BENCHMARKING THE COSTS OF

ONTARIO POWER DISTRIBUTORS

PEG

Pacific Economics Group, LLC

Economic and Litigation Consulting

6.5   Model Estimation Results

6.5.1 Featured Model

Estimation results for the featured econometric model are presented in Table 3. Working papers for these runs are available on request. Sample mean values of the data for each company can be found in the Appendix.

The parameters for the "first order" terms are the elasticities of the cost of the sample mean firm with respect to the basic variable. These are the terms that do not involve squared values of business condition variables. Estimates of these elasticities are shaded in the table for reader convenience. The tables also report the values of the asymptotic t ratios that correspond to each parameter estimate. These were also generated by the estimation program. A parameter estimate is deemed statistically significant if the hypothesis that the true parameter value equals zero is rejected. This statistical test requires the selection of a critical value for the asymptotic t ratio. In this study, we employed a critical value of 1.645, which is appropriate for a 90% confidence level given a large sample.

All included business conditions were required to have elasticity estimates that were plausible (*e.g.* sensibly signed) and significantly different from zero. All variables found to be statistically significant were included in the final model. Since, additionally, we consider for inclusion only variables that are predicted by theory or that seem relevant on the basis of our industry experience, the model is not a "black box" that confounds attempts at earnest appraisal.

Examining the results, it can be seen that all of the key cost function parameter estimates are plausible in sign and magnitude. Cost was found to be higher the higher were output quantities. At the sample mean, a 1% increase in the number of customers served was estimated to raise OM&A expenses by 0.49%. 1% hikes in the delivery volume and circuit km of distribution line were estimated to raise expenses by 0.37% and 0.09% respectively.

PRODUCTIVITY AND BENCHMARKING RESEARCH IN SUPPORT OF INCENTIVE RATE SETTING IN ONTARIO:

FINAL REPORT TO THE ONTARIO ENERGY BOARD

November 2013

(Issued on November 21, 2013 and as corrected on December 19, 2013 and January 24, 2014)

PEG

Pacific Economics Group Research, LLC

6 Econometric Research on Cost Performance

6.1 Total Cost Econometric Model

PEG benchmarked the total cost of Ontario's electricity distributors using a total cost econometric model. An econometric cost function is a mathematical relationship between the cost of service and business conditions. Business conditions are aspects of a company's operating environment that may influence its costs but are largely beyond management control. Economic theory can guide the selection of business condition variables in cost function models.

According to theory, the total cost of an enterprise depends on the amount of work it performs - the scale of its output - and the prices it pays for capital goods, labor services, and other inputs to its production process.[35] Theory also provides some guidance regarding the nature of the relationship between outputs, input prices, and cost. For example, cost is likely to rise if there is inflation in input prices or more work is performed.

For electricity distribution, total customers served and total kWh delivered are commonly used for output variables. Peak demand is another potential output variable. Peak demand is a billing determinant for some customers, but peak demand will also be an important cost driver for smaller customers whose peak demands are not metered. The reason is that delivery systems must be sized to accommodate peak demands, so there is a direct relationship between customers' peak demands and the costs of the necessary power delivery infrastructure.

In addition to output quantities and input prices, electricity distributors confront other operating conditions due to their special circumstances. Unlike firms in competitive industries, electricity distributors are obligated to provide service to customers within a given service territory. Distribution services are delivered directly into the homes, offices and businesses of end-users in this territory. Distributor cost is therefore sensitive to the circumstances of the territories in which they provide delivery service.

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[35] Labor prices are usually determined in local markets, while prices for capital goods and materials are often determined in national or even international markets.

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One important factor affecting cost is customer location. This follows from the fact that distribution services are delivered over networks that are linked directly to customers. The location of customers throughout the territory directly affects the assets that utilities must put in place to provide service. The spatial distribution of customers will therefore have implications for network cost.

The spatial distribution of customers is sometimes proxied by the total circuit km of distribution line, or the total square km of territory served. Provided customer numbers is also used as a cost measure, these variables will together reflect the impact of different levels of customer density within a territory on electricity distribution costs.

