Objectives, Legacies, and Imperatives regarding the OEB's Proposed IR

Frank Cronin
Expert Consultant
to the
Power Workers' Union

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Overview: the Past Half Decade, Currently, and the Future

- Recently and over the past half decade, we have expressed concerns about structural flaws and mal-incentives in the Board's IR. These topics include
  - line loss and reliability performance in TFP analysis
  - total cost and an appropriately specified IPI with capital
  - employing rates data to derive a price-dual as an alternative methodology for TFP
  - a nonparametric approach such as DEA for benchmarking Ontario LDCs(which has been using OEB data consistently and repeatedly since 2001)
- Lets review where we have been and where it seems we are headed

Overview: IR Structure and Incentives

- Whole point of IR is to incent certain “good” behavior and mitigate “bad” behavior

- We would expect organizations to recognize and respond to incentives; these legacy issues should be acknowledged and handled going forward

- Reflect on features of current IR regime
  - Used OM&A benchmarking to rank LDCs
  - Did not incorporate losses
  - Did not incorporate reliability standards
  - Term “Three on, One off” may have created rate step function and greatly weakened efficiency incentive if not overwhelmed intentions

Overview: Observed IR Results

- Lowered TFP, efficiency, and reliability for a number of LDCs
- Increased line loses, labour/overhead capitalization, future rates, profits for a number of LDCs
- Reduced equipment's share in capital additions and lowered the "bang for the buck" per dollar of investment; will have on-going deleterious impact on reliability
- Ignored own research re expressed customer preferences for no degradation in service
- Penalized some efficient LDCs; rewarded some inefficient
- Similar IR structural and incentive problems are clearly present in 4th Generation

Objectives: 4th Generation

- Among the Objectives that should have been incorporated ASAP but clearly before the 20th Year of the Board's IR are:
  - *Customer-centric* driven nature
    - Clear preferences for no degradation (as per the OEB's 2010 Pollara WTP/WTA findings) should have been reflected in implemented IRs
  - *Comprehensive* in costs, operations, and outcomes
    - Reliability and line losses should have been included
  - *Adaptive*, data-based adjustments as did Ofgem
    - That is modifications to account for perverse incentives
  - Input *neutral*
    - *Choices based on input prices, technology, and legacy*
  - *Rationally* green
  - *Socially optimal criteria*

Legacy: Quantity-Based TFP Growth for Ontario LDCs has been Consistently Negative: 2002-2011 (average percent per year)

	Toronto Hydro and Hydro One Excluded	Hydro One Excluded	Toronto Hydro Excluded	Toronto Hydro and Hydro One Included
2002-2011	-0.60	-1.28	-1.12	-1.46
2006-2011[a]	-0.90	-2.36	-1.76	-2.55
2008-2011[b]	-0.50	-2.57	-1.75	-2.81
2009-2011	-0.80	-3.10	-1.99	-3.31

- Why was TFP growth negative for such a long period?
- Did the Board's incentives to overcapitalize labour and overhead, reduce equipment investment, and dramatically raise the capital/labour ratio degrade productivity?
- How much of the negative growth was due to flawed IR design, recession, infrastructure, management, or other factors? How can we make policy without answering these questions?

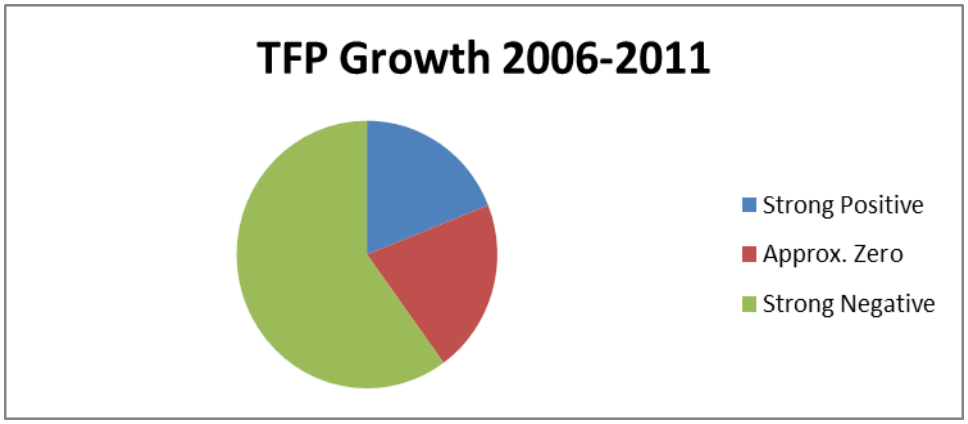
Legacy: Price-Dual TFP Estimates are Consistently Negative

- Using OEB rate data for the period 2006-2011, a price-dual TFP for Ontario LDCs was estimated and compared with a quantity-based TFP (the latter estimated using all necessary historical capital data).

	Price-dual	Quantity-based	
		Fixed Weight	Tornquist
2007-2011	-2.4%	-2.3%	-2.4%

- *PEG now reports a -5.0% TFP growth for 2012. Inputs up 6.0%*

Legacy: TFP Growth has been Strongly Negative for about 60 percent of Ontario LDCs over the 2006-2011 Period



- We have pervasive negative TFP growth for a majority of LDCs but positive growth for a fifth? Why the differences?
- What should be the 4th Gen parameter with no research offered on the causes of negative growth, the differences among LDCs, and circumstances going forward???

