SERVICE RELIABILITY STANDARDS IN ONTARIO: ANALYSIS OF OPTIONS

Pacific Economics Group Research, LLC

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1. Introduction and Executive Summary

1.1 Introduction

In October 2012, the Ontario Energy Board ("the Board') outlined a Renewed Regulatory Framework for Electricity ("RRF") in which system reliability performance plays a critical role. Distributors' measured reliability is an important element of the "scorecard" to be developed in the RRF. Each year the Board will assess distributors' reported reliability, as well as reported performance on other designated scorecard indicators, to ensure that distributors are achieving the Board's desired outcomes for customers.

Electricity distributors in Ontario currently report two system-wide reliability indices to the Board: the system average interruption frequency index ("SAIFI") and the system average interruption duration index ("SAIDI"). Distributors have been reporting these system reliability indicators to the Board since 2002.[1] However, the targets for acceptable SAIFI and SAIDI performance have not been clearly defined. Distributors are expected to maintain a three-year moving average of their system reliability performance within historical levels, but reported performance is not compared against explicit SAIFI or SAIDI benchmarks.

To support the intended outcomes of the RRF, the Board plans to establish specific performance standards for SAIFI and SAIDI. On July 24, 2013, Pacific Economics Group Research ("PEG") was hired to advise Board Staff on setting reliability standards. PEG's work was to include an analysis of available reliability data for Ontario distributors to determine reasonable performance standards that each distributor is expected to meet. PEG was also asked to consider whether these standards should be established on an individual distributor, regional, or Province-wide basis. This report presents the results of PEG's analysis.

[1] Distributors have also been reporting the customer average interruption duration index, or CAIDI, as well. CAIDI is a reliability metric that can be derived by dividing SAIDI by SAIFI.

1.2 Executive Summary

The results of this report can be briefly summarized. There are three main options for setting service reliability benchmarks for Ontario electricity distributors: 1) distributor-specific benchmarks for SAIFI and SAIDI based on the distributor's historical average values for the respective indicators; 2) peer group averages, where average SAIFI and SAIDI values for distributors in designated regional peer groups establish benchmarks on the respective indicators for all distributors within the peer group; and 3) statistically-based SAIFI and SAIDI benchmarks, where statistical models estimated using SAIFI and SAIDI data, respectively, for the entire Ontario electricity distribution industry are used to generate predictions for each distributor's SAIFI and SAIDI given the external business conditions.

PEG analyzed each of these three options using available SAIFI and SAIDI data for Ontario electricity distributors. These SAIFI and SAIDI data were provided for the 2002 through 2012 period, although there were a fair number of data 'gaps' particularly in the early years of the sample period. The available SAIFI and SAIDI data were not 'normalized' to exclude the impact of severe storms or other factors that impacted a distributor's measured outages.

PEG's analysis does not lend support for using either the peer-based or statistical approach to set reliability benchmarks in Ontario. It is often difficult for peer group benchmarking to capture all the important external business conditions that can impact measured performance, and our analysis suggests that would be the case if regional peer groups were used to set reliability benchmarks in Ontario. The challenges associated with identifying appropriate peers is the main reason peer-based benchmarks are very rarely used in service reliability regulation.

There are some precedents for using econometric methods to set reliability benchmarks, but PEG concludes that this approach is not warranted in Ontario. There is too much variability and apparent randomness in Ontario distributors' underlying SAIFI and SAIDI data for this approach to be effective. This data variability results, at least in part, from the fact that distributors have historically not normalized their reported reliability metrics to eliminate the impact of severe storms and other random factors that

can have a substantial impact on measured SAIFI and SAIDI. The randomness in the current reliability data makes it difficult to identify statistically significant 'drivers' of measured SAIFI and SAIDI and use econometric reliability driver models to predict average SAIFI and SAIDI values for Ontario electricity distributors.

PEG believes distributor-specific SAIFI and SAIDI benchmarks can be appropriate in Ontario. This is the most common method for setting benchmarks in reliability regulation. The benchmarks that would emerge from this approach in Ontario also appear generally reasonable.

PEG's analysis indicates that average values for SAIFI and SAIDI over the five most recent years (2008-2012) would be the most appropriate historical basis for setting distributor-specific reliability benchmarks. Five years is long enough to capture the impact of a distributor's external business conditions on its measured reliability data, but recent enough to reflect the current methods that are used to collect data on interruptions. However, there are a few distributors (discussed in Chapter Three) where the Board may wish to exercise discretion or gather additional information from the distributors in order to set benchmarks, rather than relying entirely on the distributor's own five-year average values for SAIFI and SAIDI.

2. Establishing Service Reliability Benchmarks

2.1 Principles

In previous work for Board staff, PEG discussed the principles for establishing service reliability benchmarks. These principles were discussed as part of our May 2010 report, *System Reliability Regulation: A Jurisdictional Survey*. This section briefly reviews that discussion.

Reliability benchmarks are the standards against which measured reliability is judged. Benchmarks can also include 'deadbands,' or a zone around the benchmark within which utility performance is neither penalized nor rewarded. Some basic criteria can be used to evaluate the design of reliability benchmarks and deadbands.

One important criterion is that benchmarks should be calculated on the same basis as the reliability indicators. If the data used to measure reliability are not comparable to those used to set the benchmark, the regulatory plan will not lead to an objective comparison of the company's measured reliability relative to the benchmark. This is a case of 'comparing apples to oranges.'

It should also be recognized that the measured reliability of electricity service will vary because of external business conditions that are beyond managerial control. Distributors have an obligation to provide service to customers in assigned territories. Power delivery also requires direct connection and delivery into the homes and businesses of end users. The conditions of a distributor's service territory and customer base can therefore affect the cost and measured quality of service for the delivery networks that distributors construct and maintain. These business condition variables also vary considerably among distributors.

The list of relevant business conditions that can impact system reliability include:

- weather (*e.g.* winds, storms, lightning, extreme heat and cold)
- vegetation (contact with power lines)

- the amount of undergrounding mandated by local authorities (reducing the contact of power lines with foreign objects but typically increasing the duration of interruptions that do occur)
- the degree of ruralization in the territory (typically increasing the exposure of feeders to the elements and lengthening response times when faults occur)
- the difficulty of the terrain served
- the mix of residential, commercial, and industrial customers (*e.g.* industrial and large commercial customers value power reliability more than smaller customers and are often willing to pay more for it; a greater share of such customers may therefore be correlated with better reliability indices)
- in the short run, it should also be noted that the age of the utility's network can also affect its reliability performance, although in the longer term this variable is subject to managerial control

In addition to varying across distributors, some of these business conditions are quite volatile and unpredictable over time. This is particularly true for weather. This implies that business conditions can lead not only to systematic differences in measured reliability across distributors, but year-to-year fluctuations in reliability indicators.[2]

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[2] Of course, a distributor's measured service reliability is not determined entirely by external conditions but also depends on the distributor's own behavior. This behavior will include work practices, worker training, and capital investment that impact measured reliability. Relevant work practices include power line maintenance procedures such as tree trimming. Relevant capital investments include the size and sophistication of the outage management system (OMS) and communications equipment and software.

In evaluating work practices and investments that can enhance quality, it is rational from both a shareholder and customer perspective to balance considerations of cost and quality. It is generally not cost effective to have the same quality levels in service territories with markedly different business conditions. For example, most will agree that it would be cost prohibitive for distributors serving highly rural territories to have the same SAIFI as an urban distributor, because circuits in rural areas are longer and more exposed to a variety of factors that can lead to outages. Rural utilities can thereby maintain the quality levels of more urbanized utilities only by incurring extra costs, such as additional protective devices or maintenance. By the same token, the extensive underground systems of highly urbanized utilities are much less exposed to contact with foreign objects than overhead networks. Distributors in such areas may be forced to underground much of their systems to comply with local ordinances.

Benchmarks and deadbands should reflect external business conditions in a distributor's service territory. A failure to control for these business conditions in a regulatory benchmark can expose utilities to arbitrary and unfair performance evaluations. For example, consider a plan where a utility is rewarded or penalized depending on how its measured reliability compares to that of another utility. Assume that both companies measure every reliability indicator in the same way. This plan would still lead to unreasonable penalties or rewards if one utility had a more demanding territory (*e.g.* more severe weather). Not controlling for the effect of business conditions in that service territory would tend to handicap the utility serving that territory.

Third, all else equal, benchmarks should be as stable as possible during the regulatory plan. Stable benchmarks give utility managers more certainty over the resources they must devote to providing adequate system reliability, as reflected in those benchmarks. It is harder for managers to hit a 'moving target,' particularly if operational changes can only be implemented over longer periods. Stable benchmarks therefore promote more effective, longer–term service quality programs.

In some cases, however, a lack of data available at the outset of regulatory plan may make it more difficult to set benchmarks that are viewed as reliable over the term of a multi–year plan. This would be true if the information systems used to record reliability data had changed recently or if there was little confidence that a short data series reflected typical external business conditions for the utility. If this is the case, benchmarks can be updated using data that become available during the term of the plan, but this should be done according to well–defined rules that are established at the outset of the plan. An example would be a benchmark equal to a ten year moving average of a company's historical performance on an indicator, until 10 years of historical data are available. This type of approach has been implemented in Massachusetts. Setting benchmarks according to such objective rules creates as much stability as is feasible given data constraints.

2.2 Precedents

There are three main options for setting service reliability benchmarks. The first approach is to use the utility's own performance on an indicator. For example, SAIDI and SAIFI benchmarks could be based the distributor's own average SAIDI and SAIFI performance over a recent period. Reliability assessments would then depend on measured reliability levels that differ either positively or negatively from recent historical experience. Historical benchmarks of this kind are the most common basis for reliability performance standards, and they are used in a number of North American jurisdictions including Massachusetts and California.

Using a distributor's past performance to set benchmarks is appealing in many respects. Historical benchmarks reflect a company's own operating circumstances. Historical data will reflect the typical external factors faced by the distributor if the period used to set benchmarks is long enough to reflect the expected temporal variations in these factors. Longer periods are more likely to achieve this goal than shorter periods and, all else equal, are therefore preferred. As noted above, if only short time series are available at the outset of a plan, benchmarks can be updated at the outset of future plans as more data become available. The rules for updating benchmarks should be spelled out clearly in advance to create the appropriate performance incentives and minimize administrative burdens.

The main concern with basing benchmarks on a distributor's past performance is whether the company's historical reliability is considered to be acceptable. If this is not the case, the benchmark would reflect a level of inefficiency in system reliability. A more objective standard of system reliability performance that did not reflect substandard reliability would, in principle, be appropriate in this instance.

The second option for setting regulatory benchmarks is peer performance. Peer–based benchmarks may be attractive conceptually since they are consistent with the operation and outcomes of competitive markets, where firms are penalized or rewarded for their price and quality performance relative to their competitors. Relying on the performance of peer utilities in the industry can therefore provide a more objective basis for establishing reliability benchmarks.

In practice, however, peer–based benchmarks are challenging. One reason is that uniform data are not generally available for utility reliability measures. Differences in how reliability metrics are defined and measured can make peer data difficult to compare and inappropriate as benchmarks.

Even if measures are defined comparably across utilities, "peer" utilities should operate under similar external business conditions as the distributor being benchmarked. This is critical because business conditions beyond managerial control can impact a distributor's measured reliability. If the selected peer group faces substantially different business conditions than the subject utility, comparing measured reliability for the distributor and the peer group will not lead to a fair assessment of the subject utility's reliability performance. It is difficult to identify peer distributors that are similar to the subject utility across the full array of business condition variables that can impact measured service reliability. The challenge of finding a suitable peer group is the main reason peer-based reliability standards are rare in practice.

A third option for setting reliability benchmarks is statistical methods. Statistical tools can be used to quantify the impact of external business conditions on a distributor's measured reliability. Statistical methods can then, in turn, generate reliability benchmarks that are tailored to the precise business conditions faced by a particular distributor. Such statistical models will 'control' for the impact of specific business conditions faced by the distributor on that distributor's measured reliability.

For example, econometric methods can be used to quantify the impact of business conditions such as customer density, the degree of undergrounding, the share of deliveries to large customers and similar "drivers" of measured reliability on the SAIFI and SAIDI values reported by distributors in a given electricity distribution industry. The coefficients estimated from the econometric model can then be multiplied by the exact values of the "driver" variables for a particular utility to determine the impact of these reliability drivers on expected SAIFI and SAIDI performance. The impacts of these identified reliability drivers can then be added up to produce the values for SAIFI and SAIDI that are expected for this utility, given reliability norms in the industry.

Using statistical methods to establish reliability benchmarks is rare but not unprecedented. Norway has been using econometric models to set reliability benchmarks for years, and other countries like the Netherlands have also made use of statistical methods. The benefit of the statistical approach is that it can in principle generate objective, service reliability benchmarks that are precisely tailored to the specific business conditions faced by an individual utility. One disadvantage of this approach is that statistical modelling is often complex. This method for setting benchmarks will also entail greater administrative costs than simpler regulatory approaches. The accuracy of statistical predictions for expected reliability also necessarily depend on the accuracy of the underlying SAIFI and SAIDI data that are used to estimate the econometric model. These data are often measured less consistently across electricity distributors than, say, distributors' cost data, in part because service reliability data are not audited or reviewed as often by regulatory staff.

2.3 Controlling for Volatility

Although historical averages of company performance will reflect typical external factors faced by a company, they will not control for shorter–term fluctuations in external factors around their norms. As noted, some business conditions that can affect measured quality are quite volatile from year to year. Weather is the salient example.

One way to accommodate year–to–year fluctuations in external factors is by measuring indicators on a multi-year basis. For example, a regulatory plan could target a three-year moving average of SAIFI and SAIDI rather than the SAIFI and SAIDI values registered each year. Measuring indicators over multiple years will tend to smooth out the impact of random factors on indicator values and lead to a more reasonable measure of the company's underlying service quality performance.