Cost can also be sensitive to the mix of customers served. The assets needed to provide delivery service will differ somewhat for residential, commercial, and industrial customers. Different types of customers also have different levels and temporal patterns of demand and different load factors.

In addition to customer characteristics, cost can be sensitive to the physical environment of the service territory. The cost of constructing, operating and maintaining a network will depend on the terrain over which the network extends. These costs will also be influenced by weather and related factors. For example, costs will likely be higher in areas with a propensity for ice storms or other severe weather that can damage equipment and disrupt service. Operating costs will also be influenced by the type and density of vegetation in the territory, which will be at least partly correlated with precipitation and other weather variables.

Econometric cost functions require that a functional form be specified that relates cost to outputs, input prices, and other business conditions. The parameter associated with a given variable reflects its impact on the dependent cost variable. Econometric methods are used to estimate the parameters of cost function models. Econometric estimates of cost function parameters are obtained using historical data on the costs incurred by distributors and measurable business condition variables that are included in the cost model.

Ontario Energy Board

Ontario

EB-2010-0379

Report of the Board

Rate Setting Parameters and Benchmarking under the Renewed Regulatory Framework for Ontario's Electricity Distributors

Issued on November 21, 2013 and as corrected on December 4, 2013

approach does not compare one distributor to another distributor. While most stakeholders expressed general support for this new approach, some commented on the specific demarcation points between the five groups. Prof. Yatchew proposed alternative demarcation points, commenting that the Board's demarcation points placed a disproportionate number of distributors in the less efficient groups. The Vulnerable Energy Consumers' Coalition ("VECC") commented that the overall result should be one where the bulk of the distributors are assigned to the three central cohorts.

The Board sees merit in starting out with an allocation across the five groups that more closely resembles a normal distribution curve. There are no compelling reasons to start off with an asymmetrical distribution of disproportionate groupings at either end of the spectrum. The Board acknowledges that a curve based on today's sector performance will shift as distributors improve their performance and views this as a positive feature of the approach.

Accordingly, based on the Board's analysis of the cost evaluation ranking set out in Table 17 in the Final PEG Report, the Board has determined that the appropriate stretch factor values for each of the five groups will be as follows.

Table 3: Demarcation Points and Stretch Factor Values

Group	Demarcation Points for Relative Cost Performance	Stretch Factor
I	Actual costs are 25% or more below predicted costs	0.00%
II	Actual costs are 10% to 25% below predicted costs	0.15%
III	Actual costs are within +/-10% of predicted costs	0.30%
IV	Actual costs are 10% to 25% above predicted costs	0.45%
V	Actual costs are 25% or more above predicted costs	0.60%

