Framework for Energy Innovation Working Group

FEIWG Meeting #5

September 15, 2021

Distribution Needs Cases

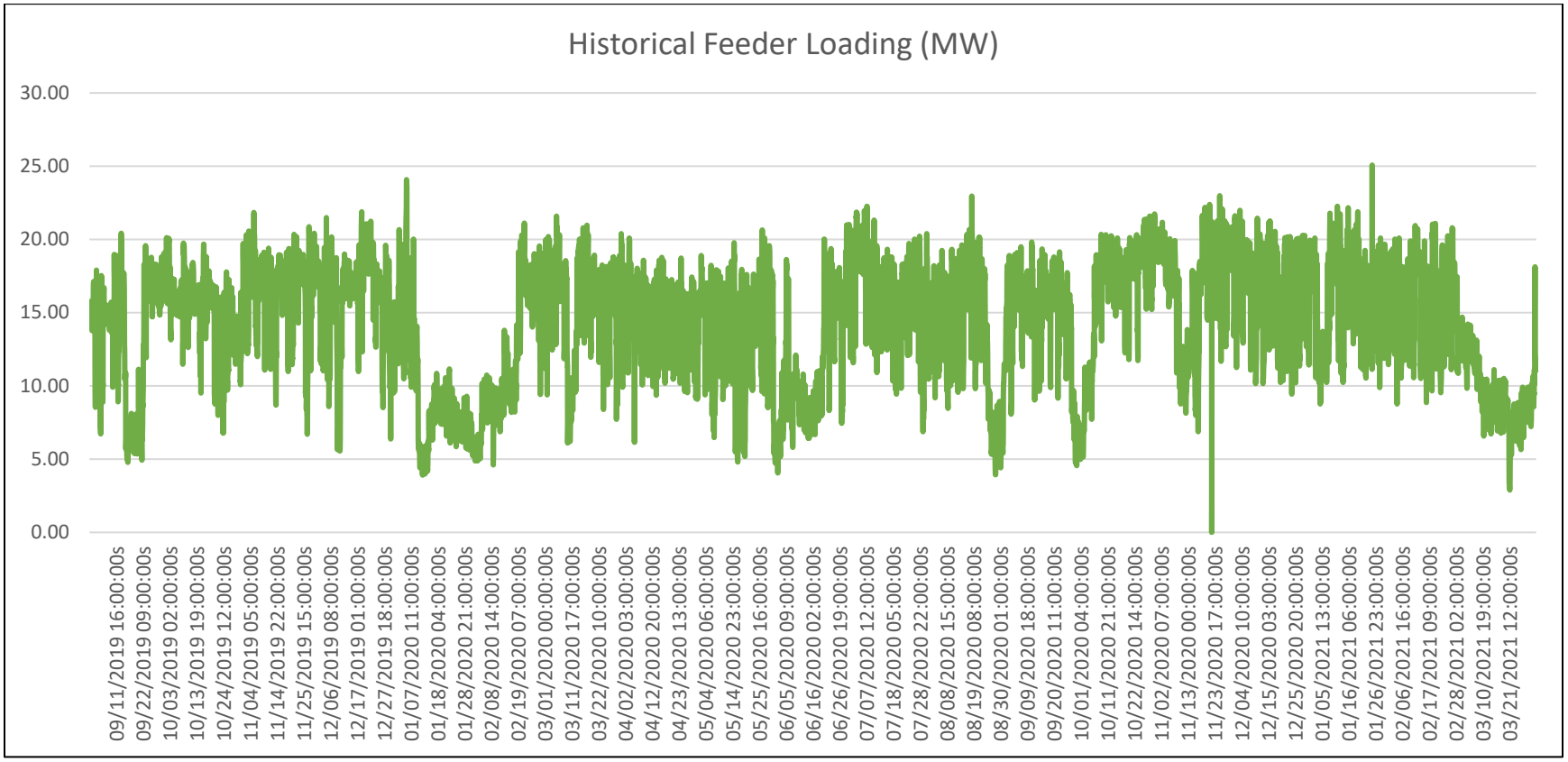
1. Capacity
2. Reliability
3. Power Quality
4. Resilience

Distribution Needs (i.e. Services to be Provided, Problems to be Solved)		
Capacity	☒	Define in relation to the specific situation being examined, as applicable
Reliability	☐	
Power Quality	☐	
Resilience	☐	