Another way to accommodate year-to-year fluctuations in external factors is through deadbands. Suppose that the value of a reliability indicator is known to fluctuate in a certain range due to external factors. The mean value of this indicator over a suitable historical period would reflect the typical long run external business conditions faced by

the utility. Variation in the company's performance around this historical mean will, at least in part, reflect short run fluctuations in those business conditions.

Deadbands should therefore reflect the observed variability in measured system reliability. One straightforward measure of this year–to–year variability is the standard deviation of the reliability indicator around its mean. San Diego Gas & Electric, based in California has a deadband around their SAIDI and SAIFI performance before penalties or rewards are levied. New Zealand has gone the furthest to minimize volatility in their SAIDI and SAIFI performance by incorporating a regime which uses both a deadband and even allowing a distributor to be non-compliant in one out of three years before penalties are considered.

3. Empirical Analysis of Benchmark Options

This chapter presents PEG's empirical analysis of three options for setting SAIFI and SAIDI benchmarks for Ontario electricity distributors. The first is a distributor-specific approach, where the benchmarks for reliability indicators are based on the distributor's own average performance on the indicators. The second is to set SAIFI and SAIDI benchmarks based on these indicators' average performance for geographically-based groups of Ontario distributors. Under this approach, all distributors within a designated, geographic peer group would be subject to the same benchmarks for SAIFI and SAIDI. The third option is to use statistical methods to generate expected values of SAIFI and SAIDI for each distributor. These statistical models are estimated using data for the entire electricity distribution industry in Ontario. We discuss our results for each of these options in turn.

3.1 Mean Value of Historical Data

The most common approach for reliability benchmarks is to base them on the distributor's own historical reliability data. In many cases, the benchmarks are constructed as the mean values of the distributor's measured reliability on designated reliability indicators over a defined period of time. The distributor's measured value of reliability on the indicators is typically adjusted to remove the impact of severe storms.

PEG was provided data on Ontario electricity distributors' SAIFI and SAIDI for the 2002-2012 period. For a number of distributors, SAIFI and SAIDI were not available for some years, particularly early in the sample period. The distributors' reliability measures also were not adjusted to remove the impact of severe storms, planned outages, or other interruptions.

The available SAIFI data are presented for each year in Table 1. Available SAIDI data are presented in Table 2. In both instances, any gaps in the available data are represented by blank entries. Tables One and Two also calculate the mean and standard deviation for SAIFI and SAIDI, respectively, for each distributor, as well as the (non-weighted) mean values for SAIFI and SAIDI for the industry in each sample year.

Table 1
SAIFI Data

Company	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	Standard Deviation
ALGOMA POWER INC.[1]	2.71	2.14	1.79	1.96	2.33	2.55	2.45	3.42	4.58	6.55	9.01	3.59	2.28
ATIKOKAN HYDRO INC.	0.07	0.01	0.02	7.09	1.34	2.22	1.47	1.99	2.01	0.63	1.47	1.67	1.98
BLUEWATER POWER DISTRIBUTION CORPORATION	2.34	4.09	3.41	4.41	2.57	2.66	2.32	2.76	2.34	3.53	5.15	3.23	0.97
BRANT COUNTY POWER INC.	1.02	2.08	0.03	1.23	1.57	2.65	1.34	1.15	2.59	1.54	1.27	1.50	0.74
BRANTFORD POWER INC.	3.26	0.93	2.88	2.14	1.54	1.25	1.71	1.37	1.95	1.24	1.23	1.77	0.73
BURLINGTON HYDRO INC.	1.29	1.92	0.92	1.20	0.88	0.68	1.69	1.17	1.72	1.00	0.95	1.22	0.40
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.47	3.09	1.04	1.09	1.36	1.74	1.08	0.98	0.85	1.41	1.49	1.42	0.62
CANADIAN NIAGARA POWER INC.[2]	4.27	3.66	2.92	3.09	12.52	3.13	3.18	3.45	2.27	2.12	3.83	4.04	2.88
CENTRE WELLINGTON HYDRO LTD.	0.23	1.92	0.89	1.40	0.66	0.07	0.63	0.88	1.68	1.90	2.43	1.15	0.76
CHAPLEAU PUBLIC UTILITIES CORPORATION	9.40	17.46	2.07	3.05	2.62	8.27	1.05	2.16	3.25	2.45	0.28	4.73	5.08
COLLUS POWER CORPORATION	0.40	0.38	0.36	1.25	0.65	0.83	25.69	1.75	1.03	0.97		3.33	7.87
COOPERATIVE HYDRO EMBRUN INC.	0.02	0.02	0.01	0.01	1.11	0.02	2.17	0.16	0.01	4.01	1.02	0.78	1.28
E.L.K. ENERGY INC.	0.01	0.02	0.01	1.46	0.83	1.18	0.70	0.17	1.29	1.70	0.52	0.72	0.63
ENERSOURCE HYDRO MISSISSAUGA INC.	0.64	0.76	0.62	0.93	0.73	0.78	0.73	1.16	1.32	1.97	1.71	1.03	0.46
ENTEGRUS POWERLINES[3]		3.62	0.20	1.32	0.16	0.98	6.37	0.92	1.91	2.17		1.96	1.97
ENWIN UTILITIES LTD.	2.30	2.29	2.70	3.12	2.20	2.11	2.75	1.18	1.81	2.73	2.17	2.31	0.53
ERIE THAMES POWERLINES CORPORATION	0.63	0.53	1.15	0.84	0.61	2.09	1.63	0.62	4.83	2.03	0.82	1.44	1.26
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	0.02	3.07	5.13		0.09	0.18	0.90	1.10	0.28	0.49	0.50	1.18	1.65
ESSEX POWERLINES CORPORATION	3.28	1.67	3.51	5.47	5.66	3.84	3.42	2.16	3.33	5.14	3.83	3.75	1.26
FESTIVAL HYDRO INC.	2.03	4.02	1.80	2.47	3.43	4.76	1.82	1.99	2.48	2.18	1.87	2.62	1.00
FORT FRANCES POWER CORPORATION	3.32	0.19	0.56		0.24	0.31	1.77	2.40	0.31	0.21	0.30	0.96	1.13
GREATER SUDBURY HYDRO INC.	5.81	1.07	0.53	0.65	2.28	1.53	1.09	1.47	1.04	1.25	1.10	1.62	1.47
GRIMSBY POWER INCORPORATED	2.62	3.85	0.48	1.76	0.41	1.28	1.69	0.27	1.06	1.24	1.73	1.49	1.05
GUELPH HYDRO ELECTRIC SYSTEMS INC.	0.98	0.94	1.04	1.03	1.18	1.02	1.42	1.56	1.26	2.46	2.53	1.40	0.57
HALDIMAND COUNTY HYDRO INC.	1.44	1.64	1.83	2.48	2.15	3.95	2.63	1.58	1.75	3.89	1.66	2.27	0.90
HALTON HILLS HYDRO INC.	0.01	0.01	0.01	0.01	1.53	0.66	1.04	1.48	2.75	1.67	1.90	1.01	0.94
HEARST POWER DISTRIBUTION COMPANY LIMITED	2.37	2.22	4.44	2.85	2.53	5.77	0.26	11.19	3.10	1.73	5.12	3.78	2.91
HORIZON UTILITIES CORPORATION					1.44	1.59	1.80	1.81	1.81	1.74	1.95	1.74	0.17
HYDRO 2000 INC.		3.63	1.36	0.01	0.01	1.44	1.20	2.56	2.04	6.30	1.50	2.00	1.86
HYDRO HAWKESBURY INC.	2.25	3.28	1.73	1.42	0.13	2.49	1.57	3.09	1.04	1.46	0.89	1.76	0.95
HYDRO ONE BRAMPTON NETWORKS INC.	2.01	7.39	1.28	1.81	1.48	1.86	1.12	1.27	1.48	1.19	1.27	2.02	1.81
HYDRO ONE NETWORKS INC.	3.24	3.51	3.18	3.89	5.19	4.08	4.79	3.57	3.25	4.57	3.68	3.90	0.68
HYDRO OTTAWA LIMITED	1.39	1.46	0.66	0.99	1.19	1.21	1.02	1.15	1.39	1.69	1.81	1.27	0.33
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.71	2.67	0.76	1.79	0.61	1.25	4.43	1.38	1.53	1.39	1.68	1.75	1.04
KENORA HYDRO ELECTRIC CORPORATION LTD.	0.01	0.01	2.63	0.01	0.30	2.86	3.14	1.60	3.51	8.32	1.46	2.17	2.44
KINGSTON HYDRO CORPORATION					0.56	1.43	0.74	2.58	0.87	1.76	1.19	1.31	0.70
KITCHENER-WILMOT HYDRO INC.	0.78	1.42	0.51	0.85	0.92	0.94	1.24	2.99	1.15	1.34	1.13	1.21	0.65

Table 1 (continued)
SAIFI Data

Company	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	Standard Deviation
LAKEFRONT UTILITIES INC.	0.94	0.88	0.22	0.01	1.97	2.15	0.80	1.15	2.07	1.61	3.26	1.37	0.95
LAKELAND POWER DISTRIBUTION LTD.	33.71	0.68	0.02	0.99	0.69	4.33	1.60	1.40	0.83	1.35	1.11	4.25	9.83
LONDON HYDRO INC.	2.93	1.89	8.37	3.30	2.14	2.46	2.39	1.59	1.12	2.36	1.42	2.72	1.98
MIDLAND POWER UTILITY CORPORATION	0.84	1.51	0.61	1.58	2.12	0.50	0.97	0.85	1.14	1.75	1.06	1.17	0.50
MILTON HYDRO DISTRIBUTION INC.	2.05	0.91	1.14	1.90	1.49	1.14	0.76	1.24	0.73	1.31	1.10	1.25	0.42
NEWMARKET-TAY POWER DISTRIBUTION LTD.							0.50	0.30	0.21	0.90	0.55	0.49	0.27
NIAGARA PENINSULA ENERGY INC.							0.99	0.00	1.24	1.54	1.70	1.09	0.67
NIAGARA-ON-THE-LAKE HYDRO INC.	5.85	1.23	1.62	2.12	0.75	2.08	2.74	0.28	0.03	4.38	0.95	2.00	1.77
NORFOLK POWER DISTRIBUTION INC.	0.01	1.33	3.80		2.21	1.71	1.41	3.54	1.71	3.91	1.47	2.11	1.26
NORTH BAY HYDRO DISTRIBUTION LIMITED	0.98	2.64	2.40	0.96	1.61	1.79	2.70	1.63	3.65	2.36	9.02	2.70	2.24
NORTHERN ONTARIO WIRES INC.	0.12	0.00	0.00	0.03		3.37	1.21	2.75	2.76	1.89	3.27	1.54	1.44
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	2.28	1.13	1.04	1.64	1.09	1.73	1.60	1.57	1.07	1.04	0.97	1.38	0.42
ORANGEVILLE HYDRO LIMITED	8.99	8.16	0.64	0.12	1.83	1.64	1.09	0.71	1.83	3.16	1.50	2.70	3.02
ORILLIA POWER DISTRIBUTION CORPORATION	1.73	1.73	1.42	1.62	1.62	3.60	2.27	2.47	1.69	1.66	2.53	2.03	0.64
OSHAWA PUC NETWORKS INC.	1.35	1.17	0.94	1.17	1.29	1.16	1.80	1.67	0.80	1.66	1.08	1.28	0.32
OTTAWA RIVER POWER CORPORATION	4.39	6.38	6.84	4.27	4.37	3.00	5.77	2.87	1.40	6.02	2.25	4.33	1.80
PARRY SOUND POWER CORPORATION	3.83	0.01	0.01	1.03	0.65	3.90	11.26	0.06	0.03	0.84	1.42	2.10	3.36
PETERBOROUGH DISTRIBUTION INCORPORATED	9.04	2.30	2.45	1.47	2.64	1.69	2.15	1.77	1.59	2.73	2.16	2.73	2.14
POWERSTREAM INC.			0.99	1.78	1.08	1.55	0.92	1.24	0.92	1.23	1.70	1.27	0.33
PUC DISTRIBUTION INC.	1.74	1.25	3.30	4.46	3.43	3.90	1.71	2.97	2.83	4.61	2.17	2.94	1.13
RENFREW HYDRO INC.	1.39	1.53	1.34	0.20	1.33	1.44	2.61	2.18	2.22	1.77	2.39	1.67	0.67
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	0.55	0.11	0.20	0.11	0.06	0.22	1.21	0.15	1.75	0.94	1.59	0.63	0.64
SIOUX LOOKOUT HYDRO INC.	1.31	0.88	1.52	3.55	5.26	2.39	0.26	0.33	3.58	1.77	1.18	2.00	1.55
ST. THOMAS ENERGY INC.	1.05	4.10	0.32	0.79	0.74	0.38	2.01	0.65	0.58	1.69	1.05	1.21	1.09
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	1.62	1.81	2.71	2.82	2.03	3.30	3.10	4.11	4.56	3.80	3.12	3.00	0.94
TILLSONBURG HYDRO INC.	2.66	0.26	0.56	11.41	1.25	3.83	2.93	0.00	6.93	3.63	4.39	3.44	3.36
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.59	3.57	1.59	2.01	2.17	2.27	1.76	1.86	1.95	1.62	1.60	2.00	0.57
VERIDIAN CONNECTIONS INC.	1.61	2.19	2.03		2.76	1.81	2.41	2.45	1.58	2.43	2.62	2.19	0.42
WASAGA DISTRIBUTION INC.	3.58	0.35	0.47	1.94	6.31	1.88	6.31	0.75	1.52	1.60	1.28	2.36	2.14
WATERLOO NORTH HYDRO INC.	0.23	0.04	0.02		1.23	1.32	1.09	1.03	0.91	0.94	2.10	0.89	0.65
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	2.34	1.93	0.01	5.77	5.09	5.31	1.72	1.16	0.96	1.92	1.33	2.50	1.96
WELLINGTON NORTH POWER INC.	5.56	0.09	0.09	0.01	0.02	0.33	2.80	1.53	2.21	0.47	2.05	1.38	1.72
WEST COAST HURON ENERGY INC.	1.13	1.79	4.62	3.53	3.19	2.92	1.03	2.99	0.56	5.03	0.21	2.45	1.62
WESTARIO POWER INC.	0.72	0.01	0.02	0.01	0.53	0.92	12.80	0.89	9.51	1.93	1.43	2.61	4.33
WHITBY HYDRO ELECTRIC CORPORATION	0.53	1.05	0.86	1.23	0.58	1.05	0.43	1.57	0.62	1.62	1.43	1.00	0.43
WOODSTOCK HYDRO SERVICES INC.	0.17	1.00	0.46	0.60	1.45	1.81	1.37	1.83	0.69	1.58	0.88	1.08	0.57
Industry Mean	**2.58**	**2.07**	**1.52**	**1.96**	**1.86**	**2.09**	**2.50**	**1.73**	**1.90**	**2.29**	**1.97**	**2.01**	**0.32**

[1] 2002-2008 data are for Great Lakes Power Ltd; 2009-2012 data are for Algoma Power Inc.

