RP-2003-0044 – ONTARIO ENERGY BOARD COMBINED SERVICE AREA AMENDMENT PROCEEDING

TORONTO HYDRO-ELECTRIC SYSTEM AND LDC COALITION RESPONSES TO BOARD STAFF INTERROGATORIES ON THE REPORT OF DR. ADONIS YATCHEW FILED ON NOVEMBER 27, 2003

BOARD STAFF INTERROGATORY #1

Please explain why you are of the view that the Wirebury model is likely to have a detrimental impact on the economies of scale, density and contiguity within the industry?

Response

The degree of impact on economies of scale, density and contiguity will depend on how the spatial pattern of service areas evolves. Nevertheless, there are likely to be detrimental impacts on overall industry costs not only through the embedded utility that has a fragmented service area but also through changes in the service area of the host utility (or utilities). Some examples might be helpful to illustrate these points.

Example 1: Discontiguity effects.

Consider a Wirebury-type utility with a discontiguous service area and a total of 10,000 customers as in Figure 1-A. Now suppose that these 10,000 customers are 'transplanted' as in Figure 1-B so that they become concentrated in a single contiguous area as in Figure 1-C. The configuration in Figure 1-C would have lower costs than that in 1-A. For example, one would expect lower operating and maintenance costs as crews and equipment would need to travel shorter distances. Indeed, fewer crews, less equipment and infrastructure may be required to achieve a given standard of service performance and response times. Capital costs in the consolidated configuration are also likely to be lower.

Example 2: Density effects.

Consider a Wirebury-type utility with 10,000 customers embedded in a utility with 20,000 customers as in Figure 2. Though the pockets are few and large, the Wirebury utility still suffers from discontiguities. Moreover, the "Swiss-cheese" pattern also *lowers the customer density of the host utility*. If the Wirebury pockets were merged into the host, then the host utility would be serving 50% more customers, in a geographic area with unchanged overall dimensions, so its density would also increase.

Example 3: Scale effects.

Suppose the host utility has 15,000 customers and Wirebury is able to capture a substantial portion of future growth in customer base. Then the costs of the host utility will continue to be higher than necessary as it will not have achieved minimum efficient scale. Nor is Wirebury likely to achieve minimum efficient scale in any of the individual pockets where it serves customers. Both of these types of scale inefficiencies will have an overall detrimental effect on costs in the industry.

> *Would there not be potential for economies to develop as an LDC, using the Wirebury model, grows and develops more embedded service points within an urbanized area of Ontario?*

Whatever economies a Wirebury-type utility develops, the presence of multiple pockets of customers will inevitably lead to the adverse effects of discontiguity. For example, suppose Wirebury services pockets of customers within a number of urban utilities as illustrated in Figure 3. Because the pockets are surrounded by densely populated urban areas, one could improve the overall industry cost structure by eliminating the discontiguities and ensuring that each utility achieves minimum efficient scale.

Again for illustrative purposes, let us consider a particularly stylized example. Suppose that over time Wirebury develops many embedded service areas and that these expand so that the resulting spatial distribution of service areas forms a checkerboard, as in Figure 4-A.[1] While such an evolution may be unlikely, it illustrates in a simple way that *both* the host utility and Wirebury would have substantially lower density than a single utility serving the same geographic area. This example also raises the question whether separate rates (e.g., wheeling rates) would be required through each zone.

Moreover, both utilities would be better off by simply dividing the geographic area into two contiguous self-contained utilities as in Figure 4-B or merging into a single utility if there are unexploited scale economies.

The point of this last example is to illustrate that if a Wirebury-type utility is able to capture many large customer pockets in a small geographic area, the density of *its* customer base will improve. But this will be at the expense of lower density on the part of the host utility. Moreover, because both utilities have an equal presence within the geographic area, capital planning will require a joint cooperative effort at the same time that the two utilities are competing with each

[1] If contiguity really did *not* matter, such patterns would not be inconceivable.

other for customers. If there are differences of opinion on which capital projects to pursue and how to share the costs, regulatory intervention would be required.

On the other hand, if Wirebury pockets are small and far-flung, for example, if Wirebury customers are comprised of new subdivisions near the boundaries of the host utility's geographic service area as in Figure 5, then the density of *its* customer base will be low, and its equipment and crews will have to travel longer distances than would be the case if all customers were served by one utility.

