Benchmarking Electric Distributors

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Bottom Line

- The most important, overriding issue in the Board's evolving benchmarking is the failure to "model or benchmark" the integrated operation of distribution utilities with comprehensive data reflecting:
  - the joint nature of LDC output
  - the substitution relationships among an LDC's inputs

  Everything else pales in comparison.

- Joint output means that just and reasonable rates cannot be determined unless costs are assessed jointly with reliability and service quality; failure to reflect all LDC outputs seriously biases the assessments in favor of LDCs with lower reliability.

- Input substitution with varying allocations means that it is meaningless to examine one input in isolation from the rest; failure to benchmark with capital measured correctly seriously biases assessments in favor of LDCs with high labor capitalization (e.g., say 50 percent of total labor compensation capitalized) versus LDCs with low capitalization (e.g., say 6 or 11 percent).

- Many of the issues (e.g., enforcing consistency of allocations) being discussed at the Workshop are 2nd or 3rd order of importance compared to the recognition of the multidimensional nature of LDC output and the substitution potential among inputs.

- Without correcting the above concerns (i.e., comprehensive cost and reliability data), benchmarking should not be used for the applications enumerated in the 8-24 *Guide*.

Outline

- Labor Capitalization, Allocations, and Benchmarking
- Partial Cost versus Total Cost Benchmarking
- Service Quality, Reliability, and Safety
  - LDC output includes reliability and quality of service (SQ)
  - Rates can not be determined to be just and reasonable without considerations of SQ
  - Service quality regulation
    - COS v. IR
    - in Ontario
    - in the U.S.
    - in Europe
      - System-wide standards, customer guarantee payments, and WTP
      - Yardstick regulation of SQ
- Board Presentation Guideline Recommendations:
  - “High-Priority Data Upgrades”
  - Methodologies
  - Benchmarking Uses in Ratemaking
  - Other Issues that Should be Considered

The PEG "High-Priority" Data Upgrades

Suggested High-Priority Data Upgrades [1]

- Tighten data reporting rules and enforcement so as to encourage more consistent allocations of labour costs between distributor functions.
- Make public the share of net OM&A expenses attributable to labour, with itemization with respect to the major distribution functions.
- Gather detailed plant addition data by account in the Uniform System of Accounts or by major asset category.
- Tighten the rules and enforcement to ensure that accurate data are available on delivery volumes by service class, as well as data on the overall peak demand.
- Gather data on the volume of deliveries to other distributors (This upgrade should be made immediately and retrospectively).
- Tighten rules and enforcement concerning the reporting of network and service territory characteristics.
- Consider collection of some additional business condition variables. For example, data on the number of customers served in 1990 would permit an estimate of the share of customers added since that date, a useful measure of system age.

Source: Comparison of Ontario Electricity Distributors' Costs (EB-2006-0268) Guide for Presentations on September 12 - 13, 2007. OEB, August 24, 2007.

[1] *Benchmarking the Costs of Ontario Power Distributors*, Pacific Economics Group, April 25, 2007, pgs 41-42

Overview – Board Presentation Guidelines

- Questions relating to “high-priority data upgrades” and methodologies discussed in the Board’s 8-24 *Guide* need to be examined in the context of what objectives the Board has established for IR/electric benchmarking; these objectives appear unclear at this time.

- Suggested high-priority upgrades, even if successfully implemented, would not permit accurate benchmarking for many, many years.

- “Tightening enforcement” to require LDCs to use prescribed labor cost allocations would appear irrelevant to the question of LDC efficiency: as we demonstrate below, LDCs with different allocations (both across OM&A, and between capital and OM&A) have equal costs.

- Making public the labor share and distribution among OM&A activities would appear irrelevant to the question of LDC efficiency (especially since PEG’s weighting implies that labor is only 13 to 17 percent of total LDC costs).

- What is relevant is for the Board to undertake the required data collection and assessment of the 60 to 70 percent of costs (i.e., capital and losses) not included in the PEG benchmarking.

Overview: Partial Cost v. Total Cost

- Benchmarking on OM&A produces inconsistent, inaccurate, and misleading information and rankings.
- Such results would distort incentives for costs, allocations, quality and reliability.
- Dissimilar allocations of L between K and OM&A and across O, M, and A can produce similar cost/rankings.
- Accurate benchmarking requires comprehensive costs (i.e., capital, OM&A, loses) and reliability data.
- Benchmarking on total costs means that differences in labor capitalization or OM&A allocations are irrelevant.
- The Board has most of the data needed to undertake comprehensive cost benchmarking; if the Board decides not to use the pre-existing PBR, data then it should recollect and update this information.
- The Board should begin a process to review the "standards" on reliability, collect customer interruptions and costs, and assess the adequacy of O&M and infrastructure.

OM&A and Cost Shares among Ontario LDCs

- The PEG report focuses mainly on OM&A for benchmarking:
  - "Regulators considering the appropriate revenue requirement of a company often have special interest in certain subsets of the total cost of service. Examples include OM&A expenses (sometimes called "opex") and even more "micro" categories such as distribution labour expenses. The interest in these expenses is due in part to the fact that they are subject to greater control by utilities in the short run than are capital costs." (PEG report, p. 5)

- PEG reports using labor cost shares of 35 percent for OM&A.

- This would imply that labor as a share of total costs would equal about 13 to 17 percent; or somewhat more than line losses in Ontario.
  - If accurate why has there been so much concern and attention paid to the issue of labor costs
  - Capital has about twice the share of labor
  - Overcapitalization has often been found to be an issue for regulated firms

- 1999 Board Staff Report calculated labor to equal 69 percent of OM&A*

- This equaled 29 percent of total costs including line losses and 34 percent without losses.

***Cronin, F., J., et al, *Productivity and Price Performance for Electric Distributors, in Ontario,* OEB, July, 1999.**

Range of Cost Shares across LDCs

Exhibit 3.2: Range of Annual Cost Shares for Ontario Distributors 1988 - 1997

	Capital	Line Losses	Combined	Labour	Materials	Combined
Minimum	33.1	5.1	38.2	18.8	8.0	26.8
Maximum	63.2	10.0	73.2	44.4	17.4	61.8

Source: Data examined in 1999 Staff report.

Labor Capitalization and Perceived Costs

- The PEG report/Guide suggests “rules and enforcement” to “encourage” consistency of labor allocations across distributor functions.
- LDCs allocate varying amounts/shares of labor between OM&A and capital; without information on capital costs, varying allocations can make some LDCs appear less efficient and others more efficient when judged solely on OM&A.
- The share of labor capitalized ranges from less than 10 to 50 percent or more; the share of labor in capital additions can range from 15 to over 75 percent.
- For LDCs using the same total labor, differences of 15 percentage points in the share capitalized can produce differences of 20 percent in labor assigned to OM&A and more than 12 percent differences in OM&A costs.
- LDCs with significantly different reported shares of capitalized labor can have nearly the same costs when just capitalized labor is included.