Metro Phoenix

9/17/2013

APS SERVICE AREA
NON-APS SERVICE AREA
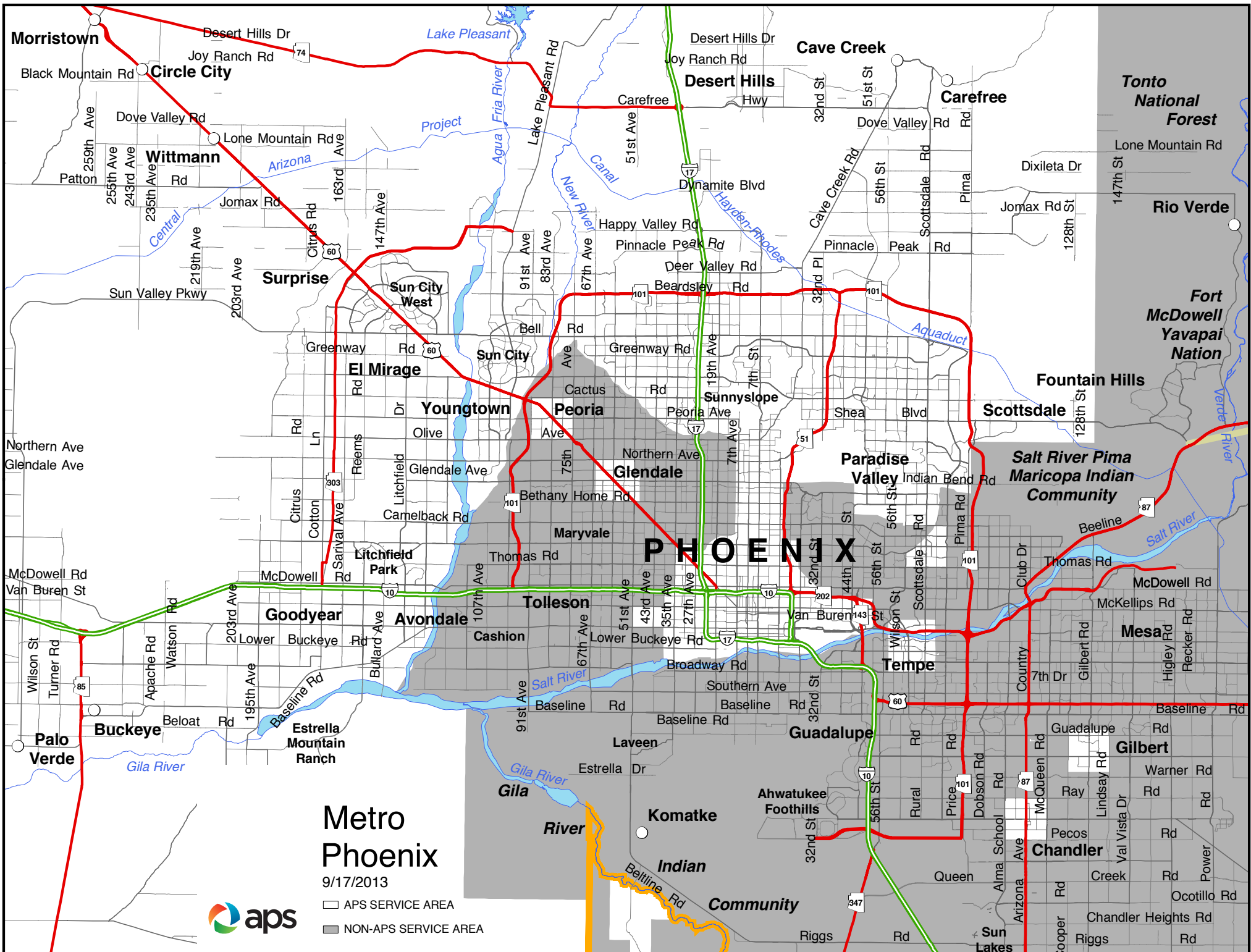
PROJECT NAME:

Toronto Hydro-Electric System Limited – Custom IR application (2015-2019)

EB-2014-0116

A) PROJECT BACKGROUND:

In October 2010, the Board began a consultation on a Renewed Regulatory Framework for Electricity Distributors (RRFE): A Performance Based Approach. The Framework included the following aspects: an integrated approach to network planning, regional infrastructure planning, development of the Smart Grid and performance, benchmarking and rate adjustment indices.

The Board issued its RRFE report on October 18, 2012 and indicated that the RRFE is designed to support the cost-effective planning and operation of the electricity distribution network – a network that is efficient, reliable, sustainable, and provides value for customers. Through taking a longer term view, the new framework will provide an appropriate alignment between a sustainable, financially viable electricity sector and the expectations of customers for reliable service at a reasonable price.

The RRFE report included a number of options for distributors to use for setting distribution rates in Ontario, including a Custom Incentive Rate setting option ("custom IR"). The RRFE established that distributors filing a custom IR application were required to file a network investment plan (now called a distribution system plan) for five forecast years. The custom IR application is required to have a distributor-specific rate trend for the plan term informed by: (1) the distributor's forecasts (revenue and costs, inflation, productivity); (2) the Board's inflation and productivity analyses; and (3) benchmarking to assess the reasonableness of the distributor's forecasts.

On July 31, 2014, Toronto Hydro-Electric System Limited filed a 5 Year Custom Incentive Rate-setting application for setting distribution rates from 2015 to 2019. The applicant has hired an external consultant to assist with developing the incentive rate-setting component of its application and will in all likelihood continue to assist the applicant throughout the course of the proceeding.

