. The installation of remotely monitored fault indicators will provide data to ETPL to help identify issues and provide the ability to focus resources directly to the issue; resulting in less time patrolling lines to find issues. System automation type projects do not look to address specific safety issues however remotely operated switches will result in less exposure to manual switching operations which is most often done in less than favourable outage scenarios (i.e. storm & fault conditions)
Factors Affecting Implementation Timing & Priority	There are minimal risks associated with the timing of these types of projects however system automation type are relatively new to ETPL and often times do not fall under standardized practices. As a result it is extremely important that the proper due diligence be completed prior to choosing and implementing system automation solutions ensuring that benefits to customers are maximized.
Alternative Solution Analysis	On a high level the alternative to investing in system automation is to do nothing and maintain the status quo. This alternative will lead to a decrease in customer satisfaction resulting in more frequent and longer outages for customers who value reliability as a top priority moving forward. On a more granular level each type of system automation solution, whether it is automated switches, or fault indicators have alternative manufacturers, varying capabilities and varying costs. Each solution is evaluated based on these criteria and implemented to maximize the benefits to the distribution system in line with customer preferences.

2018 - Project Assessment Form

Project Name	ALL-DEVICES-IT		Municipality	ALL
			Cost Category	Capital
			Project Type	Enhancement

General Information

Project Description	This project represents costs associated with upgrades and replacements of various IT related devices such as desktops, laptops, printers, firewalls & servers. These are typically replaced on a proactive basis based on current requirements, performance etc. and are expected to be relatively minimal throughout the coming years.	
Investment Category	General Plant	
Capital Investment	Gross Capital	$56,000
	Customer Contribution	$0
	Net Capital	$56,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	ALL
	Customer Load (if available)	ALL
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	20%
	Q2	30%
	Q3	30%
	Q4	20%
Risks and Mitigation	There are minimal risks associated with these types of projects and they generally follow a predictable schedule.	
Comparative Information	Each year these types of replacements occur and there is not a great deal of comparative information that is used to adjust or modify the budget from year to year.	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for IT related purchases is to ensure that the proper systems are in place for staff to be efficient and enable them to perform their job. Other items such as firewalls, servers etc. also take into consideration regulatory requirements and industry best practices with regards to security and data handling.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP.
Project Alternatives	On a high level the alternative to investing in IT is to do nothing or scale back spending and only reactively replace equipment as it fails. This would result in increased O&M costs based on inefficiencies with staff not being able to effectively accomplish their required tasks.
Operational Benefits	Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as

	possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Reliability Benefits	Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Customer Benefits	Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Safety	IT infrastructure does not directly relate to safety for either the public or employees however it indirectly enables the ability to efficiently provide training to employees, allow customers to report outages and safety concerns, enable effective planning to reduce safety concerns etc.
Cyber-Security, Privacy	Various security and privacy measure are implemented; ETPL is involved in industry working groups and will look to implement and maintain cyber security measures as they evolve within the industry.
Co-ordination, Interoperability	IT projects typically require very little coordination with third parties and distribution infrastructure changes (poles, lines etc.) are minimal.
Economic Development	This project does not directly relate to any economic growth.
Environmental Benefits	Minimal environmental benefits are expected as a result of this project.

Category Specific Requirements

System Service Project	
Assessment of the Benefits to Customers	Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Information Related to Regional Planning	Planned IT spending will not be applicable to the regional planning process.
Integration of Advanced Technology	All IT spending will include the implementation of more advanced technology from simple components like upgrade computers to more substantial improvements such as firewalls to maintain security requirements.
System Benefits to Reliability, Efficiency and Safety	Maintaining sufficient IT infrastructure ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Factors Affecting Implementation Timing & Priority	There are minimal risks associated with the timing of these types of projects.
Alternative Solution Analysis	On a high level the alternative to investing in IT is to do nothing or scale back spending and only reactively replace equipment as it fails. This would result in increased O&M costs based on inefficiencies with staff not being able to effectively accomplish their required tasks.

2018 - Project Assessment Form

Project Name	ALL-FACRL-Relocation of Plant	Municipality Cost Category Project Type	All Capital Enhancement

General Information

Project Description	This project represents the cost associated with the relocation of hydro infrastructure within the municipal road allowance to accommodate road widening and other modifications. ETPL meets and communicates with our municipalities to have a better understanding of the facility relocations required for future years. When specific projects are known in advance a dedicated project is created and this particular project is to accommodate facility relocation requests that arise throughout the year without prior knowledge.	
Investment Category	System Access	
Capital Investment	Gross Capital	$214,286
	Customer Contribution	$64,286 (50% of labour and labour saving devices, approx. 30% of project cost)
	Net Capital	$150,000 (approx. 70% of project cost)
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	Varies - Customer Driven
	Customer Load (if available)	Varies - Customer Driven
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	10%
	Q2	40%
	Q3	40%
	Q4	10%
Risks and Mitigation	The timing and completion of these projects are driven by the requirements of the municipality requesting the relocation. Coordination and frequent communication between ETPL and the municipality ensure that timelines are met accommodating the needs of both parties.	
Comparative Information	2018: $150,000 (budget) 2017: $50,000 (budget) 2016: $266,349 2015: $577,124 2014: $94,165 2013: $243,155	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for this project is accommodating mandatory municipally driven infrastructure upgrades. Regular communication with municipalities attempt to align municipal projects with areas requiring upgrades and prevent unnecessary replacement of

	assets that are not at their end of life however this is not always able to be accomplished.
Investment Priority	These projects are mandatory and are driven by municipal requests.
Project Alternatives	ETPL works with local municipalities to explain the available options and associated costs however the relocation is dictated by the road modifications and often few alternatives exist.
Operational Benefits	Facility relocations do not look to address specific operational issues however construction is completed to current standards which will provide incremental benefits. When additional benefits can be achieved in conjunction with the relocation ETPL will incorporate these into the design.
Reliability Benefits	Facility relocations do not look to address specific reliability issues however construction is completed to current standards which will provide incremental benefits. When additional benefits can be achieved in conjunction with the relocation ETPL will incorporate these into the design.
Customer Benefits	Not applicable
Safety	Facility relocations do not look to address specific safety issues however construction is completed to current standards which will provide incremental benefits. When additional safety benefits can be achieved in conjunction with the relocation ETPL will incorporate these into the design.
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

System Access Project Factors Affecting Project Timing/Priority	The factors affecting the timing of facility relocations are primarily driven by timelines set out by the municipality and are a top priority.
Factors Relating to Customer Preference	Municipal preferences and input are always taken into consideration during the design and alternative options and costs are communicated to the municipality when applicable. Regular communication between the utility and the municipality often result in a solution that meets the requirements of the relocation while minimizing the financial impacts.
Factors Affecting Project Cost	The final cost of the project as a whole is driven by requirements of the municipality. Cost sharing between the municipality and ETPL is completed in accordance with the Public Service Works on Highways Act and results in the municipality contributing 50% to the cost of labour and labour saving devices.
Controllable Cost Minimization	Controllable costs are minimized through effective communication and standard design practices.
Other Planning Objectives Met	On a project by project basis ETPL evaluates the requirements to see if other planning objectives can be accomplished. Examples of this include the ability to complete voltage

	conversions or prepare for future plans.
Technically Feasible Project Options	ETPL works with local municipalities to explain the available options and associated costs however the relocation is dictated by the road modifications and often few alternatives exist.
Results of Economic Evaluation	Not applicable
Nature and Magnitude of System Impacts, Costs & Cost Recovery	Typically facility relocations have a very minimal impact to the distributions system as a whole. If a specific relocation drives a substantial investment to the distribution system a separate project will be created and evaluated.

2018 - Project Assessment Form

Project Name	ALL-LEASEHOLD-Leasehold Improvements	Municipality	ALL
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description	This project represents costs associated with upgrades at each of Erie Thames three operating centers. In the past this budget has accounted for improvements such as overhead doors, new fence/gates, painting and other miscellaneous renovations. No substantial investments in this budget are expected within the next two years and the total for this entire budget items is below the materiality threshold.	
Investment Category	General Plant	
Capital Investment	Gross Capital	$35,000
	Customer Contribution	$0
	Net Capital	$35,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	ALL
	Customer Load (if available)	ALL
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	20%
	Q2	30%
	Q3	30%
	Q4	20%
Risks and Mitigation	There are minimal risks associated with these types of projects.	
Comparative Information	Each year these types of replacements occur and there is not a great deal of comparative information that is used to adjust or modify the budget from year to year.	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for Leasehold Improvement spending is to ensure that the proper facilities are in place for staff to be efficient and enable them to perform their job.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP.
Project Alternatives	The most obvious alternative to yearly leasehold improvements would be constructing new operations centers which do not financially make sense at this point as our current facilities are able to be maintained at a suitable level without too much investment year over year.
Operational Benefits	Maintaining proper facilities ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.

Reliability Benefits	Maintaining proper facilities ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Customer Benefits	Maintaining proper facilities ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
<u>Safety</u>	Maintaining proper facilities ensures that day-to-day operations are able to be completed as safely as possible.
<u>Cyber-Security, Privacy</u>	Not applicable
<u>Co-ordination, Interoperability</u>	Not applicable
<u>Economic Development</u>	Not applicable
<u>Environmental Benefits</u>	Minimal environmental benefits are expected as a result of spending within this budget.

Category Specific Requirements

<u>General Plant Project</u>	
Qualitative & Quantitative Analyses including Assessment of Options	The most obvious alternative to yearly leasehold improvements would be constructing new operations centers which do not financially make sense at this point as our current facilities are able to be maintained at a suitable level without too much investment year over year.
Business Case for projects that substantially exceed the materiality threshold.	Not applicable

2018 - Project Assessment Form

Project Name	ALL-MAPS-Maps & Records	Municipality	All
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description	This project represents the costs associated with updating maps and records within ETPL's Geographical Information System (GIS). This includes adding and modifying new and upgraded services and updating maps based on system renewal type projects. These are simply tracked in a separate budget due to the timing of when updates are completed and when the physical construction of projects is done.	
Investment Category	System Renewal	
Capital Investment	Gross Capital	$120,000
	Customer Contribution	$0
	Net Capital	$120,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	Varies - Customer Driven
	Customer Load (if available)	Varies - Customer Driven
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	25%
	Q2	25%
	Q3	25%
	Q4	25%
Risks and Mitigation	None	
Comparative Information	2018: $120,000 (budget) 2017: $120,000 (budget) 2016: $170,315 2015: $130,770 2014: $162,105 2013: $89,122	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	Having up-to-date, accurate maps are an operational requirement that must be completed.
Investment Priority	Due to the project driver this is a high priority and considered mandatory.
Project Alternatives	None
Operational Benefits	Up-to-date and accurate maps allow staff to efficiently and safely execute all aspects of their daily work.

Reliability Benefits	Up-to-date and accurate maps allow staff to efficiently restore outages and complete switching to minimize outages during planned work.
Customer Benefits	Up-to-date and accurate maps allow staff to minimize outages and complete work as efficiently as possible.
Safety	Up-to-date and accurate maps allow staff to establish work protection in order to safely execute projects.
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

<u>System Renewal Project</u>

Asset Condition Relative to Typical Life Cycle	Not applicable, however this project is tied to all other system renewal projects and is linked to their asset condition.
Number of Customers in Each Class Potentially Affected	All
Quantitative Customer Impacts	Up-to-date and accurate maps allow staff to efficiently restore outages and complete switching to minimize outages during planned work.
Qualitative Customer Impacts	Difficult to quantify however customer satisfaction is generally linked to the utilities ability to efficiently perform work and minimize outages.
Value of Customer Impact	Difficult to quantify
Other Factors Affecting Project Timing	None
Consequences for System O&M Costs	Exact consequences are difficult to quantify for this budget.
Reliability & Safety Factors	Exact impacts are difficult to quantify for this budget.
Analysis of Project Benefits & Timing	Not applicable
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	ALL-METERS-Meter Stock	Municipality	All
		Cost Category	Capital
		Project Type	Metering

General Information

Project Description	This project represents the cost associated with replacement of metering equipment which includes single and three phase meters, associated hardware and AMI equipment (i.e. collector units) The replacement of these units is driven by failures and regulatory requirements.	
Investment Category	System Access	
Capital Investment	Gross Capital	$234,500
	Customer Contribution	$0
	Net Capital	$234,500
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	ALL
	Customer Load (if available)	ALL
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	25%
	Q2	25%
	Q3	25%
	Q4	25%
Risks and Mitigation	There are minimal risks associated with the completion of this project as planned. With that being said a portion of the budget is dependent on meter failures which are unpredictable and based on historical failure rates.	
Comparative Information	2017: $248,628 2016: $142,345 2015: $264,836 2014: $134,232 2013: $237,155	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	Mandatory regulatory requirements. (DSC & Measurement Canada)
Investment Priority	New customer connections and upgrades are a top priority and typically organized by engineering staff in compliance with DSC requirements. Measurement Canada compliance is again a top priority and handled by metering staff.
Project Alternatives	Not applicable.
Operational Benefits	Not applicable.

Reliability Benefits	Not applicable.
Customer Benefits	Not applicable.
Safety	Not applicable.
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	Not applicable..
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

<u>System Access Project</u>

Factors Affecting Project Timing/Priority	The factors affecting the timing of metering replacements/upgrades are typically customer preferences, failures and regulatory requirements.
Factors Relating to Customer Preference	Meter replacements, especially for commercial/industrial customers are scheduled to best meet customer preferences.
Factors Affecting Project Cost	Meter failure rates are one of the largest factors affecting this project.
Controllable Cost Minimization	There a minimal controllable factors for cost mitigation.
Other Planning Objectives Met	Metering requirements typically do not meet any other planning objectives however; the use of smart meters will enable more informed decision making for both the customer and the LDC.
Technically Feasible Project Options	Not applicable
Results of Economic Evaluation	Not applicable
Nature and Magnitude of System Impacts, Costs & Cost Recovery	Not applicable

2018 - Project Assessment Form

Project Name	ALL-OHUPG-Planned Pole Replacements	Municipality	ALL
		Cost Category	Capital
		Project Type	Preventative

General Information

Project Description

The pole replacement project is a blanket project used to account for the typical number of end of life pole replacements identified as part of the ETPL yearly pole testing program. The current pole testing program tests 1/9 of the ETPL service area every year along with "re-tests" based remaining strength estimates. The pole testing schedule has been created to ensure a consistent level of pole replacements are assigned to each operations center in any given year. This project is also used to account for reactive pole replacements resulting from storm damage and other unknown factors.

Preliminary Project Information

Age of Plant:	>50 years	Construction Standards:	Legacy
Primary Voltage:	VARIES	Primary Conductor:	VARIES
Pole Type:	Wood	Secondary Conductor:	VARIES
Area Description:	VARIES	Traffic Volume:	VARIES

Asset Condition Issues

Rotten Poles	☒	PCB's	☐	Open Bus	☐
Broken Equipment	☒	Clearances	☐	Capacity	☐
Revitalization	☐	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☒

Investment Category

System Renewal

Capital Investment

Gross Capital	$200,000
Customer Contribution	$0
Net Capital	$200,000

	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments Customer Load (if available)	VARIES VARIES
Expected Project Timing	Start Date End Date	Q1 Q4
Expected Expenditure Timing	Q1 Q2 Q3 Q4	20% 30% 30% 20%

Risks and Mitigation

The vast majority of projects require varying degrees of outages to complete upgrades to the distribution system, which can create the risk of customer displeasure. ETPL staff has a great deal of experience and construction practices are in place to ensure that outages are always minimized and communicated with customers. In addition ETPL staff is aware of these requirements and budgeting and planning is completed with this in mind.