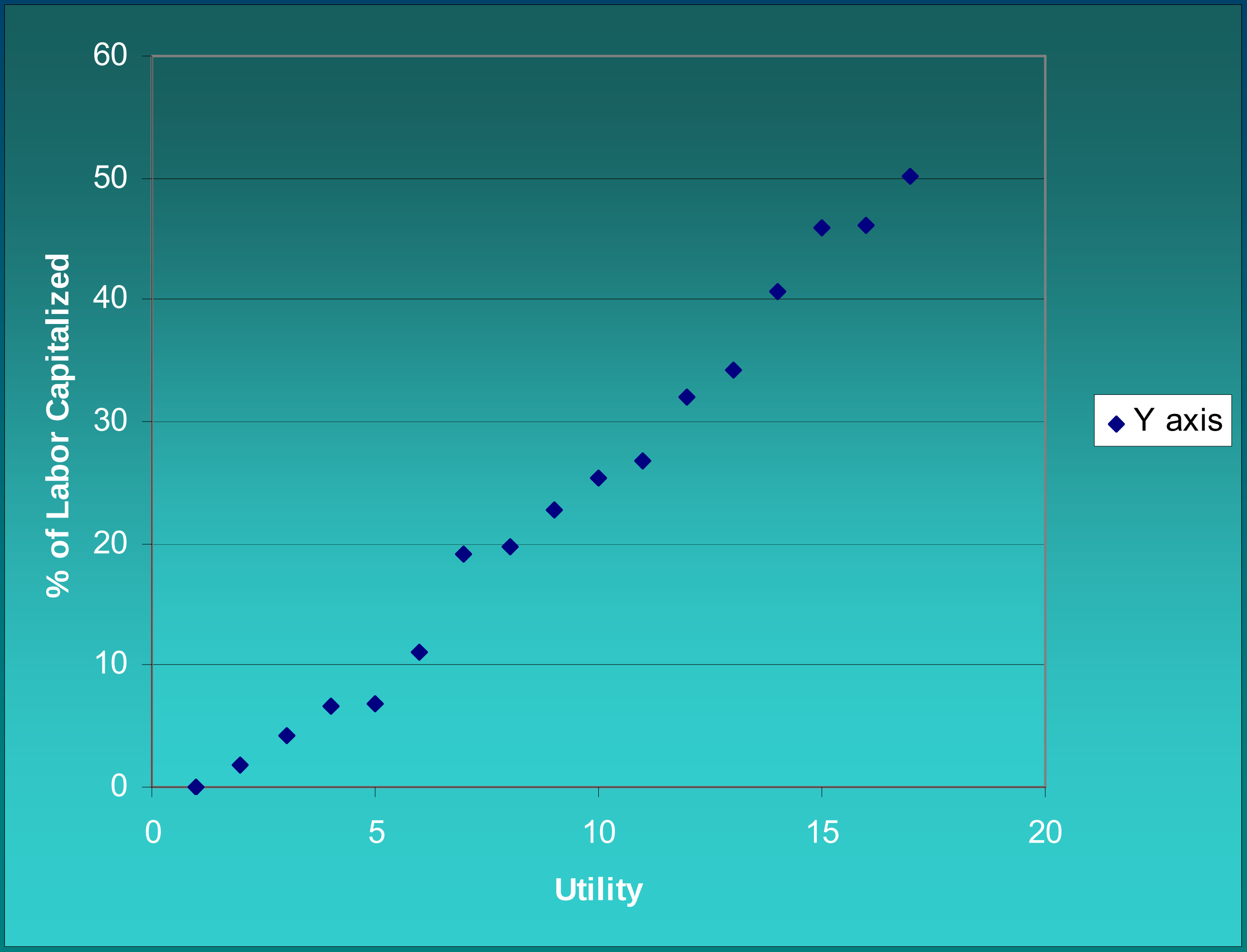
The Impact of Varying Labor Capitalization on OM&A Costs

Exhibit 4.5: Comparing 2 Illustrative Utilities with the Same Costs but Differing Labor Capitalization Policies

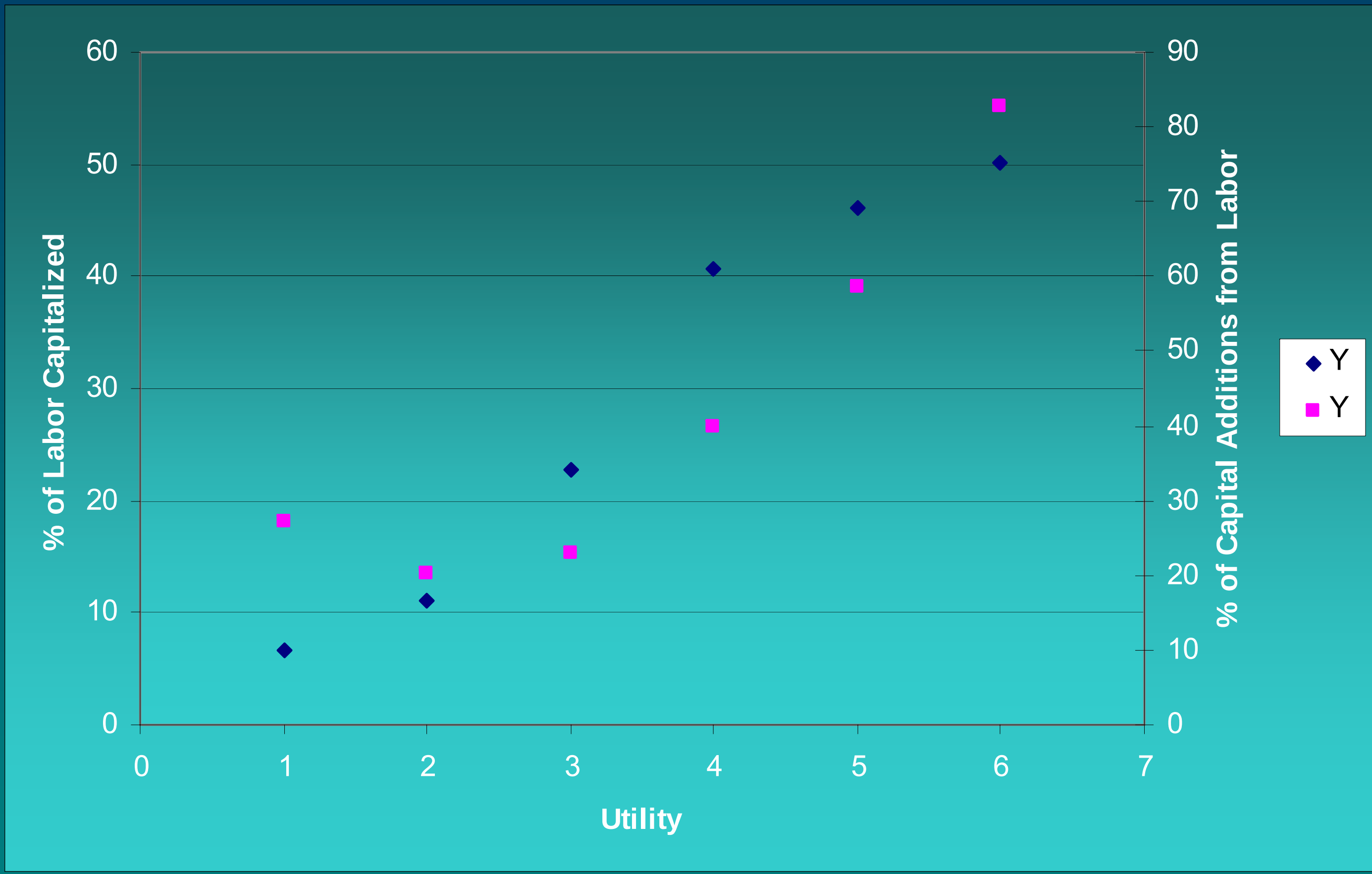
Capitalization Policy	Total Costs Per customer	Total Labor Costs @ 29 percent	Percent Labor Capitalized	Labor Assigned To OM&A	Reported OM&A Expenses
High Capitalization Utility	$500	$145	30	$102	$167
Low Capitalization Utility	$500	$145	15	$123	$188

