

Pacific Economics Group Research

Working Papers and Overview of Calculations

These working papers contain the data and calculations undertaken to produce the productivity and cost performance results contained in the report. They are organized as follows:

Part I: Company-level source data and aggregation

These working papers take the source data provided by the OEB and aggregate over 300 distributors to produce a consistent time series for each current distributor.

Part II: Cost, Productivity, and other calculations

These working papers use the forgoing data, non-company specific data provided by the OEB, and publicly available data from Statistics Canada to produce a database for use in econometric research. The productivity trend results are also calculated here. Additional spreadsheets are also included which contains details of the peer group, backcast, and economic depreciation calculations.

Part III: Econometric Program Code and Results

These working papers contain the data and programming code used to estimate the parameters of the econometric models used to produce the cost performance benchmarks. The detailed output of the models is also provided.

The authors anticipate that those reviewing this work will gain the most benefit from Part II of the working papers. Part I is useful for verifying and analyzing how the data used in Part II was compiled from the raw data. Part III contains relatively technical statistical modeling and computer programming.

Overview of Part I

The company level accounting and operating data were provided by OEB staff and posted on the OEB website. The files provided in Part I were

- Gross Plant Data: the MUDBANK data file which contain data from 1989-2011 with a gap from 1998-2001.
- Accumulated Amortization Data: the MUDBANK data file which contain data from 1989-2011 with a gap from 1998-2001.
- Information provided in response to Supplemental data requests: Contains Smart meter data, HV charges and other information.

- HV OMA: OM&A associated with HV assets.
- LV Charges from Hydro One 2002-2011: Amounts billed by Hydro One for LV service to embedded distributors.
- Non-Capital RRR data: these data contain a wide variety of data on cost, operations, and other business conditions from 2002-2011.
- Cost Performance Database: This Microsoft Access file imports the previous six files and contains queries that aggregate the data into the currently existing distributors.

The method for processing these data was to build a spreadsheet around the existing excel files that would allow these data to be transparently converted into a form that would allow a further processing in Microsoft Access.

In the case of the non-capital RRR file, this entailed inserting a number of rows for each year of data. Each row would then reference the relevant line of data in each year. When done for each year, the result is a standard ordering of data items which did not exist in the raw data. The next step was to create a sheet that used formulas to effectively transpose each year's data such that the companies and years were in the rows and columns contained the different data items. An additional column was added that shows the relationship between each reporting company and the currently existing company. These data were then in a format that lent itself for exporting to a database program for additional processing.

A similar procedure was used for the gross plant and accumulated amortization files. Columns were added to show the relationship of each observation to the currently existing distributor. Columns were also added to show the specific accounts used in the construction of the gross plant used for the TFP work and benchmarking work. These differ by whether HV or customer contributions are included in the total.

The file containing responses to the supplemental data request was compiled from the individual company responses received before the submission deadline. The remaining files did not require much processing to allow them to be imported into the Access database.

The Cost Performance Database contains the above file as tables. There are four queries that contain data that are aggregated by currently existing distributor. Each of these is exported for additional calculations in Part II. They are:

- Q Capital: This contains gross plant, accumulated amortization (depreciation), smart meter investment data, and other data necessary to construct capital cost and quantity.
- Q Output: This query contains data on number of customers, kWh deliveries, billed kW demand, revenue by customer class that are necessary to calculate output quantity indexes or be used directly in the benchmarking database or productivity calculations.

- Q OM&A: This query contains data necessary to calculate OM&A cost relevant to either benchmarking or TFP calculations. It includes the OM&A, LV charges, HV OM&A, and other data.
- Q Business Conditions: This query contains a wide variety of business conditions used in the econometric work such as system peak load, service territory area, km of line, and km of underground line.

The results of these four queries are exported and form the basis of the TFP and Bench calculations worksheet.

Overview of Part II

Data Used

The TFP and Bench calculations file contains the results from the above queries and additional data including:

- Rate of return data
- Price indexes from Statistics Canada

PEG corrected a very limited number of (apparently) obvious data errors. These are summarized on Table 9 of the report and the formulas used are available in the spreadsheet.

Sheets in Workbook

Below are the sheets in the workbook and a brief description of each

- TFP Calculations: TFP Calculations
- Bench Database: Benchmarking database exported to Part III
- Peer Group Data: Source of data for peer group analysis
- Capital Calculations for TFP: Capital cost calculations using productivity specification
- Capital Calculations for Bench: Capital cost calculations using benchmarking specification
- OM&A Calculations: Data from Part I and calculations to adjust for HV cost
- Output Indexes: Creates revenue-weighted output trend indexes
- Historical Asset Price: Creates average historical asset price using "triangular" weighting
- OM&A Price: Constructs the OM&A input price index

- Z Variables: Constructs business condition variables from Part I data
- Q Capital Data: Data from Part I
- Q OM&A: Data from Part I
- Q Output: Data from Part I
- Q Business Conditions: Data from Part I
- data request responses: responses to supplemental data requests by current distributors
- Aggregate HV charges: data response data aggregated by embedded distributor and not reporting distributor
- HV related OM&A: Provided by OEB staff
- GDPIPI Ontario: Construction of the time series for Ontario GDP implicit price index

Overview of Part III

This part of the working papers contains the data and computer program code used to calculate the benchmarking results and provide output weights for TFP calculations. The computer code is written in Version 8 of the GAUSS programming language available from Aptech Systems.

Sixteen (16) files are provided under an agreement of strict confidentiality:

- OEBPMwp.prg: main program for primary results
- OEBPMwpWithH1TH.prg: model with Hydro One and Toronto Hydro included
- OEBPMwpTests.prg: program file used to produce joint test statistics
- oebpmwp.out: results output
- oebpmwpWithH1TH.out: results output
- model.inc: specification of restrictions and variables, called by main program
- Var_namePwrDx.inc: variable descriptions for output file
- R_square2.inc: calculates R^2 for the system of equations and similar statistics
- SOCs_2.inc: verifies satisfaction of second order conditions
- Est_SLM2.inc: calculates coefficients of the redundant share equation
- Surh3up.src: contains the procedures for SUR estimation with iterated GLS

- Print2011.inc: called for time period and variable names printed in table of coefficients
- idOntario.txt: used to print Ontario distributor names with benchmarking results
- idsOntario: also used in printing Ontario distributor names
- Irset.src: certain declarations set for main program
- OEBwp.xls: the econometric database

These files document the process used in the econometric portion of this study. In order to run the files, GAUSS is required. Certain files provided with GAUSS should be in the working directory: Lrutil.src, Lr.ext, Lr.dec, and Rmatrix.src. The program should also know where the Aptech file Lrsseh.src is located; this is usually done by specifying the folder in user.lcg. Some versions of the programming language require a separate linear regression module for these five files, and the reading of the Excel file may need to be modified if a different version of GAUSS is used.