Comparative Information

ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. Pole replacements as a result of pole testing and reactive causes are tracked historically to ensure proper budgets and best practices are developed and improved as necessary.

REG Investment

This project is not associated with a REG investment

Leave to Construct Approval

This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers

The primary driver for this project is the replacement of end of life poles as identified by regular pole testing. This type of project is aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers as set out in the Asset Management Plan.

Investment Priority

Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives

No alternative designs were examined as part of this program. The majority of pole replacements are completed on a one for one basis and only minor changes to the distribution system as a whole are made.

Operational Benefits

The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff.

Reliability Benefits

The completion of the project will upgrade the existing aged assets as required and in turn provide a more reliable system simply based on the installation of new upgraded distribution assets.

Customer Benefits

The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.

<u>Safety</u>

All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.

<u>Cyber-Security, Privacy</u>

Not applicable to this project

<u>Co-ordination, Interoperability</u>

This project does not apply to the regional infrastructure planning framework.

ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

<u>Economic Development</u>

This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

<u>Environmental Benefits</u>

System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

<u>System Renewal Project</u>

Asset Condition Relative to Typical Life Cycle

The pole replacements that are completed as part of this program have been identified through annual testing as requiring expedient replacement. Therefore all assets replaced under this program are considered at the end of their useful life.

Number of Customers in Each Class Potentially Affected

Pole replacements as identified by pole testing and reactive replacements due to failure can affect a wide range of customers including residential, commercial and industrial. This can include hospitals, large manufacturing facilities and other important loads depending on the location of the required replacement. Pole failures can result in large outages affecting entire feeders depending on the severity. Since the poles replaced under this program have been identified through testing as end of life the probability of a failure is much more likely as compared to typical useful life approximations.

Quantitative Customer Impacts

If the poles identified through the testing program are not replaced it is likely that an afterhours unplanned replacement would be required at some point. Depending on the severity of the failure a large feeder outage could be expected with an extended duration. In contrast a planned pole replacement can typically be completed with minimal to no outages to customers.

Qualitative Customer Impacts

This program is aimed at maintaining system reliability and public safety by eliminating all poles reaching end of life. This will ensure that current customer satisfaction levels are maintained.

Value of Customer Impact

The pole replacement program can affect all customer classes depending on the poles that are

	identified as requiring replacement. As previously mentioned the risk of failure is much higher since the poles have been identified through testing as requiring replacement and an unplanned replacement due to failure can result in a larger outage with a greater duration. A planned pole replacement very rarely results in a loss of service to customers.
Other Factors Affecting Project Timing	Due to the nature of the project and condition of the assets identified this program must be completed on a yearly basis.
Consequences for System O&M Costs	The largest consequence for system O&M costs is the resulting unplanned pole replacements that are likely if the program is not completed. This results in larger outage for customers and higher costs.
Reliability and Safety Factors	The poles identified are at their end of life and require expedient replacement to avoid any reliability and safety concerns.
Analysis of Project Benefits & Timing	There are no alternatives that can be considered regarding the timing and completion of this program due to the nature of the end of life assets.
Like for Like Renewal Analysis	The majority of pole replacements are completed in a like-for-like manner aside from upgrades to the materials, and design standards that are implemented. If a pole identified for replacement can be leveraged to cost effectively improve the distribution system outside of a like-for-like replacement than it is considered on a pole by pole basis.

2018 - Project Assessment Form

	Project Name	ALL-SRVCI-Commercial & Industrial Connections	Municipality	All
			Cost Category	Capital
			Project Type	New C&I

General Information

Project Description	This project represents the cost associated with the connection of new commercial and industrial customers. This includes modifications and/or expansions to the existing distribution system to accommodate the connection of new customers.	
Investment Category	System Access	
Capital Investment	Gross Capital	$408,000
	Customer Contribution	$204,000 (approx. 50%)
	Net Capital	$204,000 (approx. 50%)
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	Varies - Customer Driven
	Customer Load (if available)	Varies - Customer Driven
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	25%
	Q2	25%
	Q3	25%
	Q4	25%
Risks and Mitigation	C&I service connections are a common practice throughout any given year and ETPL has well developed standards and guidelines to guide all stages of design, construction and administration. Risks associated with C&I connections are primarily a result of ensuring that all procedures and requirements are followed by the utility and the customers. These risks are mitigated through frequent communication between both parties.	
Comparative Information	2018: $204,000 (budget) 2017: $204,000 (budget) 2016:$63,614 2015:$284,033 2014:$245,649 2013:$144,478	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	C&I service connections are mandatory service requirements and are driven by customer requests and timelines.
Investment Priority	All customer service connections are top priority and are dependent on customer timelines.

Project Alternatives	C&I service connections follow a standardized process in line with ETPL's Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground) Each connection is evaluated by ETPL staff and a suitable connection is made with input from the customer in line with developed standards.
Operational Benefits	New customer service connections do not look to address specific operational issues however are constructed to current standards which will provide incremental operational benefits moving forward. (ex. accessible metering)
Reliability Benefits	New customer service connections do not look to address specific reliability issues however are constructed to current standards which will provide incremental reliability benefits moving forward.
Customer Benefits	Not applicable
Safety	New customer service connections do not look to address specific safety issues however are constructed to current standards which will provide incremental safety benefits moving forward.
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

System Access Project	The factors affecting the timing of C&I service connections are primarily driven by timelines set out by the customer and are a top priority. Customer preferences and input are always taken into consideration during the design of a new connection, however all connections are made ensuring that current standard practices are followed in a consistent manner. The final cost of the project as a whole is driven by customer requests and can vary year to year. On a more granular level each connection is evaluated and the cost of the connection can vary depending on the size & type of service along with existing conditions. The connection of new C&I customers is completed through well established procedures that have continuously improved over time to provide cost efficiency to both ETPL and customers. Any material used by ETPL is purchased through a buying group of multiple local utilities that aims to standardize and minimize costs. On a project by project basis ETPL evaluates the connection requirements to see if other planning objectives can be accomplished. Examples of this include expansions to service new developments from the 28kV system or service requirements to leverage future conditions. C&I service connections follow a standardized process in line with ETPL's Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground) Each connection is

evaluated by ETPL staff and a suitable connection is made with input from the customer in line with developed standards.

When a capital contribution is applicable it is calculated in accordance with the methodology included in the DSC and is completed on a project by project basis. These contributions vary on a year by year basis depending on demand and historical trends are used to budget.

Typically individual C&I connections have a very minimal impact to the distributions system. If a connection drives a substantial investment to the distribution system a separate project will be created and evaluated.

2018 - Project Assessment Form

Project Name	ALL-SRVRES-Residential Connections	Municipality	All
		Cost Category	Capital
		Project Type	New Residential

General Information

Project Description	This project represents the cost associated with the connection of new residential customers. This includes modifications and/or expansions (subdivisions) to the existing distribution system to accommodate the connection of new customers.	
Investment Category	System Access	
Capital Investment	Gross Capital	$577,500
	Customer Contribution	$346,500 (approx. 60%)
	Net Capital	$231,000 (approx. 40%)
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	Varies - Customer Driven
	Customer Load (if available)	Varies - Customer Driven
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	25%
	Q2	25%
	Q3	25%
	Q4	25%
Risks and Mitigation	Residential service connections are a common practice throughout any given year and ETPL has well developed standards and guidelines to guide all stages of design, construction and administration. Risks associated with residential connections are primarily a result of ensuring that all procedures and requirements are followed by the utility and the customers. These risks are mitigated through frequent communication between both parties.	
Comparative Information	2018: $231,000 (budget) 2017: $231,000 (budget) 2016: $126,816 2015: $321,656 2014: $278,162 2013: $163,601	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	Residential service connections are mandatory service requirements and are driven by customer requests and timelines.
Investment Priority	All customer service connections are top priority and are dependent on customer timelines.

Project Alternatives	Residential service connections follow a standardized process in line with ETPL's Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground, meter base location etc.) Each connection is evaluated by ETPL staff and a suitable connection is made with input from the customer in line with developed standards.
Operational Benefits	New customer service connections do not look to address specific operational issues however are constructed to current standards which will provide incremental operational benefits moving forward. (ex. accessible meter base location)
Reliability Benefits	New customer service connections do not look to address specific reliability issues however are constructed to current standards which will provide incremental reliability benefits moving forward. (ex. underground secondary installed in duct on customer property)
Customer Benefits	Not applicable
Safety	New customer service connections do not look to address specific safety issues however are constructed to current standards which will provide incremental safety benefits moving forward.
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

System Access Project

The factors affecting the timing of residential service connections are primarily driven by timelines set out by the customer and are a top priority.

Customer preferences and input are always taken into consideration during the design of a new connection, however all connections are made ensuring that current standard practices are followed in a consistent manner.

The final cost of the project as a whole is driven by customer requests and can vary year to year. On a more granular level each connection is evaluated and the cost of the connection can vary depending on the size & type of service along with existing conditions.

The connection of new residential customers is completed through well established procedures that have continuously improved over time to provide cost efficiency to both ETPL and customers. Any material used by ETPL is purchased through a buying group of multiple local utilities that aims to standardize and minimize costs.

On a project by project basis ETPL evaluates the connection requirements to see if other planning objectives can be accomplished. Examples of this include expansions to service new developments from the 28kV system or service requirements to leverage future conditions.

Residential service connections follow a standardized process in line with ETPL's Conditions of Service. Depending on the situation there may or may not be alternative solutions with regards to the service connection. (i.e. overhead vs. underground, meter base location etc.) Each connection is evaluated by ETPL staff and a suitable connection is made with input from the customer in line with developed standards.

When a capital contribution is applicable it is calculated in accordance with the methodology included in the DSC and is completed on a project by project basis. These contributions vary on a year by year basis depending on demand and historical trends are used to budget.

Typically individual residential connections and subdivision developments have a very minimal impact to the distributions system. If a connection drives a substantial investment to the distribution system a separate project will be created and evaluated.

2018 - Project Assessment Form

	Project Name	ALL-STNUPG-Substation Upgrades	Municipality Cost Category Project Type	ALL Capital Enhancement

General Information

Project Description	This budget is used to make minor upgrades to Erie Thames nine (9) remaining municipal substations on a yearly basis. They typically include fencing, building upgrades, etc. and are generally well below the materiality threshold; any substation upgrades above the threshold would be detailed in a separate project budget.	
Investment Category	General Plant	
Capital Investment	Gross Capital	$8,000
	Customer Contribution	$0
	Net Capital	$8,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	ALL
	Customer Load (if available)	ALL
Expected Project Timing	Start Date	Q1 2018
	End Date	Q4 2018
Expected Expenditure Timing	Q1	10%
	Q2	40%
	Q3	40%
	Q4	10%
Risks and Mitigation	There are very minimal risks related to this budget item.	
Comparative Information	Each year these types of upgrades occur and there is not a great deal of comparative information that is used to adjust or modify the budget from year to year.	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver	The primary driver of this budget is to ensure that ETPL's substations are maintained in a safe, reliable manner.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP.
Project Alternatives	None; conversion will eventually result in the removal of all ETPL owned substations.
Operational Benefits	Maintaining safe, reliable substations ensure that no public or employee safety hazards exist and ensure that the customers supplied do not experience unnecessary outages.

Reliability Benefits	Maintaining safe, reliable substations ensure that no public or employee safety hazards exist and ensure that the customers supplied do not experience unnecessary outages.
Customer Benefits	Maintaining safe, reliable substations ensure that no public or employee safety hazards exist and ensure that the customers supplied do not experience unnecessary outages.
Safety	Maintaining safe, reliable substations ensure that no public or employee safety hazards exist and ensure that the customers supplied do not experience unnecessary outages
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework.
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

<u>**System Renewal Project**</u>

Asset Condition Relative to Typical Life Cycle	Typically assets in this budget are at or near their useful lives.
Number of Customers in Each Class Potentially Affected	The project affects every customer connected to ETPL's 4kV system; approximately 7542 customers or 41%.
Quantitative Customer Impacts	Exact impacts are difficult to quantify for this budget.
Qualitative Customer Impacts	Exact impacts are difficult to quantify for this budget.
Value of Customer Impact	Exact impacts are difficult to quantify for this budget.
Other Factors Affecting Project Timing	None
Consequences for System O&M Costs	Exact consequences are difficult to quantify for this budget.
Reliability & Safety Factors	Exact impacts are difficult to quantify for this budget.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP.
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	ALL-UNPLND-Unplanned Capital Projects	Municipality	All
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description	This project budget is allocated for unplanned capital expenditures that come up within a given year and have not been budgeted for. The majority of this spending includes items such as transformer/cable replacements, MVA's (motor vehicle accidents) and storm damage and are typically associated with asset replacement (System Renewal).	
Investment Category	System Renewal	
Capital Investment	Gross Capital	$150,000
	Customer Contribution	$0
	Net Capital	$150,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	Varies
	Customer Load (if available)	Varies
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	25%
	Q2	25%
	Q3	25%
	Q4	25%
Risks and Mitigation	The risks and mitigations measures for this budget are difficult to predict based on the nature of the project.	
Comparative Information	2018: $150,000 (budget) 2017: unbudgeted 2016: unbudgeted 2015: unbudgeted 2014: unbudgeted 2013: unbudgeted	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The drivers for this budget are difficult to predict based on the nature of the project, however the majority are based on asset failure and external factors such as MVA's and weather.
Investment Priority	The projects typically encompassed by this budget are high priority and usually considered mandatory.
Project Alternatives	The majority of spending that falls within this budget does not have any alternatives. With that being said each situation is examined by engineering and operations staff to ensure the best decision is made.

Operational Benefits	Not applicable
Reliability Benefits	Not applicable
Customer Benefits	Not applicable
Safety	Not applicable
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	Not applicable
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

System Renewal Project

Asset Condition Relative to Typical Life Cycle	Typically the condition of the assets replaced under this budget will be at their end of life, since they are replaced based on a failure. Other investments under this budget such as storm damage and MVA's can vary and are difficult to predict.
Number of Customers in Each Class Potentially Affected	Varies
Quantitative Customer Impacts	Not applicable
Qualitative Customer Impacts	Not applicable
Value of Customer Impact	Not applicable
Other Factors Affecting Project Timing	Not applicable
Consequences for System O&M Costs	Not applicable .
Reliability & Safety Factors	Not applicable
Analysis of Project Benefits & Timing	Not applicable
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	ALL-VEHICLE-Fleet Replacement	Municipality	All
		Cost Category	Capital
		Project Type	Vehicle

General Information

Project Description	This project budget covers the yearly replacement of rolling stock including large & small vehicles, forklifts, and trailers. The replacement schedule is outlined in the Fleet Sustainment Plan included in Appendix M of the DSP. The 2018 budget includes only the replacement of a single trailer.	
Investment Category	General Plant	
Capital Investment	Gross Capital	$20,000
	Customer Contribution	$0
	Net Capital	$20,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	ALL
	Customer Load (if available)	ALL
Expected Project Timing	Start Date	Q1
	End Date	Q4
Expected Expenditure Timing	Q1	10%
	Q2	40%
	Q3	40%
	Q4	10%
Risks and Mitigation	There are very minimal risks associated with the completion of this project as planned. The primary risk would be the long lead time associated with replacing a large vehicle (i.e. bucket truck, RBD etc.)	
Comparative Information	2017: $135,000 (budget) 2016: $346,258 2015: $336,906 2014: $94,891 2013: $340,031	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for this project is to maintain a fleet that enables staff to be safe and efficient when completing required activities.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2c) of the DSP. On a more granular level individual vehicles are prioritized based a number of factors outlined in the Fleet Sustainment Plan.