Source: Ontario Energy Board, 1999 PBR filing and author calculations.

Capitalized Labor Shares



Capitalized Labor Allocations and Labor Shares in Capital Additions



% of Labor Capitalized (♦)   % of Capital Additions from Labor (■)

OM&A Benchmarking

OM&A Costs per Customer for Selected Utilities

Utility	OM&A per Customer
1	206
2	146
3	160
4	179
5	130
6	154

Benchmarking with Capitalized Labor

OM&A Costs with and without Capitalized Labor per Customer

Utility	OM&A per Customer	OM&A + Capitalized Labor per Customer	Capitalized Labor per Customer
1	206	220	14
2	146	186	39
3	160	219	59
4	179	192	12
5	130	182	51
6	154	186	32

Labor Allocation across O,M, and A

- The PEG report/Guide suggests “rules and enforcement” to “encourage” consistency of labor allocations across distributor functions.
- Reported labor allocations across OM&A activities do vary widely among LDCs.
- Presumably, management of each LDC has reasons for such allocations; should regulatory reporting requirements supersede such judgment, especially when this enforcement is unnecessary in determining LDC efficiency.
- LDCs with very different share allocations can have essentially identical costs.

Labor Allocations across OM&A for Equal Cost LDCs

O, M, and A Labor Allocations as a Share of Total Compensation

	Operations	Billing	Administration
Utility	27.1	6.7	14.8
Utility	48.4	0	0
Utility	36.7	8.3	22.3
Utility	19.5	15.9	36.3

Benchmarking and Capital

- Accurate benchmarking must include capital costs; their lack or improper definition leads to inaccurate and misleading results/rankings.
- PEG notes that capital's share of total costs is about 45 – 60 percent.
- 1999 Board Staff Report found capital was 45 percent with line losses and about 54 percent without.
- Subsequent research found some Ontario LDCs had increased capital's share after 1993.
- Capital's share is likely 45 to 65 percent, or twice the share of labor based on the Staff Report or 3 to 4 times based on PEG's weights.
- Prior Board efforts collected the data to properly measure capital.

Calculating the Real Stock of Capital

Exhibit 4.1: Capital Stock, Additions, Depreciation, and Retirements 1980 to 1982

	Stock* (nominal) [start of year]	Stock (real, 1986$) [start of year]	Capital Additions (nominal)	Capital Additions (real, 1986$)	Depreciation** (real, 1986$)	Retirements*** (real, 1986$)	Constant $ Stock of Capital
1980	14,771,522	37,291,508	1,152,953	1,608,024	2,076,697	368,607	36,454,228
1981		36,454,228	2,206,708	2,821,877	2,106,242	197,006	36,972,858
1982		36,972,858	2,681,409	3,136,150	2,160,426	24,576	37,924,006

Source: Ontario Energy Board, 1999 PBR Filing, Capital Components 1980 to 1997.

Calculating Capital Expenses

Exhibit 4.2: Capital Stock, 1994 to 1995

	Capital Stock Nominal	Average Depreciation Rate	Bond Rate Opportunity Cost of Capital	P_k=(L+M)*J/100	Capital Price Index (1988=1)	Capital Expense
1994	40,748,208	5.390%	8.600%	0.176	1.032	9,064,561
1995	38,617,408	5.390%	8.350%	0.182	1.066	9,329,258

Source: Ontario Energy Board, 1999 PBR Filing, Capital Components 1980 to 1997.

Gross Book Value v. Real Capital Stock

- PEG uses Gross Book Value to proxy capital costs, not net real stock which is the approach used in the 1999 Staff Report.

- PEG notes "serious" research would have used net real capital/service price approach and is the approach used by PEG in their analysis of Union and Enbridge in the Gas IR proceeding (EB-2006-0209, EB-2007-0606, EB-2007-0615).

- The average GBV to NRS ratio is about 1.8, that is, for the average utility GBV is 80 percent larger than NRS. For some utilities however, the ratio of GBV to NRS is much lower (utility 1 below has a ratio about 30 percent below the mean) while for other utilities the ratio is much higher (utility 4 has a ratio 40 percent higher then the mean). The average GBV to CE ratio is about 11 percent. For some utilities however, the ratio of GBV to CE is much lower than the average (utility 1 has a ratio almost 10 percent below the mean) while for other utilities the ratio is much higher (utility 4 has a ratio over 40 percent higher than the mean).

Gross Book Value v. Real Capital Stock

- For some utilities like 4 below, the use of GBV proxy capital costs greatly overstates their capital cost relative to other distributors while for utilities like 1 and 2, GBV greatly understates their capital stock relative to others.

- More problematic is the fact that rankings based on these costs would be seriously biased: illustrative utility 4 actually uses more than 15 percent less capital stock than utility 1 (i.e., $95m v. $115m) but appears based on GBV to use 60 percent more capital (i.e., $245 v. $150).