Figure 1-A
Discontiguous Utility Serving 10,000 Customers

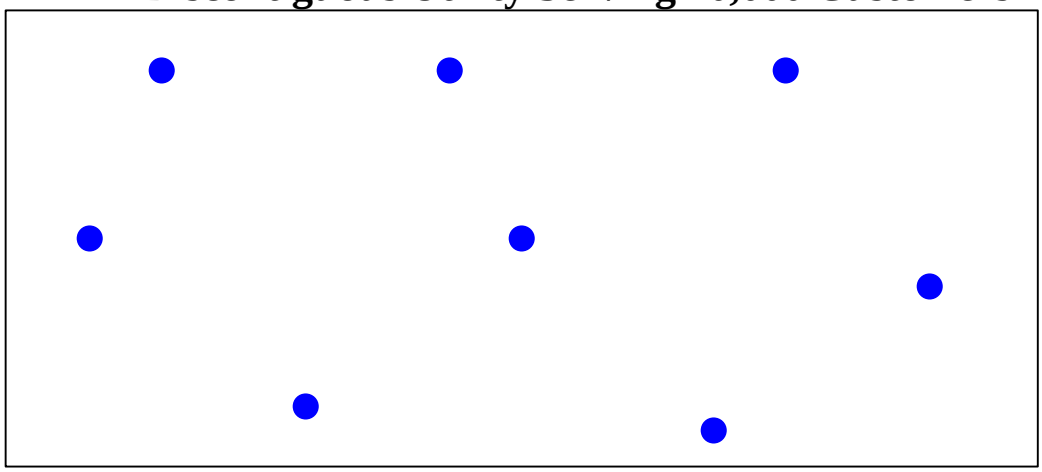


Figure 1-B

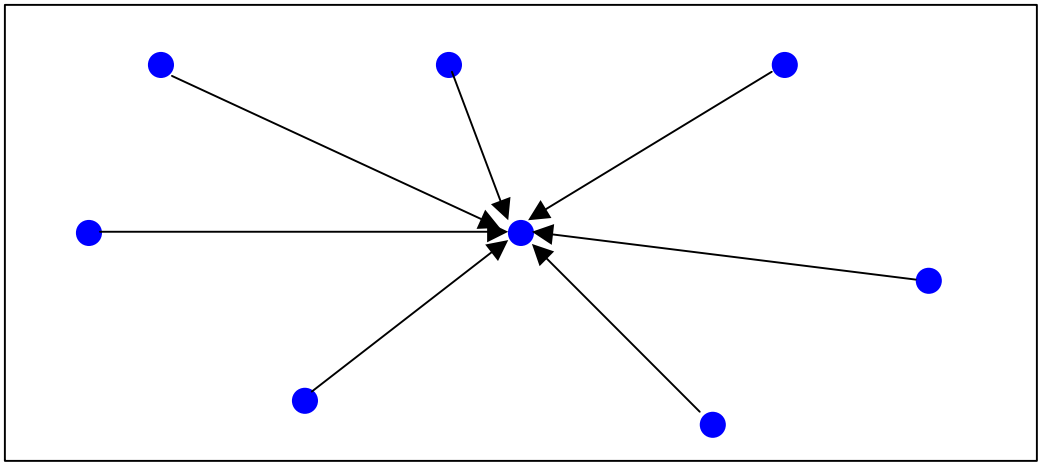


Figure 1-C