Project Alternatives	There are not really any alternatives to maintaining a fleet capable of safely constructing, maintaining and operating the system. There are however numerous variations of the pace of replacement, type of vehicle etc. Ere Thames looks at its requirements each time a vehicle is scheduled for replacement to see if a smaller/larger version is required, or whether the fleet can be reconfigured to reduce financial requirements.
Operational Benefits	Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Reliability Benefits	Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Customer Benefits	Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Safety	Maintaining proper fleet vehicles ensures that day-to-day operations are as efficient as possible; this relates to almost every aspect of the utility operation and provides operations, reliability and customer benefits.
Cyber-Security, Privacy	Not applicable
Co-ordination, Interoperability	Not applicable
Economic Development	Not applicable
Environmental Benefits	Not applicable

Category Specific Requirements

General Plant Project

Qualitative & Quantitative Analyses including Assessment of Options	There are numerous variations of the pace of replacement, type of vehicle etc. when scheduling fleet replacements. Erie Thames looks at its requirements each time a vehicle is scheduled for replacement to see if a smaller/larger version is required, or whether the fleet can be reconfigured to reduce financial requirements.
Business Case for projects that substantially exceed the materiality threshold.	Not applicable.

2018 - Project Assessment Form

Project Name	AYL-OHCONV-Caverly Rd., Anne St. to Fath Ave.	Municipality	Aylmer
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

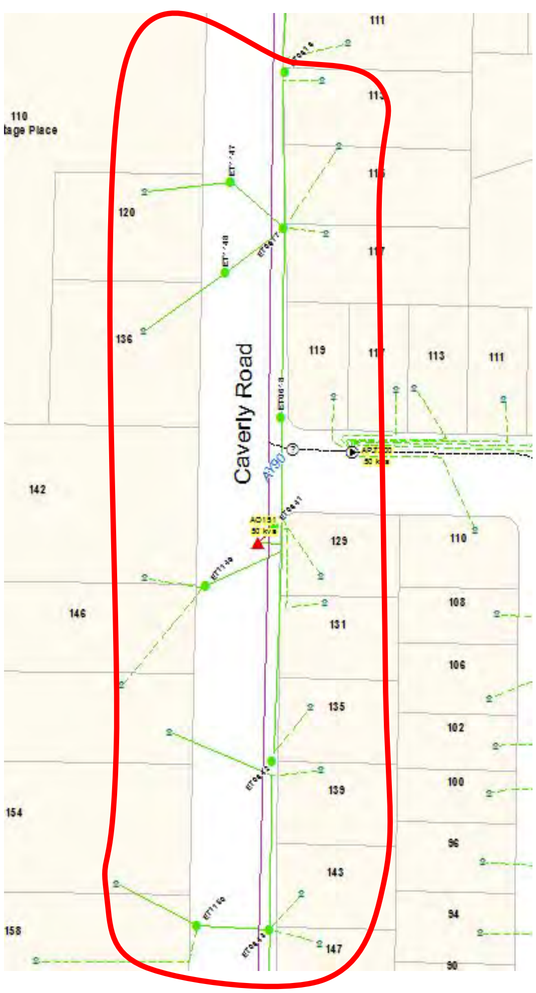
This project will extend 28kV from Fath Ave. to Anne St. along Caverly Rd. and will result in voltage conversion to the area. The poles in the area are in reasonably good condition and therefore we intend to simply re-insulate for the higher voltage and string new primary and secondary conductor. This is one of a multi-project effort to tie the existing M3 feeder from the Aylmer TS to the McBrien MS eliminating the requirement for the supply from Edgeware TS. We will also be required to install a step-down (“rabbit”) transformer to supply Marchant St.

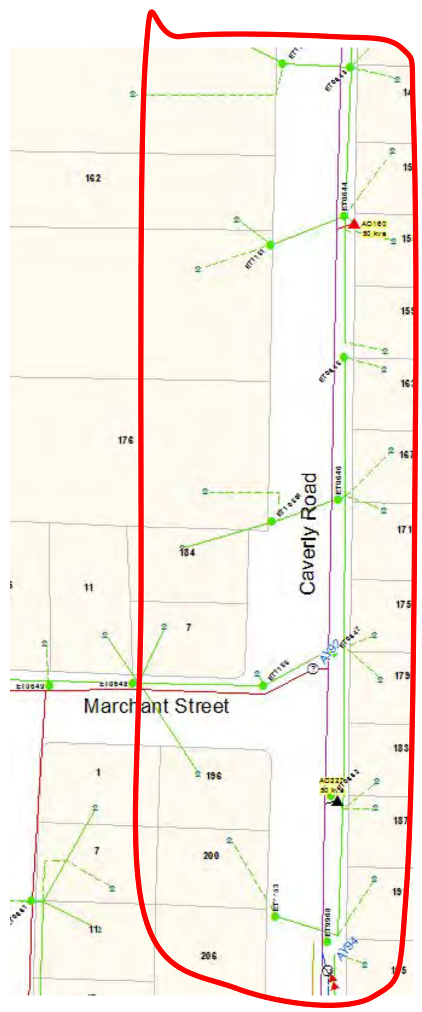
Preliminary Project Information

Age of Plant:	20-30 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	3/0 ACSR
Pole Type:	Wood	Secondary Conductor:	Open Bus
Area Description:	Residential	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☐	PCB’s	☐	Open Bus	☒
Broken Equipment	☐	Clearances	☐	Capacity	☐
End of Life Assets	☐	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☐





Investment Category	System Renewal	
Capital Investment	Gross Capital	$82,200
	Customer Contribution	$0
	Net Capital	$82,200
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	34 residential
Expected Project Timing	Start Date	Q1 2018
	End Date	Q2 2018
Expected Expenditure Timing	Q1	50%
	Q2	50%
	Q3	0%
	Q4	0%
Risks and Mitigation	Due to the nature of this project various installations (poles, transformers, junctions etc.) will be installed creating visual changes to the hydro infrastructure in the area. Often times this leads to concerns from customers, however ETPL has a great deal of experience communicating with customers allowing a better understanding of the requirements and alleviating any concerns.	
Comparative Information	ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver	The primary driver for this project is to convert the existing infrastructure allowing it to be supplied from the preferred 28kV distribution system. The voltage conversion also aligns with replacement of end of life assets justified in the Asset Management Plan. In certain situations newer assets are required to be replaced based on 28kV design requirements (pole heights etc.) however due to the nature of the distribution system this may be required. In the longer term voltage conversion will provide a great deal of benefit to the customer.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Project Alternatives	There are no viable project alternatives for this project. The area will be replaced in a “like-for-like” fashion and no major configuration changes are expected.
Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.
Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility

	for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project	
Asset Condition Relative to Typical Life Cycle	The assets included in this project still have approximately 20 years of remaining life and therefore we will not be replacing poles and will simply be re-insulating and stringing new conductor to allow the area to be converted to 28kV.
Number of Customers in Each Class Potentially Affected	34 residential
Quantitative Customer Impacts	Currently no outages have resulted from failure of assets in the area however the ability to connect the McBrien DS to the Aylmer TS M3 feeder will result in much improved reliability for a large number of customers in Aylmer.
Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project however customers supplied in the area experience below average reliability due to the McBrien DS being supplied from a long radial feeder out of the Hydro One owned Edgeware TS.
Value of Customer Impact	The customers affected by the project are all residential and typically do not have backup power.

Other Factors Affecting Project Timing	This project is part of our capital project portfolio which is in line with recommendations for asset replacement levels based on the AMP. This specific project has been optimized against other investments as described above and further in the DSP.
Consequences for System O&M Costs	The main consequence on not implementing the project would be that the McBrien DS will experience low reliability until it can be connected to the Aylmer TS M3.
Reliability & Safety Factors	There are no known safety factors associated with this project. The primary reliability factor is the requirement to connect the McBrien DS to the Aylmer TS M3 feeder.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	AYL-UGCONV-Talbot St.-Myrtle St. to Wellington St.	Municipality	Aylmer
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

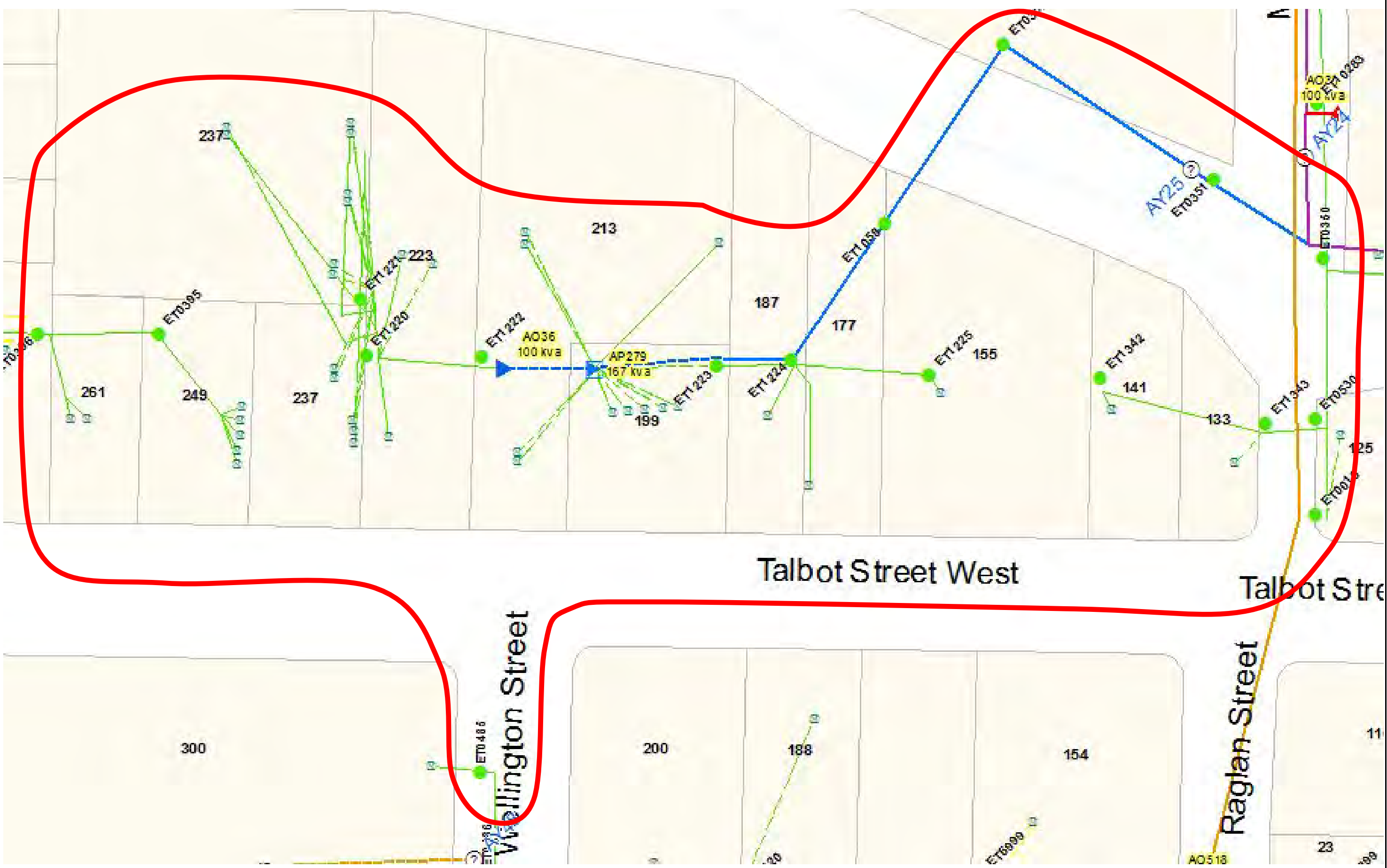
This project looks to remove an end of life, rear yard, 4kV pole line and replace it with an underground system along Talbot St. The project has been deferred since 2016 to coordinate with the Town of Aylmer who is performing road works in the area in 2018. A single phase supply will be taken from the corner of Myrtle & Talbot St. and tie into Wellington Street; the majority of the duct required for the project has already been placed in the past and some directional boring will be required.

Preliminary Project Information

Age of Plant:	>50 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	1/0 ACSR
Pole Type:	Wood	Secondary Conductor:	3/0 Triplex
Area Description:	Downtown	Traffic Volume:	High

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☒	Capacity	☐
End of Life Assets	☒	Road Construction	☒	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☒	Access	☒	Structural	☐



Investment Category	System Renewal	
Capital Investment	Gross Capital	$200,120
	Customer Contribution	$0
	Net Capital	$200,120
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	38 commercial/residential
Expected Project Timing	Start Date	Q2 2018
	End Date	Q4 2018
Expected Expenditure Timing	Q1	0%
	Q2	20%
	Q3	60%
	Q4	20%

Risks and Mitigation

This project requires that customer services be modified to accommodate the installation of upgraded hydro infrastructure. This creates the risk of customer opposition and the possibility of adverse effects to the customer premises. This risk is mitigated through effective communication with customers along with the use of only trusted electricians who perform work with a high degree of competence.

Another risk associated with this project is the additional coordination that will be required with the municipalities' road works. Good communication early in the process will result in these issues being mitigated. ETPL has completed numerous projects with various municipalities and does not expect the project to be negatively affected by this.

Comparative Information

ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

REG Investment

This project is not associated with a REG investment

Leave to Construct Approval

This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver

The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.

An additional driver for this project is to remove the existing 4.16kV primary circuit from the rear yard which will mitigate a possible safety concern.

Investment Priority

Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives	The only alternative would be to keep the infrastructure in the rear yard however the costs associated with moving it to the front have been reduced due to duct being placed earlier during sidewalk construction and therefore the current design is the best option moving forward.
Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.
Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards. This project will remove primary rear yard distribution assets eliminating the potential of customers coming into contact with hydro lines.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

<u>**System Renewal Project**</u>

Asset Condition Relative to Typical Life Cycle	The assets that will be replaced as part of this project are beyond their typical useful life (>50 years) and pole testing has indicated a pole that is required to be replaced.