Gross Book Value v. Net Real and Capital Expenses

Exhibit 4.3: Illustrative Comparison of PEG's Capital Variable (Gross Book Value) to the Correctly Calculated Capital Stock Variable (Net Real Capital) and Capital Expenses (millions of dollars)

	Gross Book Value	Net Real Capital	GBV/NRC (approx)	Capital Expenses	GBV/CE
Utility 1	150	115	1.3	15	10
Utility 2	105	75	1.4	12	10
Utility 3	195	120	1.6	18	9
Utility 4	245	95	2.6	16	16

Source: Illustrative example similar to LDCs situation in the initial PBR.

Total v. Partial Cost Benchmarking

For more information on this topic, see:

- Cronin, F. J. and Motluk, S. A., forthcoming, "Flawed Competition Policies: Designing 'Markets' with Biased Costs and Efficiency Benchmarks," *Review of Industrial Organization*. Originally, "The (Mis)Specification of Efficiency Benchmarks among Electric Utility Peer Groups." Presented at the North American Productivity Workshop II, Union College, NY, 2002.
- Frank J. Cronin and Stephen A. Motluk, "Inter-Utility Differences in Technical and Allocative Efficiency." presented at the Canadian Economics Association 35th Annual Meeting at McGill University, Montreal, Quebec in June 2001.
- Frank Cronin and Stephen Motluk, "The Road Not Taken: PBR with Endogenous Market Designs," *Public Utilities Fortnightly*, March 2004. An earlier version of this paper *Restructuring Monopoly Regulation With Endogenous Market Designs* was presented at the Michigan State University, Institute for Public Utilities, *Annual Regulatory Conference*, Charleston, S.C. December, 2003.
- F. Cronin, "*Restructuring Monopoly Providers or Regulation through Revelation*," invited seminar, 46th Annual Regulatory Studies Program, Michigan State University, Institute for Public Utilities, August 2004.

Total Cost v. Partial Cost Benchmarking

Exhibit 5.6: Base Case and Alternative Regulatory Benchmarking Results for Technical Efficiency

Base Case Inputs				Base Case Outputs			
Firm	**Total Energy Only**	**Total Customers Only**	**Base Case**	**Base Case no SL**	**CK, SL**	**O&M**	**NK, O&M**
1	0.588	0.444	**0.588**	0.389	0.588	0.331	1.000
2	0.806	0.906	**0.906**	0.870	0.622	0.862	0.870
3	0.806	0.899	**0.899**	0.899	0.637	0.899	1.000
4	1.000	1.000	**1.000**	1.000	1.000	1.000	1.000
5	0.740	0.924	**0.924**	0.880	0.742	0.857	0.866
6	0.605	1.000	**1.000**	1.000	1.000	0.952	0.971
7	0.914	0.982	**0.982**	0.972	0.756	0.972	0.977
8	1.000	1.000	**1.000**	1.000	0.517	1.000	1.000
9	0.882	0.696	**0.882**	0.684	0.781	0.684	0.899
10	1.000	1.000	**1.000**	0.874	1.000	0.836	0.836
11	0.719	0.856	**0.856**	0.856	0.695	0.831	0.938
12	0.516	0.778	**0.778**	0.688	0.778	0.629	0.651
13	0.408	0.717	**0.717**	0.669	0.615	0.669	-
14	0.716	0.738	**0.738**	0.738	0.519	0.738	0.739
15	0.526	0.803	**0.803**	0.803	0.613	0.803	0.804
16	0.725	0.929	**0.930**	0.885	0.761	0.884	-
17	0.508	0.724	**0.724**	0.685	0.682	0.656	0.657
18	0.825	0.746	**0.825**	0.732	0.696	0.732	0.733
19	0.931	1.000	**1.000**	0.980	1.000	0.980	0.981
Mean	**0.748**	**0.850**	**0.871**	**0.821**	**0.737**	**0.806**	**0.878**

Source: Cronin, F. J. and Motluk, S. A., forthcoming, "Flawed Competition Policies: Designing 'Markets' with Biased Costs and Efficiency Benchmarks," *Review of Industrial Organization*. Originally, "The (Mis)Specification of Efficiency Benchmarks among Electric Utility Peer Groups." Presented at the North American Productivity Workshop II, Union College, NY, 2002.

Total Cost v. Partial Cost Benchmarking

Exhibit 5.7: Base Case and Alternative Regulatory Benchmarking Results for Allocative Efficiency

	Base Case Inputs			Base Case Outputs			
Firm	**Total Energy Only**	**Total Customers Only**	**Base Case**	**Base Case no SL**	**CK, SL**	**O&M**	**NK, O&M**
1	0.583	0.746	**0.613**	0.925	0.663	0.860	0.282
2	0.468	0.467	**0.495**	0.514	0.600	0.996	0.991
3	0.728	0.661	**0.713**	0.713	0.967	0.780	0.697
4	1.000	0.909	**1.000**	1.000	1.000	0.978	0.976
5	0.554	0.665	**0.676**	0.709	0.753	0.998	0.989
6	0.960	1.000	**1.000**	1.000	1.000	0.999	0.981
7	0.374	0.436	**0.454**	0.458	0.488	0.902	0.983
8	0.453	0.417	**0.457**	0.456	0.735	1.000	1.000
9	0.484	0.625	**0.532**	0.684	0.571	0.778	0.587
10	0.660	0.831	**0.865**	0.988	0.868	0.984	0.983
11	0.856	0.778	**0.830**	0.830	0.967	0.992	0.885
12	0.677	0.816	**0.816**	0.922	0.846	0.879	0.846
13	0.691	0.761	**0.761**	0.815	0.857	0.859	-
14	0.539	0.491	**0.536**	0.535	0.658	0.889	0.884
15	0.798	0.725	**0.745**	0.745	0.954	0.758	0.751
16	0.582	0.704	**0.712**	0.748	0.786	0.975	-
17	0.843	0.872	**0.888**	0.938	0.940	0.945	0.941
18	0.613	0.708	**0.687**	0.773	0.764	0.919	0.913
19	0.369	0.587	**0.588**	0.599	0.505	0.927	0.923
Mean	**0.644**	**0.695**	**0.704**	**0.756**	**0.785**	**0.917**	**0.854**

Source: Cronin, F. J. and Motluk, S. A., forthcoming, “Flawed Competition Policies: Designing 'Markets' with Biased Costs and Efficiency Benchmarks,” *Review of Industrial Organization*. Originally, “The (Mis)Specification of Efficiency Benchmarks among Electric Utility Peer Groups.” Presented at the North American Productivity Workshop II, Union College, NY, 2002

Benchmarking Must Include Reliability and Quality of Service

- LDC output includes reliability and quality of service (SQ)
- LDC costs are affected by the SQ that comes together with access to the network
- Reliability and quality vary across LDCs; therefore, costs vary as well
- Rates can not be determined to be just and reasonable without considerations of SQ
- Service quality regulation: COS v. IR
- Service quality regulation
  - in Ontario
  - in the U.S.
    - an empirical analysis of IR, O&M costs, and reliability
  - in Europe
    - CEER’s Third Benchmarking Report on SQ
    - System-wide standards, customer guarantee payments, and WTP
    - Yardstick regulation of SQ
- Benchmarking cannot be accurately done without including reliability and SQ