Contiguous Utility Serving 10,000 Customers

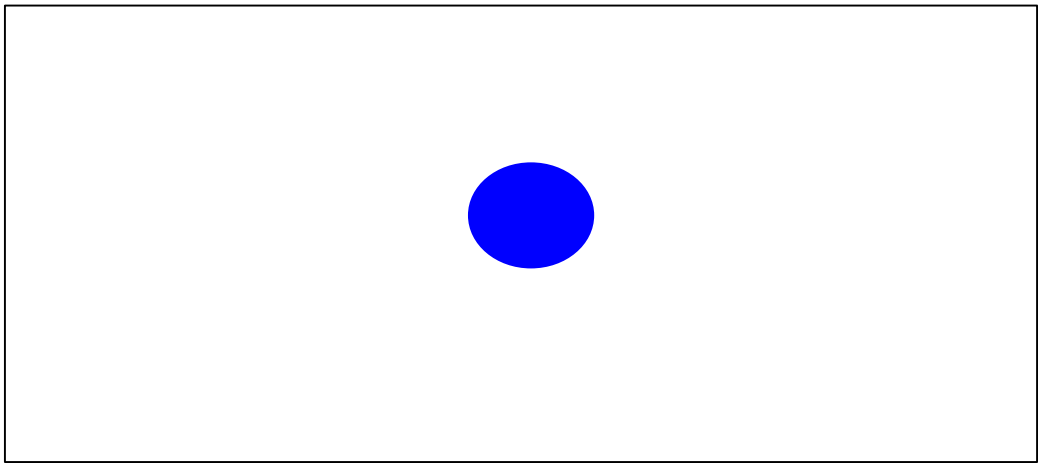


Figure 2

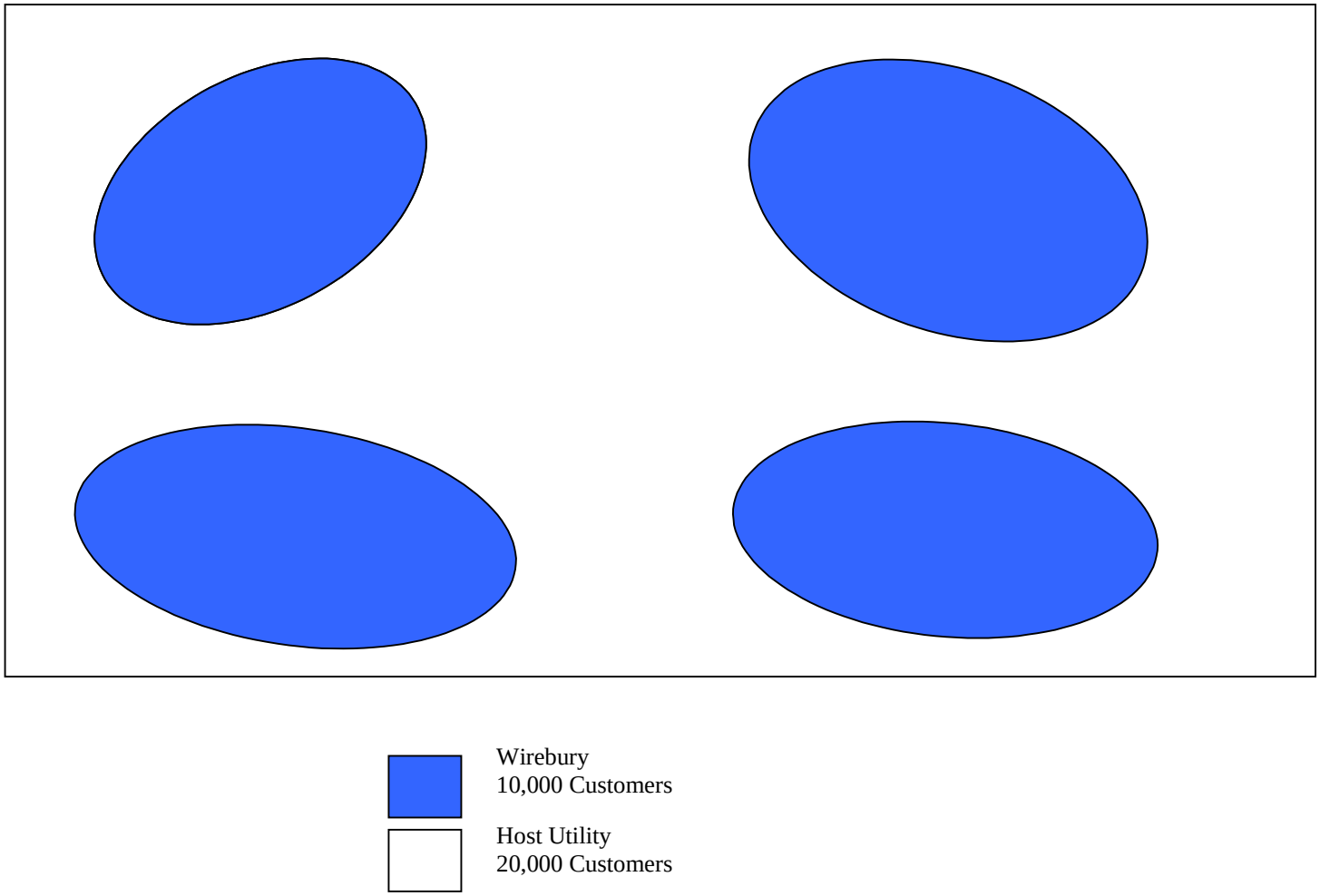


Figure 3

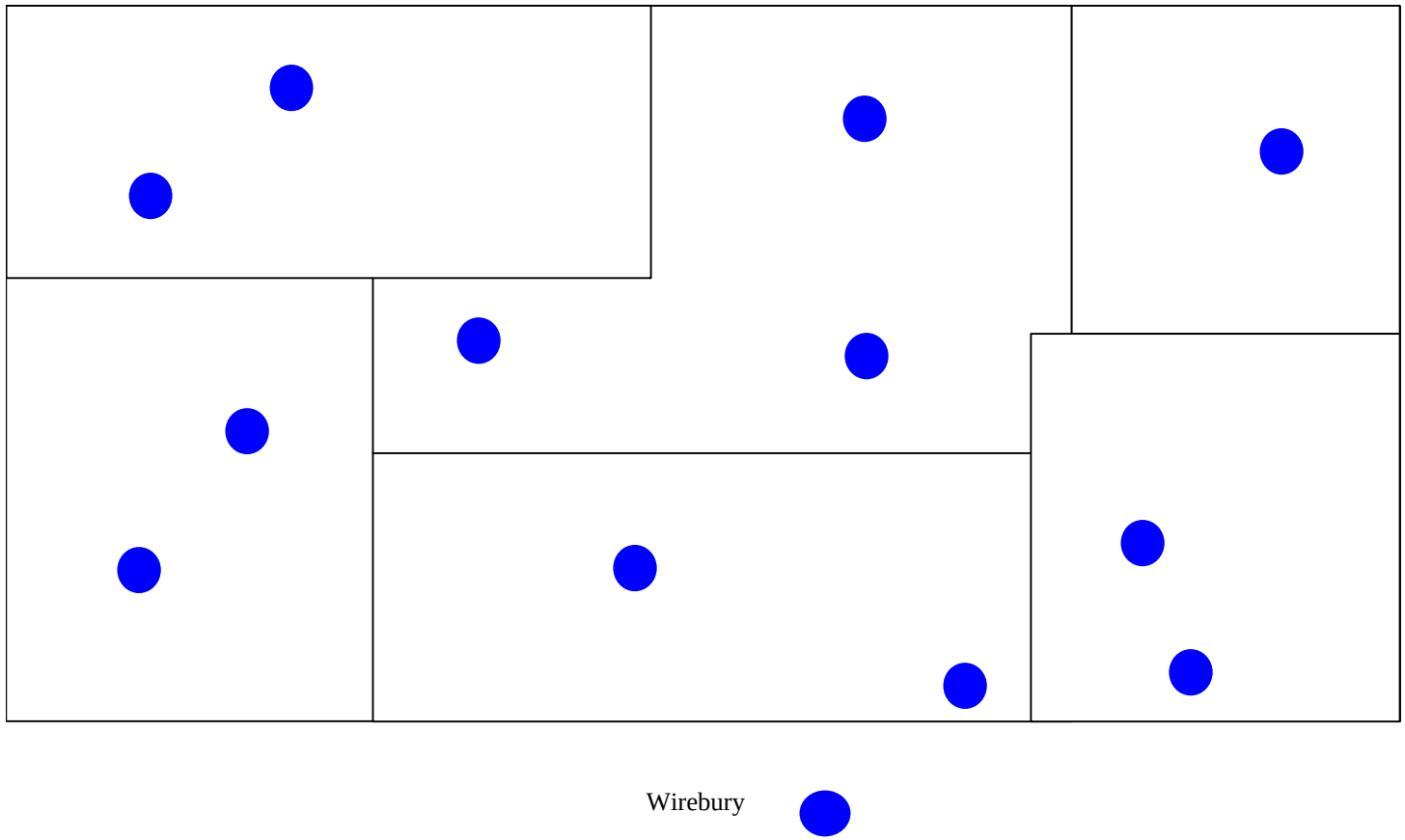


Figure 4-A.