Number of Customers in Each Class Potentially Affected	38 commercial/residential
Quantitative Customer Impacts	Currently no outages have resulted from failure of assets in the area, however if the poles, wires, transformers etc. are not replaced more frequent outages would be expected.
Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project. If the area is not rebuilt it is expected that assets would begin to fail and result in poor customer satisfaction due to outages.
Value of Customer Impact	The customers affected by the project are primarily residential who do not typically have backup generation.
Other Factors Affecting Project Timing	This project is part of our capital project portfolio which is in line with recommendations for asset replacement levels based on the AMP. This specific project has been optimized against other investments as described above and further in the DSP.
Consequences for System O&M Costs	The main consequence on not implementing the project would be the resulting unplanned and possibly afterhours repairs required to maintain the end of life assets in the area. The exact costs are difficult to quantify.
Reliability & Safety Factors	Again, based on the age and condition of the assets the reliability in the area is expected to decline if the assets are not proactively replaced. The elimination of primary voltages (>600V) from public/rear yard areas is a major concern for ETPL and is driving this project.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	AYL-OHCONV-Talbot Street w/ Pool	Municipality	Aylmer
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

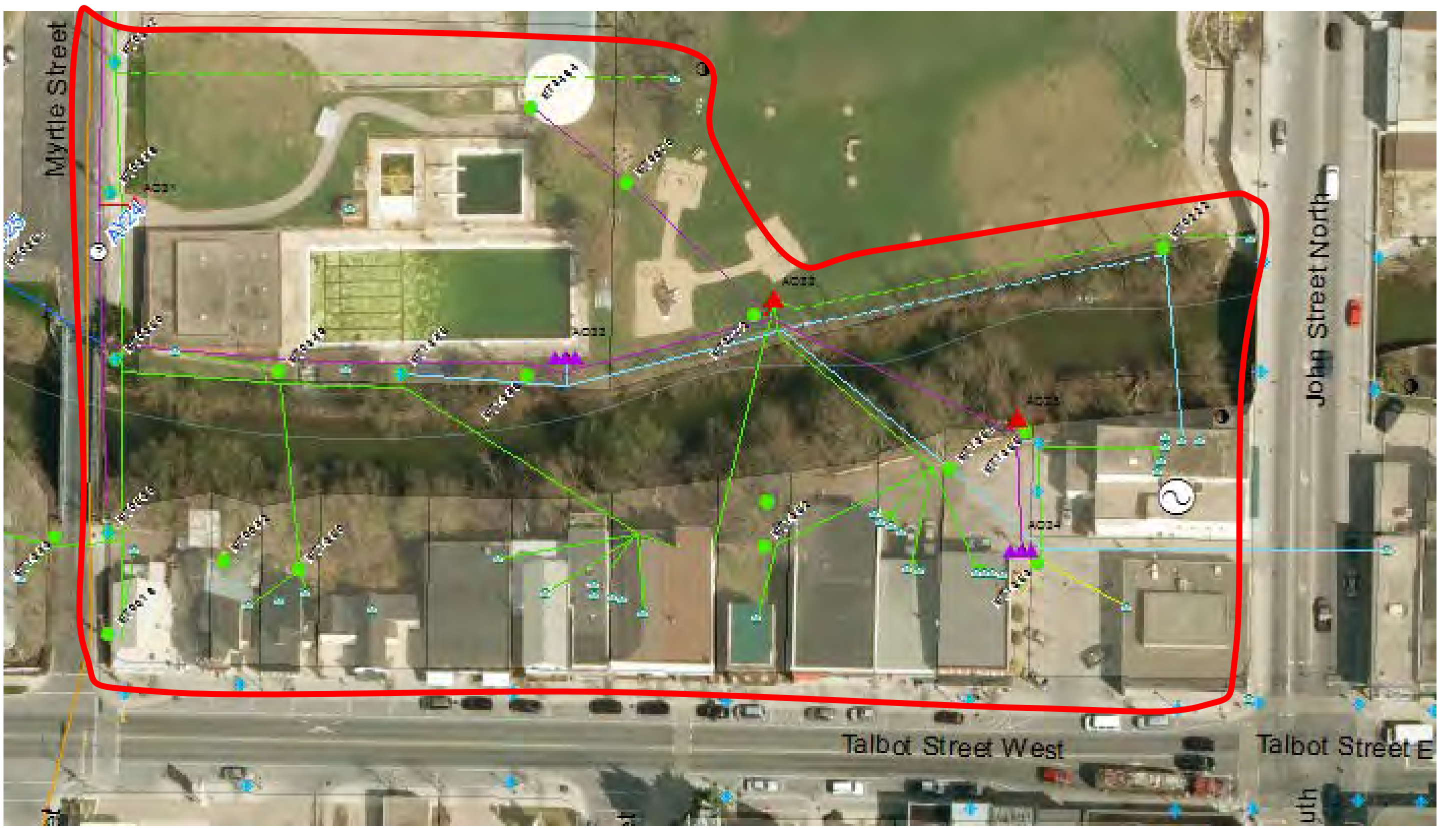
This project aims to rebuild a downtown area that also currently supplies the public pool. The area will be rebuilt and converted with a combination of OH and UG construction. It will eliminate OH lines in close proximity to the public pool and reduce the number of river crossings. The project will consist of U/G primary through the park to an O/H river crossing which will supply a three phase padmount in the rear of the Royal Bank parking lot. It will supply the three phase pool service from Myrtle and will result in a number of primary poles being replaced by secondary service poles.

Preliminary Project Information

Age of Plant:	>50 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	3/0 ACSR
Pole Type:	Wood	Secondary Conductor:	3/0 Triplex
Area Description:	Water Shed	Traffic Volume:	Medium

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☒	Capacity	☐
End of Life Assets	☒	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☒	Access	☒	Structural	☐



Investment Category	System Renewal	
Capital Investment	Gross Capital	$258,840
	Customer Contribution	$0
	Net Capital	$258,840
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	30
Expected Project Timing	Start Date	Q3 2018
	End Date	Q3 2018
Expected Expenditure Timing	Q1	10%
	Q2	40%
	Q3	60%
	Q4	0%

Risks and Mitigation

This project involves ETPL staff to complete work on customer property which creates the risk of cu
mitigated with proper communication to customers along with a high degree of professionalism by
near customer property. This project in particular will also have easement requirements which add
project, however with proper planning this can be mitigated.
Another risk to the project is due to the customers associated with this project; mainly commercial
uninterrupted supply of power during typical business hours. ETPL staff has a great deal of experien
in place to ensure that outages are always minimized and communicated with customers. In additio
requirements and budgeting and planning is completed with this in mind.

Comparative Information

ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

REG Investment

This project is not associated with a REG investment

Leave to Construct Approval

This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver

The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.

An additional driver for this project is to remove the existing 4.16kV primary circuit from the area around the public pool and park. This will mitigate a public safety concern moving forward.

Investment Priority

Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives

The ideal solution to supply this area of town would be to install underground infrastructure in the front yard along Talbot St. W. This would however require a great deal of efforts to modify

	customer services, and the cost would be prohibitive.
Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.
Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards. This project will remove primary rear yard distribution assets eliminating the potential of customers coming into contact with hydro lines.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods. \

Category Specific Requirements

System Renewal Project Asset Condition Relative to Typical Life Cycle	The assets encompassed by this project range from 30 - >50 years old and are constructed to legacy standards with regards to clearances etc. Any poles that can be maintained as secondary poles will remain however all primary assets including underground cables, and transformers will be replaced due to voltage conversion requirements.

Number of Customers in Each Class Potentially Affected	30 commercial/residential
Quantitative Customer Impacts	Currently no outages have resulted from failure of assets in the area, however if the poles, wires, transformers etc. are not replaced more frequent outages would be expected.
Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project. If the area is not rebuilt it is expected that assets would begin to fail and result in poor customer satisfaction due to outages.
Value of Customer Impact	The customers affected by the project are primarily business that would be greatly affected if outages become more prevalent.
Other Factors Affecting Project Timing	This project is part of our capital project portfolio which is in line with recommendations for asset replacement levels based on the AMP. This specific project has been optimized against other investments as described above and further in the DSP.
Consequences for System O&M Costs	The main consequence on not implementing the project would be the resulting unplanned and possibly afterhours repairs required to maintain the end of life assets in the area. The exact costs are difficult to quantify.
Reliability & Safety Factors	Again, based on the age and condition of the assets the reliability in the area is expected to decline if the assets are not proactively replaced. The elimination of primary voltages (>600V) from public/rear yard areas is a major concern for ETPL and is driving this project.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH			$7,500	$0	
	Primary 3PH			$10,000	$0	
	Secondary			$5,000	$0	
	Service			$3,500	$0	
	Primary 1PH Riser			$1,200	$0	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH		$75,000	$0	
		3PH		$15,000	$0	
	Padmount TX	1PH		$10,000	$0	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	1		$75	$0	
		2		$85	$0	
		3		$100	$0	
		>3		$125	$0	
Cable & Pull	Primary (per run)			$25	$0	
	Secondary(per run)			$25	$0	
Secondary	Service Work			$2,000	$0	
	Splice Box			$1,500	$0	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement			$2,500	$0	
	Tree Trimming			$5,000	$0	
	Restoration			$5,000	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		0	
			Contingency		0	
			Engineering		0	
			Overall Total		**0**	

2018 - Project Assessment Form

Project Name	AYL-OHCONV-Bank of Montreal & Community Living	Municipality	Aylmer
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

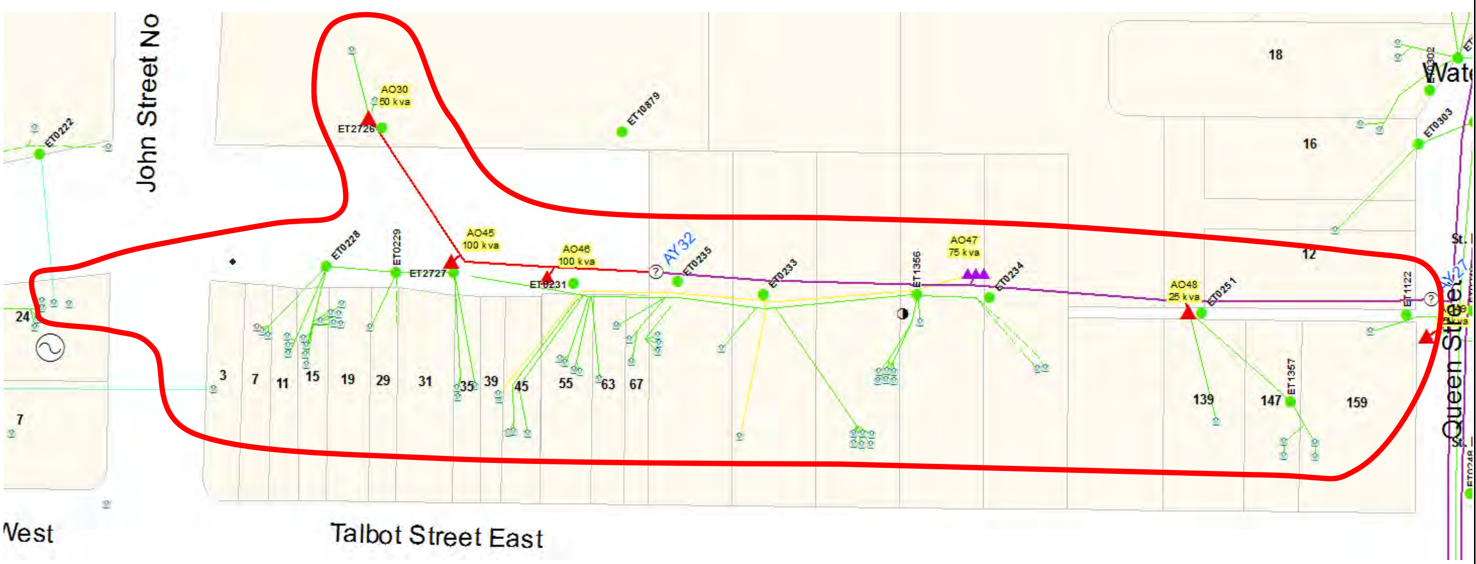
This project will rebuild a backyard portion of downtown Aylmer including the Bank of Montreal and Community Living services which will be supplied from infrastructure east of John St. N. Unfortunately this portion of line will not be converted at this time however will be constructed to 28kV standards to facilitate minimal conversion efforts in the future. Completion of this project will allow for the backyard infrastructure west of John St. N. to be converted in 2018 which involves a public park & pool and end of life assets.

Preliminary Project Information

Age of Plant:	30-40 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	1/0 ACSR
Pole Type:	Wood	Secondary Conductor:	3/0 Triplex
Area Description:	Downtown	Traffic Volume:	Medium

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☒	Capacity	☐
End of Life Assets	☒	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☐



Investment Category System Renewal

Capital Investment

Gross Capital	$135,240
Customer Contribution	$0
Net Capital	$135,240
O&M Costs (if applicable)	$0

Customer Information

Number of Customer Attachments	62
Customer Load (if available)	

Expected Project Timing	Start Date	Q2	2017
	End Date	Q3	2017

Expected Expenditure Timing	Q1	20%
	Q2	40%
	Q3	40%
	Q4	Choose an item.

Risks and Mitigation	This project involves ETPL staff to complete work on customer property which creates the risk of customer displeasure. This risk is mitigated with proper communication to customers along with a high degree of professionalism by ETPL staff when working on or near customer property. This project in particular will also have easement requirements which add an additional complexity to the project, however with proper planning this can be mitigated. Another risk to the project is due to the customers associated with this project; mainly commercial businesses who rely on an uninterrupted supply of power during typical business hours. ETPL staff has a great deal of experience and construction practices are in place to ensure that outages are always minimized and communicated with customers. In addition ETPL staff is aware of these requirements and budgeting and planning is completed with this in mind.
Comparative Information	ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. This project in particular could be compared to C15641-UGCONV-Talbot St. E. (Coopers Alley) which took place is 2015. The infrastructure requirements vary between the two projects (overhead vs. underground) however the customer base was very similar and required additional planning with regards to outages, and customer service modifications.
REG Investment	This project is not associated with a REG investment
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for this project is to continue voltage conversion efforts in line with replacement of end of life assets justified in the Asset Management Plan. This particular project will not convert the area however will be built to easily convert in the future and enable other required portions of the system to be converted as a result.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Project Alternatives	In this situation we considered leaving the supply to the Bank of Montreal and Community Living on the west side of John St. N. and therefore this portion of the system would not require renewal until a time when we could convert. This however would make the west side of John St. extremely difficult to rebuild as there is very limited space to locate another pole and/or transformer required for an additional service voltage. It was decided that the cost to rebuild east of John St. N. at 4kV and then convert in the future would be more feasible.
Operational Benefits	The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff.

Reliability Benefits	The completion of the project will upgrade the existing aged assets in the area and in turn provide a more reliable system simply based on the installation of new upgraded distribution assets.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	ETPL is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ETPL also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power. This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability. This particular project will provide more confidence to local businesses regarding the hydro supply and hopefully contribute to a sustained downtown core in the Town of Aylmer.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as transformer insulating fluids and pole treatment methods.