LDC Output Includes Reliability and Quality of Service

- Electric distribution connects customers to the network to receive power.
- The output produced includes power, power quality, reliability, service quality, and public safety.
  - “Continuous use of electric power is essential to the functioning of modern homes and businesses…customers want local delivery capability to be continuous.” PEG report, p. 28
  - “The provision of customer care services requires capital, labour, and other operating inputs.” PEG report p. 32
  - “The quality of customer service matters to customers and some quality measures are used in service quality incentive plans.” PEG report p. 34

Reliability and thus Costs Vary across LDCs

- "The reliability of distribution services provided by utilities varies widely. Better reliability generally comes at a higher cost. The cost impact of quality is thus a valid issue in distribution benchmarking." PEG report, pp30 – 31
- Since reliability varies, higher reliability LDCs will have higher costs; if cost differences are simply observed through OM&A differences, we will mistakenly identify higher cost LDCs as being less efficient, when they actually have higher, unaccounted for, output or quality.
- Such IR schemes could incent high-reliability LDCs to reduce OM&A expenses to improve benchmarking scores.
- Research finds that IR does reduce O&M and that this reduction reduces reliability.
- Regulators in the U.S. and Europe have instituted somewhat alternative versions of service quality regulation in response to performance IR induced network degradations. (more below on this)

Reliability and Just and Reasonable Rates

- Regulators generally have a dual responsibility: ensure just and reasonable rates and that the appropriate level of service/reliability is delivered.
- OEB's obligation under Section 1 of the Energy Board Act (1998): "To protect the interests of consumers with respect to prices and the reliability and quality of service."
- The OEB has acknowledged such, e.g.:
  - "…a determination of just and reasonable rates must take into account the adequacy and level of service quality…" August 29, 2003 Board Notification.
  - "A consideration of just and reasonable rates must take into account the quality of the product or service provided." September 15, 2003, OEB Staff Report on Service Quality Regulation.

SQR: COS v. IR

- It is clear that incentive regulation alters the motivations of utilities. Rather than focusing on higher ROE through increases in the rate base, for example, IR encourages utilities to reduce costs. Under COS, increases in OM&A expenses, if judged prudent, would not be in conflict with the goal of maximizing ROE since such OM&A expenses would be recouped through higher rates.
  - The 2003 Staff report noted under COS the firm's incentives were not at odds with SQ since they earned a return on investments, including capitalized labor, and prudent and necessary cost were passed along to the customers.

- However, the shift to IR can put O&M costs directly in conflict with the pursuit of profit during the plan's term.
  - Commenting on PBR, the 2003 Staff report noted that the firm's differing incentives might result "in cost containment that results in degraded service" and that "Service quality monitoring serves as a counterbalance to ensure that adequate service is maintained." Unlike COS regulation, Board staff noted "an increased need for on going monitoring of service performance" under PBR "to ensure that any problems that do occur are addressed in an effective and timely manner."

SQR: COS v. IR

- Firms will only optimize those costs internal to its cost structure, generally capital and OM&A. The costs borne by customers due to the utility's non-performance, i.e., interruptions for example, are not factored into the calculations made by a utility when deciding how much to spend on capital and O&M (as in some European jurisdictions). Under these circumstances, an LDC would generally spend too little on reliability.

- Cost reductions experienced earlier in a plan's term are worth more to a utility than cost reductions achieved in later years. Since capital may not be subject to significant changes within the earliest years of a plan's term, the utility could be incented to cut OM&A expenses beyond what is prudent for the quality and reliability of the network. The consequences are compounded by the fact that O&M expenses may only be apparent over a longer time period (thus multi-term monitoring) .
  - As PEG notes (p. 11): "In the long run, utilities that defer maintenance will experience service quality deterioration."

Service Quality Regulation in Ontario

- The reliability and customer care standards operative today are based on the recommendations of the 1999 PBR Implementation Task Force.
  - With respect to customer care, the TF recommended minimum standards that it felt LDCs were already meeting as determined through a survey of LDCs.
  - With respect to reliability the TF could not even recommend minimum standards:
    - LDCs with reliability data should keep their performance within the range of whatever it had been over the prior three-year period, i.e., 1997 to 1999
    - LDCs without data should begin to collect it.

- The Board explained the reasoning behind the standards selected as follows:
  - "PBR task force survey results indicate that the degree of service quality monitoring that the electricity distribution utilities currently carry out varies. Therefore the Board's approach to encourage the maintenance of service quality during the first generation PBR plan is to apply minimum standard guidelines for customer service indicators, and to apply a utility's historic performance as its specific service reliability standards. Where a utility has not monitored service reliability in the past, it is required to initiate monitoring and reporting of the indices." (p. 7-2)

Service Quality Regulation in Ontario

- The general expectation was that the Board would move quickly, possibly early in the first generation but no later than the beginning of the second generation to set reliability performance targets based on a more reasoned and judicious rationale than “just do whatever it was that you were doing.”
- The Board itself stated its intent to move expeditiously:
  – In the absence of historical service quality data, it is not possible to identify service degradation during the first year of the PBR plan. However, upon review of the first year's results, the Board will determine whether there is sufficient data to set thresholds to determine service degradation for years 2 and 3. When established, the Board will issue these thresholds and any utility whose performance falls below these thresholds will be required to file a remedial action plan. (OEB, DRH, Service Quality, March, 2000 p. 7-10)

Service Quality Regulation in Ontario

- The Board also discussed what surveys and customer research it might undertake in setting standards for the second PBR, i.e., after the initial 3 year PBR term:
  - "In addition to imposing service quality performance standards, the Board may conduct surveys to determine customer satisfaction with the electricity distribution service quality. The Board may also conduct customer research to identify those elements of service quality most important to customers for use in setting standards for the second PBR term." (OEB, DRH, p. 7-2)

Service Quality Regulation in Ontario

- Finally, the Board noted its intent to set industry service standards by the advent of the second generation; financial consequences would be tied into the standards.
  - "It is anticipated that by the second generation PBR plan, there will be sufficient data collected to set industry service quality performance standards. Once these standards have been established, PBR incentive mechanisms with economic consequences will be introduced around the service quality indicators." (p. 7-10)

- In fact, the Board seems not to have reviewed the PBR first year's result "to set thresholds to determine service degradation."

- Nearly 3 years later, about the time that the second generation PBR would have been about to commence, the Board was still not in a position "to set industry service quality performance standards… with economic consequences."

- Indeed, in the late summer of 2003, the Board initiated a process which, if completed, should have provided the information necessary to set thresholds and financial consequences.