[2] 2002-2005 data are for Canadian Niagara Power Inc. - Fort Erie; 2006-2012 data are for Canadian Niagara Power Inc.

[3] Data are for Middlesex Power Distribution Corporation.

Table 2
SAIDI Data

Company	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	Standard Deviation
ALGOMA POWER INC.[1]	6.48	4.97	4.69	5.36	4.34	6.50	7.54	9.86	16.65	13.69	11.25	8.30	4.07
ATIKOKAN HYDRO INC.	0.01	0.03	0.04	7.44	1.40	4.90	1.11	1.45	0.07	0.78	4.31	1.96	2.48
BLUEWATER POWER DISTRIBUTION CORPORATION	2.94	3.85	2.31	3.25	2.31	2.76	2.37	2.09	1.75	5.83	3.19	2.97	1.12
BRANT COUNTY POWER INC.	28.77	5.73	1.69	0.05	2.54	2.95	1.81	1.42	2.89	2.20	1.48	4.68	8.11
BRANTFORD POWER INC.	1.44	0.57	1.42	1.38	1.05	1.20	0.86	0.97	1.09	0.49	0.30	0.98	0.39
BURLINGTON HYDRO INC.	1.21	1.91	1.15	1.27	1.05	1.02	1.35	1.07	1.13	1.06	0.90	1.19	0.27
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	0.82	5.09	0.75	1.12	0.93	1.51	0.70	0.52	0.97	0.74	1.05	1.29	1.29
CANADIAN NIAGARA POWER INC.[2]	15.19	4.17	4.90	2.66	61.74	3.95	3.39	5.67	1.26	2.02	7.76	10.25	17.50
CENTRE WELLINGTON HYDRO LTD.	0.19	0.82	2.09	0.28	0.69	0.10	0.61	1.30	2.19	3.67	3.76	1.43	1.33
CHAPLEAU PUBLIC UTILITIES CORPORATION	5.89	37.21	21.09	10.58	42.74	10.33	3.89	8.22	101.68	2.63	0.44	22.25	29.82
COLLUS POWER CORPORATION	0.79	2.26	1.38	3.27	1.15	2.22	28.09	1.87	1.10	1.36		4.35	8.37
COOPERATIVE HYDRO EMBRUN INC.	0.04	0.03	0.04	0.02	0.01	0.08	7.14	0.01	0.02	10.01	3.08	1.86	3.50
E.L.K. ENERGY INC.	2.76	3.41	1.04	2.08	1.66	1.53	2.14	0.64	4.33	3.57	1.76	2.27	1.13
ENERSOURCE HYDRO MISSISSAUGA INC.	0.39	0.39	0.37	0.53	0.45	0.64	0.33	0.61	0.58	0.89	0.70	0.53	0.17
ENTEGRUS POWERLINES[3]		9.25	0.53	2.07	0.22	0.83	7.66	2.10	3.77	3.10		3.28	3.18
ENWIN UTILITIES LTD.	1.19	1.84	1.20	2.62	1.39	1.20	1.34	0.55	0.99	2.49	1.06	1.44	0.63
ERIE THAMES POWERLINES CORPORATION	3.75	2.04	2.32	1.63	1.14	3.16	6.09	1.91	11.20	4.47	2.56	3.66	2.88
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	10.26	14.99	37.65		0.14	0.63	0.81	1.57	1.04	0.53	1.13	6.88	11.93
ESSEX POWERLINES CORPORATION	8.31	2.41	2.60	4.30	3.45	3.59	3.54	3.16	5.81	6.38	4.53	4.37	1.80
FESTIVAL HYDRO INC.	1.89	3.16	1.89	2.33	3.07	4.13	1.69	1.74	1.97	1.49	1.96	2.30	0.81
FORT FRANCES POWER CORPORATION	4.30	0.27	0.14		0.15	0.30	3.77	6.63	0.60	0.09	0.30	1.65	2.36
GREATER SUDBURY HYDRO INC.	4.26	0.62	0.38	0.78	2.35	2.01	1.41	1.45	1.10	1.26	1.70	1.57	1.07
GRIMSBY POWER INCORPORATED	11.00	4.83	1.80	5.82	0.62	1.51	3.39	0.38	3.00	2.10	1.23	3.24	3.08
GUELPH HYDRO ELECTRIC SYSTEMS INC.	0.33	0.47	0.38	0.48	0.37	0.59	0.57	0.68	0.39	2.03	1.41	0.70	0.53
HALDIMAND COUNTY HYDRO INC.	4.79	3.07	3.06	5.81	11.74	10.86	7.10	4.30	3.00	8.53	2.83	5.92	3.24
HALTON HILLS HYDRO INC.	0.87	3.43	1.14	1.61	1.19	1.22	1.44	2.00	1.78	1.55	1.53	1.61	0.68
HEARST POWER DISTRIBUTION COMPANY LIMITED	0.01	15.56	4.68	3.76	3.59	19.03	0.99	37.50	13.87	8.18	8.13	10.48	10.85
HORIZON UTILITIES CORPORATION					0.94	1.01	1.49	1.18	1.24	2.25	1.45	1.37	0.44
HYDRO 2000 INC.		15.94	18.83	0.01	0.01	4.85	0.41	10.00	5.34	20.27	6.12	8.18	7.75
HYDRO HAWKESBURY INC.	7.58	15.13	10.63	1.06	0.17	7.68	2.95	2.81	1.17	1.07	0.78	4.64	4.92
HYDRO ONE BRAMPTON NETWORKS INC.	1.05	4.28	0.73	1.09	0.86	1.27	0.78	0.79	0.67	0.73	0.76	1.18	1.04
HYDRO ONE NETWORKS INC.	12.46	15.13	6.91	14.44	28.44	11.37	21.57	9.95	9.36	22.12	11.29	14.82	6.56
HYDRO OTTAWA LIMITED	1.32	1.44	0.76	1.09	1.51	1.40	0.98	1.50	1.35	2.60	1.64	1.42	0.47
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.93	4.88	0.83	2.14	0.70	0.76	5.80	1.37	1.40	1.04	3.09	2.18	1.73
KENORA HYDRO ELECTRIC CORPORATION LTD.	5.99	0.01	4.30	0.36	0.78	2.44	9.92	1.66	1.89	9.75	0.73	3.44	3.62
KINGSTON HYDRO CORPORATION					0.62	1.52	0.68	3.54	1.14	1.47	1.88	1.55	0.99
KITCHENER-WILMOT HYDRO INC.	0.71	0.98	0.54	1.10	0.66	1.10	1.11	1.42	0.82	1.53	0.99	1.00	0.31

Table 2 (continued)
SAIDI Data

Company	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	Standard Deviation
LAKEFRONT UTILITIES INC.	1.67	4.67	13.56	1.60	3.69	2.36	1.77	1.47	4.11	2.26	3.27	3.67	3.46
LAKELAND POWER DISTRIBUTION LTD.	3.98	1.27	0.05	4.63	3.44	11.76	5.49	3.39	3.61	4.19	3.26	4.10	2.95
LONDON HYDRO INC.	2.59	1.10	5.26	2.29	1.25	1.69	2.29	0.89	0.88	1.86	0.90	1.91	1.27
MIDLAND POWER UTILITY CORPORATION	0.00	4.34	0.97	5.80	7.84	1.64	2.79	3.06	4.88	3.68	1.13	3.29	2.34
MILTON HYDRO DISTRIBUTION INC.	2.71	1.25	0.54	1.05	1.35	1.54	1.01	1.16	0.69	1.40	0.88	1.23	0.58
NEWMARKET-TAY POWER DISTRIBUTION LTD.							1.34	0.40	0.30	1.26	0.89	0.84	0.48
NIAGARA PENINSULA ENERGY INC.							1.60	0.00	2.11	2.58	2.75	1.81	1.11
NIAGARA-ON-THE-LAKE HYDRO INC.	5.36	0.96	0.87	1.24	0.42	2.42	4.07	0.33	0.06	15.48	1.54	2.98	4.46
NORFOLK POWER DISTRIBUTION INC.	21.09	1.28	1.96		2.21	5.07	2.53	2.88	1.95	10.05	2.28	5.13	6.17
NORTH BAY HYDRO DISTRIBUTION LIMITED	1.13	2.07	0.97	1.76	21.08	1.67	2.72	1.93	2.77	2.91	2.04	3.73	5.79
NORTHERN ONTARIO WIRES INC.	0.00	0.00	0.00	0.03		4.71	3.65	3.84	5.17	7.22	10.49	3.51	3.59
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	1.22	0.93	0.57	0.70	0.79	1.27	1.54	0.77	0.73	0.47	0.81	0.89	0.32
ORANGEVILLE HYDRO LIMITED	11.79	9.53	0.58	0.24	2.16	2.99	1.51	0.84	2.85	5.47	1.54	3.59	3.81
ORILLIA POWER DISTRIBUTION CORPORATION	1.32	1.32	0.41	1.57	1.65	5.37	1.69	2.53	1.32	1.55	1.14	1.80	1.28
OSHAWA PUC NETWORKS INC.	3.97	1.44	1.50	1.16	2.27	1.76	1.73	3.49	0.65	1.88	1.27	1.92	0.99
OTTAWA RIVER POWER CORPORATION	7.44	7.46	3.32	1.25	4.99	2.19	6.56	3.20	1.21	10.70	3.31	4.69	3.02
PARRY SOUND POWER CORPORATION	2.09	1.69	0.25	14.58	0.36	0.61	16.47	1.54	0.07	1.13	0.39	3.56	5.97
PETERBOROUGH DISTRIBUTION INCORPORATED	12.11	1.81	1.97	1.35	5.49	1.35	2.91	4.60	2.22	5.17	2.49	3.77	3.14
POWERSTREAM INC.			0.59	1.00	0.87	2.18	1.00	1.98	0.81	1.20	1.16	1.20	0.53
PUC DISTRIBUTION INC.	1.78	2.38	3.64	4.45	2.48	3.28	2.23	2.14	2.11	8.44	1.65	3.14	1.95
RENFREW HYDRO INC.	0.99	4.33	1.36	0.18	2.05	2.20	2.70	2.14	2.50	1.18	2.42	2.01	1.09
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	1.61	0.21	0.60	0.27	0.12	0.68	2.94	0.29	0.91	2.41	3.82	1.26	1.27
SIOUX LOOKOUT HYDRO INC.	0.75	1.24	0.77	15.60	18.06	4.42	0.42	0.32	11.02	7.75	0.53	5.53	6.61
ST. THOMAS ENERGY INC.	1.45	1.39	0.15	0.67	0.19	0.49	0.80	0.28	0.34	1.72	0.22	0.70	0.57
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	0.92	1.01	1.96	1.94	1.62	2.00	1.64	4.40	2.94	2.79	1.29	2.05	1.01
TILLSONBURG HYDRO INC.	2.48	0.27	0.46	1.44	0.85	4.47	4.48	0.00	4.09	2.63	3.51	2.24	1.73
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.35	2.57	1.10	1.75	1.57	1.95	1.24	2.91	1.66	1.43	1.50	1.73	0.56
VERIDIAN CONNECTIONS INC.	2.03	1.64	1.31		2.54	1.94	2.36	3.69	0.92	2.24	1.89	2.06	0.75
WASAGA DISTRIBUTION INC.	3.84	0.70	0.89	2.46	14.88	1.92	9.10	0.83	1.89	1.69	1.12	3.57	4.45
WATERLOO NORTH HYDRO INC.	13.74	3.74	2.59		1.06	0.91	1.01	1.23	0.80	1.04	3.37	2.95	3.95
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	3.00	0.97	0.75	5.47	2.02	4.91	1.41	1.04	0.77	2.87	1.26	2.23	1.66
WELLINGTON NORTH POWER INC.	5.56	0.12	0.08	0.02	0.04	0.32	4.80	4.07	0.00	1.02	3.38	1.77	2.21
WEST COAST HURON ENERGY INC.	8.53	10.17	21.07	10.78	7.74	3.66	15.05	2.29	0.05	51.93	0.42	11.97	14.70
WESTARIO POWER INC.	0.01	13.10	5.02	0.38	0.87	0.30	40.10	1.35	1.54	11.77	4.78	7.20	11.83
WHITBY HYDRO ELECTRIC CORPORATION	0.48	1.51	0.46	0.88	0.78	0.83	0.24	2.25	0.49	1.48	0.96	0.94	0.59
WOODSTOCK HYDRO SERVICES INC.	0.28	1.49	0.41	0.33	2.36	1.57	1.26	1.64	0.30	0.51	0.55	0.97	0.72
Industry Mean	**4.18**	**4.09**	**3.19**	**2.79**	**4.36**	**2.94**	**4.13**	**2.78**	**3.80**	**4.62**	**2.41**	**3.52**	**0.76**

[1] 2002-2008 data are for Great Lakes Power Ltd; 2009-2012 data are for Algoma Power Inc.