Category Specific Requirements	
Asset Condition Relative to Typical Life Cycle	The risk of outage aligns with the age of assets in the area which are nearing end of life. An asset failure in the project area would result in an outage of 4-8 hours which could be drastic based on the customer base and the time of day the outage were to occur. The risk of an outage will increase as the assets continue to age.
Number of Customers in Each Class Potentially Affected	This area of distribution supplies approximately 20 small businesses and 40 residential units.
Quantitative Customer Impacts	As mentioned earlier this project is part of the voltage conversion required to eliminate the Forest Street municipal substation. The Forest Street substation currently supplies approximately 700 customers and any outage at the station level would result in an extended

	outage for a large number of customers.
Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project. If the area is not rebuilt it is expected that assets would begin to fail and result in poor customer satisfaction due to outages.
Value of Customer Impact	The customers most affected by a reduction in reliability would be the small businesses that rely on a constant hydro supply.
Other Factors Affecting Project Timing	This project like many is best to be constructed during non-winter months due to the extra cost to install poles and underground assets with frost in the ground. This is avoided with proper planning.
Consequences for System O&M Costs	The renewal of this area will reduce the O&M simply based on the installation of new assets constructed to current standards, which will help to reduce the frequency and duration of outages.
Reliability & Safety Factors	Currently the reliability of this portion of the system is good and very few outages are reported as a result of this specific area, however with the assets near or at end of life the reliability is expected to decrease if not addressed. The pole line that will be addressed as a result of this project had 2 poles proactively replaced as a result of pole testing in 2013 and is a good indicator that the condition of the poles are at or nearing end of life.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH		0	$7,500	$0	
	Primary 3PH		5	$10,000	$50,000	
	Secondary		0	$5,000	$0	
	Service		1	$3,500	$3,500	
	Primary 1PH Riser			$1,200	$0	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH	3	$5,000	$15,000	reduced because transferring existing
		3PH	1	$22,500	$22,500	bank of montreal/community living
	Padmount TX	1PH		$10,000	$0	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	1		$75	$0	
		2		$85	$0	
		3		$100	$0	
		>3		$125	$0	
Cable & Pull	Primary (per run)			$25	$0	
	Secondary(per run)		90	$30	$2,700	new spun bus
Secondary	Service Work		2.5	$2,000	$5,000	
	Splice Box			$1,500	$0	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement		2	$2,500	$5,000	
	Tree Trimming		0	$5,000	$0	
	Restoration		1	$2,000	$2,000	
	Removals		1	$5,000	$5,000	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		$110,700.00	
			Contingency		$11,070.00	
			Engineering		$11,070.00	
			Overall Total		**$132,840.00**	

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH			$7,500	$0	
	Primary 3PH			$10,000	$0	
	Secondary			$5,000	$0	
	Service			$3,500	$0	
	Primary 1PH Riser			$1,200	$0	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH		$75,000	$0	
		3PH		$15,000	$0	
	Padmount TX	1PH		$10,000	$0	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	1		$75	$0	
		2		$85	$0	
		3		$100	$0	
		>3		$125	$0	
Cable & Pull	Primary (per run)			$25	$0	
	Secondary(per run)			$25	$0	
Secondary	Service Work			$2,000	$0	
	Splice Box			$1,500	$0	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement			$2,500	$0	
	Tree Trimming			$5,000	$0	
	Restoration			$5,000	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		0	
			Contingency		0	
			Engineering		0	
			Overall Total		**0**	

2018 - Project Assessment Form

Project Name	AYL-UGCONV-Davenport Public School	Municipality	Aylmer
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

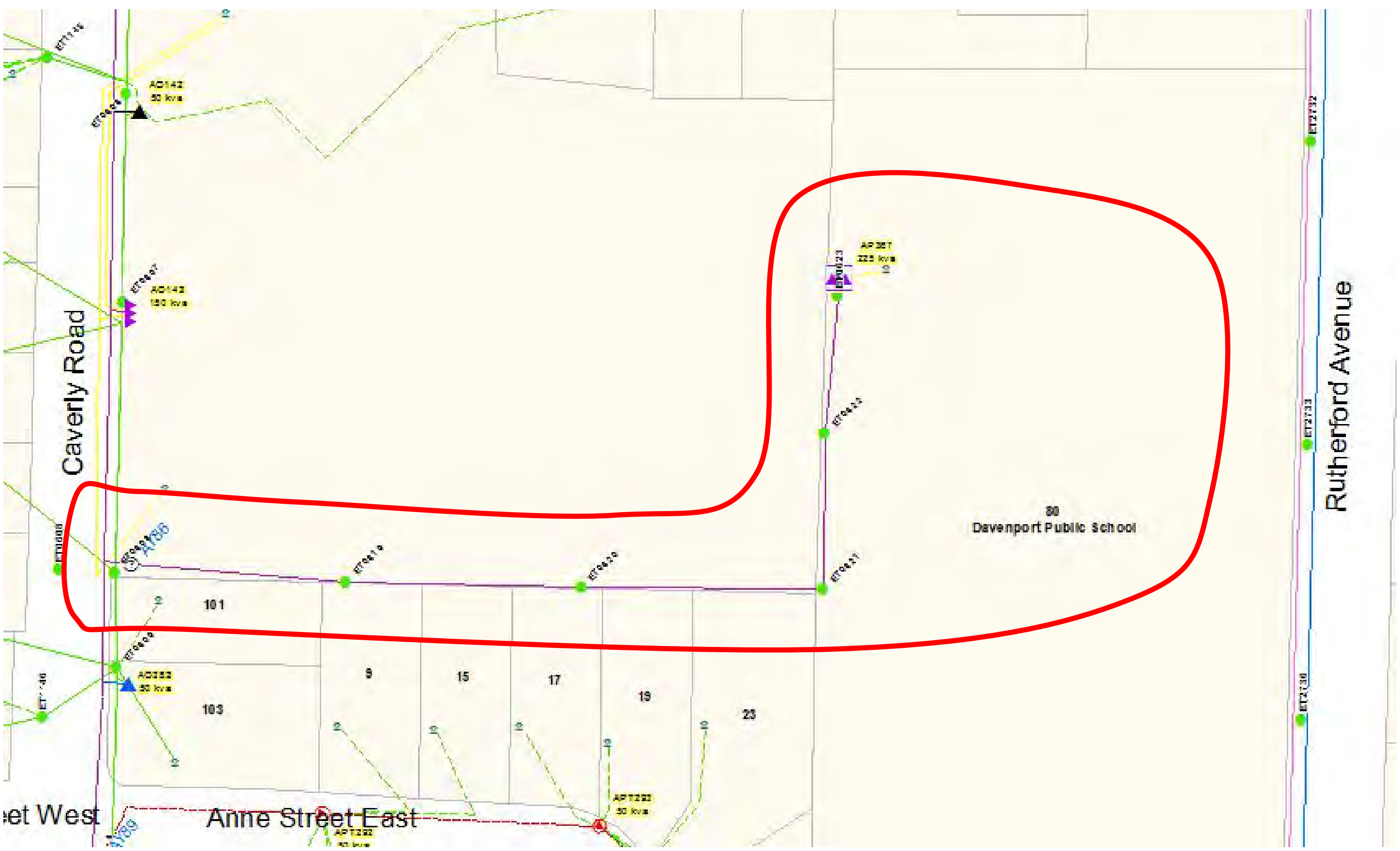
This project will convert the Davenport Public School from 4kV to 28kV. It will remove the current rear yard pole line through the playground and will supply the school via an underground supply from Rutherford Ave.

Preliminary Project Information

Age of Plant:	>50 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	3/0 ACSR
Pole Type:	Wood	Secondary Conductor:	Choose an item.
Area Description:	School Area	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☐	Capacity	☐
End of Life Assets	☒	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☒	Grounding	☐	Meter Access	☐
Backyard	☒	Access	☒	Structural	☐



Investment Category	System Renewal	
Capital Investment	Gross Capital	$105,450
	Customer Contribution	$0
	Net Capital	$105,450
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	1 commercial (public school)
Expected Project Timing	Start Date	Q3 2018
	End Date	Q3 2018
Expected Expenditure Timing	Q1	0%
	Q2	20%
	Q3	80%
	Q4	0%

Risks and Mitigation: This project involves ETPL staff to complete work on customer property which creates the risk of customer displeasure. This risk is mitigated with proper communication with customers along with a high degree of professionalism by ETPL staff when working on or near customer property.

Comparative Information: ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

REG Investment: This project is not associated with a REG investment

Leave to Construct Approval: This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver: The primary driver for this project is to convert the existing infrastructure allowing it to be supplied from the preferred 28kV distribution system. The voltage conversion also aligns with replacement of end of life assets justified in the Asset Management Plan. In certain situations newer assets are required to be replaced based on 28kV design requirements (pole heights etc.) however due to the nature of the distribution system this may be required. In the longer term voltage conversion will provide a great deal of benefit to the customer.

Investment Priority: Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives: There are no viable project alternatives for this project.

Operational Benefits: The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.

Reliability Benefits: As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one

	distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages. This particular project also is part of a multi-project initiative to connect the McBrien DS to the Aylmer TS M3 circuit which will provide much better reliability to all customers connected to the station.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

<u>**System Renewal Project**</u> Asset Condition Relative to Typical Life Cycle	The assets included in this project are at end of life (>50 years) and are in need of replacement. This is being completed in conjunction with strategic voltage conversion initiatives.
Number of Customers in Each Class Potentially Affected	1 commercial (school)
Quantitative Customer Impacts	Currently no outages have resulted from failure of assets in the area however the ability to connect the McBrien DS to the Aylmer TS M3 feeder will result in much improved reliability for a large number of customers in Aylmer.
Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project however customers supplied in the area experience below average reliability due to the McBrien DS being supplied from a long radial feeder out of the Hydro One owned Edgeware TS.
Value of Customer Impact	The customer that will be converted is a public school and outages during typical school hours would be extremely disruptive. The customers who will have the existing primary lines

	removed from their rear yards will also see safety and aesthetic benefits.
Other Factors Affecting Project Timing	This project is part of our capital project portfolio which is in line with recommendations for asset replacement levels based on the AMP. This specific project has been optimized against other investments as described above and further in the DSP.
Consequences for System O&M Costs	The main consequence on not implementing the project would be that the McBrien DS will experience low reliability until it can be connected to the Aylmer TS M3.
Reliability & Safety Factors	The primary safety factor related to this project is the 4kV primary lines in a rear yard which are more susceptible to inadvertent contact by customers. The primary reliability factor is the requirement to connect the McBrien DS to the Aylmer TS M3 feeder.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	CLI-UGCONV-Princess St., Percival to William St.	Municipality	Clinton
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

This project will convert approximately 1172kVA of connected load and continue to develop the 28kV supply loop in the Town of Clinton. This project is a part of a multi-phase project to connect the Clinton MS to both of the 28kV feeders that supply Clinton which will provide redundancy and greater reliability. The poles along Princess street are only 10-20 years old and therefore will be maintained if possible however they are only 40’ and typically it is difficult to accommodate a three phase circuit on a 40’ pole. The project will consist of a step down (“rabbit”) transformer bank to supply load on Raglan St.

Preliminary Project Information

Age of Plant:	10-20 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	5kV UG Cable
Pole Type:	Wood	Secondary Conductor:	Choose an item.
Area Description:	Residential	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☐	PCB’s	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☐	Capacity	☐
Revitalization	☐	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☐

Investment Category	System Renewal	
Capital Investment	Gross Capital	$241,728
	Customer Contribution	$0
	Net Capital	$241,728
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	18 residential + 1 commercial (school)
Expected Project Timing	Start Date	Q2
	End Date	Q3
Expected Expenditure Timing	Q1	20%
	Q2	40%
	Q3	40%
	Q4	0%

Risks and Mitigation	Due to the nature of this project various installations (poles, transformers, junctions etc.) will be installed creating visual changes to the hydro infrastructure in the area. Often times this leads to concerns from customers, however ETPL has a great deal of experience communicating with customers allowing a better understanding of the requirements and alleviating any concerns.
Comparative Information	ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.
REG Investment	This project is not associated with a REG investment
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for this project is to convert the existing infrastructure allowing it to be supplied from the preferred 28kV distribution system. The voltage conversion also aligns with replacement of end of life assets justified in the Asset Management Plan. In certain situations newer assets are required to be replaced based on 28kV design requirements (pole heights etc.) however due to the nature of the distribution system this may be required. In the longer term voltage conversion will provide a great deal of benefit to the customer.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Project Alternatives	Other routes for the three phase 28kV feeder loop were examined in an effort to avoid replacing newer poles simply due to insufficient height however due to the location of three phase loads and the Clinton MS it was deemed that Princess St. was the most logical route.
Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.

Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses. This project will also provide an additional benefit to the multiple customers who will have the existing poles removed from their property.

Safety

All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ETPL is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ETPL also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

Environmental Benefits

System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project

Asset Condition Relative to Typical Life Cycle	The condition of the assets encompassed by this project are in relatively good condition and not at risk of failure. The replacement is being driven by voltage conversion and the need to tie the two 28kV feeders into Clinton.
Number of Customers in Each Class Potentially Affected	18 residential + 1 commercial (school)

Quantitative Customer Impacts	Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. The Clinton MS is nearing its end of life and voltage conversion is needed to extend the life of the station transformer and ensure a failure does not occur as it would affect a large number of customers.
Qualitative Customer Impacts	More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station.
Value of Customer Impact	This particular project indirectly affects a large number of customers connected to the Clinton DS which is nearing its end of life and need to have load removed from it.
Other Factors Affecting Project Timing	The primary factor affecting the timing of this project is the requirement to remove load from the Clinton MS.
Consequences for System O&M Costs	If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify.
Reliability & Safety Factors	This project does not directly address any reliability or safety factors however indirectly affects a large number of customers by reducing load on the DS.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	This project will be a like-for-like replacement aside from the voltage conversion aspects.

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH		4	$7,500	$30,000	
	Primary 3PH		0	$10,000	$0	
	Secondary		1	$5,000	$5,000	
	Service		0	$3,500	$0	
	Primary 1PH Riser		3	$1,200	$3,600	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH	1	$7,500	$7,500	
		3PH	0	$15,000	$0	
	Padmount TX	1PH	2	$10,000	$20,000	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	2	170	$125	$21,250	PRIMARY 2 Conduits - 1 Phase
		1	125	$25	$3,125	SECONDARY
		2	105	$50	$5,250	SECONDARY
		>3		$125	$0	
Cable & Pull	Primary (per run)		210	$25	$5,250	
	Secondary(per run)		350	$20	$7,000	
Secondary	Service Work			$2,000	$0	
	Splice Box			$1,500	$0	
	Spun Bus		240	$30	$7,200	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement			$2,500	$0	
	Tree Trimming		1	$2,500	$2,500	
	Restoration		2	$5,000	$10,000	
	Hydro One Costs		0	$15,000	$0	
	Removals		2	$5,000	$10,000	
	Railway Crossing		0	$10,000	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		$137,675.00	
			Contingency		$13,767.50	
			Engineering		$13,767.50	

2018 - Project Assessment Form

Project Name	CLI-UGCONV-Princess St., Percival to Schools	Municipality	Clinton
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description: This project will convert two schools with a total connected load of 850kVA.

Preliminary Project Information

Age of Plant:	20-30 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	5kV UG Cable
Pole Type:	Wood	Secondary Conductor:	Choose an item.
Area Description:	School Area	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☐	Capacity	☐
Revitalization	☐	Road Construction	☐	5kV UG Cable	☒
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☐

Investment Category	System Renewal	
Capital Investment	Gross Capital	$161,400
	Customer Contribution	$0
	Net Capital	$161,400
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	3 commercial (schools)
Expected Project Timing	Start Date	Q2
	End Date	Q3
Expected Expenditure Timing	Q1	0%
	Q2	50%
	Q3	50%
	Q4	0%

Risks and Mitigation	The largest risk to this project is that it must be completed within a small window of time when the schools are not in use. This will be mitigated with proper planning and communication with the facilities.
Comparative Information	ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.
REG Investment	This project is not associated with a REG investment
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for this project is to convert the existing infrastructure allowing it to be supplied from the preferred 28kV distribution system. The voltage conversion also aligns with replacement of end of life assets justified in the Asset Management Plan. In certain situations newer assets are required to be replaced based on 28kV design requirements (pole heights etc.) however due to the nature of the distribution system this may be required. In the longer term voltage conversion will provide a great deal of benefit to the customer.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Project Alternatives	There are no practicable project alternatives that were considered for this project. The assets directly related to the scope of the project are being replaced in a like for like fashion.
Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.
Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less

	frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses. This project will also provide an additional benefit to the multiple customers who will have the existing poles removed from their property.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	ETPL is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ETPL also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power. This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project	
Asset Condition Relative to Typical Life Cycle	The condition of the assets encompassed by this project are in relatively good condition and not at risk of failure. The replacement is being driven by voltage conversion and the need to tie the two 28kV feeders into Clinton.
Number of Customers in Each Class Potentially Affected	3 commercial customers (schools)
Quantitative Customer Impacts	Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will

	experience more frequent outages if not addressed. The Clinton MS is nearing its end of life and voltage conversion is needed to extend the life of the station transformer and ensure a failure does not occur as it would affect a large number of customers.
Qualitative Customer Impacts	More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will remove load from the station.
Value of Customer Impact	This particular project indirectly affects a large number of customers connected to the Clinton DS which is nearing its end of life and need to have load removed from it.
Other Factors Affecting Project Timing	The primary factor affecting the timing of this project is the requirement to remove load from the Clinton MS.
Consequences for System O&M Costs	If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify.
Reliability & Safety Factors	This project does not directly address any reliability or safety factors however indirectly affects a large number of customers by reducing load on the DS.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	This project will be a like-for-like replacement aside from the voltage conversion aspects.