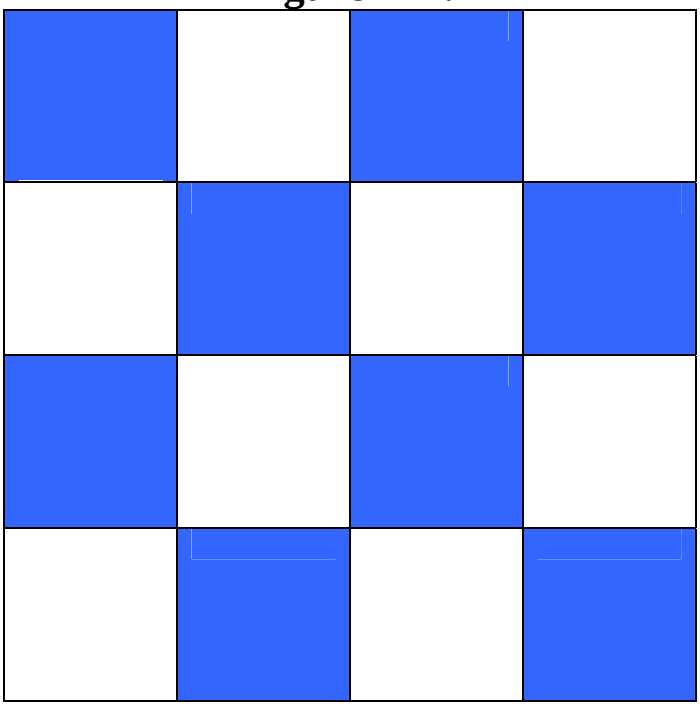


Figure 4-B

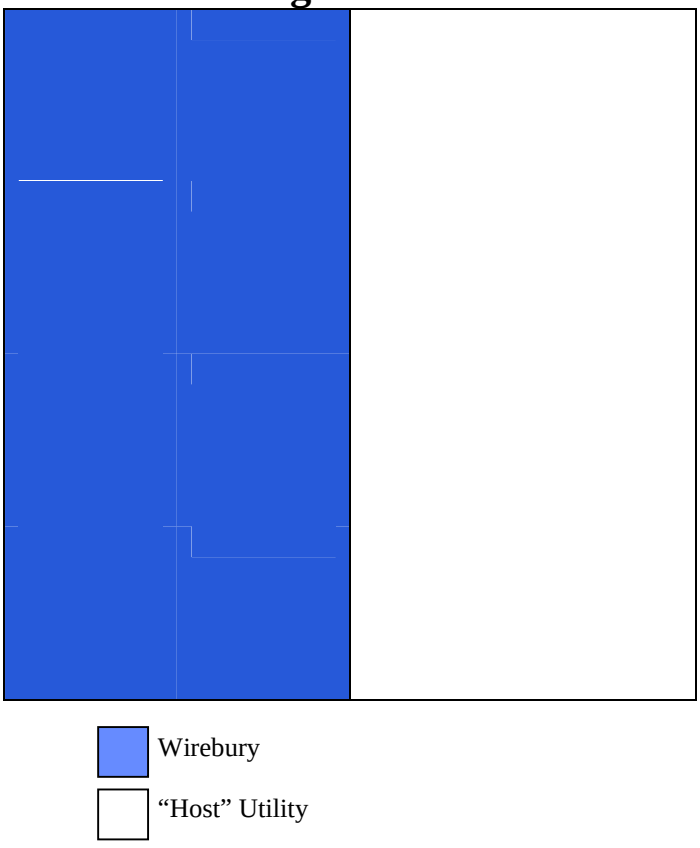
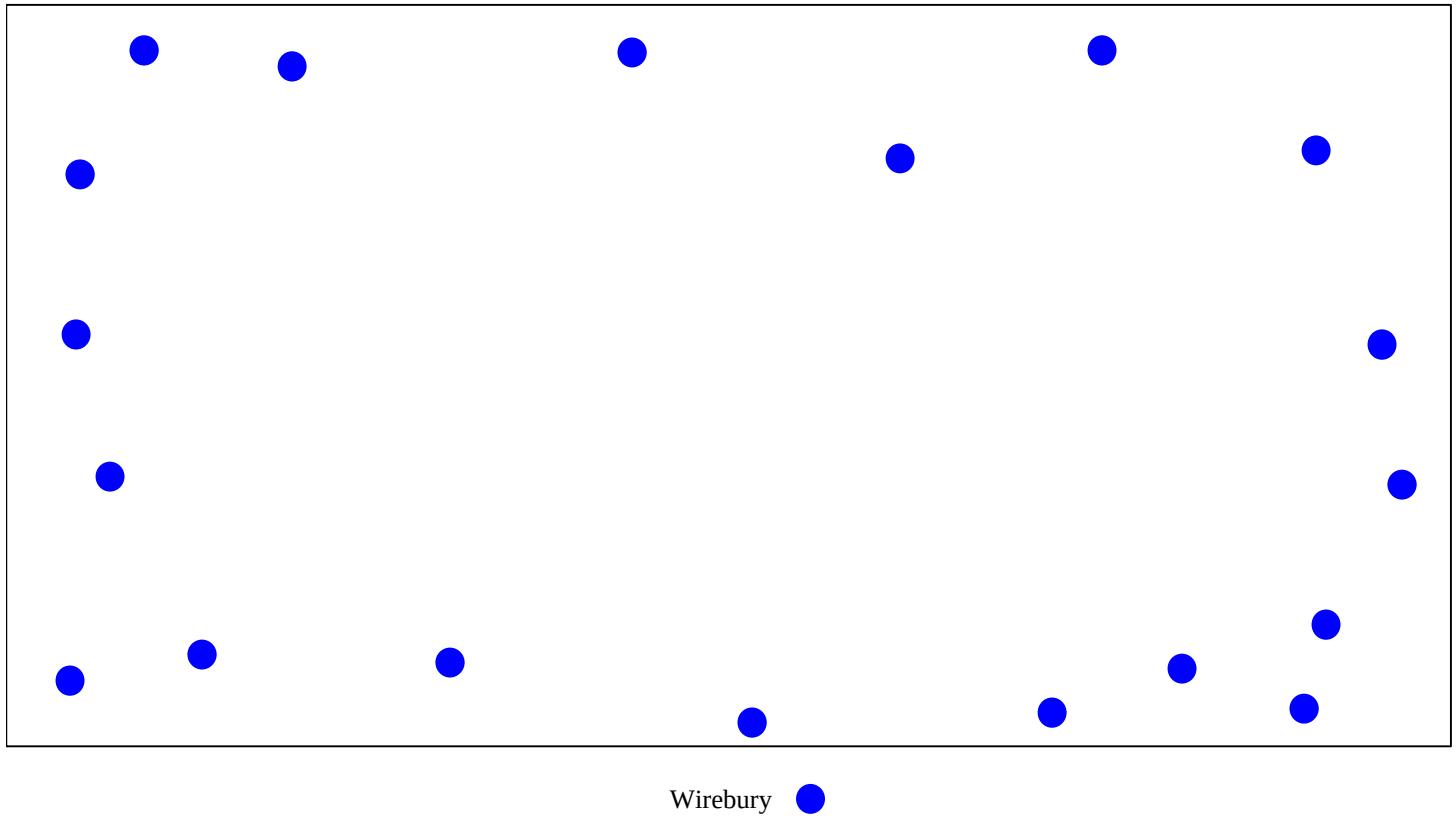