[2] 2002-2005 data are for Canadian Niagara Power Inc. - Fort Erie; 2006-2012 data are for Canadian Niagara Power Inc.

[3] Data are for Middlesex Power Distribution Corporation.

Table 1 shows that there is considerable fluctuation in SAIFI data, both across time and distributors in the industry. A number of distributors effectively reported zero average outages across their entire customer base (*e.g.* SAIFI of .01 or .02) in one or more years. Frankly, SAIFI values this low are almost certainly inaccurate; even North American distributors that operate entirely networked, underground systems (such as Consolidated Edison in New York City) report SAIFI above these values. Some distributors have also reported 10 or more outages for an average customer in a year. The highest measured SAIFI in Ontario over the 2002-2012 period was 25.7.

Industry-wide, SAIFI averaged 2.01 over the sample period. Although some observers have argued that service reliability in the Province has deteriorated over time, there is little evidence of such a trend in the SAIFI data. The industry's average SAIFI was 2.58 in 2002, which was the highest average annual value for the entire 11 years of the sample period. SAIFI fell sharply in 2003 to 2.07 and again in 2004 to 1.52, then fluctuated in a relatively narrow range between 1.86 and 2.09 in 2005-2007. SAIFI spiked up to 2.50 in 2008, but then fell to 1.73 and 1.90 in 2009 and 2010, respectively. SAIFI rose to 2.29 in 2011 but then fell to 1.97 in 2012.

Two caveats must be kept in mind when considering SAIFI data for the industry and individual distributors. First, the reported values do not adjust for severe storms, and much of the year-to-year variation is undoubtedly due to differences in storm activity across years. Second, there are more missing and (apparently) inaccurate data in the early years of the sample period. PEG therefore believes that, when considering appropriate reliability benchmarks, less weight should be given to earlier years.

Table 2 presents data on SAIDI for individual distributors and the overall industry. There is even more fluctuation across time and across distributors for SAIDI than there is for SAIFI. In several instances, distributors effectively report zero hours of average outage time for a customer on their system. Again, these figures are probably not credible, since even fully-networked, underground systems rarely report SAIDI values this low. Some Ontario distributors have outage durations of more than 15 hours, for an average customer, several times over the sample period. The highest annual SAIDI value for the industry between 2002 and 2012 was 102 hours.

The industry average SAIDI was 3.52 hours in 2002-2012. Again, there is little apparent trend in this metric. SAIDI was 4.18 hours in 2002 but then fell steadily to 4.09 hours, 3.19 hours, and 2.79 hours in each of the subsequent three years (2003-2005). SAIDI followed an up/down pattern over the next five years (2006-2010), in which an increased SAIDI value in one year was followed by a decrease the following year. SAIDI did increase in 2011, making 2010-2011 the only two years of the period in which industry-wide SAIDI rose from the previous year. In 2012, however, SAIDI declined sharply from 4.62 hours to 2.41 hours, the lowest measured value over the 2002-2012 sample period.

Both of the caveats mentioned above for the SAIFI data also apply to SAIDI. In addition, it should be noted that measured SAIFI and SAIDI tend to increase when distributors install more advanced OMS and SCADA systems that measure interruptions more accurately, but SAIDI is typically affected more than SAIFI when measurement systems improve. Smart metering should also lead to more accurate interruption records, and the rollout of smart meters in Ontario has been taking place since 2006. All else equal, the increasing prevalence of smart metering in Ontario is likely to increase reported SAIDI, and to a lesser extent reported SAIFI, for Ontario electricity distributors.

Tables 3 and 4 present data on average values for SAIFI and SAIDI, respectively, for each distributor in the industry for three different sample periods: the most recent three years (2010-2012), the most recent five years (2008-2012), and the most recent ten years (2003-2012). PEG believes that mean values for SAIFI and SAIDI over each of these three periods may be a feasible basis for SAIFI and SAIDI benchmarks. As discussed in the previous chapter, longer periods are generally preferred for setting benchmarks because long periods are more likely to represent each distributor's typical, external business conditions that can impact its measured reliability. At the same time, benchmarks should be measured on the same basis as the reliability measures that will be benchmarked. Smart meters will play a role in measuring interruptions going forward, but SAIFI and SAIDI data in Ontario prior to 2006 will not reflect the potential impact of smart metering on measured reliability.

Table 3 shows that the average SAIFI value for each distributor as well as the industry-average SAIFI. Under a distributor-specific approach, the benchmark for each

Table 3

Alternate Company-Specific Benchmarks for SAIFI[1]

Company	Three-Year Average (2010-2012)	Five-Year Average (2008-2012)	Ten-Year Average (2003-2012)
ALGOMA POWER INC.[2]	6.71	5.20	3.68
ATIKOKAN HYDRO INC.	1.37	1.52	1.83
BLUEWATER POWER DISTRIBUTION CORPORATION	3.67	3.22	3.32
BRANT COUNTY POWER INC.	1.80	1.58	1.55
BRANTFORD POWER INC.	1.47	1.50	1.62
BURLINGTON HYDRO INC.	1.23	1.31	1.21
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.25	1.16	1.41
CANADIAN NIAGARA POWER INC.[3]	2.74	2.97	4.02
CENTRE WELLINGTON HYDRO LTD.	2.00	1.50	1.25
CHAPLEAU PUBLIC UTILITIES CORPORATION	2.00	1.84	4.27
COLLUS POWER CORPORATION	***1.00***	***7.36***	***3.66***
COOPERATIVE HYDRO EMBRUN INC.	1.68	1.48	0.85
E.L.K. ENERGY INC.	1.17	0.88	0.79
ENERSOURCE HYDRO MISSISSAUGA INC.	1.67	1.38	1.07
ENTEGRUS POWERLINES[4]	***2.04***	***2.84***	***1.96***
ENWIN UTILITIES LTD.	2.24	2.13	2.31
ERIE THAMES POWERLINES CORPORATION	2.56	1.99	1.52
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	0.42	0.65	***1.30***
ESSEX POWERLINES CORPORATION	4.10	3.57	3.80
FESTIVAL HYDRO INC.	2.18	2.07	2.68
FORT FRANCES POWER CORPORATION	0.27	1.00	***0.70***
GREATER SUDBURY HYDRO INC.	1.13	1.19	1.20
GRIMSBY POWER INCORPORATED	1.35	1.20	1.38
GUELPH HYDRO ELECTRIC SYSTEMS INC.	2.08	1.84	1.44
HALDIMAND COUNTY HYDRO INC.	2.43	2.30	2.36
HALTON HILLS HYDRO INC.	2.11	1.77	1.11
HEARST POWER DISTRIBUTION COMPANY LIMITED	3.32	4.28	3.92
HORIZON UTILITIES CORPORATION	1.83	1.82	***1.74***
HYDRO 2000 INC.	3.28	2.72	2.00
HYDRO HAWKESBURY INC.	1.13	1.61	1.71
HYDRO ONE BRAMPTON NETWORKS INC.	1.31	1.27	2.02
HYDRO ONE NETWORKS INC.	3.83	3.97	3.97
HYDRO OTTAWA LIMITED	1.63	1.41	1.26
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.53	2.08	1.75
KENORA HYDRO ELECTRIC CORPORATION LTD.	4.43	3.61	2.39
KINGSTON HYDRO CORPORATION	1.27	1.43	***1.31***
KITCHENER-WILMOT HYDRO INC.	1.21	1.57	1.25

Table 3 (continued)

Alternate Company-Specific Benchmarks for SAIFI[1]

Company	Three-Year Average (2010-2012)	Five-Year Average (2008-2012)	Ten-Year Average (2003-2012)
LAKEFRONT UTILITIES INC.	2.31	1.78	1.41
LAKELAND POWER DISTRIBUTION LTD.	1.10	1.26	1.30
LONDON HYDRO INC.	1.63	1.77	2.70
MIDLAND POWER UTILITY CORPORATION	1.32	1.15	1.21
MILTON HYDRO DISTRIBUTION INC.	1.05	1.03	1.17
NEWMARKET-TAY POWER DISTRIBUTION LTD.	0.55	0.49	***0.49***
NIAGARA PENINSULA ENERGY INC.	1.49	1.09	***1.09***
NIAGARA-ON-THE-LAKE HYDRO INC.	1.79	1.68	1.62
NORFOLK POWER DISTRIBUTION INC.	2.36	2.41	***2.34***
NORTH BAY HYDRO DISTRIBUTION LIMITED	5.01	3.87	2.88
NORTHERN ONTARIO WIRES INC.	2.64	2.38	***1.70***
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	1.03	1.25	1.29
ORANGEVILLE HYDRO LIMITED	2.16	1.66	2.07
ORILLIA POWER DISTRIBUTION CORPORATION	1.96	2.12	2.06
OSHAWA PUC NETWORKS INC.	1.18	1.40	1.28
OTTAWA RIVER POWER CORPORATION	3.22	3.66	4.32
PARRY SOUND POWER CORPORATION	0.76	2.72	1.92
PETERBOROUGH DISTRIBUTION INCORPORATED	2.16	2.08	2.10
POWERSTREAM INC.	1.28	1.20	***1.27***
PUC DISTRIBUTION INC.	3.20	2.86	3.06
RENFREW HYDRO INC.	2.13	2.23	1.70
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	1.43	1.13	0.63
SIOUX LOOKOUT HYDRO INC.	2.18	1.42	2.07
ST. THOMAS ENERGY INC.	1.11	1.20	1.23
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	3.83	3.74	3.14
TILLSONBURG HYDRO INC.	4.98	3.58	3.52
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.72	1.76	2.04
VERIDIAN CONNECTIONS INC.	2.21	2.30	***2.25***
WASAGA DISTRIBUTION INC.	1.47	2.29	2.24
WATERLOO NORTH HYDRO INC.	1.32	1.22	***0.97***
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	1.40	1.42	2.52
WELLINGTON NORTH POWER INC.	1.58	1.81	0.96
WEST COAST HURON ENERGY INC.	1.93	1.96	2.59
WESTARIO POWER INC.	4.29	5.31	2.80
WHITBY HYDRO ELECTRIC CORPORATION	1.22	1.13	1.04
WOODSTOCK HYDRO SERVICES INC.	1.05	1.27	1.17

Table 4

Alternate Company-Specific Benchmarks for SAIDI[1]

Company	Three-Year Average (2010-2012)	Five-Year Average (2008-2012)	Ten-Year Average (2003-2012)
ALGOMA POWER INC.[2]	13.86	11.80	8.49
ATIKOKAN HYDRO INC.	1.72	1.55	2.15
BLUEWATER POWER DISTRIBUTION CORPORATION	3.59	3.05	2.97
BRANT COUNTY POWER INC.	2.19	1.96	2.28
BRANTFORD POWER INC.	0.63	0.74	0.93
BURLINGTON HYDRO INC.	1.03	1.10	1.19
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	0.92	0.80	1.34
CANADIAN NIAGARA POWER INC.[3]	3.68	4.02	9.75
CENTRE WELLINGTON HYDRO LTD.	3.20	2.30	1.55
CHAPLEAU PUBLIC UTILITIES CORPORATION	34.92	23.37	23.88
COLLUS POWER CORPORATION	***1.23***	***8.11***	***4.74***
COOPERATIVE HYDRO EMBRUN INC.	4.37	4.05	2.04
E.L.K. ENERGY INC.	3.22	2.49	2.22
ENERSOURCE HYDRO MISSISSAUGA INC.	0.72	0.62	0.55
ENTEGRUS POWERLINES[4]	***3.44***	***4.16***	***3.28***
ENWIN UTILITIES LTD.	1.51	1.29	1.47
ERIE THAMES POWERLINES CORPORATION	6.08	5.25	3.65
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	0.90	1.02	***6.50***
ESSEX POWERLINES CORPORATION	5.57	4.68	3.98
FESTIVAL HYDRO INC.	1.81	1.77	2.34
FORT FRANCES POWER CORPORATION	0.33	2.28	***1.36***
GREATER SUDBURY HYDRO INC.	1.36	1.38	1.31
GRIMSBY POWER INCORPORATED	2.11	2.02	2.47
GUELPH HYDRO ELECTRIC SYSTEMS INC.	1.28	1.02	0.74
HALDIMAND COUNTY HYDRO INC.	4.79	5.15	6.03
HALTON HILLS HYDRO INC.	1.62	1.66	1.69
HEARST POWER DISTRIBUTION COMPANY LIMITED	10.06	13.73	11.53
HORIZON UTILITIES CORPORATION	1.65	1.52	***1.37***
HYDRO 2000 INC.	10.58	8.43	8.18
HYDRO HAWKESBURY INC.	1.01	1.76	4.35
HYDRO ONE BRAMPTON NETWORKS INC.	0.72	0.75	1.20
HYDRO ONE NETWORKS INC.	14.25	14.86	15.06
HYDRO OTTAWA LIMITED	1.86	1.62	1.43
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.84	2.54	2.20
KENORA HYDRO ELECTRIC CORPORATION LTD.	4.13	4.79	3.18
KINGSTON HYDRO CORPORATION	1.50	1.74	***1.55***
KITCHENER-WILMOT HYDRO INC.	1.11	1.18	1.03