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH		4	$7,500	$30,000	
	Primary 3PH		0	$10,000	$0	
	Secondary		1	$5,000	$5,000	
	Service		0	$3,500	$0	
	Primary 1PH Riser		3	$1,200	$3,600	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH	1	$7,500	$7,500	
		3PH	0	$15,000	$0	
	Padmount TX	1PH	2	$10,000	$20,000	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	2	170	$125	$21,250	PRIMARY 2 Conduits - 1 Phase
		1	125	$25	$3,125	SECONDARY
		2	105	$50	$5,250	SECONDARY
		>3		$125	$0	
Cable & Pull	Primary (per run)		210	$25	$5,250	
	Secondary(per run)		350	$20	$7,000	
Secondary	Service Work			$2,000	$0	
	Splice Box			$1,500	$0	
	Spun Bus		240	$30	$7,200	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement			$2,500	$0	
	Tree Trimming		1	$2,500	$2,500	
	Restoration		2	$5,000	$10,000	
	Hydro One Costs		0	$15,000	$0	
	Removals		2	$5,000	$10,000	
	Railway Crossing		0	$10,000	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		$137,675.00	
			Contingency		$13,767.50	
			Engineering		$13,767.50	

2018 - Project Assessment Form

Project Name	ING-OHCONV-Bruce & Metcalfe St.	Municipality	Ingersoll
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

This project will convert an area of Ingersoll that is experiencing an increasing number of end of life poles as identified by the pole testing program. On a high level the Town of Ingersoll has two very lightly loaded 4kV substations both with transformers in relatively good condition. This area of town is the farthest from the substations and once converted will enable ETPL to remove a substation from service without any concerns around voltage drop etc. This will provide the option to re-task one of the substation transformers for use as an emergency backup for the remaining substations within the system. On a more detailed level this project will bring a single phase supply to Bruce St. from Kensington St. and supply Metcalfe with a radial supply. The single phase will tie into Carnegie St. to complete a single phase loop of the area.

Preliminary Project Information

Age of Plant:	40-50 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	3/0 ACSR
Pole Type:	Wood	Secondary Conductor:	3/0 Triplex
Area Description:	Residential	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☒	PCB's	☐	Open Bus	☒
Broken Equipment	☐	Clearances	☒	Capacity	☐
End of Life Assets	☒	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☐

Investment Category	System Renewal	
Capital Investment	Gross Capital	$295,000
	Customer Contribution	$0
	Net Capital	$295,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	43 residential
Expected Project Timing	Start Date	Q3 2018
	End Date	Q4 2018
Expected Expenditure Timing	Q1	10%
	Q2	30%
	Q3	30%
	Q4	30%

Risks and Mitigation

Due to the nature of this project various installations (poles, transformers, junctions etc.) will be installed creating visual changes to the hydro infrastructure in the area. Often times this leads to concerns from customers, however ETPL has a great deal of experience communicating with customers allowing a better understanding of the requirements and alleviating any concerns.

Comparative Information

ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

REG Investment

This project is not associated with a REG investment

Leave to Construct Approval

This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver

The primary driver for this project is to convert the existing infrastructure allowing it to be supplied from the preferred 28kV distribution system. The voltage conversion also aligns with replacement of end of life assets justified in the Asset Management Plan. In certain situations newer assets are required to be replaced based on 28kV design requirements (pole heights etc.) however due to the nature of the distribution system this may be required. In the longer term voltage conversion will provide a great deal of benefit to the customer.

This project is also driven by asset condition; multiple pole tests in the area have indicated that the poles are at or very near end of life and replacement on a planned basis will result in lower replacement costs.

In addition, this project will be 1/3 of the conversion required to allow ETPL to confidently remove one of the remaining substations in Ingersoll and re-task it as a replacement for other ageing stations.

Investment Priority

Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives

There are no viable project alternatives for this project. The area will be replaced in a “like-for-like” fashion and no major configuration changes are expected.

Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.
Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project Asset Condition Relative to Typical Life Cycle	As previously noted, the poles encompassed by this project are in an area where testing has indicated that the poles are either at or near their end of life. To date a failure has not occurred as a result of the current condition however a planned replacement of the entire area will result in lower costs as compared to piecemeal replacement based on testing.
Number of Customers in Each Class Potentially Affected	43 residential
Quantitative Customer Impacts	Currently no outages have resulted from failure of assets in the area, however if the poles, wires, transformers etc. are not replaced more frequent outages would be expected.

Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project. If the area is not rebuilt it is expected that assets would begin to fail and result in poor customer satisfaction due to outages.
Value of Customer Impact	The customers affected by the project are all residential and typically do not have backup power.
Other Factors Affecting Project Timing	This project is part of our capital project portfolio which is in line with recommendations for asset replacement levels based on the AMP. This specific project has been optimized against other investments as described above and further in the DSP.
Consequences for System O&M Costs	The main consequence on not implementing the project would be the resulting unplanned and possibly afterhours repairs required to maintain the end of life assets in the area. The exact costs are difficult to quantify.
Reliability & Safety Factors	Again, based on the age and condition of the assets the reliability in the area is expected to decline if the assets are not proactively replaced. There are no specific safety factors that relate to this project aside from the risk of asset failure based on condition.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

2018 - Project Assessment Form

Project Name	MIT-OHCONV-Step Down Tx-Arthur St.	Municipality	Mitchell
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

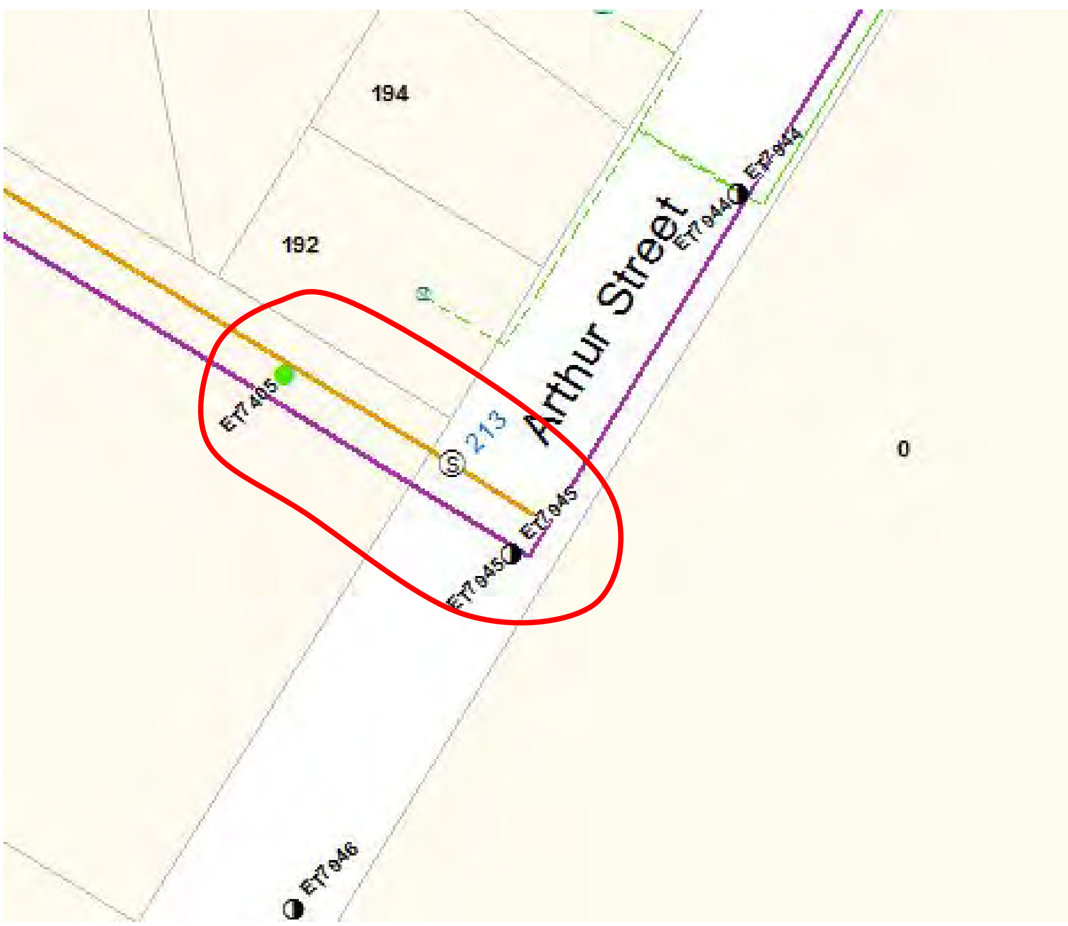
This project will facilitate the removal of the Mitchell MS by installing a three phase stepdown ("rabbit") transformer to supply the remaining 4kV load in Mitchell. This stepdown will allow the station to be removed quicker than converting the remaining six (6) streets and will enable ETPL to focus capital spending on areas in more need. The step down will be installed on a pole on Arthur St. where the existing 28kV taps off of the main line.

Preliminary Project Information

Age of Plant:	Choose an item.	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	Choose an item.
Pole Type:	Wood	Secondary Conductor:	Choose an item.
Area Description:	Residential	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☐	Capacity	☐
Revitalization	☐	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☒	Access	☒	Structural	☐



Investment Category	System Renewal	
Capital Investment	Gross Capital	$46,000
	Customer Contribution	$0
	Net Capital	$46,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	0 directly (>100 indirectly)
Expected Project Timing	Start Date	Q2
	End Date	Q3
Expected Expenditure Timing	Q1	0%
	Q2	50%
	Q3	50%
	Q4	0%
Risks and Mitigation	The greatest risk associated with this project is the loading that the step down transformers will be required to supply. ETPL has proactively installed temporary metering devices to understand the loading in the area and does not anticipate any issues.	
Comparative Information	ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.	
REG Investment	This project is not associated with a REG investment	
Leave to Construct Approval	This project does not require Leave to Construct approval under section 92 of the OEB Act	

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Drivers	The primary driver for this project is to remove the Mitchell MS which is at its end of life.
Investment Priority	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Project Alternatives	There are no practicable project alternatives that were considered for this project; rather than install the step down bank ETPL could complete voltage conversion to the remaining six (6) streets however this would delay the removal of the substation and defer spending from areas of greater need for a few years.
Operational Benefits	The greatest operational benefit of this project will be the fact that the Mitchell MS can be removed and will no longer need to be maintained or operated moving forward.
Reliability Benefits	The largest reliability benefit will result in the remaining 4kV customers being supplied from a new step down transformer bank as opposed to an end of life MS.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses. This project will also provide an additional benefit to the multiple customers who will have the existing poles removed from their property.

Safety

All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ETPL is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ETPL also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

Environmental Benefits

System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project

Asset Condition Relative to Typical Life Cycle

The Mitchell MS is at its end of life and has been identified by ETPLs third party substation maintenance contractor as requiring investment or removal from service as soon as possible.

Number of Customers in Each Class Potentially Affected

The project indirectly affects >100 residential customers.

Quantitative Customer Impacts

Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed.

Qualitative Customer Impacts

More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will ensure that customer continue to have good reliability for many years.

Value of Customer Impact

This particular project affects residential customers and substantial economic consequences would not be expected as a result of an outage; however residential customers do not typically have access to back-up generation and prolonged outages could be considered

	substantial to the residents affects.
Other Factors Affecting Project Timing	None
Consequences for System O&M Costs	If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify.
Reliability & Safety Factors	The renewal of assets in the project scope will result in increased reliability simply based on new assets with a reduced risk of failure.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH		4	$7,500	$30,000	
	Primary 3PH		0	$10,000	$0	
	Secondary		1	$5,000	$5,000	
	Service		0	$3,500	$0	
	Primary 1PH Riser		3	$1,200	$3,600	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH	1	$7,500	$7,500	
		3PH	0	$15,000	$0	
	Padmount TX	1PH	2	$10,000	$20,000	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	2	170	$125	$21,250	PRIMARY 2 Conduits - 1 Phase
		1	125	$25	$3,125	SECONDARY
		2	105	$50	$5,250	SECONDARY
		>3		$125	$0	
Cable & Pull	Primary (per run)		210	$25	$5,250	
	Secondary(per run)		350	$20	$7,000	
Secondary	Service Work			$2,000	$0	
	Splice Box			$1,500	$0	
	Spun Bus		240	$30	$7,200	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement			$2,500	$0	
	Tree Trimming		1	$2,500	$2,500	
	Restoration		2	$5,000	$10,000	
	Hydro One Costs		0	$15,000	$0	
	Removals		2	$5,000	$10,000	
	Railway Crossing		0	$10,000	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		$137,675.00	
			Contingency		$13,767.50	
			Engineering		$13,767.50	

2018 - Project Assessment Form

Project Name	MIT-UGCONV-St. Andrews & Maple Crt.	Municipality	Mitchell
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

This project will convert St. Andrews Street and Maple Court. The 27.6kV supply will be taken from Henry Street and extend down St. Andrews Street with an overhead pole line ending at house #235. A new underground primary feed will be directionally bored to a new padmounted transformer on St. Andrew Street and another new primary feed will again be directionally bored to supply a new padmounted transformer on Maple Court. Two backyard services will also be modified as required to be supplied from the infrastructure on the street. It will also address two "poletrans" which have been identified as an employee safety concern. This project is required to facilitate the removal of the end of life Mitchell MS2 substation.

Preliminary Project Information

Age of Plant:	40-50 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	1/0 ACSR
Pole Type:	Wood	Secondary Conductor:	3/0 Triplex
Area Description:	Residential	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☐	PCB's	☐	Open Bus	☒
Broken Equipment	☐	Clearances	☒	Capacity	☐
Revitalization	☒	Road Construction	☐	5kV UG Cable	☒
Direct Buried Cable	☒	Submersible TX	☐	Poletrans	☒
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☒	Access	☒	Structural	☐

Investment Category	System Renewal	
Capital Investment	Gross Capital	$188,472
	Customer Contribution	$0
	Net Capital	$188,472
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	29 residential
	Customer Load (if available)	
Expected Project Timing	Start Date	Q2
	End Date	Q3
Expected Expenditure Timing	Q1	20%
	Q2	40%
	Q3	40%
	Q4	Choose an item.

Risks and Mitigation

This particular project does not have many risks that are above and beyond typical concerns such as scheduling with other projects, man power requirements etc. that are mitigated with proper planning. Due to the nature of this project various installations (poles, transformers, junctions etc.) will be installed creating visual changes to the hydro infrastructure in the area. Often times this leads to concerns from customers, however ETPL has a great deal of experience communicating with customers allowing a better understanding of the requirements and alleviating any concerns. This project also contains an underground portion that will need to be completed while frost is out of the ground which again is mitigated with proper planning.

Comparative Information

ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible. The underground portion of this project would be comparable to Willow Lane completed in 2015, Golden Gardens completed in 2014 ($281,159), Towerview Subdivision completed in 2012 ($193,594) and a number of other underground conversion projects. The overhead portion of the project is fairly small (5 poles) and ETPL has extensive experience with pole line rebuilds.

REG Investment

This project is not associated with a REG investment

Leave to Construct Approval

This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

<u>Efficiency, Customer Value & Reliability</u>

Project Drivers

The primary driver for this project is to convert the existing infrastructure allowing it to be supplied from the preferred 28kV distribution system. The voltage conversion also aligns with replacement of end of life assets justified in the Asset Management Plan. In certain situations newer assets are required to be replaced based on 28kV design requirements (pole heights etc.) however due to the nature of the distribution system this may be required. In the longer term voltage conversion will provide a great deal of benefit to the customer. This particular project is aimed at eliminating the Mitchell MS2 substation by 2018.