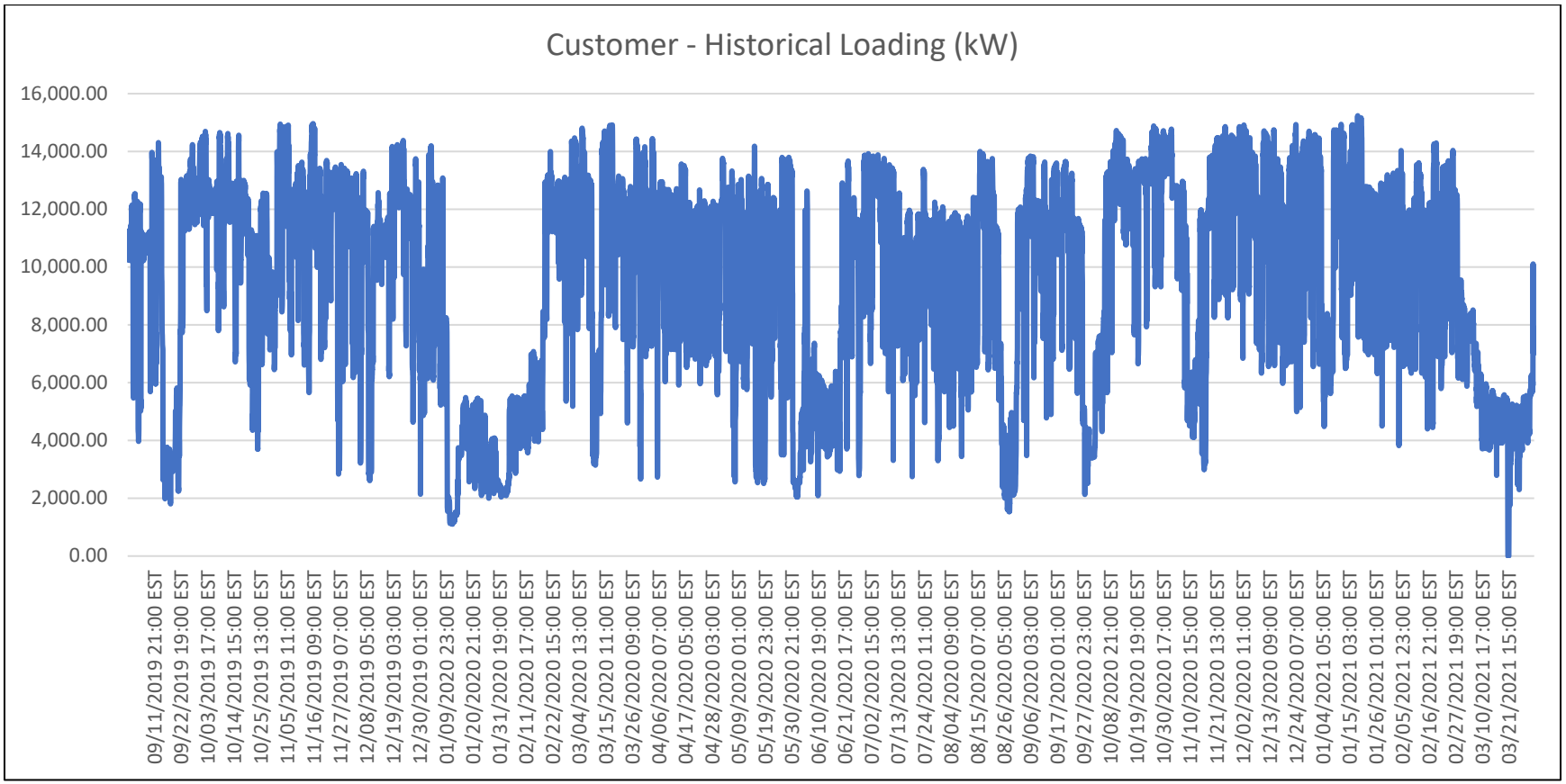
Distribution Needs Case: Capacity – Supplying additional load to a large customer on a capacity constrained feeder

Needs Case	**Traditional Utility Solution**	**Service Characteristics**
• A large Distribution Customer with approx. 15MW of existing peak load (Loading profile provided below), requires an additional 5MW of load by early 2022. The existing feeder is unable to handle this increase in demand and some reconfiguration work is required to accommodate the increased peak of 20MW total (15MW existing + 5MW incremental). • Furthermore, the customer is looking for another 10MW of additional capacity (30MW Total) in the long term, which will require a brand new feeder from the station to handle the incremental load.	• Feeder reconfiguration is required to accommodate the incremental 5MW. The customer contribution for this work is around $540K (see detailed Discounted Cash Flow (DCF) results below). It will take about 1.5 years to complete the work. • For their long term 10MW incremental load, they will need a new feeder from the station, which is around 4km away. This will require an IESO SIA with a new Station breaker and around 4km of feeder build. This work will take 2-3 years to complete.	The utility is seeking DER proposals to satisfy these characteristics: • Capacity: Incremental 5MW in the short term and possibly up to 15MW long term • Reliable supply, as the customer's processes are very sensitive to interruptions • Consistent Power Quality is required (must be within standards). **Customer Proposed Future Loading (Total):** • 2022 - 20MW (5MW incremental) • 2023 – 20MW • 2024 – 25MW • 2025 – 30MW • 2026 – 30MW 24x7 operations

Historical Feeder Loading (MW)



Customer's Existing Loading (kW)



DCF Summary:

DCF Required?	**Yes**
Expansion Deposit (Indicate Class A or Class C?)	**Class C - $347,609**
Expansion Details	
Rate Class	**ST**
Revenue Horizon	**10 Years**
Class C Estimate	**$1,195,000**
Avg. Monthly Peak Load:	**5000KW**
ArcFM Output Sheet	
Total Cost of Connection = PV Capital Upfront (incl. Overheads and AFUDC) plus PV OM&A **In DCF "Report Page", add Cell G43 and F47**	**$1,238,956**
Customer Contribution = Capital Contribution (before HST) **Use DCF "Input Page" Cell I5**	**$543,737**
HONI Investment = Total Cost of Connection minus Customer Contribution	**$695,219**

Distribution Needs (i.e. Services to be Provided, Problems to be Solved)		
Capacity	☐	
Reliability	☒	Reliability refers to the ability of the electric grid to deliver power in the quality and quantity demanded by customers
Power Quality	☐	
Resilience	☐	

Distribution Needs Case: Reliability

Needs Case	**Traditional Utility Solution**	**Service Characteristics**
As weather becomes more extreme, intermittent generation penetration increases (solar and other renewable energy generation), EV usage becomes predominant, and society becomes more dependent on energy intensive technologies, grid reliability and resilience will be at a premium.	Traditional utility reliability planning is based on forecasted coincident peak load. Utility assets are built and managed to cater this coincident peak load; for most of the load asset class this occurs only few hours/days during the year; i.e. major utility assets are under-utilized for most of the year. To manage higher reliability, traditionally reliability planning methods size distribution - substation transformers and feeders 200% of average loading. Traditional utility reliability planning based on coincident forecasted peak load will not prove efficient and effective due to intermittent nature of renewable distributed energy resources and undefined characteristics of energy storage,	The utility is seeking DER proposals to satisfy these characteristics: • Load-generation balance is a key factor in operating any electrical distribution/transmission grid. New era of continuously changing load and generation within distribution system will pose challenges to maintain reliability. • If utilities continue traditional planning methods; with increasing penetration of DER and energy storage; reliability will be difficult manage. • Planning and implementation of community microgrids with full monitoring and control to utility operator is the key factor in achieving higher reliability in this scenario. • In addition to improving reliability, one of the most exciting features of this community microgrid is the ability for customers to take control of their energy use. This leads to more

	V2G electrical vehicles - load or generation.	customer awareness of energy production and use, which can lower energy bills and drive environmental and grid benefits for society. • NWA are an important tool in moving to a more customer-centric electric system.

Distribution Needs (i.e. Services to be Provided, Problems to be Solved)		
Capacity	☐	
Reliability	☐	
Power Quality	☒	Define in relation to the specific situation being examined, as applicable
Resilience	☐	

Distribution Needs Case: Power Quality

Needs Case	**Traditional Utility Solution**	**Service Characteristics**
All distribution feeder has a voltage drop, which is more significant in long distribution feeders with high load conditions. In such situations, the utility may not be able to provide supply voltage at the customer entrance as per the CSA standard limits.	Utilities are typically used following solutions to mitigate distribution voltage drop in traditional radial distribution feeders. 1)Transformer station bus voltage keeps higher than the rated distribution voltage to compensate for the drop, and distribution transformers off load tap changers are set to boost /buck depending on the location. 2)The utility can install automatic voltage regulators in the feeder to boost the voltage. 3)The utility can install remotely operable capacitor banks in identified feeder locations to improve the voltage.	The utility is seeking DER proposals to satisfy these characteristics: • Invertor-based generators should be able to provide reactive power. • Both inverter base & traditional DER proponent shall agree to provide reactive power when utility is requested. • The utility may need direct communication with the DER operator to provide distribution requirements. • The utility operator may need some operation control of DER.

Distribution Needs (i.e. Services to be Provided, Problems to be Solved)		
Capacity	☐	
Reliability	☐	
Power Quality	☐	
Resilience	☒	Define in relation to the specific situation being examined, as applicable

Distribution Needs Case: Resilience

Needs Case	**Traditional Utility Solution**	**Service Characteristics**
A utility has experienced that a particular section of a 44 KV distribution feeder is subject to multiple outages from catastrophic tree failures and contacts. The trees in question are not in the utility ROW or on private land making it difficult to apply any further vegetation control measures. The outages are significant often resulting in half of the service area being out for 2 hours or more.	The utility would traditionally respond in operations by isolating the fault and picking up the lost load on adjacent feeders; however, those feeders are reaching loading levels during peak days that may limit available capacity to pick up load. The utility would then pick up partial load on adjacent feeders and perform rolling brownouts until the restoration of the faulted feeder. The traditional long-term utility solution may be to build additional adjacent feeder capacity.	The utility is seeking DER proposals to satisfy these characteristics: • Resilience: 10 MWs of short term Energy or Demand Response within the service area • Seasonality: During storm season (May-Oct) • Days: Dispatchable when high winds are forecasted • Hours: Dispatchable when high winds are forecasted • Delivery duration: up to 2 hours • Connected to adjacent feeders within the service area to offload feeders when dispatched and directed freeing up capacity to pick up lost load