Table 4 (continued)

Alternate Company-Specific Benchmarks for SAIDI[1]

Company	Three-Year Average (2010-2012)	Five-Year Average (2008-2012)	Ten-Year Average (2003-2012)
LAKEFRONT UTILITIES INC.	3.21	2.57	3.87
LAKELAND POWER DISTRIBUTION LTD.	3.69	3.99	4.11
LONDON HYDRO INC.	1.21	1.36	1.84
MIDLAND POWER UTILITY CORPORATION	3.23	3.11	3.61
MILTON HYDRO DISTRIBUTION INC.	0.99	1.03	1.09
NEWMARKET-TAY POWER DISTRIBUTION LTD.	0.82	0.84	***0.84***
NIAGARA PENINSULA ENERGY INC.	2.48	1.81	***1.81***
NIAGARA-ON-THE-LAKE HYDRO INC.	5.69	4.30	2.74
NORFOLK POWER DISTRIBUTION INC.	4.76	3.94	***3.36***
NORTH BAY HYDRO DISTRIBUTION LIMITED	2.57	2.47	3.99
NORTHERN ONTARIO WIRES INC.	7.63	6.07	***3.90***
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	0.67	0.86	0.86
ORANGEVILLE HYDRO LIMITED	3.29	2.44	2.77
ORILLIA POWER DISTRIBUTION CORPORATION	1.34	1.65	1.85
OSHAWA PUC NETWORKS INC.	1.27	1.80	1.71
OTTAWA RIVER POWER CORPORATION	5.07	5.00	4.42
PARRY SOUND POWER CORPORATION	0.53	3.92	3.71
PETERBOROUGH DISTRIBUTION INCORPORATED	3.29	3.48	2.94
POWERSTREAM INC.	1.06	1.23	***1.20***
PUC DISTRIBUTION INC.	4.07	3.32	3.28
RENFREW HYDRO INC.	2.03	2.19	2.11
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	2.38	2.07	1.22
SIOUX LOOKOUT HYDRO INC.	6.43	4.01	6.01
ST. THOMAS ENERGY INC.	0.76	0.67	0.63
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	2.34	2.61	2.16
TILLSONBURG HYDRO INC.	3.41	2.94	2.22
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.53	1.75	1.77
VERIDIAN CONNECTIONS INC.	1.68	2.22	***2.06***
WASAGA DISTRIBUTION INC.	1.57	2.93	3.55
WATERLOO NORTH HYDRO INC.	1.74	1.49	***1.75***
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	1.63	1.47	2.15
WELLINGTON NORTH POWER INC.	1.47	2.65	1.39
WEST COAST HURON ENERGY INC.	17.47	13.95	12.32
WESTARIO POWER INC.	6.03	11.91	7.92
WHITBY HYDRO ELECTRIC CORPORATION	0.97	1.08	0.99
WOODSTOCK HYDRO SERVICES INC.	0.45	0.85	1.04

distributor would be its own mean value over a designated period. It can be seen that the industry-wide SAIFI is 1.99 over the 2003-2012 period, 2.08 in 2008-2012, and 2.05 in 2010-2012. SAIFI also tends to be less variable for longer periods, with a standard deviation of 1.01 in 2003-2012 and 1.29 in 2008-2012, although it does decline to 1.20 in 2010-2012.

Table 3 also shows a significant disparity in average SAIFI across distributors. If we look at the Five-Year Average column, for example, average SAIFI ranges from 0.49 for Newmarket-Tay Power Distribution to 4.73 for Chapleau Public Utilities. Three other distributors all have average SAIFI values exceeding 4.0 for this period, and eight other distributors have an average SAIFI over 3.0.

Table 4 shows that the industry's mean value of SAIDI is 3.51 hours in 2003-2012, 3.55 hours in 2008-2012, and 3.61 hours in 2010-2012. SAIDI is also less variable across utilities as the time period used to compute the mean increases. The standard deviation of SAIDI is 3.72 hours over the 2003-2012 period, 3.95 hours for the 2008-2012 period, and 4.95 hours for the 2010-2012 period.

PEG would not recommend using a ten-year average as the basis for SAIFI and SAIDI benchmarks in Ontario for two reasons. First, too many distributors have missing and/or suspect SAIFI and SAIDI data in the 2003-2005 period. Second, the early years in this sample period take place before distributors began installing smart meters. For many distributors, data from the early years of the sample are therefore likely to be collected on a different basis, and therefore not comparable, with how SAIFI and SAIDI data will be measured going forward.

PEG also believes that three years is too short of a sample period for establishing reliability benchmarks. There is a high probability that measured SAIFI and SAIDI performance over a three-year period will potentially be impacted by an outlier observation or atypical business conditions for a distributor. This concern is heightened in the present case because the Ontario SAIFI and SAIDI data include outages that have occurred because of storms.

PEG therefore believes that, of these three distributor-specific options, the preferred alternative would be to construct SAIFI and SAIDI benchmarks using each distributor's average value for the metric over the 2008-2012 period. In most cases, the

benchmarks that would result from this approach appear generally reasonable, although there may be some exceptions. For example, 12 distributors have a mean value of SAIFI exceeding 3.0 for the 2008-2012 period. Similarly, 61 of 73 distributors have average values of SAIDI that are below 5 hours for the 2008-2012 period, but eight distributors registered mean SAIDI values that exceeded 8 hours for this period. The prospect of approving SAIFI benchmarks greater than 3.0 and SAIDI benchmarks in excess of 5 hours may merit further consideration by the Board.

3.2 Geographic Peer Groups

Another option for setting benchmarks in Ontario is to rely on geographic peer groups. Board staff have informally established such geographic peer groups as part of its current monitoring of service reliability monitoring in the Province. The following eight regional peer groups have been established:

1. Large Northern Local Distribution Companies (LDCs)
2. Small Northern LDCs
3. Large City Southern LDCs
4. Southwest Midsize LDCs
5. Southwest Small Towns LDCs
6. Eastern LDCs
7. GTA Towns
8. Hydro One Networks (only one distributor in 'group')

The specific distributors in each of these eight peer groups are identified in Table 5.

To investigate the desirability of peer group benchmarks in Ontario, PEG began by constructing mean values for each peer group's SAIFI and SAIDI over the 2002-2012 period. We then compared each distributor's actual, mean values for SAIFI and SAIDI to its peer group averages for the same metrics over the 2002-2012 period. It should be noted that comparing each distributor's mean SAIFI and SAIDI to the peer group's mean SAIFI and SAIDI will, in general, reduce the disparity between these values, because averaging SAIFI and SAIDI values for each distributor will smooth out much of the year-to-year variability that is observed in these measures. The comparisons of distributor-specific and peer group SAIFI and SAIDI are presented in Tables 6, 7 and 8.

Table 5
Peer Groups

Large Northern LDCs
- Greater Sudbury Hydro Inc.
- North Bay Hydro Distribution Limited
- PUC Distribution Inc.
- Thunder Bay Hydro Electricity Distribution Inc.

Small Northern LDCs
- Algoma Power Inc
- Atikokan Hydro Inc.
- Chapleau Public Utilities Corporation
- Espanola Regional Hydro Distribution Corporation
- Fort Frances Power Corporation
- Hearst Power Distribution Company Limited
- Kenora Hydro Electric Corporation Ltd.
- Lakeland Power Distribution Ltd.
- Northern Ontario Wires Inc.
- Ottawa River Power Corporation
- Sioux Lookout Hydro Inc.

Large City Southern
- Enersource Hydro Mississauga Inc.
- ENWIN Utilities Ltd.
- Horizon Utilities Corporation
- Hydro One Brampton Networks Inc.
- Hydro Ottawa Limited
- London Hydro Inc.
- PowerStream Inc.
- Toronto Hydro-Electric System Limited
- Veridian Connections Inc.

Southwest Midsize LDCs
- Bluewater Power Distribution Corporation
- E.L.K. Energy Inc.
- Entegrus Powerlines[1]
- Erie Thames Powerlines Corporation
- Essex Powerlines Corporation
- Festival Hydro Inc.
- Canadian Niagara Power Inc.
- Haldimand County Hydro Inc.
- Innisfil Hydro Distribution Systems Limited
- Orillia Power Distribution Corporation
- St. Thomas Energy Inc.
- Wasaga Distribution Inc.
- Westario Power Inc.
- Woodstock Hydro Services Inc.

Southwest Small Towns
- Brant County Power Inc.
- COLLUS Power Corporation
- Grimsby Power Incorporated
- Halton Hills Hydro Inc.
- Midland Power Utility Corporation
- Niagara-on-the-Lake Hydro Inc.
- Norfolk Power Distribution Inc.
- Orangeville Hydro Limited
- Tillsonburg Hydro Inc.
- Wellington North Power Inc.
- West Coast Huron Energy Inc.

Hydro One Networks
- Hydro One Networks Inc.

Eastern LDCs
- Cooperative Hydro Embrun Inc.
- Hydro 2000 Inc.
- Hydro Hawkesbury Inc.
- Kingston Hydro Corporation
- Lakefront Utilities Inc.
- Parry Sound Power Corporation
- Peterborough Distribution Incorporated
- Renfrew Hydro Inc.
- Rideau St. Lawrence Distribution Inc.

GTA Towns
- Brantford Power Inc.
- Burlington Hydro Inc.
- Cambridge and North Dumfries Hydro Inc.
- Centre Wellington Hydro Ltd.
- Guelph Hydro Electric Systems Inc.
- Kitchener-Wilmot Hydro Inc.
- Milton Hydro Distribution Inc.
- Newmarket - Tay Power Distribution Ltd.
- Niagara Peninsula Energy Inc.
- Oakville Hydro Electricity Distribution Inc.
- Oshawa PUC Networks Inc.
- Waterloo North Hydro Inc.
- Welland Hydro-Electric System Corp.
- Whitby Hydro Electric Corporation

[1] **Data are for Middlesex Power Distribution Corporation.**

Table 6

Peer Group SAIFI*

Peer Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	Standard Deviation
Large Northern LDCs	2.75	1.60	2.15	2.25	2.34	2.67	2.12	2.67	2.97	2.97	3.22	2.52	0.47
Small Northern LDCs	7.01	2.34	2.27	2.19	2.05	3.03	2.44	2.72	2.39	3.85	3.23	3.05	1.42
Southwest Midsize LDCs	1.88	2.23	1.68	2.43	2.98	2.54	3.61	1.70	2.80	2.62	2.45	2.45	0.58
Southwest Small Towns	1.11	1.19	1.09	1.26	1.43	1.51	4.71	1.59	1.97	2.41	1.67	1.81	1.04
Large City Southern	1.64	2.83	1.86	1.85	1.70	1.79	1.55	1.56	1.55	1.72	1.73	1.80	0.36
Hydro One Networks	3.24	3.51	3.18	3.89	5.19	4.08	4.79	3.57	3.25	4.57	3.68	3.90	0.68
Eastern LDCs	3.56	1.74	1.63	0.98	1.46	1.64	1.85	1.84	1.36	2.12	1.84	1.82	0.65
GTA Towns	1.46	1.36	0.90	1.48	1.28	1.35	1.27	1.52	1.09	1.39	1.37	1.32	0.18
Industry Mean	**2.83**	**2.10**	**1.84**	**2.04**	**2.30**	**2.33**	**2.79**	**2.15**	**2.17**	**2.71**	**2.40**	**2.33**	**0.32**

***Peer group SAIFI is weighted by the number of customers.**

Table 7

Peer Group SAIDI*

Peer Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	Standard Deviation
Large Northern LDCs	2.11	1.36	1.70	2.13	5.16	2.22	1.87	2.63	2.18	3.55	1.61	2.41	1.08
Small Northern LDCs	4.80	4.51	2.72	4.20	4.88	5.82	5.33	6.15	8.39	7.83	5.12	5.43	1.60
Southwest Midsize LDCs	3.89	3.92	2.18	2.52	7.18	3.20	6.88	2.22	2.81	4.48	3.19	3.86	1.73
Southwest Small Towns	7.59	2.88	1.41	2.54	1.94	2.69	6.35	1.84	2.11	6.14	1.77	3.39	2.19
Large City Southern	1.36	2.01	1.23	1.46	1.29	1.59	1.23	1.89	1.18	1.66	1.31	1.48	0.28
Hydro One Networks	12.46	15.13	6.91	14.44	28.44	11.37	21.57	9.95	9.36	22.12	11.29	14.82	6.56
Eastern LDCs	5.54	3.40	3.78	1.25	2.71	1.85	2.69	3.28	1.88	3.37	2.35	2.92	1.17
GTA Towns	1.60	1.76	1.00	1.22	1.03	1.30	1.13	1.28	0.88	1.41	1.34	1.27	0.26
Industry Mean	**4.92**	**4.37**	**2.62**	**3.72**	**6.58**	**3.75**	**5.88**	**3.65**	**3.60**	**6.32**	**3.50**	**4.45**	**1.30**