Investment Priority

Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives

There are no practicable project alternatives that were considered for this project. The assets

	directly related to the scope of the project are at or nearing the end of their useful life and their replacement is justified in the Asset Management Plan. In addition the Mitchell MS2 is an end of life substation that would require substantial investment to replace and can be avoided with conversion efforts.
Operational Benefits	The completion of this project will convert the area to 28kV which will provide more flexibility for switching operations during outages and load shifting. Voltage conversion also aligns with infrastructure being constructed to current standards ensuring that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff. Ultimately the completion of voltage conversion will lead to the elimination of ETPL municipal substations.
Reliability Benefits	As mentioned earlier this project will convert the area to 28kV and will provide more flexibility for switching operations which will aid in reducing outage duration. Ultimately when one distribution voltage is attained the reliability of the system will be greatly improved due to less frequent and shorter outages.
Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses. This project will also provide an additional benefit to the multiple customers who will have the existing poles removed from their property.

Safety

All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.

This project will remove rear yard distribution assets eliminating the potential of customers coming into contact with hydro lines. Currently there is a risk of downed hydro lines in rear yards, and inadvertent contact due to the proximity to customer owned structures, trees etc.

Cyber-Security, Privacy

Not applicable to this project

Co-ordination, Interoperability

ETPL is a member of the USF (Utilities Standard Forum) which provides recognized construction standards to a large number of utilities throughout Ontario that have been created to maintain consistency and consider future development. ETPL also actively participate in the SWBG (Southwest Buying Group) which is a group of utilities who come together to standardize on materials and purchasing practices to take advantage of improved purchasing power.

This project does not apply to the regional infrastructure planning framework.

ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.

Economic Development

This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.

Environmental Benefits

System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project

Asset Condition Relative to Typical Life Cycle	The assets that will be replaced within the scope of the project vary in age from 52 to 19 years. The largest risk and consequence is associated with the radially supplied underground portion of the project which is at the end of it useful life. A failure in either the poletrans or underground cable would result in a lengthy outage for 10-12 customers as the conductor is most likely direct buried and the 'poletrans' are not an asset that is ever replaced in a like for like fashion. The Mitchell MS2 station is also at its end of life and would result in an expensive and lengthy outage to approximately 236 customers if it were to fail.
Number of Customers in Each Class Potentially Affected	The project directly affects 29 residential customers; however Mitchell MS2 currently supplies 236.
Quantitative Customer Impacts	Exact frequency and duration statistics are not currently known for the area; however the further deterioration of end of life assets will increase the probability that customers will experience more frequent outages if not addressed. As noted a failure in the underground portion of the project could result in an extended outage.
Qualitative Customer Impacts	More frequent and extended outages will result in reduced customer satisfaction. The completion of the project will ensure that customer continue to have good reliability for many years.
Value of Customer Impact	This particular project affects residential customers and substantial economic consequences would not be expected as a result of an outage; however residential customers do not typically have access to back-up generation and prolonged outages could be considered substantial to the residents affects.
Other Factors Affecting Project Timing	The timing of this project on a high level coincides with the need to eliminate Mitchell MS2 prior to a failure that could result in a large outage. On a more granular level the project will be scheduled during Q2 & Q3 to ensure that all underground work is completed in the warmer months.
Consequences for System O&M Costs	If this project and other system renewal projects are not completed O&M will drastically increase over time as asset failure will result in costly unplanned repairs. At this time specific O&M consequences are difficult to quantify.
Reliability & Safety Factors	The renewal of assets in the project scope will result in increased reliability simply based on new assets with a reduced risk of failure. The conversion also provides more operational flexibility to reduce outage duration. The safety to both the public and employees will be increased again due to the nature of a renewal project where infrastructure is constructed to current standards and use current equipment.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	This project will resemble a like-for-like replacement in the fact that an existing overhead pole line will be replaced with a new overhead pole line in a similar fashion and the underground

portion will be replaced with underground infrastructure in a similar fashion. The new assets will be upgraded to current standards and conversion to 28kV will be completed with only minor changes to the physical distribution system in the area.

Type	Description		Quantity	Unit Price	Total	Notes
Poles	Primary 1PH		4	$7,500	$30,000	
	Primary 3PH		0	$10,000	$0	
	Secondary		1	$5,000	$5,000	
	Service		0	$3,500	$0	
	Primary 1PH Riser		3	$1,200	$3,600	
	Primary 3PH Riser			$3,500	$0	
	Load Break Switch			$20,000	$0	
	Hydro One Costs			$15,000	$0	
Equipment	Polemount TX	1PH	1	$7,500	$7,500	
		3PH	0	$15,000	$0	
	Padmount TX	1PH	2	$10,000	$20,000	
		3PH		$40,000	$0	
	Primary 3Ø4W Junction			$7,500	$0	
	Primary 3Ø4W Switch			$50,000	$0	
Conduit	Open Cut	1		$50	$0	
		2		$65	$0	
		3		$80	$0	
		>3		$100	$0	
	Bore	2	170	$125	$21,250	PRIMARY 2 Conduits - 1 Phase
		1	125	$25	$3,125	SECONDARY
		2	105	$50	$5,250	SECONDARY
		>3		$125	$0	
Cable & Pull	Primary (per run)		210	$25	$5,250	
	Secondary(per run)		350	$20	$7,000	
Secondary	Service Work			$2,000	$0	
	Splice Box			$1,500	$0	
	Spun Bus		240	$30	$7,200	
Meters	1Ø			$300	$0	
	3Ø			$1,000	$0	
EXTRAS	Easement			$2,500	$0	
	Tree Trimming		1	$2,500	$2,500	
	Restoration		2	$5,000	$10,000	
	Hydro One Costs		0	$15,000	$0	
	Removals		2	$5,000	$10,000	
	Railway Crossing		0	$10,000	$0	
	*Description			$0	$0	
	*Description			$0	$0	
			Subtotal		$137,675.00	
			Contingency		$13,767.50	
			Engineering		$13,767.50	

2018 - Project Assessment Form

Project Name	PTS-OHUPGD-George St. Completion	Municipality	Port Stanley
		Cost Category	Capital
		Project Type	Enhancement

General Information

Project Description

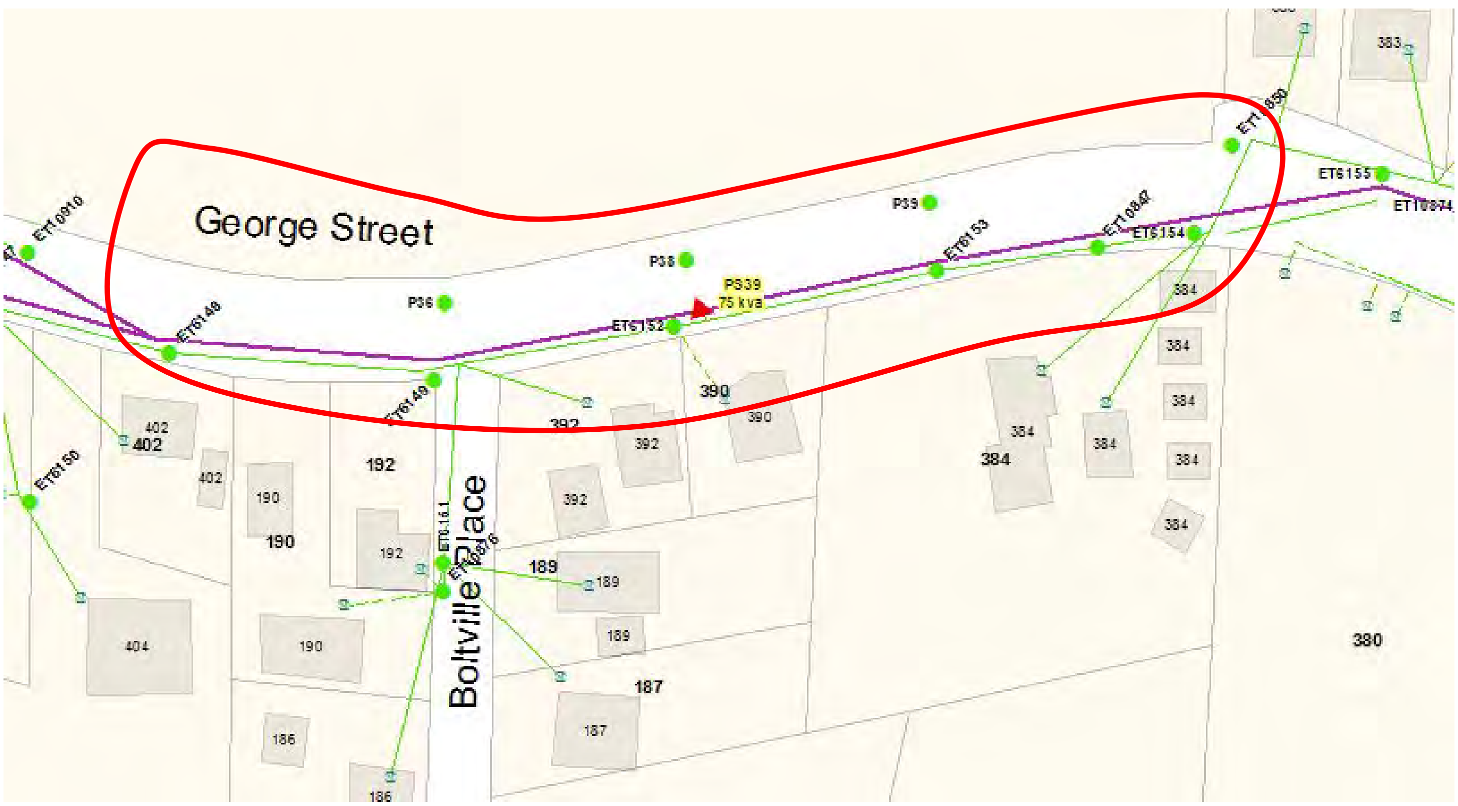
This project is simply required to finish a previous capital project that was initiated in 2013/2014. A small portion of the project was not completed due to property issues that needed to be resolved between the property owner and the municipality. This has now been resolved and ETPL will need to finish the remaining pole installations.

Preliminary Project Information

Age of Plant:	40-50 years	Construction Standards:	Legacy
Primary Voltage:	4kV	Primary Conductor:	3/0 ACSR
Pole Type:	Wood	Secondary Conductor:	3/0 Triplex
Area Description:	Residential	Traffic Volume:	Low

Asset Condition Issues

Rotten Poles	☒	PCB's	☐	Open Bus	☐
Broken Equipment	☐	Clearances	☒	Capacity	☐
End of Life Assets	☒	Road Construction	☐	5kV UG Cable	☐
Direct Buried Cable	☐	Submersible TX	☐	Poletrans	☐
TX Base	☐	Grounding	☐	Meter Access	☐
Backyard	☐	Access	☐	Structural	☐



Investment Category	System Renewal	
Capital Investment	Gross Capital	$60,000
	Customer Contribution	$0
	Net Capital	$60,000
	O&M Costs (if applicable)	$0
Customer Information	Number of Customer Attachments	4 residential
Expected Project Timing	Start Date	Q1 2018
	End Date	Q2 2018
Expected Expenditure Timing	Q1	40%
	Q2	60%
	Q3	0%
	Q4	0%

Risks and Mitigation — Due to the nature of this project various installations (poles, transformers, junctions etc.) will be installed creating visual changes to the hydro infrastructure in the area. Often times this leads to concerns from customers, however ETPL has a great deal of experience communicating with customers allowing a better understanding of the requirements and alleviating any concerns.

Comparative Information — ETPL completes various projects throughout a given year and possesses a great deal of expertise with regards to budgeting, design, planning and construction of OH and UG rebuilds and is continually improving its processes to ensure projects are completed as efficiently as possible.

REG Investment — This project is not associated with a REG investment

Leave to Construct Approval — This project does not require Leave to Construct approval under section 92 of the OEB Act

Evaluation Criteria & Information Requirements

Efficiency, Customer Value & Reliability

Project Driver — The initial primary driver for this project was the replacement of existing overhead infrastructure which has reached its end of life and/or has seen an increase in failures creating reliability issues. This type of project is aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers.

Investment Priority — Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.

Project Alternatives — There are no viable project alternatives for this project. The area will be replaced in a “like-for-like” fashion and no major configuration changes are expected.

Operational Benefits — The largest operational benefit of this project is related to the upgraded infrastructure being constructed to current standards. This ensures that proper clearances, spacing, protective devices and other equipment are implemented which are more easily accessed and operated by operations staff.

Reliability Benefits — The completion of the project will upgrade the existing aged assets in the area and in turn provide a more reliable system simply based on the installation of new upgraded distribution assets.

Customer Benefits	The benefits to customers resulting from the completion of a system renewal project arise from the upgrade in distribution assets that align with the long term plan for the system to current design standards. This will provide an increase in safety to the public and more reliable system that is much more cost effective to operate due to improved equipment, access and a reduction in line losses.
Safety	All system renewal projects result in an upgrade to the existing distribution assets which will provide a greater deal of both customer and worker safety simply based on the reduced risk of equipment failure and construction to current standards.
Cyber-Security, Privacy	Not applicable to this project
Co-ordination, Interoperability	This project does not apply to the regional infrastructure planning framework. ETPL communicates its projects with the required third parties to properly coordinate all work and gain efficiencies if possible.
Economic Development	This project does not directly relate to any economic growth however with any system renewal ETPL considers any future potential for customer connections or load growth and addresses these with an appropriate design. System renewal projects especially voltage conversion will provide a distribution system more capable of connecting future customers with higher reliability.
Environmental Benefits	System Renewal projects implement the use of the most current equipment which comply with much more stringent environmental requirements than existing infrastructure such as current transformer insulating fluids and pole treatment methods.

Category Specific Requirements

System Renewal Project	
Asset Condition Relative to Typical Life Cycle	The poles that will be replaced as part of this project are beyond their typical useful life (>50years) old and the primary driver for the original project was poor asset condition and reliability in the area.
Number of Customers in Each Class Potentially Affected	4 residential
Quantitative Customer Impacts	Currently no outages have resulted from failure of the assets specifically related to this project, however if the poles, wires, transformers etc. are not replaced more frequent outages would be expected.
Qualitative Customer Impacts	To date, no customer related complaints or concerns have been recorded related specifically to the area included in this project. If the area is not rebuilt it is expected that assets would begin to fail and result in poor customer satisfaction due to outages.
Value of Customer Impact	The customers affected by the project are all residential and typically do not have backup power.
Other Factors Affecting Project Timing	This project is part of our capital project portfolio which is in line with recommendations for asset replacement levels based on the AMP. This specific project has been optimized against other investments as described above and further in the DSP.
Consequences for System O&M	The main consequence on not implementing the project would be the resulting unplanned

Costs	and possibly afterhours repairs required to maintain the end of life assets in the area. The exact costs are difficult to quantify.
Reliability & Safety Factors	Again, based on the age and condition of the assets the reliability in the area is expected to decline if the assets are not proactively replaced. There are no specific safety factors that relate to this project aside from the risk of asset failure based on condition.
Analysis of Project Benefits & Timing	Erie Thames Powerlines implements a software based Investment Optimizer which evaluates multiple projects based on weighted criteria in order to identify, select, prioritize and pace investments. This process is detailed in Section 5.4.2 of the DSP.
Like for Like Renewal Analysis	Not applicable

APPENDIX N - DSP THIRD PARTY REVIEW

costello
Utility Consultants

4096 Meadowbrook Drive, Unit 112
London, ON N6L 1G4
Phone (519) 203-1222

August 8, 2017

SUBJECT: Distribution System Plan – Prepared by Erie Thames Powerlines

Dear Reader,

As part of their Cost of Service Rate Application (EB-2017-0038), Erie Thames Powerlines (ETPL) has prepared the attached Distribution System Plan (DSP), which follows the current Chapter 5 Filing Requirements outlined by the Ontario Energy Board.