Figure 5



BOARD STAFF INTERROGATORY #2

Do you have any knowledge of any other jurisdictions which allow service area overlap? Please describe these arrangements.

Response

I am not aware of other jurisdictions which allow service area overlap. Indeed, exclusive franchise is common in the distribution business.

BOARD STAFF INTERROGATORY #3

Do you have any knowledge of any other jurisdictions which have or permit embedded distributors? Please describe these arrangements and your assessment of the pros and cons?

Response

I am not aware of other jurisdictions which have or permit the creation of multiple embedded distributors serving discontiguous pockets of customers as proposed by Wirebury.

BOARD STAFF INTERROGATORY #4

With reference to p. 4 of your written evidence, you indicate that "overlapping service areas should not be permitted except on a temporary basis or by mutual agreement of neighbouring incumbent utilities." Please be more specific, providing examples, as to what situations would lend themselves to an appropriate service area overlap on a temporary basis or the circumstances that lend themselves to mutual consent for overlap by adjacent LDCs?

Response

The kinds of circumstances that would lead to temporary overlap in service areas are much like the ones that currently result in load transfers. For example, suppose the incumbent utility cannot at the present time supply a customer as economically as a neighbouring utility. In this case, the incumbent utility would find it in its interest to connect to the neighbouring utility for supply to the customer at a mutually agreed upon fee. In due time, as the incumbent's infrastructure expands, supply to the customer could be repatriated. It should be emphasized that such resolutions to border issues are much more likely to be reached if the two utilities do not view each other as adversaries competing for customers and territory.

BOARD STAFF INTERROGATORY #5

Please elaborate on how the creation of new embedded distributors serving multiple discontiguous areas would potentially result in increased capital costs?

Response

First, distribution system infrastructure has a relatively long lifetime and once it has been put in place, it cannot be redeployed.[2] As a result, increased uncertainty about future customer growth reduces the utility's optimal planning horizon and may prevent the utility from choosing investments that might be more cost effective in the long run. This effect would be present whatever the source of uncertainty with respect to customer base – whether it is as a result of the presence of embedded distributors, or as a result of uncertainty about service area boundaries.

Second, under the Wirebury proposal, service areas could change over time. This, in turn, would introduce another source of uncertainty into the network planning problem.