***Peer group SAIDI is weighted by the number of customers.**

Table 8

Actual vs. Peer Group Reliability Performance

Company	SAIFI			SAIDI		
	Actual	Peer Benchmark	Difference (%)	Actual	Peer Benchmark	Difference (%)
	[A]	[B]	[(A-B)/B]	[C]	[D]	[(C-D)/D]
ALGOMA POWER INC.	3.59	3.05	18%	8.30	5.43	53%
ATIKOKAN HYDRO INC.	1.67	3.05	-45%	1.96	5.43	-64%
BLUEWATER POWER DISTRIBUTION CORPORATION	3.23	2.45	32%	2.97	3.86	-23%
BRANT COUNTY POWER INC.	1.50	1.81	-17%	4.68	3.39	38%
BRANTFORD POWER INC.	1.77	1.32	35%	0.98	1.27	-23%
BURLINGTON HYDRO INC.	1.22	1.32	-7%	1.19	1.27	-6%
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.42	1.32	8%	1.29	1.27	2%
CANADIAN NIAGARA POWER INC.	4.04	2.45	65%	10.25	3.86	165%
CENTRE WELLINGTON HYDRO LTD.	1.15	1.32	-12%	1.43	1.27	12%
CHAPLEAU PUBLIC UTILITIES CORPORATION	4.73	3.05	55%	22.25	5.43	310%
COLLUS POWER CORPORATION	3.33	1.81	84%	4.35	3.39	28%
COOPERATIVE HYDRO EMBRUN INC.	0.78	1.82	-57%	1.86	2.92	-36%
E.L.K. ENERGY INC.	0.72	2.45	-71%	2.27	3.86	-41%
ENERSOURCE HYDRO MISSISSAUGA INC.	1.03	1.80	-43%	0.53	1.48	-64%
ENTEGRUS POWERLINES	1.96	2.45	-20%	3.28	3.86	-15%
ENWIN UTILITIES LTD.	2.31	1.80	28%	1.44	1.48	-2%
ERIE THAMES POWERLINES CORPORATION	1.44	2.45	-41%	3.66	3.86	-5%
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	1.18	3.05	-61%	6.88	5.43	27%
ESSEX POWERLINES CORPORATION	3.75	2.45	53%	4.37	3.86	13%
FESTIVAL HYDRO INC.	2.62	2.45	7%	2.30	3.86	-40%
FORT FRANCES POWER CORPORATION	0.96	3.05	-68%	1.65	5.43	-70%
GREATER SUDBURY HYDRO INC.	1.62	2.52	-36%	1.57	2.41	-35%
GRIMSBY POWER INCORPORATED	1.49	1.81	-18%	3.24	3.39	-4%
GUELPH HYDRO ELECTRIC SYSTEMS INC.	1.40	1.32	6%	0.70	1.27	-45%
HALDIMAND COUNTY HYDRO INC.	2.27	2.45	-7%	5.92	3.86	53%
HALTON HILLS HYDRO INC.	1.01	1.81	-44%	1.61	3.39	-52%
HEARST POWER DISTRIBUTION COMPANY LIMITED	3.78	3.05	24%	10.48	5.43	93%
HORIZON UTILITIES CORPORATION	1.74	1.80	-3%	1.37	1.48	-7%
HYDRO 2000 INC.	2.00	1.82	10%	8.18	2.92	180%
HYDRO HAWKESBURY INC.	1.76	1.82	-3%	4.64	2.92	59%
HYDRO ONE BRAMPTON NETWORKS INC.	2.02	1.80	12%	1.18	1.48	-20%
HYDRO ONE NETWORKS INC.	3.90	3.90	0%	14.82	14.82	0%
HYDRO OTTAWA LIMITED	1.27	1.80	-29%	1.42	1.48	-4%
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.75	2.45	-29%	2.18	3.86	-44%
KENORA HYDRO ELECTRIC CORPORATION LTD.	2.17	3.05	-29%	3.44	5.43	-37%
KINGSTON HYDRO CORPORATION	1.31	1.82	-28%	1.55	2.92	-47%
KITCHENER-WILMOT HYDRO INC.	1.21	1.32	-8%	1.00	1.27	-21%

Table 8 (continued)

Actual vs. Peer Group Reliability Performance

Company	SAIFI			SAIDI		
	Actual	Peer Benchmark	Difference (%)	Actual	Peer Benchmark	Difference (%)
	[A]	[B]	[(A-B)/B]	[C]	[D]	[(C-D)/D]
LAKEFRONT UTILITIES INC.	1.37	1.82	-25%	3.67	2.92	26%
LAKELAND POWER DISTRIBUTION LTD.	4.25	3.05	39%	4.10	5.43	-25%
LONDON HYDRO INC.	2.72	1.80	52%	1.91	1.48	29%
MIDLAND POWER UTILITY CORPORATION	1.17	1.81	-35%	3.29	3.39	-3%
MILTON HYDRO DISTRIBUTION INC.	1.25	1.32	-5%	1.23	1.27	-3%
NEWMARKET-TAY POWER DISTRIBUTION LTD.	0.49	1.32	-63%	0.84	1.27	-34%
NIAGARA PENINSULA ENERGY INC.	1.09	1.32	-17%	1.81	1.27	43%
NIAGARA-ON-THE-LAKE HYDRO INC.	2.00	1.81	10%	2.98	3.39	-12%
NORFOLK POWER DISTRIBUTION INC.	2.11	1.81	16%	5.13	3.39	52%
NORTH BAY HYDRO DISTRIBUTION LIMITED	2.70	2.52	7%	3.73	2.41	55%
NORTHERN ONTARIO WIRES INC.	1.54	3.05	-49%	3.51	5.43	-35%
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	1.38	1.32	5%	0.89	1.27	-30%
ORANGEVILLE HYDRO LIMITED	2.70	1.81	49%	3.59	3.39	6%
ORILLIA POWER DISTRIBUTION CORPORATION	2.03	2.45	-17%	1.80	3.86	-53%
OSHAWA PUC NETWORKS INC.	1.28	1.32	-3%	1.92	1.27	51%
OTTAWA RIVER POWER CORPORATION	4.33	3.05	42%	4.69	5.43	-14%
PARRY SOUND POWER CORPORATION	2.10	1.82	15%	3.56	2.92	22%
PETERBOROUGH DISTRIBUTION INCORPORATED	2.73	1.82	50%	3.77	2.92	29%
POWERSTREAM INC.	1.27	1.80	-29%	1.20	1.48	-19%
PUC DISTRIBUTION INC.	2.94	2.52	17%	3.14	2.41	30%
RENFREW HYDRO INC.	1.67	1.82	-8%	2.01	2.92	-31%
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	0.63	1.82	-66%	1.26	2.92	-57%
SIOUX LOOKOUT HYDRO INC.	2.00	3.05	-34%	5.53	5.43	2%
ST. THOMAS ENERGY INC.	1.21	2.45	-50%	0.70	3.86	-82%
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	3.00	2.52	19%	2.05	2.41	-15%
TILLSONBURG HYDRO INC.	3.44	1.81	90%	2.24	3.39	-34%
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	2.00	1.80	11%	1.73	1.48	17%
VERIDIAN CONNECTIONS INC.	2.19	1.80	22%	2.06	1.48	39%
WASAGA DISTRIBUTION INC.	2.36	2.45	-4%	3.57	3.86	-7%
WATERLOO NORTH HYDRO INC.	0.89	1.32	-32%	2.95	1.27	132%
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	2.50	1.32	90%	2.23	1.27	75%
WELLINGTON NORTH POWER INC.	1.38	1.81	-24%	1.77	3.39	-48%
WEST COAST HURON ENERGY INC.	2.45	1.81	35%	11.97	3.39	254%
WESTARIO POWER INC.	2.61	2.45	7%	7.20	3.86	87%
WHITBY HYDRO ELECTRIC CORPORATION	1.00	1.32	-24%	0.94	1.27	-26%
WOODSTOCK HYDRO SERVICES INC.	1.08	2.45	-56%	0.97	3.86	-75%

Table 6 shows the annual average and overall mean values for SAIFI for each peer group. It can be seen that there is a significant variation among average SAIFI values for different groups. Hydro One has the highest average SAIFI of 3.90, followed by Small Northern LDCs with a SAIFI of 3.05. The Large Northern LDCs and the Southwest LDCs have the next highest values (SAIFI averages of 2.52 and 2.45, respectively). The Eastern LDCs, Southwest Small Towns, and Large City Southern City LDCs all have very similar average values for SAIFI (1.82, 1.81 and 1.80, respectively). The GTA towns register the lowest average SAIFI of 1.32. SAIFI values also display the least variability across the distributors in GTA towns and Large Southern City LDCs peer groups, with standard deviations of 0.18 and 0.36, respectively.

Table 7 presents analogous data for SAIDI. As with SAIFI, Hydro One has the highest value for SAIDI with a mean of 14.82 hours. It is followed by the Small Northern LDC group, which averaged 5.43 hours of SAIDI each year. The two Southwest LDC groups each averaged more than 3 hours of SAIDI. Eastern LDCs averaged 2.92 hours of SAIDI, Large Northern LDCs averaged 2.41 hours of SAIDI, while average output durations were much smaller for the Large City Southern and GTA Towns groups, at 1.48 hours and 1.27 hours, respectively.

Table 8 shows how each distributor's average values for SAIFI and SAIDI compare with its peer group averages for these metrics. In both cases, because it has no identified peers, there is obviously no difference between Hydro One's average SAIFI and SAIDI and that of its group. However, only 29 of the other 72 distributors in the industry have an average value for SAIFI that is within +/- 20% of its group average. Similarly, only 21 of the other 72 distributors had an average value for SAIDI that was within +/- 21% of its group average. Forty-three distributors had average values for SAIFI, and 51 distributors had average values for SAIDI, that were more than 20% or more above or below the respective peer group average.

PEG believes this discrepancy is notable. By way of comparison, PEG recently prepared an econometric cost benchmarking model for Board staff where we found only five distributors whose costs were 20% or more below the econometric benchmark and 17 distributors whose costs were 20% or more above the econometric benchmark. Here we find more than twice that number and, as discussed, these numbers would almost

certainly be higher if PEG undertook this same analysis using annual rather than 2002-2012 average values for the reliability metrics.

Given these findings, PEG believes there is too much variation in measured SAIFI or SAIDI among distributors within each peer group for peer group average SAIFI or SAIDI values to be used as benchmarks. This is not surprising, because the peer groups established here vary only in terms of geography (Northern, Southern, Southwestern, or Eastern) and size of distributor (Large, Midsize, Towns, Small). Many other external business conditions that can impact measured reliability are not reflected in these criteria for determining peer groups. It should also be noted that the Board recently rejected using peer groups to benchmark costs in the RRF because of concerns about properly controlling for differences in business conditions using peer group comparisons. PEG believes these concerns are even more evident in the reliability data for distributors than in the cost data. We therefore do not believe there would be value in pursuing peer group-based reliability benchmarks in Ontario.

3.3 Statistical Benchmarks

PEG also analyzed the use of statistical methods to set reliability benchmarks. For both SAIFI and SAIDI, we examined the statistical relationship between values for reliability and a variety of external business conditions that could impact measured reliability. In general, these statistical modeling results were not successful. The main reason is that there is a great deal of variation, and apparent randomness, in the SAIDI and SAIFI data provided to PEG. This is likely because the reliability data have not been normalized to exclude the impact of storms or other severe events, and PEG did not have data (or enough time to find potential data) on storm severity throughout Ontario over the sample period.

The most successful "reliability driver" models that PEG developed for SAIFI and SAIDI are presented in Tables 9 and 10, respectively. These models are then used to predict SAIFI and SAIDI for each distributor. The difference between each distributor's mean values for SAIFI and SAIDI and those predicted by the statistical models are presented in Tables 11 and 12, respectively.

Table 9

SAIFI Econometric Model

VARIABLE KEY

LRG = Deliveries to Large Customers (%)
UND = Line that is Underground (%)
DEN = Customers per km of line
SMA = Total Investment in Smart Meters (C$)

Explanatory Variable	Estimated Coefficient	Standard Error	P-Value
LRG	0.0062	0.0099	0.532
UND	-0.0632	0.0443	0.154
DEN	0.0174	0.0945	0.854
SMA*	0.0205	0.0044	0.000
Constant	0.0933	0.4215	0.825
R-Squared	0.0359		
Sample Period	2002-2012		
Number of Observations	316		

***Variable is significant at 95% confidence level**

Table 10
SAIDI Econometric Model

VARIABLE KEY

LRG = Deliveries to Large Customers (%)
UND = Line that is Underground (%)
DEN = Customers per km of line
SMA = Total Investment in Smart Meters (C$)

Explanatory Variable	Estimated Coefficient	Standard Error	P-Value
LRG	0.0134	0.0141	0.340
UND*	-0.2380	0.0412	0.000
DEN	-0.0641	0.0838	0.445
SMA*	0.0192	0.0044	0.000
Constant	0.3395	0.3552	0.339
R-Squared	0.0415		
Sample Period	2002-2012		
Number of Observations	316		