The DSP was prepared by ETPL, and is based on an Asset Management Plan (AMP) and Asset Condition Assessment (ACA) that was originally created by a third-party consultant (METSCO) in 2011. ETPL has refined the AMP and ACA using additional data they have collected via staff and third-party contractors.

Costello Associates Inc. (Costello) has reviewed this DSP and confirms that it addresses the Performance Outcomes identified by the OEB – Customer Focus, Operational Effectiveness, Public Policy Responsiveness, and Financial Performance.

The work that is planned for the Forecast Period reflects the condition of the assets, the risks they pose to safety and reliability, a reasonable assumption of system and load growth, and the preferences of customers. Performance metrics are in place to monitor the effectiveness of the planned work and ensure the system continues to perform at the level expected by ETPL customers.

Sincerely,

Jac Vanderbaan, P. Eng., CPA, CMA
jvanderbaan@costelloassociates.ca
Vice President, Operations
Costello Utility Consultants

Attachment 4 (of 8):

2-C(i) DSP Review Letter

costello
Utility Consultants

4096 Meadowbrook Drive, Unit 112
London, ON N6L 1G4
Phone (519) 203-1222

August 8, 2017

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Sincerely,

Jac Vanderbaan, P. Eng., CPA, CMA
jvanderbaan@costelloassociates.ca
Vice President, Operations
Costello Utility Consultants

Attachment 5 (of 8):

2-D Appendix 2-AB Capital Expenditure Summary

File Number:	2017-0038
Exhibit:	2
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Appendix 2-AB
Table 2 - Capital Expenditure Summary from Chapter 5 Consolidated Distribution System Plan Filing Requirements

First year of Forecast Period: *2018*

CATEGORY	Historical Period (previous plan[1] & actual)															Forecast Period (planned)				
	2013			2014			2015			2016			2017			2018	2019	2020	2021	2022
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual[2]	Var					
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000				
System Access	560,000	758,310	35.4%	405,000	1,420,455	250.7%	680,220	1,316,968	93.6%	806,021	1,060,304	31.5%	793,628		-100.0%	879,500	920,100	812,700	816,300	759,900
System Renewal	1,986,000	789,397	-60.3%	2,198,000	2,298,252	4.6%	1,995,440	1,830,486	-8.3%	1,978,591	1,515,632	-23.4%	1,673,992		-100.0%	2,142,450	2,002,230	1,907,040	2,168,882	1,939,454
System Service	275,775	42,215	-84.7%	225,000	3,856	-98.3%	530,000	64,232	-87.9%	253,430	188,030	-25.8%	448,318		-100.0%	73,000	74,875	76,750	55,900	55,000
General Plant	470,000	572,239	21.8%	425,000	332,164	-21.8%	468,250	763,110	63.0%	558,900	486,054	-13.0%	633,975		-100.0%	148,000	234,875	451,750	223,400	526,450
TOTAL EXPENDITURE	3,291,775	2,162,161	-34.3%	3,253,000	4,054,727	24.6%	3,673,910	3,974,796	8.2%	3,596,942	3,250,020	-9.6%	3,549,913	-	-100.0%	3,242,950	3,232,080	3,248,240	3,264,482	3,280,804
System O&M			--			--			--			--		$ -	--	$ 116,389	$ 117,553	$ 118,728	$ 119,915	$ 121,115

Notes to the Table:

1. Historical "previous plan" data is not required unless a plan has previously been filed. However, use the last Board-approved, at least on a Total (Capital) Expenditure basis for the last cost of service rebasing year, and the applicant should include their planned budget in each subsequent historical year up to and including the Bridge Year.
2. Indicate the number of months of 'actual' data included in the last year of the Historical Period (normally a 'bridge' year): 8

Explanatory Notes on Variances (complete only if applicable)
Notes on shifts in forecast vs. historical budgets by category
Notes on year over year Plan vs. Actual variances for Total Expenditures
Notes on Plan vs. Actual variance trends for individual expenditure categories

Attachment 6 (of 8):

2-E Appendix 2-AA Capital Projects Table

File Number:	2017-0038
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Date:	06-Sep-17

Appendix 2-AA
Capital Projects Table

Projects	2013	2014	2015	2016	2017 Bridge Year	2018 Test Year
Reporting Basis	CGAAP	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
System Access						
Comm & Ind Connections	110,248	199,892	251,974	192,895	204,000	204,000
Residential Connections	41,910	377,856	395,111	371,236	231,000	231,000
Munc Road Reconstruction	70,551	123,310	452,380	229,747		
Subdivisions	104,546	402,882	140,002	110,037		
Joint Use Make Ready Work	933	0	0	14,044		
Meter Stock Purchases	57,723	151,357	73,325	142,345	248,628	234,500
MIT-EXPN-3878 WELLINGTON ST.	12,719	0	0	0		
AYL-FACRL-84 SOUTH ST. W.	2,473	0	0	0		
ING-FACRL-HOLCROFT ST.	312,060	1,664	0	0		
ING-FACRL-CHARLES ST.W.	3,915	24,339	0	0		
TAVI-FACRL-79 MARIA ST.	40,238	0	0	0		
BEL-FACRL-Belmont PME	829	0	0	0		
ING-FACRL-Holcroft St Rail Xing		87,643	0	0		
PTS-FACRL-Mitchell St		1,960	0	0		
THA-FACRL-CHRISTIAN RETREAT		32,484	0	0		
CLI-SRVCI-270 Victoria St	0	17,068	0	0		
TAV-FACRL-117 Hope St		0	3,225	0		
Facility Relocates		0	0	0	50,000	150,000
		0	0	0		
	0	0	0	0		
	0	0	0	0		
Miscellaneous	165	0	950	0		
Sub-Total	**758,310**	**1,420,455**	**1,316,968**	**1,060,304**	**733,628**	**819,500**
System Renewal						
TAV-EXPN-WILLIAM ST.	14,360	0	0	0		
TAV-UGUPG-JACOB ST.	8,925	0	0	0		
BEL-REPL FAC-HAZELWOOD UG UPG	60,787	0	0	0		
ING-REPL FAC-MELITA & WONHAM	97,003	0	0	0		
CLI-TXCVN-MAPLEHILL APTS	12,769	0	0	0		
AYL-Fath Ave Rear Yard	58,173	10,815	0	0		
ING-GOLDEN GARDENS	126,981	22,912	0	0		
TAV-CONUIT-HOPE & CENTENNIAL	1,437	0	0	0		
PTS-GEORGE ST/RIVER/VALLEY/LAK	12,373	428,520	38,991	-8,021		
OTT-27OHRECON-DOVER ST.		20,247	0	0		
MIT-OHUPG-NAPIER & CLAYTON		94,998	0	0		
TAV-UGUPG-ARENA & SCHOOL		36,093	0	0		
BEL-FACRL-Belmont PME		65,619	0	0		
NOR-OHUPG-STOVER ST N		285,371	728	0		
CLI-27OHCVN-VICTORIA ST.			13,283	0		
ING-UGRECON-UNDERWOOD AVE-PLLN			56,524	73,875		
PTS-OHUPGD-473 LOWER SPRING ST			6,590	0		
TAV-REPLCON-WILLIAM ST.SEWPUMP			5,093	0		
AYL-OHUPG-207 Talbot St E			1,078	-992		
BEL-FACRL-140 Borden Ave			0	1,991		
PTS-FACRL-Edith Cavell Blvd. E.			0	140,086		
ING-FACRL-205 INGERSOLL ST. S				14,789		
NOR-OHUPF-Municipal Supply Upgr				3,949		
THA-REPLACE FAULTED RABBIT-				7,896		
CLI-EXPN-Mary St				3,183		
ING-REPL SYNERTEC-325 INGERSOLL			0	711		
AYL-LDISP-89 Progress Dr (IGPC)				14,257		
ING-OGCONV-Bruce & Metcalfe						295,000
AYL-OHCONV-BMO & Comm Living						135,240
AYL-ONCONV-Myrtle to John w/ pool						258,840
AYL-OHCONV-Caverly RD, Anne to Fath						82,200
AYL-UGCONV-Davenport School						105,450
PTS-OHUPGD-George St Completion						60,000
AYL-OHCONV-Talbot, Myrtle to Wellington						200,120
CLI-OHCONV-Princess, Percival to Schools						161,400
MIT-UGCONV-St Andrew & Maple Crt						188,472
MIT-OHCONV-Step Down TX, Arthur St.						46,000

Projects	2013	2014	2015	2016	2017 Bridge Year	2018 Test Year
Reporting Basis	CGAAP	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
CLI-OHCONV-Princess, Percival to William St						241,728
BEA-OHCON-Station Egress and Crossing					120,000	
TAV-STNUPG-Station Upgrades (PH2)					100,000	
OTT-OHUPG-Grove & Maple					110,292	
AYL-UGCONV-Talbot St. E.-King to Queen					185,000	
AYL-STATION-New Feeder Egress & PME					304,200	
AYL-OHCONV-South Street, Caverly to Rutherford					132,000	
CLI-OHCONV-Bayfield Road					274,500	
Service Upgrades	0	0	0	63,119	50,000	
Conversions	218,830	735,463	1,288,617	701,866		
SubStation Upgrades	12,222	4,681	85,829	56,971	15,000	8,000
Replacement - Poles	71,613	62,883	133,130	176,409	123,000	200,000
Replacement - Transformers	15,295	11,336	52,935	50,465		
Replacement - Insulators	8,103	262,169	0	0		
Replacement - Switches	0	0	0	48,155	50,000	
Replacement - Primary	7,530	0	4,939	0		
Replacement - Secondary	690	0	0	0		
	0	0	0	0		
Emergencies - Storm	8,721	8,754	13,841	13,593		
Emergencies - Misc	13,455	52,104	24,845	29,060		
Unplanned Capital Investments					150,000	100,000
	0	0	0	0		
Maps & Records	40,129	196,286	104,063	124,402	120,000	120,000
		0		0		
Miscellaneous		0		-132		
Sub-Total	**789,397**	**2,298,252**	**1,830,486**	**1,515,632**	**1,733,992**	**2,202,450**
System Service						
Smart Grid, SCADA & Automation	42,216	3,856	64,232	188,030	50,000	90,000
AYL-NEW HYDRO ONE TS					383,343	
Sub-Total	**42,216**	**3,856**	**64,232**	**188,030**	**433,343**	**90,000**
General Plant						
Leasehold Improvements	57,279	49,451	132,939	41,813	49,000	35,000
Rolling Stock	386,632	137,334	371,568	347,832	135,000	20,000
Computer Hardware	57,214	34,018	11,372	22,003	79,950	56,000
Computer Software	54,671	87,557	218,361	27,000		
Tools	16,442	23,803	28,871	15,489	35,000	20,000
Communications Equipment				31,915		
New Shop built in Mitchell					350,000	
Miscellaneous						
Sub-Total	**572,237**	**332,164**	**763,110**	**486,054**	**648,950**	**131,000**
Miscellaneous						
Total	**2,162,160**	**4,054,727**	**3,974,796**	**3,250,020**	**3,549,913**	**3,242,950**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets ***(input as negative)***						
Total	**2,162,160**	**4,054,727**	**3,974,796**	**3,250,020**	**3,549,913**	**3,242,950**

Notes:

1 Please provide a breakdown of the major components of each capital project undertaken in each year. Please ensure that all projects below the materiality threshold are

2 The applicant should group projects appropriately and avoid presentations that result in classification of significant components of the capital budget in the miscellaneous

Attachment 7 (of 8):

2-F Appendix 2-D Overhead Expense

File Number:	2017-0038
Exhibit:	2
Tab:	5
Schedule:	1
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Appendix 2-D
Overhead Expense

Applicants are to provide a breakdown of OM&A before capitalization in the below table. OM&A before capitalization may be broken down by cost center, program, drivers or another format best suited to focus on capitalized vs. uncapitalized OM&A.

OM&A Before Capitalization	**2014 Historical Year**	**2015 Historical Year**	**2016 Historical Year**	**2017 Bridge Year**	**2018 Test Year**
Distribution	$ 688,177	$ 448,729	$ 378,376	$ 384,808	$ 413,025
Billing and Collecting	$ 1,259,465	$ 1,111,468	$ 981,647	$ 998,335	$ 1,040,307
Community Relations	$ 22,871	$ 21,168	$ 24,584	$ 24,953	$ 25,327
Administrative and General	$ 4,376,576	$ 4,934,199	$ 5,274,396	$ 5,456,568	$ 5,691,140
Total OM&A Before Capitalization (B)	$ 6,347,089	$ 6,515,564	$ 6,659,003	$ 6,864,664	$ 7,169,798

Applicants are to provide a breakdown of capitalized OM&A in the below table. Capitalized OM&A may be broken down using the categories listed in the table below if possible. Otherwise, applicants are to provide its own break down of capitalized OM&A.

Capitalized OM&A	**2014 Historical Year**	**2015 Historical Year**	**2016 Historical Year**	**2017 Bridge Year**	**2018 Test Year**	**Directly Attributable? (Yes/No)**	**Explanation for Change in Overhead Capitalized**
Labour Burden	$ 744,139	$ 723,341	$ 666,502	$ 682,755	$ 713,030	**Yes**	**Training expenses no longer Capitalized under MIFRS**
Material Burden	$ -	$ -	$ -	$ -	$ -	**Yes**	**No Changes necessary on transition to MIFRS**
Vehicle Burden	$ -	$ -	$ -	$ -	$ -	**Yes**	**No Changes necessary on transition to MIFRS**
Insert description of additional item(s) and new rows if needed							
Total Capitalized OM&A (A)	$ 744,139	$ 723,341	$ 666,502	$ 682,755	$ 713,030		

% of Capitalized OM&A (=A/B)	12%	11%	10%	10%	10%		

Attachment 8 (of 8):

2-G Appendix 2-G Service Reliability and Quality indicators

File Number:	2017-0038
Exhibit:	2
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Schedule:	1
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Appendix 2-G
Service Reliability and Quality Indicators
2012-2016

Service Reliability

Index	Including outages caused by loss of supply					Excluding outages caused by loss of supply					Excluding Major Event Days				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
SAIDI	2.560	1.230	2.210	3.850	3.960	1.470	0.410	0.590	0.730	1.880	1.470	0.410	0.590	0.730	3.000
SAIFI	0.820	0.510	0.910	1.050	1.130	0.310	0.200	0.300	0.480	0.470	0.310	0.200	0.300	0.480	0.740

5 Year Historical Average

	Including outages caused by loss of supply	Excluding outages caused by loss of supply	Excluding Major Event Days
SAIDI	2.762	1.016	1.240
SAIFI	0.884	0.352	0.406

SAIDI = System Average Interruption Duration Index

SAIFI = System Average Interruption Frequency Index

Service Quality

Indicator	OEB Minimum Standard	2012	2013	2014	2015	2016
Low Voltage Connections	90.0%	98.8%	98.8%	99.4%	98.4%	99.6%
High Voltage Connections	90.0%	n/a	n/a	n/a	n/a	n/a
Telephone Accessibility	65.0%	94.6%	95.8%	95.5%	98.4%	98.4%
Appointments Met	90.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Written Response to Enquires	80.0%	100.0%	98.8%	98.6%	100.0%	100.0%
Emergency Urban Response	80.0%	90.5%	100.0%	100.0%	100.0%	100.0%
Emergency Rural Response	80.0%	n/a	n/a	n/a	n/a	n/a
Telephone Call Abandon Rate	10.0%	6.2%	4.2%	4.4%	1.6%	1.6%
Appointment Scheduling	90.0%	100.0%	100.0%	94.5%	95.8%	99.2%
Rescheduling a Missed Appointment	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Reconnection Performance Standard	85.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**no missed appointments so none needed to be rescheduled