B) OBJECTIVES:

To retain an economic expert who will act as the Board staff subject matter expert in this area so that the applicant's evidence is sufficiently tested and Board staff will be in a position to file an informed submission for the Panel's consideration regarding Toronto Hydro's proposals.

The expert will review the pre-filed evidence, including the forecast costs, the incentive rate-setting component of the application, any benchmarking or productivity evidence and any proposals addressing the treatment of capital during the incentive rate-setting period. The expert will prepare interrogatories, cross examination documentation and submissions.

C) PURPOSE AND SCOPE:

1) To assess Toronto Hydro's 5 year Custom Incentive Rate-setting plan by assessing the applicant's expert evidence and ensuring the Board adequately tests the information and rationale regarding:

- Appropriateness of the approaches proposed by the applicant to define and measure productivity and utility performance.

- Applicant-specific productivity and benchmarking trend estimates for comparable distributors/utilities.

- The methods for determining, and the associated values for estimating productivity and benchmarking trends, including appropriate data and empirical work needed to estimate these trends.

- Whether there is a statistically significant difference between costs/rates for electricity distributors in major international cities, as compared to costs/rates for other distributors.

- Appropriateness of any custom capital factor to recover the cost of capital expenditures in the outer years.

- Off-ramps, benefits sharing and other considerations relevant to a five year, outcomes-based plan.

2) To undertake analysis to test the reasonableness of Toronto Hydro's forecast costs by comparing to those of relevant urban U.S. utilities as Toronto Hydro is a large urban utility whose operating territory is in Canada's largest city. Given these considerations, a comparative study of Toronto Hydro's costs to those of comparable U.S. utilities would be of use to the Board in assessing Toronto Hydro's evidence.

External expertise on specific performance and rate-setting matters would assist in developing a more robust assessment of the evidence, including any assessment of information and methods applicable to the establishment of distribution rates according to the principles embedded in the RRFE.

D) PROJECT REQUIREMENTS (DESCRIPTION OF SPECIFIC DELIVERABLES / MILESTONES):

The Board staff consultant will evaluate the evidence on the record of the proceeding and undertake research, evaluation and other activities relevant to the proceeding, including participation in the stages of the proceeding as it unfolds, which may include, among other things, reviewing evidence, assisting Board staff with interrogatories and submissions.

The Board has recently completed benchmarking of Toronto Hydro to other distributors in Ontario; therefore further benchmarking with Ontario distributors is not required.

The following is an initial list of the deliverables. This list will likely change depending

on the procedural steps decided upon initially by the Registrar and eventually, the Panel deciding the application

- Presentations and information sessions for staff, as required (September 2014)
- Briefing notes on THESL's proposals (September 2014)
- Interrogatories (October 2014)
- Interrogatory response evaluations (November 2014)
- Preparation of evidence (TBD) (November 2014)
- Responses to interrogatories on staff evidence (TBD) (December 2014)
- Issues list development (December 2014)
- Evidence Conference (December 2014)
- ADR support, as required in preparing a staff submisison on any settlement filed (December 2014)
- Cross examination documentation (December/January 2014)
- Oral hearing support (January 2014)
- Final staff submission (February 2014)
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E) TIMELINES OF PROJECT:

The following are some of the key timelines of this proceeding. The dates are based on a typical oral hearing schedule and will likely change depending on the process decided upon initially by the Registrar, and then by the Panel deciding this application:

Application filed: July 31, 2014
1st Round of Interrogatories due: October 14, 2014
Responses to interrogatories due: October 28, 2014
Staff or Intervenor evidence due: November 7, 2014
Interrogatories on staff or intervenor evidence due: November 17, 2014
Responses to interrogatories on staff or intevenor evidence due: November 24, 2014
ADR: November 26, 2014 (likely to take place in December)
Oral Hearing: December 29 (likely to take place in January)
Staff submission: January 13, 2015 (likely in February)
Decision due: March 23, 2015

F) MANDATORY REQUIREMENTS:

N/A