***Variable is significant at 95% confidence level**

Table 11
SAIFI Econometric Benchmarking

Company	Econometric Prediction [A]	Company Mean (2002-2012) [B]	Difference (%) [(B-A)/B]
ALGOMA POWER INC.	2.00	3.59	44%
ATIKOKAN HYDRO INC.	1.60	1.67	4%
BLUEWATER POWER DISTRIBUTION CORPORATION	1.45	3.23	55%
BRANT COUNTY POWER INC.	1.28	1.50	14%
BRANTFORD POWER INC.	1.21	1.77	32%
BURLINGTON HYDRO INC.	1.58	1.22	-29%
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.34	1.42	6%
CANADIAN NIAGARA POWER INC.		4.04	
CENTRE WELLINGTON HYDRO LTD.	1.31	1.15	-13%
CHAPLEAU PUBLIC UTILITIES CORPORATION	1.60	4.73	66%
COLLUS POWER CORPORATION		3.33	
COOPERATIVE HYDRO EMBRUN INC.	1.59	0.78	-104%
E.L.K. ENERGY INC.	1.43	0.72	-100%
ENERSOURCE HYDRO MISSISSAUGA INC.	1.36	1.03	-32%
ENTEGRUS POWERLINES	1.51	1.96	23%
ENWIN UTILITIES LTD.	1.35	2.31	42%
ERIE THAMES POWERLINES CORPORATION	1.49	1.44	-4%
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	1.60	1.18	-36%
ESSEX POWERLINES CORPORATION	1.21	3.75	68%
FESTIVAL HYDRO INC.	1.67	2.62	36%
FORT FRANCES POWER CORPORATION	1.69	0.96	-76%
GREATER SUDBURY HYDRO INC.	1.36	1.62	16%
GRIMSBY POWER INCORPORATED	1.25	1.49	16%
GUELPH HYDRO ELECTRIC SYSTEMS INC.	1.42	1.40	-1%
HALDIMAND COUNTY HYDRO INC.	1.76	2.27	23%
HALTON HILLS HYDRO INC.	1.24	1.01	-23%
HEARST POWER DISTRIBUTION COMPANY LIMITED	1.51	3.78	60%
HORIZON UTILITIES CORPORATION	1.64	1.74	6%
HYDRO 2000 INC.	1.45	2.00	28%
HYDRO HAWKESBURY INC.		1.76	
HYDRO ONE BRAMPTON NETWORKS INC.	1.42	2.02	30%
HYDRO ONE NETWORKS INC.	1.99	3.90	49%
HYDRO OTTAWA LIMITED	1.51	1.27	-19%
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.27	1.75	27%
KENORA HYDRO ELECTRIC CORPORATION LTD.	1.33	2.17	39%
KINGSTON HYDRO CORPORATION	1.50	1.31	-15%
KITCHENER-WILMOT HYDRO INC.	1.45	1.21	-20%

Table 11 (continued)
SAIFI Econometric Benchmarking

Company	Econometric Prediction [A]	Company Mean (2002-2012) [B]	Difference (%) [(B-A)/B]
LAKEFRONT UTILITIES INC.	1.51	1.37	-10%
LAKELAND POWER DISTRIBUTION LTD.	1.65	4.25	61%
LONDON HYDRO INC.	1.66	2.72	39%
MIDLAND POWER UTILITY CORPORATION	1.49	1.17	-27%
MILTON HYDRO DISTRIBUTION INC.	1.43	1.25	-14%
NEWMARKET-TAY POWER DISTRIBUTION LTD.		0.49	
NIAGARA PENINSULA ENERGY INC.	1.62	1.09	-48%
NIAGARA-ON-THE-LAKE HYDRO INC.	1.21	2.00	40%
NORFOLK POWER DISTRIBUTION INC.	1.53	2.11	28%
NORTH BAY HYDRO DISTRIBUTION LIMITED	1.54	2.70	43%
NORTHERN ONTARIO WIRES INC.	1.72	1.54	-12%
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	1.55	1.38	-12%
ORANGEVILLE HYDRO LIMITED	1.41	2.70	48%
ORILLIA POWER DISTRIBUTION CORPORATION	1.39	2.03	31%
OSHAWA PUC NETWORKS INC.	1.43	1.28	-12%
OTTAWA RIVER POWER CORPORATION		4.33	
PARRY SOUND POWER CORPORATION	1.31	2.10	38%
PETERBOROUGH DISTRIBUTION INCORPORATED	1.57	2.73	43%
POWERSTREAM INC.	1.47	1.27	-16%
PUC DISTRIBUTION INC.	1.74	2.94	41%
RENFREW HYDRO INC.	1.58	1.67	5%
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	1.54	0.63	-145%
SIOUX LOOKOUT HYDRO INC.	1.79	2.00	10%
ST. THOMAS ENERGY INC.	1.32	1.21	-8%
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	1.28	3.00	57%
TILLSONBURG HYDRO INC.	1.52	3.44	56%
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.31	2.00	35%
VERIDIAN CONNECTIONS INC.	1.46	2.19	33%
WASAGA DISTRIBUTION INC.	1.44	2.36	39%
WATERLOO NORTH HYDRO INC.	1.72	0.89	-93%
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	1.71	2.50	32%
WELLINGTON NORTH POWER INC.		1.38	
WEST COAST HURON ENERGY INC.	1.67	2.45	32%
WESTARIO POWER INC.		2.61	
WHITBY HYDRO ELECTRIC CORPORATION		1.00	
WOODSTOCK HYDRO SERVICES INC.		1.08	

Table 12

SAIDI Econometric Benchmarking

Company	Econometric Prediction [A]	Company Mean (2002-2012) [B]	Difference (%) [(B-A)/B]
ALGOMA POWER INC.	7.20	8.30	13%
ATIKOKAN HYDRO INC.	3.98	1.96	-103%
BLUEWATER POWER DISTRIBUTION CORPORATION	1.74	2.97	42%
BRANT COUNTY POWER INC.	1.73	4.68	63%
BRANTFORD POWER INC.	1.23	0.98	-25%
BURLINGTON HYDRO INC.	1.69	1.19	-42%
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.49	1.29	-15%
CANADIAN NIAGARA POWER INC.		10.25	
CENTRE WELLINGTON HYDRO LTD.	1.28	1.43	10%
CHAPLEAU PUBLIC UTILITIES CORPORATION	2.56	22.25	88%
COLLUS POWER CORPORATION		4.35	
COOPERATIVE HYDRO EMBRUN INC.	1.60	1.86	14%
E.L.K. ENERGY INC.	1.49	2.27	34%
ENERSOURCE HYDRO MISSISSAUGA INC.	1.36	0.53	-154%
ENTEGRUS POWERLINES	1.73	3.28	47%
ENWIN UTILITIES LTD.	1.48	1.44	-3%
ERIE THAMES POWERLINES CORPORATION	1.71	3.66	53%
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORATION	2.37	6.88	65%
ESSEX POWERLINES CORPORATION	1.23	4.37	72%
FESTIVAL HYDRO INC.	1.73	2.30	25%
FORT FRANCES POWER CORPORATION	2.25	1.65	-36%
GREATER SUDBURY HYDRO INC.	1.63	1.57	-4%
GRIMSBY POWER INCORPORATED	1.45	3.24	55%
GUELPH HYDRO ELECTRIC SYSTEMS INC.	1.39	0.70	-99%
HALDIMAND COUNTY HYDRO INC.	3.00	5.92	49%
HALTON HILLS HYDRO INC.	1.55	1.61	4%
HEARST POWER DISTRIBUTION COMPANY LIMITED	1.91	10.48	82%
HORIZON UTILITIES CORPORATION	1.59	1.37	-16%
HYDRO 2000 INC.	1.87	8.18	77%
HYDRO HAWKESBURY INC.		4.64	
HYDRO ONE BRAMPTON NETWORKS INC.	1.37	1.18	-16%
HYDRO ONE NETWORKS INC.	3.40	14.82	77%
HYDRO OTTAWA LIMITED	1.57	1.42	-10%
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.69	2.18	22%
KENORA HYDRO ELECTRIC CORPORATION LTD.	1.76	3.44	49%
KINGSTON HYDRO CORPORATION	1.58	1.55	-2%
KITCHENER-WILMOT HYDRO INC.	1.51	1.00	-51%

Table 12 (continued)
SAIDI Econometric Benchmarking

Company	Econometric Prediction [A]	Company Mean (2002-2012) [B]	Difference (%) [(B-A)/B]
LAKEFRONT UTILITIES INC.	1.88	3.67	49%
LAKELAND POWER DISTRIBUTION LTD.	2.00	4.10	51%
LONDON HYDRO INC.	1.64	1.91	14%
MIDLAND POWER UTILITY CORPORATION	1.57	3.29	52%
MILTON HYDRO DISTRIBUTION INC.	1.58	1.23	-28%
NEWMARKET-TAY POWER DISTRIBUTION LTD.		0.84	
NIAGARA PENINSULA ENERGY INC.	1.95	1.81	-8%
NIAGARA-ON-THE-LAKE HYDRO INC.	1.49	2.98	50%
NORFOLK POWER DISTRIBUTION INC.	2.10	5.13	59%
NORTH BAY HYDRO DISTRIBUTION LIMITED	1.96	3.73	47%
NORTHERN ONTARIO WIRES INC.	3.57	3.51	-2%
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	1.47	0.89	-66%
ORANGEVILLE HYDRO LIMITED	1.47	3.59	59%
ORILLIA POWER DISTRIBUTION CORPORATION	1.71	1.80	6%
OSHAWA PUC NETWORKS INC.	1.46	1.92	24%
OTTAWA RIVER POWER CORPORATION		4.69	
PARRY SOUND POWER CORPORATION	1.90	3.56	47%
PETERBOROUGH DISTRIBUTION INCORPORATED	1.70	3.77	55%
POWERSTREAM INC.	1.43	1.20	-19%
PUC DISTRIBUTION INC.	2.15	3.14	32%
RENFREW HYDRO INC.	2.53	2.01	-26%
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	2.02	1.26	-60%
SIOUX LOOKOUT HYDRO INC.	3.45	5.53	38%
ST. THOMAS ENERGY INC.	1.39	0.70	-99%
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	1.62	2.05	21%
TILLSONBURG HYDRO INC.	1.67	2.24	25%
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.37	1.73	21%
VERIDIAN CONNECTIONS INC.	1.55	2.06	25%
WASAGA DISTRIBUTION INC.	1.48	3.57	59%
WATERLOO NORTH HYDRO INC.	1.94	2.95	34%
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	1.94	2.23	13%
WELLINGTON NORTH POWER INC.		1.77	
WEST COAST HURON ENERGY INC.	1.97	11.97	84%
WESTARIO POWER INC.		7.20	
WHITBY HYDRO ELECTRIC CORPORATION		0.94	
WOODSTOCK HYDRO SERVICES INC.		0.97	

Table 9 presents our results for SAIFI. There are four independent "driver" variables in our model, and we posit the following relationship between these variables and a distributor's measured SAIFI in any given year:

- The share of deliveries to large customers (LRG): relatively large customers generally demand more reliable power supplies, and their rates reflect the costs incurred to deliver more power more reliably. Since a large share of deliveries to large customers is therefore expected to be associated with a lower value of SAIFI, the coefficient on this variable is expected to be negative.
- Percent of line that is underground (UND): underground lines are less prone to contacts that would lead to outages. Since the amount of lines that are underground is expected to be associated with a lower value of SAIFI, the coefficient on this variable is expected to be negative.
- Customer density, or customers per km of distribution line (DEN): more dense service territories generally have shorter lines that are less prone to contact that lead to outages. Since higher values of customer per km of distribution line are expected to be associated with a lower value of SAIFI, the coefficient on this variable is expected to be negative.
- Total investment in smart meters (SMA) per customer: as discussed, smart metering may record outages that would have been missed or incompletely recorded with manual or less sophisticated systems. PEG was provided data on nearly every distributor's annual smart meter expenditures as part of our cost benchmarking work in the RRF. Since higher values of smart meter expenditures per customer will lead to more accurate outage recording systems and higher reported values of SAIFI, the coefficient on this variable is expected to be positive.

PEG investigated a log linear relationship between SAIFI and the independent variables. We also explored other specifications and some other independent variables but the results were not substantively different than what are reported in Table 9. Our estimation procedure included a group-wise heteroskedasticity correction.

It can be seen that only the smart meter variable has the expected sign and is statistically significant. Our results therefore show that higher levels of smart meter expenditures are associated with higher measured values for SAIFI. It should be noted, however, that the R-squared estimate for this regression is only .036, which means that the independent variables in this model are capturing only about 3.6% of the variation in distributors' measured SAIFI. This indicates that most of the variation in SAIFI over time and across distributors is due to storms and other factors that are not quantified in our analysis.

Table 10 presents analogous statistical results for SAIDI. The independent variables and expected coefficients are the same as in Table 9. Our specification and estimation procedure were also identical to Table 9.

As before, PEG finds that the coefficient on smart meters is positive and statistically significant. This indicates that there is a statistically significant relationship between a distributor's annual smart meter expenditures per customer and its measured SAIDI. We also find that the coefficient on undergrounding has the expected negative sign and is statistically significant. A higher share of underground lines is therefore associated with lower measured values for SAIDI. The estimates for deliveries to large customers and customers per square km of line were not statistically significant. The R-squared statistic for this regression is .0415, which means that the independent variables in this model are capturing only about 4% of the variation in distributors' measured SAIDI.

Tables 11 and 12 show these models' predictions for SAIFI and SAIDI, respectively, and distributors' mean SAIFI and SAIDI values. Table 11 shows that only 21 of the 73 distributors have average SAIFI values for 2002-2012 that are within +/- 20% of the model's prediction. Table 12 shows that only 17 of the 73 distributors have average 2002-2012 SAIDI that are within +/- 20% of the model's prediction.

Given these findings, PEG believes that statistical methods should not be used at the present time to establish SAIFI and SAIDI benchmarks. The main problem with using statistical tools to set benchmarks is that there is so much apparently random variation in the SAIFI and SAIDI data over time and across distributors, presumably resulting from random and difficult to quantify storm activity. This makes it difficult to

identify statistically significant relationships between SAIFI and/or SAIDI and underlying external business conditions that can impact differences in measured SAIDI and SAIDI across electricity distributors. PEG does not have enough confidence in the underlying statistical results (either the estimates of the models' parameters or the overall explanatory power of the models) to recommend that they be used to set SAIFI and SAIDI benchmarks.

4. Conclusion

This report has analyzed three options for setting service reliability benchmarks for Ontario electricity distributors: 1) distributor-specific benchmarks for SAIFI and SAIDI based on the distributor's historical average values for the respective indicators; 2) peer group averages, where average SAIFI and SAIDI values for distributors in designated regional peer groups establish benchmarks on the respective indicators for all distributors within the peer group; and 3) statistically-based SAIFI and SAIDI benchmarks, where statistical models estimated using SAIFI and SAIDI data, respectively, for the entire Ontario electricity distribution industry are used to generate predictions for each distributor's SAIFI and SAIDI given the external business conditions that distributor faces. Table 13 displays the empirical benchmarks that would result under each of these three approaches for SAIFI for all 73 distributors in Ontario. Table 14 shows the analogous empirical benchmarks for SAIDI.