Third, embedded distributors may, in time, seek to invest in their own upstream facilities. They may be motivated to do so because of customer growth, the desire to add to rate base which would attract a regulated rate of return, or as a result of differences of opinion with the host distributor about the timing and location of upstream investments or how the costs would be shared. Such differences would likely be exacerbated if there were multiple embedded distributors operating within a single distributor's service area. While joint projects may still occur, the competitive relationship among distributors would substantially increase the risk of duplication of infrastructure. More cost effective projects that would normally be undertaken by a single distributor may be supplanted by individual projects that are collectively more expensive. In any event, such capital decisions will likely require greater regulatory scrutiny.

[2] At the opposite end of the spectrum, one has the airline industry, in which the major capital investment-aircraft-can easily be moved, bought and sold, or redeployed. Thus, an airline can lease an aircraft for a period and if customer growth does not materialize, simply not renew the lease. No similar option is available in the distribution business.

BOARD STAFF INTERROGATORY #6

In your analysis of how contiguity of service area affects costs (p. 7), you suggest that a utility serving multiple discontiguous areas will likely have higher costs than an LDC serving a contiguous area? Would this always be the case? If not, please elaborate.

Response

It is helpful to distinguish two cases. The first is a Wirebury-type utility which serves multiple discontiguous pockets that *lie within or are adjacent to urban or suburban areas.* In this case industry costs can be reduced by merging those pockets into the host utility and thus eliminating discontiguities.

The second case is where a utility serves several discontiguous areas of high density that are themselves surrounded by sparsely populated territory. In this case, a single utility serving these discontiguous areas may be more cost-effective than separate local municipal utilities of much smaller size that cannot hope to achieve minimum efficient scale. Alternatively, one might consider a single regional distributor which serves both the urban areas and the surrounding rural areas.

The main difference between these two examples is that in the first example (i.e., the Wirebury model) discontiguities are created where they are unnecessary and can easily be eliminated. In the second example, discontiguities exist because of insufficient concentration of customers and therefore cannot easily be eliminated.

BOARD STAFF INTERROGATORY #7

In your analysis you suggest that discontiguity of LDC service areas may be inefficient. Please elaborate more fully on the economic arguments, empirical evidence and network system planning considerations supporting this conclusion. Please also explain more fully what makes contiguous LDCs a more efficient model for Ontario's electricity distribution sector?

Response

The above responses to Board Staff Interrogatories #1, #5 and #6 provide additional discussion on the consequences of discontiguity.

I have not, for the purposes of this hearing, undertaken an analysis of the optimal distribution structure for the Province and therefore cannot conclude that the Province would be best served by a "shoulder-to-shoulder" distributional structure of contiguous utilities, as recommended by the Macdonald Committee. Other models may be preferable. Nevertheless, in my view, the empirical evidence and arguments are persuasive that the creation of unnecessary discontiguities, as would occur under the Wirebury model, is inappropriate.

BOARD STAFF INTERROGATORY #8

Your evidence indicates that you are not aware of any studies that analyse economies of contiguity. If you were to undertake such a study, and augment the cost function used in your study and the others you have provided, how would you do so? What measure of contiguity would be used in such a study?

Response

As indicated in the response to Board Staff Interrogatory # 6, two cases should be distinguished. The first involves discontiguities in urban utilities of the kind created by the Wirebury model. I am not aware of any empirical work that *directly* analyzes the economies of contiguity in this case because urban utilities typically have contiguous service areas. However, to the extent that low density utilities share some of the cost characteristics of discontiguous utilities, statistical analysis of density effects can shed light on the effects of discontiguity. The studies of electricity distribution in Ontario, Norway, New Zealand and Switzerland all include density variables.[3]

The second case involves utilities which serve multiple discontiguous areas of high density which are surrounded by rural territory.[4] Again, cost data would be required for such utilities in order to compare their cost-effectiveness to that of regional distributors which serve both rural and urban communities. While my preference is for hard empirical data, engineering based cost analyses and simulations should also be of assistance in analysing alternative configurations.

In such analyses, the simplest indirect measure of contiguity that could be used is density of the customer base. This could be augmented by variables such as the number of distinct pockets, their average size, the average distance between pockets and perhaps the variability in pocket size.

Finally, it is perhaps worth pointing out that the analytical tools for analyzing discontiguity (in particular, the mathematical and statistical techniques) are readily available. The absence of direct statistical analyses of discontiguity in electricity distribution stems from the absence of data, as electricity distribution is–in the vast majority of cases-performed by utilities serving contiguous areas.

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[3] Please see Appendices B-F of the Evidence.

[4] My understanding is that Veridian is an example of a distributor which serves several discontiguous communities in addition to a large urban area. The surrounding rural territory is serviced by Hydro One.

BOARD STAFF INTERROGATORY #9

In page 13 of your evidence you indicate that "...where there is natural monopoly, industry structure is driven by a confluence of economic, historic, regulatory, and political forces and not by direct competition. As a result the existing industry structure may not be optimal from a public policy point of view." On page 15 you say "Put another way, if contiguity were not an essential feature of efficiency, then one would observe cities like Toronto with a checkerboard pattern of service areas belonging to two or more distinct utilities. The very fact that we do not observe such utilities, comprises strong empirical evidence of their sub-optimality." It seems that efficient market forces operate with respect to contiguity but not necessarily with respect to other aspects of industry structure. Please elaborate on these processes and explain the differences.

Response

In my view, it is not market forces -- in the sense of competition in the marketplace -- that have operated with respect to contiguity, but technological and economic considerations that have influenced political, regulatory and policy decisions in favour of contiguity. It is because contiguity is such a critical feature of efficient design and operation of distribution infrastructure that it has been affirmed in jurisdiction after jurisdiction. Contiguity has been a *de facto* guiding principle.