Service Quality Regulation in Ontario

- The August 29, 2003 notice (the notice) on "**Initiation of Working Group on the Review of Service Quality Regulation" Board File No. RP-2003-0190,** reviewed the Board's initial PBR decision and specification of service/reliability indicators. Speaking of the initial standards set in the 2000 Rate Handbook, the notice said:
  - "For most SQIs, the Board approved initial minimum standards. The Board determined that other aspects of service quality regulation, including remedial action and/or financial consequences of service degradation, should be considered, but that a proper assessment of these issues required experience with the measurement and reporting of the SQIs."

- The notice also discussed subsequent developments regarding second generation PBR:
  - "On October 28, 2002, the Board advised stakeholders of the planned phased development of a second-generation PBR ("PBR II") plan. A review of currently reported service quality indicators and associated standards, as well as consideration of other indicators and elements of service quality regulation, were identified as one of the components of PBR II plan development. ….As electricity distributors have been reporting their service performance for three years now, the Board considered it timely to review the SQIs and to further develop service quality regulation applicable to electricity distributors, and indicated that Board staff would be commencing consultations by mid-2003."

Service Quality Regulation in Ontario

- The notice then explained the forthcoming process.
  - "Board staff are starting a working group to consider service quality regulation ("SQR"). Staff will also shortly be issuing a discussion paper on service quality regulation that will help to start informed consideration of pertinent issues in this area. The Board has assigned file number RP-2003-0190 to this matter. The Appendix to this letter provides a generic, but not necessarily exhaustive, list of issues to be considered by the SQR working group."
  - "The consultations are targeted to conclude by the fall of 2003. Board directions on a public regulatory process to consider the proposed service quality regulation will be issued in due course."

Service Quality Regulation in Ontario

- The Notice listed the following issues for review:
  - Review of the existing service quality indicators ("SQIs").
  - Review of SQI standards to assess whether these standards are appropriate…Where appropriate, standards for the reliability indicators should be established.
  - The consideration of additional or replacement indicators... Other operational indicators, or measures of customer complaints or customer satisfaction, could also be investigated.
  - The frequency of reporting and the periodicity of reported performance should be considered.
  - The criteria for defining degraded service need to be established. Regulatory responses to service degradation (remedial action reports, possible financial consequences) should be considered.
  - Other matters - e.g. should there be a distinction in terms of reporting or standards for urban/rural or large/small utilities?
  - What should be the form and purpose of service quality audits and investigations? The role of SQ audits increases in a comprehensive SQR plan, where there are regulatory impacts (remedial action plans and/or financial rewards and/or penalties).

Service Quality in Ontario

- The Notice laid out the following schedule:
  - "The consultations are targeted to conclude by the fall of 2003. Board directions on a public regulatory process to consider the proposed service quality regulation will be issued in due course."
- Unfortunately, the reliability and customer care standards remain as set by the TF in 1999.

Service Quality Regulation In the US

- North America has experienced a number of power outages in the recent past.
- In the U.S., following a series of significant outages often caused by imprudent reductions in O&M expenses, both Federal and State regulators have increasingly imposed on the utilities directed tasking requirements concerning how these LDCs run their operations:
  - Such mandates cover inspection and maintenance, and sometimes investment.
  - These mandates specify the nature, timing/cycles and, in some cases, the money and/or staffing necessary to fulfill the regulations.
  - At least one regulator examined the level/adequacy of LDCs' in-house crew staffing and the need not to transfer excessive capability to outsourced crews not under the direct control of management to ensure adequate emergency responses in regional outages.

SQR in the US: LDC Responses to IR Empirical Research

- One study has examined the US experience of IR for electric distribution.*
- This study employed data from 78 LCDs from 23 states over the 1993 to 1999 period.
- The study finds that IR is associated with a reduction in O&M expenses; this reduction is associated with a reduction in reliability.
  - LDCs on IR without standards reduce expenses throughout the period.
  - LDCs on IR with standards/penalties increased O&M every year rising 17 percent.
  - LDCs without standards had 64 percent rise in SAIDI, 13 percent rise in SAIFI.
  - LDCs with s/p had 26 percent decline in SAIDI, 23 percent decline in SAIFI.
- Because of these perverse SQ results, it is common for LDCs under IR to have explicit and strict SQIs; 70 percent of the LDCs with IR had such standards/penalty schemes.
- The study concludes that the incorporation of strict standard/penalty schemes can offset the incentive of IR plans to imprudently cut critical O&M activities.

***Ter-Martirosyan, A., "The Effects of Incentive Regulation on Quality of Service in Electricity Markets," Working Paper, 2002.**

Service Quality Regulation in Europe

- In Europe, regulators such as the Council of European Energy Regulators (CEER) have documented and encouraged the adoption of service/reliability quality regulation (SQR) which combines system-wide standards with incentive/penalty schemes as well as single-customer guarantees with monetary payments for nonperformance. Some regulators have used willingness to pay (WTP) studies to gauge the value customers place on reliability and the amount they would be willing to pay for service improvements or interruption avoidance.

Service Quality Regulation in Europe

- **The CEER Working Group, Quality of Supply Task Force**, “Third Benchmarking Report on Quality of Electricity Supply 2005” examined the reasons behind the need for service quality regulation (p. 31):
  - “In recent years, a growing number of countries have adopted price-cap as the form of regulation for electricity distribution…. Price-cap regulation without any quality standards or incentive/penalty regimes … may provide unintended and misleading incentives to reduce quality levels. Incentive regulation for quality can ensure that cost cuts required by price-cap regimes are not achieved at the expense of quality.”
  - “The increased attention to quality incentive regulation is rooted not only in the risk of deteriorating quality deriving from the pressure to reduce costs under price-cap, but also in the increasing demand for higher quality services on the part of consumers. For these reasons, a growing number of European regulators have adopted some form of quality incentive regulation over the last few years.”
  - “Moreover, quality is multidimensional and some aspects of quality have a long recovery time after deterioration. Hence, quality of service is usually regulated over more than one regulatory period to address numerous issues, including continuous monitoring of actual levels of performance.”

Service Quality Regulation in Europe

According to the CEER, SQR comprises three aspects:

- **measuring actual and perceived levels of quality -** a necessary and preliminary step, since setting continuity standards and/or incentive/penalty regimes requires robust and reliable data on the service actually provided and on customers' perception. …customer surveys, through which regulators can collect …information on quality as perceived by customers, which is extremely valuable for regulatory decision-making;
- **promoting continuity improvement -** giving utilities signals and incentives to evaluate their investment and management decisions not only in light of their costs but also … the effects on actual quality levels. Regulators can promote continuity improvement …by introducing incentive/penalty schemes, generally based on system-level quality standards that refer to the average quality level in a geographical area…
- **ensuring good continuity levels to consumers -** especially worst-served ones; regulators can do this through guaranteed standards that refer to the quality level experienced by each single customer connected to the network. Single-customer guaranteed standards are associated with the payment of compensations to the affected customers where the company fails to meet the standard.