As discussed in Chapter Three, PEG believes that our analysis does not lend support towards using either the peer-based or statistical approach to set reliability benchmarks in Ontario. It is often difficult for peer group benchmarking to capture all the important external business conditions that can impact measured performance, and our analysis suggests that would be the case if regional peer groups were used to set reliability benchmarks. The challenges associated with identifying appropriate peers is the main reason peer-based benchmarks are very rarely used in service reliability regulation.

There are some precedents for using econometric methods to set reliability benchmarks, but PEG concludes that this approach is not warranted in Ontario. There is too much variability and apparent randomness in Ontario distributors' underlying SAIFI and SAIDI data for this approach to be effective. This data variability results, at least in part, from the fact that distributors have historically not normalized their reported reliability metrics to eliminate the impact of severe storms and other random factors that can have a substantial impact on measured SAIFI and SAIDI. The randomness in the

current reliability data makes it difficult to identify statistically significant 'drivers' of measured SAIFI and SAIDI and use econometric reliability driver models to predict average SAIFI and SAIDI values for Ontario electricity distributors.

PEG believes distributor-specific SAIFI and SAIDI benchmarks can be appropriate in Ontario. This is the most common method for setting benchmarks in reliability regulation. The benchmarks that would emerge from this approach in Ontario also appear generally reasonable.

PEG's analysis indicates that average values for SAIFI and SAIDI over the five most recent years (2008-2012) would be the most appropriate historical basis for setting distributor-specific reliability benchmarks. Five years is long enough to capture the impact of a distributor's external business conditions on its measured reliability data, but recent enough to reflect the current methods that are used to collect data on interruptions. However, there are a few distributors (discussed in Chapter Three) where the Board may wish to exercise discretion or gather additional information from the distributors in order to set benchmarks, rather than relying entirely on the distributor's own five-year average values for SAIFI and SAIDI.

Table 13

Comparative Benchmarks: SAIFI

Company	Company Mean (2002-2012)	Peer Benchmark	Econometric Benchmark
ALGOMA POWER INC.	3.59	3.05	2.00
ATIKOKAN HYDRO INC.	1.67	3.05	1.60
BLUEWATER POWER DISTRIBUTION CORPORATION	3.23	2.45	1.45
BRANT COUNTY POWER INC.	1.50	1.81	1.28
BRANTFORD POWER INC.	1.77	1.32	1.21
BURLINGTON HYDRO INC.	1.22	1.32	1.58
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.42	1.32	1.34
CANADIAN NIAGARA POWER INC.	4.04	2.45	
CENTRE WELLINGTON HYDRO LTD.	1.15	1.32	1.31
CHAPLEAU PUBLIC UTILITIES CORPORATION	4.73	3.05	1.60
COLLUS POWER CORPORATION	3.33	1.81	
COOPERATIVE HYDRO EMBRUN INC.	0.78	1.82	1.59
E.L.K. ENERGY INC.	0.72	2.45	1.43
ENERSOURCE HYDRO MISSISSAUGA INC.	1.03	1.80	1.36
ENTEGRUS POWERLINES	1.96	2.45	1.51
ENWIN UTILITIES LTD.	2.31	1.80	1.35
ERIE THAMES POWERLINES CORPORATION	1.44	2.45	1.49
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORA	1.18	3.05	1.60
ESSEX POWERLINES CORPORATION	3.75	2.45	1.21
FESTIVAL HYDRO INC.	2.62	2.45	1.67
FORT FRANCES POWER CORPORATION	0.96	3.05	1.69
GREATER SUDBURY HYDRO INC.	1.62	2.52	1.36
GRIMSBY POWER INCORPORATED	1.49	1.81	1.25
GUELPH HYDRO ELECTRIC SYSTEMS INC.	1.40	1.32	1.42
HALDIMAND COUNTY HYDRO INC.	2.27	2.45	1.76
HALTON HILLS HYDRO INC.	1.01	1.81	1.24
HEARST POWER DISTRIBUTION COMPANY LIMITED	3.78	3.05	1.51
HORIZON UTILITIES CORPORATION	1.74	1.80	1.64
HYDRO 2000 INC.	2.00	1.82	1.45
HYDRO HAWKESBURY INC.	1.76	1.82	
HYDRO ONE BRAMPTON NETWORKS INC.	2.02	1.80	1.42
HYDRO ONE NETWORKS INC.	3.90	3.90	1.99
HYDRO OTTAWA LIMITED	1.27	1.80	1.51
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	1.75	2.45	1.27
KENORA HYDRO ELECTRIC CORPORATION LTD.	2.17	3.05	1.33
KINGSTON HYDRO CORPORATION	1.31	1.82	1.50
KITCHENER-WILMOT HYDRO INC.	1.21	1.32	1.45

Table 13 (continued)
Comparative Benchmarks: SAIFI

Company	Company Mean (2002-2012)	Peer Benchmark	Econometric Benchmark
LAKEFRONT UTILITIES INC.	1.37	1.82	1.51
LAKELAND POWER DISTRIBUTION LTD.	4.25	3.05	1.65
LONDON HYDRO INC.	2.72	1.80	1.66
MIDLAND POWER UTILITY CORPORATION	1.17	1.81	1.49
MILTON HYDRO DISTRIBUTION INC.	1.25	1.32	1.43
NEWMARKET-TAY POWER DISTRIBUTION LTD.	0.49	1.32	
NIAGARA PENINSULA ENERGY INC.	1.09	1.32	1.62
NIAGARA-ON-THE-LAKE HYDRO INC.	2.00	1.81	1.21
NORFOLK POWER DISTRIBUTION INC.	2.11	1.81	1.53
NORTH BAY HYDRO DISTRIBUTION LIMITED	2.70	2.52	1.54
NORTHERN ONTARIO WIRES INC.	1.54	3.05	1.72
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	1.38	1.32	1.55
ORANGEVILLE HYDRO LIMITED	2.70	1.81	1.41
ORILLIA POWER DISTRIBUTION CORPORATION	2.03	2.45	1.39
OSHAWA PUC NETWORKS INC.	1.28	1.32	1.43
OTTAWA RIVER POWER CORPORATION	4.33	3.05	
PARRY SOUND POWER CORPORATION	2.10	1.82	1.31
PETERBOROUGH DISTRIBUTION INCORPORATED	2.73	1.82	1.57
POWERSTREAM INC.	1.27	1.80	1.47
PUC DISTRIBUTION INC.	2.94	2.52	1.74
RENFREW HYDRO INC.	1.67	1.82	1.58
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	0.63	1.82	1.54
SIOUX LOOKOUT HYDRO INC.	2.00	3.05	1.79
ST. THOMAS ENERGY INC.	1.21	2.45	1.32
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	3.00	2.52	1.28
TILLSONBURG HYDRO INC.	3.44	1.81	1.52
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	2.00	1.80	1.31
VERIDIAN CONNECTIONS INC.	2.19	1.80	1.46
WASAGA DISTRIBUTION INC.	2.36	2.45	1.44
WATERLOO NORTH HYDRO INC.	0.89	1.32	1.72
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	2.50	1.32	1.71
WELLINGTON NORTH POWER INC.	1.38	1.81	
WEST COAST HURON ENERGY INC.	2.45	1.81	1.67
WESTARIO POWER INC.	2.61	2.45	
WHITBY HYDRO ELECTRIC CORPORATION	1.00	1.32	
WOODSTOCK HYDRO SERVICES INC.	1.08	2.45	

Table 14

Comparative Benchmarks: SAIDI

Company	Company Mean (2002-2012)	Peer Benchmark	Econometric Benchmark
ALGOMA POWER INC.	8.30	5.43	7.20
ATIKOKAN HYDRO INC.	1.96	5.43	3.98
BLUEWATER POWER DISTRIBUTION CORPORATION	2.97	3.86	1.74
BRANT COUNTY POWER INC.	4.68	3.39	1.73
BRANTFORD POWER INC.	0.98	1.27	1.23
BURLINGTON HYDRO INC.	1.19	1.27	1.69
CAMBRIDGE AND NORTH DUMFRIES HYDRO INC.	1.29	1.27	1.49
CANADIAN NIAGARA POWER INC.	10.25	3.86	
CENTRE WELLINGTON HYDRO LTD.	1.43	1.27	1.28
CHAPLEAU PUBLIC UTILITIES CORPORATION	22.25	5.43	2.56
COLLUS POWER CORPORATION	4.35	3.39	
COOPERATIVE HYDRO EMBRUN INC.	1.86	2.92	1.60
E.L.K. ENERGY INC.	2.27	3.86	1.49
ENERSOURCE HYDRO MISSISSAUGA INC.	0.53	1.48	1.36
ENTEGRUS POWERLINES	3.28	3.86	1.73
ENWIN UTILITIES LTD.	1.44	1.48	1.48
ERIE THAMES POWERLINES CORPORATION	3.66	3.86	1.71
ESPANOLA REGIONAL HYDRO DISTRIBUTION CORPORA	6.88	5.43	2.37
ESSEX POWERLINES CORPORATION	4.37	3.86	1.23
FESTIVAL HYDRO INC.	2.30	3.86	1.73
FORT FRANCES POWER CORPORATION	1.65	5.43	2.25
GREATER SUDBURY HYDRO INC.	1.57	2.41	1.63
GRIMSBY POWER INCORPORATED	3.24	3.39	1.45
GUELPH HYDRO ELECTRIC SYSTEMS INC.	0.70	1.27	1.39
HALDIMAND COUNTY HYDRO INC.	5.92	3.86	3.00
HALTON HILLS HYDRO INC.	1.61	3.39	1.55
HEARST POWER DISTRIBUTION COMPANY LIMITED	10.48	5.43	1.91
HORIZON UTILITIES CORPORATION	1.37	1.48	1.59
HYDRO 2000 INC.	8.18	2.92	1.87
HYDRO HAWKESBURY INC.	4.64	2.92	
HYDRO ONE BRAMPTON NETWORKS INC.	1.18	1.48	1.37
HYDRO ONE NETWORKS INC.	14.82	14.82	3.40
HYDRO OTTAWA LIMITED	1.42	1.48	1.57
INNISFIL HYDRO DISTRIBUTION SYSTEMS LIMITED	2.18	3.86	1.69
KENORA HYDRO ELECTRIC CORPORATION LTD.	3.44	5.43	1.76
KINGSTON HYDRO CORPORATION	1.55	2.92	1.58
KITCHENER-WILMOT HYDRO INC.	1.00	1.27	1.51

Table 14 (continued)
Comparative Benchmarks: SAIDI

Company	Company Mean (2002-2012)	Peer Benchmark	Econometric Benchmark
LAKEFRONT UTILITIES INC.	3.67	2.92	1.88
LAKELAND POWER DISTRIBUTION LTD.	4.10	5.43	2.00
LONDON HYDRO INC.	1.91	1.48	1.64
MIDLAND POWER UTILITY CORPORATION	3.29	3.39	1.57
MILTON HYDRO DISTRIBUTION INC.	1.23	1.27	1.58
NEWMARKET-TAY POWER DISTRIBUTION LTD.	0.84	1.27	
NIAGARA PENINSULA ENERGY INC.	1.81	1.27	1.95
NIAGARA-ON-THE-LAKE HYDRO INC.	2.98	3.39	1.49
NORFOLK POWER DISTRIBUTION INC.	5.13	3.39	2.10
NORTH BAY HYDRO DISTRIBUTION LIMITED	3.73	2.41	1.96
NORTHERN ONTARIO WIRES INC.	3.51	5.43	3.57
OAKVILLE HYDRO ELECTRICITY DISTRIBUTION INC.	0.89	1.27	1.47
ORANGEVILLE HYDRO LIMITED	3.59	3.39	1.47
ORILLIA POWER DISTRIBUTION CORPORATION	1.80	3.86	1.71
OSHAWA PUC NETWORKS INC.	1.92	1.27	1.46
OTTAWA RIVER POWER CORPORATION	4.69	5.43	
PARRY SOUND POWER CORPORATION	3.56	2.92	1.90
PETERBOROUGH DISTRIBUTION INCORPORATED	3.77	2.92	1.70
POWERSTREAM INC.	1.20	1.48	1.43
PUC DISTRIBUTION INC.	3.14	2.41	2.15
RENFREW HYDRO INC.	2.01	2.92	2.53
RIDEAU ST. LAWRENCE DISTRIBUTION INC.	1.26	2.92	2.02
SIOUX LOOKOUT HYDRO INC.	5.53	5.43	3.45
ST. THOMAS ENERGY INC.	0.70	3.86	1.39
THUNDER BAY HYDRO ELECTRICITY DISTRIBUTION INC.	2.05	2.41	1.62
TILLSONBURG HYDRO INC.	2.24	3.39	1.67
TORONTO HYDRO-ELECTRIC SYSTEM LIMITED	1.73	1.48	1.37
VERIDIAN CONNECTIONS INC.	2.06	1.48	1.55
WASAGA DISTRIBUTION INC.	3.57	3.86	1.48
WATERLOO NORTH HYDRO INC.	2.95	1.27	1.94
WELLAND HYDRO-ELECTRIC SYSTEM CORP.	2.23	1.27	1.94
WELLINGTON NORTH POWER INC.	1.77	3.39	
WEST COAST HURON ENERGY INC.	11.97	3.39	1.97
WESTARIO POWER INC.	7.20	3.86	
WHITBY HYDRO ELECTRIC CORPORATION	0.94	1.27	
WOODSTOCK HYDRO SERVICES INC.	0.97	3.86	