On the other hand, decision makers have varied in their choice of distribution industry structure. In many cases, distribution has been part of vertically integrated utility – a feature that is now widely considered to be an impediment to competition in generation. In other jurisdictions, the desire for local control and accountability led to the creation of multiple municipal distribution companies, each serving a well-defined contiguous area.

In short, while the spatial structure of distribution varies, perhaps the most prominent common feature is contiguity. Moreover, this pervasiveness of contiguity has been due to the technological and economic benefits it confers.

BOARD STAFF INTERROGATORY #10

The Filippini paper defines economies of density as the proportional increase in total costs brought about by a proportional increase in kWh output. Filippini says (pg. 161) that this measure is relevant to decide whether side-by-side competition or local monopoly are the most efficient form in the electricity distribution industry. Please elaborate carefully on how this measure is relevant to this question.

Response

Filippini uses the density variable to assess whether there is benefit to having multiple companies provide service in the same area (i.e., side-by-side). If there are statistically significant economies of density, then it is more cost-effective to have a single distributor. In particular, at pages 168-169 he states:

> "The estimated indicators of economies of output and customer density can clarify the efficiency of side-by-side competition at all points of a given service territory versus monopolistic provision of electric power. The finding shows that the cost of serving a market of size *y* over a municipal territory with one utility is lower than the cost of serving the same market with *n* competitive utilities which install parallel facilities everywhere. Therefore, side-by-side competition is less cost-efficient than the monopolistic distribution of electric power. In general, at the distribution level, the companies should continue to operate as local franchised monopolies with legally-defined services territories."

In summary, when Filippini speaks of "side-by-side" competition, he is not addressing the issue of border competition between contiguous utilities. He is asking whether it makes sense for two competing companies to run wires down the same street. His conclusion is that it does not.

BOARD STAFF INTERROGATORY #11

The Giles and Wyatt paper uses the proportional increase in total costs brought about by a proportional increase in kWh output to define economies of scale. Please explain the difference between Filippini on the one hand, and Giles and Wyatt on the other.

Response

When considering the size or "scale" of a distributor one might use the number of customers or the quantity of energy sales. Large distributors typically have many customers and high volumes of energy sales, small distributors have few customers and low volumes of sales. For purposes of measuring scale effects, the Giles and Wyatt study uses sales volumes as their output measure, Filippini uses the number of customers.[5]

However, both studies recognize that the costs of distribution are affected by the number of customers, the density of the customers and the sales per customer. For example, Giles and Wyatt state at page 371: "As the number of customers, and energy demand, rises for a given area, average cost falls."

The Filippini study estimates three kinds of "economies": economies of scale, (ES); economies which result from selling more electricity to each customer (Economies of Output Density, EOD) and economies resulting from having higher customer density (Economies of Customer Density, ECD). See for example Table 3 at page 168.

[5] At page 162, Filippini states "Economies of scale (ES) are defined as the proportional increase in total costs brought about by a proportional increase in output, the number of customers and the size of the service territory.." Thus one wants to know what is the percentage increase in costs, if sales, customers and territory all increase by say 10%. However, a 10% increase in these three variables implies that sales per customer and density both remain constant as the number of customers increases by 10%.

BOARD STAFF INTERROGATORY #12

Your evidence argues that a customer, once served becomes effectively captured and no longer contestable. Yet in comments on the Todd paper, you argue (pages 23-24) that trivial technical changes could result in a "served" customer being redefined as "unserved" and hence contestable again. Please resolve these two arguments.

Response

The purpose of the discussion at pages 23-24 is to indicate that positions on contestability expressed on behalf of Wirebury appear to be inconsistent with one another.

In particular, my evidence at page 24 states:

> "What appears to be yet a third position is expressed in Wirebury's response to LDC Interrogatory #23 which states that
>
> > "A location would only become contestable, if at a later date it again became 'unserved or underserved' due to technological change or redevelopment of the location."
>
> Now, it is possible to interpret virtually any service enhancement, no matter how minor, as technological change, in which case, under this interpretation, all customers would be perpetually contestable."

The purpose of the latter statement is to illustrate the ambiguity inherent in relating contestability to technological change. Indeed, it would appear to be inappropriate to link contestability to technological change until major advances eliminate natural monopoly in the wires business. Thus, I continue to believe that "the overwhelming majority of customers will be uncontestable" (page 24, line 23).

You argue that the effective non-contestability of "served" customers means that competition between distributors is unlikely to result in sustained incentives for efficiency. Is there anything else that limits the potential for competition between distributors to yield sustained incentives for efficiency?

Response

Non-contestability is the root cause of the absence of direct competitive pressures in the distribution industry. If customers cannot "exit" or switch providers, then providers cannot compete for their business. The non-contestability, in turn, flows from the natural monopoly character of the industry, the high fixed costs and the long asset lifetimes. Put simply, given the present state of technology, it is not cost-effective to have more than one company provide an electricity connection to a household.

BOARD STAFF INTERROGATORY #13

In summarizing the conclusions of your statistical results (p.12), you note that "there is a significant age effect suggesting that new facilities - for example the distribution wires running through a new sub-division - should have lower associated maintenance costs. This would explain why they are attractive as targets for acquisition by distributors." Does this not potentially provide an economic rationale for the entry of new embedded distributors?