Benchmarking Should Include Customer Interruption Costs

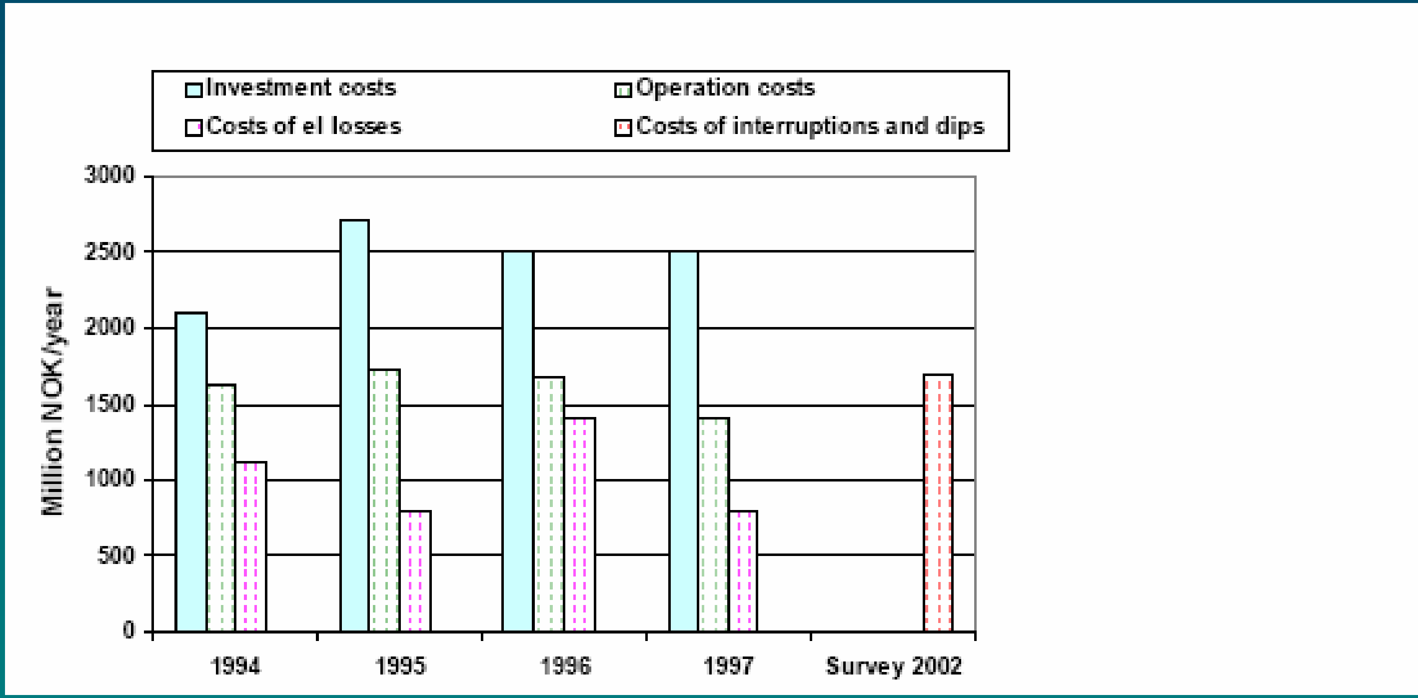
- CEER notes that regulators should ensure that utilities "evaluate their investment and management decisions not only in light of their costs but also … the effects on actual quality levels" i.e., on the customers affected by the O&M or investment decisions.
- Regulators in Italy, Sweden, Norway , and the U.K. among others have broadened their considerations of reliability to encompass the consequences on customers from interruptions or other aspects of lessened quality
- European regulators have estimated the extent/type of interruptions and the associated costs of interruptions to customers
- Regulators like OFGEM have used WTP estimates as parameters in their IR mechanisms for establishing single customer payments
- Norway has pioneered the application of these techniques to address the question of just how regulators define the correct level of reliability and its associated O&M and infrastructure

Benchmarking Should Include the Optimal Level of Reliability

- Norway has used customer interruption data together with WTP and direct cost estimates to internalize the value of customer interruption costs within an LDCs planning process.
- The socially optimal level of reliability is determined by examining the value of reliability that minimizes total costs inclusive of associated OM&A and infrastructure.
- The Norwegian regulator, NVE, has estimated that customer interruption costs are greater than an LDC's line loss and OM&A costs and about 80 percent of annual investment.

NVE's Estimate of Cost of Energy Not Supplied

Figure 6.2: Norway Utilities Internal investment and OM&A costs and Electrical Losses



Sand, et al, Quality of Supply Regulation – Status and Trends

Yardsticking SQ Regulation in Europe

- Commenting on, the possible approaches to SQR, the 2003 Staff report noted that "Yardstick comparisons" were an option for consideration.
  - "A second method is to compare performance against that of other firms. With around 100 licensed electricity distributors currently operating in Ontario, "yardsticking" of service performance is conceptually possible. However, yardsticking appears to be little used (at least for regulatory purposes) in other jurisdictions and industries."

Yardsticking SQ Regulation in Europe

- But, in fact, over the recent past regulators have moved aggressively to apply yardstick benchmarking of service quality performance. The CEER report on service quality benchmarking notes that Italy, Great Britain, Hungary, Norway, Portugal, Spain, and Sweden have all incorporated some form of service performance yardstick benchmarking into their regulatory framework.
  - "In Great Britain there is no territorial classification, but the regulator developed a methodology for benchmarking company performance that is used also to set targets for the interruption incentive scheme. Ofgem collects physical characteristics and performance information for each MV circuit for each distribution company. These circuits are then divided into 22 circuit groups with physically similar characteristics. The groups are defined so that differences in the percentage of overhead line, circuit length and number of connected customers are minimised and that no group is dominated by a single company. Performance is compared and benchmarked within each circuit group. Ofgem then establishes an overall benchmark for each company based on its mix of circuits and compares actual performance with these benchmarks." (CEER, p. 8)

Yardsticking SQ Regulation in Europe

- As the CEER report noted for Italy, there was a concern converging the worst performing distributors toward the better performing utilities:
  - "Incentive/penalty schemes have been implemented in European countries with the general objective of improving/maintaining continuity levels at a socio-economically acceptable level, in particular under price- or revenue-cap types of regulation. In one case only (Italy) has the regulator designed the mechanism specifically around a country-specific objective: the convergence of continuity levels towards unique targets (for districts having the same territorial characteristics). (CEER, p. 39)