Response

It may explain in part why new developments are attractive acquisitions for companies such as Wirebury, as well as for the host utilities. It does not provide economic justification for the creation of embedded utilities serving multiple discontiguous areas. Such utilities will still suffer from the adverse effects of discontiguity.

Moreover, if it were practical for the regulator to develop locational distribution rates which reflect the sub-division's low O&M costs, the incentive to "cherry-pick" low maintenance sites would be diminished.

BOARD STAFF INTERROGATORY #14

What constitutes an optimal industry structure for Ontario's electricity distribution sector?

Response

A persuasive response to this question would require an analysis that I have not performed for the purposes of this hearing. However, a number of possible structures and their hybrids might be considered.

The first would involve further mergers and rationalization among small utilities in order to achieve minimum efficient scale wherever possible but otherwise retaining the existing structure.

A second alternative would be that recommended by the Macdonald Committee where distributors would expand to attain a "shoulder-to-shoulder structure".

A third alternative would be to have regional rural utilities and the existing municipal utilities with rationalization of small distributors.

Finally, it may be that a hybrid model would be most suitable, with municipal utilities achieving a "shoulder-to-shoulder" structure in more populated portions of the Province, and Hydro One or regional rural distributors serving the vast sparsely populated areas

Each approach has advantages and disadvantages and major restructuring would have substantial transitional costs. Some would improve regulatory efficiency, others may be more practical from an implementation point of view.

BOARD STAFF INTERROGATORY #15

Please elaborate as to why capital expenditures would require increased regulatory scrutiny under the Wirebury Model?

Response

Please see response to Board Staff Interrogatory #5.

BOARD STAFF INTERROGATORY #16

With reference to p. 4 and p. 31 of the evidence, please provide examples of gaming, other than "race for the border" that may occur if overlapping service areas are approved.

Response

In order to attract new customers, utilities may be tempted to engage in cross-subsidization in order to attract customers in overlapping service areas. They might apply for locational rates or devise new customer classes.

The exact types of such behaviour are difficult to predict or anticipate. For example, in the California electricity market, various participants devised or participated in elaborate exchanges in order to avoid regulatory mechanisms intended to control electricity prices.

BOARD STAFF INTERROGATORY #17

With reference to p. 11 and p. 15 of the evidence, please elaborate on why a "swiss cheese" structure is appropriate for Hydro One Networks and the municipal utilities but not for the Wirebury concept?

Response

The two situations are fundamentally different. The "holes" in the Hydro One "Swiss cheese" are municipal utilities, many of which have achieved minimum efficient scale. Indeed, less than 10% of customers in the Province are served by utilities with less than 20,000 customers. Moreover, some of the small utilities are not contiguous to utilities of high density so that amalgamation to achieve minimum efficient scale may not be an option. And, absorption into Hydro One could substantially reduce local accountability and could have adverse rate impacts. Having said this, the existing distribution system likely has structural inefficiencies that can be improved upon.

On the other hand, the "Swiss cheese" under the Wirebury model would have pockets of customers, none of which would be likely to achieve minimum efficient scale, and all of which could be served more cost effectively by the host utility through elimination of the discontiguities.

BOARD STAFF INTERROGATORY #18

With reference to pages 29 through 31, what methodology should the regulator use to assess whether an application to alter service area boundaries is in the public interest? Please be as specific as possible, for example, how would the regulator quantify the economies or diseconomies that might result?

Response

Pages 20 to 31 of the evidence consider changes in service areas involving two contiguous utilities. Part of the methodology would involve a demonstration of the economic benefits of the change. It would seem appropriate for the applicant to establish a positive case that its costs of serving the area have a high likelihood of being lower - on a sustainable basis - than the costs of the incumbent. Moreover, the persuasiveness of the case may be bolstered by a record of historically lower costs.

Nevertheless, as stated at page 32 of the testimony, "service area amendments should not be a routine and common occurrence."

BOARD STAFF INTERROGATORY #19

With reference to p. 30, what would constitute a "compelling case" that a proposed change in service area boundary would serve the public interest?

Response

A compelling case for change in service area boundary would exist if the incumbent is unlikely to be able to economically provide service to the area in the foreseeable future.

BOARD STAFF INTERROGATORY #20

Should changes in service area boundaries ever be approved where the incumbent distributor already serves customers in the area? If yes, should the regulator require these existing customers to switch distributors?

Response

As indicated in response to Board Staff Interrogatory #14, the optimal industry structure may be different from its current configuration. Should the regulator and the Government deem it appropriate to promote a substantial change to the current structure, it may be that service area boundaries would be altered with attendant shifts of some customers. However, if one is considering minor modifications of territory, the preferred approach would be to encourage the involved utilities to resolve the differences in a mutually satisfying manner.

BOARD STAFF INTERROGATORY #21

With reference to p. 35 and following, you have argued that current government policy does not contemplate competition in the electricity distribution sector. Please explain the implications of section 70 (6) of the Ontario Energy Board Act, 1998, which suggests that service areas are non-exclusive?

Response

Legislation and Government policies are often stated in general terms, leaving implementation to the regulator. Moreover, it is often the case that exceptions are incorporated into legislation to accommodate existing arrangements or historical anomalies.

The stated section, while seeming to suggest that service areas are non-exclusive, also does not preclude service areas being made exclusive. Moreover, the non-exclusivity allowed by the legislation, does not, in and of itself, imply direct or open competition *per se*.

It should also be noted that the non-exclusivity clause Section 70 (6) applies to a range of market participants including retailers, generators and others and may have been principally intended for them.

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