Yardsticking SQ Regulation in Europe

- The CEER report also noted for Italy, Great Britain, and Hungary:
  - "In Italy, Great Britain, and Hungary the worst performing companies have larger improvements to make: this choice enables a convergence of continuity levels for the entire country. Continuity targets are set in all cases by company. The only exception is Italy, where targets are given by territorial district. Historical performance and structural differences in network layouts must be taken into account when setting the standards, in order to set targets that are achievable for the company and valuable for consumers. Differentiating targets by density area, as in Italy, or by company, as in other countries, does just that."
- For Norway, the CEER report noted the regulator's use of reliability data for all utilities to benchmark the expected performance of each individual utility after adjusting for the effects of certain structural variables:
  - In Norway a regression model is used to calculate "expected total interruption costs" for each company using historical data and various structural variables (energy supplied, network extension, number of transformers, wind, geographical dummies). (CEER, p. 44)

Recommendations: High Priority Upgrades

- Suggested high-priority upgrades, even if successfully implemented, would not permit accurate benchmarking for many, many years.

- Tightening of enforcement for more consistent labor cost allocations would appear irrelevant to the question of LDC efficiency: different allocations can have equal costs.

- Making public the labor share and distribution among OM&A activities would appear irrelevant to the question of LDC efficiency; what is relevant is for the Board to undertake an assessment of the 60 percent of costs (i.e., capital and losses) not included in the PEG benchmarking.

- The Board collected the detailed plant addition data in 1999 (for about 25 years) as well as the capital components to calculate net real stock and capital costs; plant additions were collected for some number of years beginning in 2000. The Board should employ these data and collected updates to allow a comprehensive benchmarking of costs.

Recommendations: High Priority Upgrades

- I believe the Board collects data on LDC wheeling.
- Detailed data was collected in 1999 for almost 300 LDCs on many, many characteristics; subsequent annual PBR filings provided updates to these data.
- Customers added since 1990 is not necessarily a good proxy for age. However, this data could be acquired from the 1999 PBR data as well as the Statistical Yearbooks. The 1999 data had some business conditions data and looked at the question of age of infrastructure based on the share of depreciated stock. The annual PBR filings had numerous business conditions variables.
- The most important overriding issue is the failure to "model or benchmark" the integrated distribution function with comprehensive data reflecting the joint nature of LDC output and the substitution relationships among an LDC inputs.

Recommendations: Methodologies

- No methodology will overcome the problems of inadequate data; superior data will overcome shortcomings in some methodologies.
- Norway and other European regulators employed frontier techniques.
- Norway, which had over 200 LDCs, used a multi-period frontier technique to establish system-wide X factors based on secular growth performances of frontier firms.
- Subsequently, NVE employed individual X factors based on calculated inefficiencies relative to a peer-based frontier; LDCs off the frontier were expected to eliminate a certain percentage of inefficiency during the term of the plan.
- Individual X factors ranged from 0 to 3 percent with 0 percent used for frontier firms and 3 percent used for LDCs with more than 20 percent inefficiency; during the second term, LDCs were required to eliminate another certain percentage.

Benchmarking Uses in Ratemaking

- The most important overriding issue in the Board's evolving benchmarking is the failure to "model or benchmark" the integrated distribution function with comprehensive data reflecting the joint nature of LDC output and the substitution relationships among an LDC inputs.
- Joint output means that just and reasonable rates cannot be determined unless costs are assessed jointly with SQ.
- Input substitution with varying allocations means that it is meaningless to examine one input in isolation from the rest.
- Without comprehensive cost and reliability data, benchmarking should not be used for the applications enumerated in the 8-24 *Guide.*

Benchmarking Uses in Ratemaking

- A staged approach could be considered.
- Norway's staged approach appears to be a reasonable and well thought out.
- By staged approach we mean an interim term based, say, on total factor productivity (TFP) measures while the Board collects and analyses the data required to comprehensively measure LDCs' costs and output including reliability.
- I do not support any approach based on partial cost measures, staged or not.

Conclusions

- Questions relating to "high-priority data upgrades" and methodologies discussed in the Board's 8-24 *Guide* need to be examined in the context of what objectives the Board has established for IR/electric benchmarking; these objectives appear unclear at this time.
- Suggested high-priority upgrades, even if successfully implemented, would not permit accurate benchmarking for many, many years; some are irrelevant to efficiency benchmarking.
- OM&A benchmarking is inaccurate and misleading.
- OM&A benchmarking distorts incentives for costs, allocations, quality, and reliability.
- Accurate benchmarking requires comprehensive costs and data on reliability.

Conclusions

- Without such comprehensive cost and reliability data, benchmarking should not be used for the applications enumerated in the 8-24 *Guide*.
- The Board has most of the data needed to undertake comprehensive cost benchmarking; if the Board decides not to use the pre-existing PBR data, then it should recollect and update this information.
- The Board should begin a process to review the “standards” on reliability, collect customer interruptions and costs, and access the adequacy of O&M and infrastructure.

PBR Capital and Additions Data Collected in 1999

Exhibit 2.1: PBR Data Collected in 1999. Gross Book Value, Depreciation, Amortization, Retirements, and Additions; Capital Investment Category 1973 to 1995

	Gross Book	Depreciation Expense	Amortization Expense	Retirements	Additions Total	Land	Land Rights	Buildings & Fixtures
1973	11,417,589	348,783	0	14,873	2,619,551	0	683	1,248
1974	12,233,949	344,925	0	35,570	852,591	51,513	3,060	3,215
1975	13,672,265	395,944	0	89,662	1,523,535	0	338	0

Exhibit 2.1: PBR Data Collected in 1999. Gross Book Value, Depreciation, Amortization, Retirements, and Additions; Capital Investment Category 1973 to 1995, continued

	Generating Assets	Transmission Line	Transmission Station Equipment	Distribution Station Equipment	Sub Feeder Overhead	Sub Feeder Underground	Distribution Lines Overhead	Distribution Lines Underground
1973	0	0	173,954	0	64,476	0	100,952	191,048
1974	0	0	29,717	0	19,002	0	122,195	176,094
1975	0	0	239,067	0	25,995	0	320,098	371,041

Exhibit 2.1: PBR Data Collected in 1999. Gross Book Value, Depreciation, Amortization, Retirements, and Additions; Capital Investment Category 1973 to 1995, continued

	Leasehold Improve	Rolling Stock	Misc Equipment (Tools, Meter read)	Water Heaters	Load Management Control	System Supervisory Equipment (SCADA)	Sentinel Lights	Contributed Capital/Develop Charges
1973	0	46,103	2,264	76,518	0	0	647	0
1974	0	96,389	24,168	86,925	0	0	0	0
1975	0	70,748	22,657	115,597	0	0	0	0

Source: 1999 Staff report.