Legacy: Input Incentives (OM&A/K Ratios) and Labour Capitalization for Aggregate and Selected LDCs: 2000 and - 2010

	2000			2010		
OM&A						
$920m	$710m	130%		$1351m	$1805m	75%
LDC1 Hydro One		178%				79%
LDC2 Horizon		122%				100%
LDC3 Hydro Ottawa		84%				61%
Aggregate Labour Capitalization		10%				35%

Legacy: Diversity in 2011 Capital Additions Shares for selected LDCs…

		L & Over*	Equip& Materials	CC	Retire
LDC1	Horizon	31	32	12	74
LDC2	Port Colborne	60	34	25	0
LDC3	Veridian	53	41	215	1.1
LDC4	ENWIN	25	75	2	19
LDC5	North Bay	21	16	6	5
LDC6	Hydro Ottawa	37	38	26	58
LDC7	CNPI	46	34	6	0
LDC8	London	26	67	14	40
LDC9	Hydro One	47	27	12	6

*Labour & overhead, equipment and materials, contributed capital.

Legacy: the Negative TFP Growth may have several Causes, probably including the Helter-skelter "Three on, One off" inconsistent RAM which overwhelmed intentions

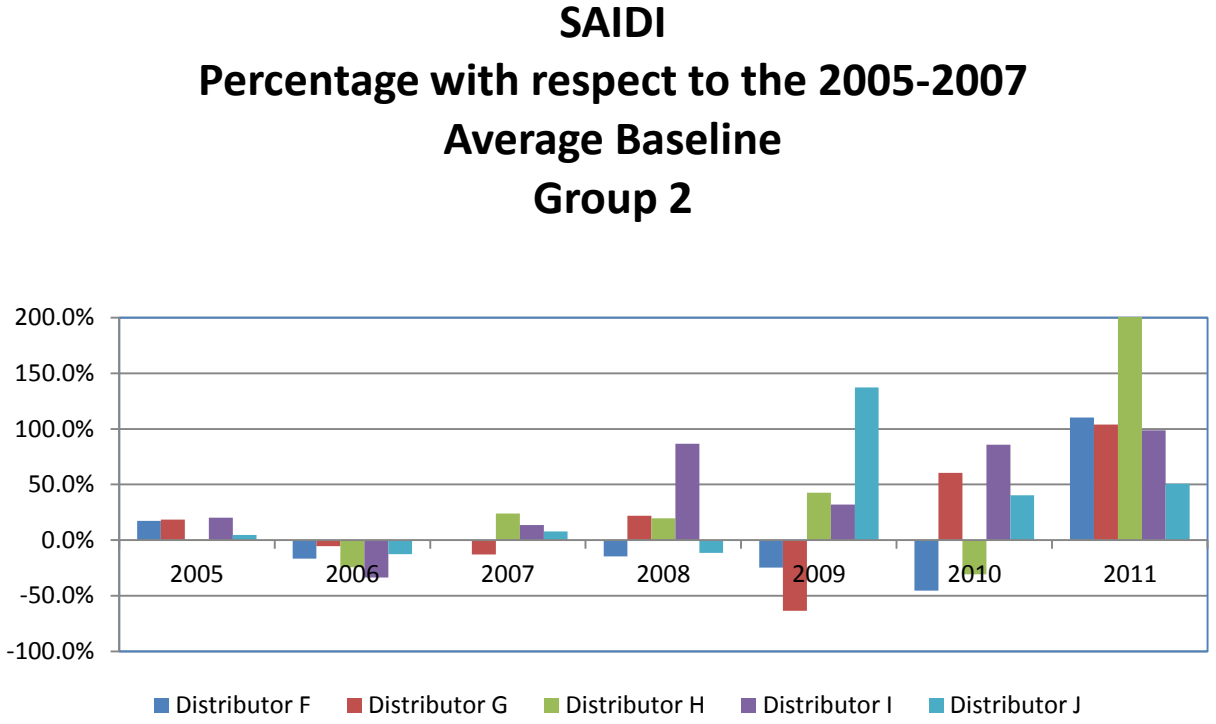
LDC	2006	2007	2008	2009	2010	2011
Horizon	COS	2nd	COS	3rd	3rd	COS
London	COS	2nd	2nd	COS	3rd	3rd
Milton	COS	2nd	2nd	2nd	2nd	COS

Legacy: Compared to a 2005-2007 Baseline, SAIDI Performance has Degraded Significantly for a Number of LDCs, sometimes by 100 percent or More

Distributor	2005	2006	2007	2008	2009	2010	2011	2005-2007 Average Baseline
Bluewater Power	3.25	2.31	2.76	2.37	2.09	1.51	5.83	2.77
ELK Energy	2.08	1.66	1.53	2.14	0.64	2.82	3.58	1.76
Guelph Hydro	0.48	0.36	0.59	0.57	0.68	0.33	2.02	0.48
North Bay Hydro	1.76	0.97	1.66	2.73	1.93	2.72	2.91	1.46
Thunder Bay	1.94	1.62	2	1.64	4.4	2.6	2.79	1.85

Blue is < Mean
Brown = 10% > Mean
Red = 25% > Mean
Green = 50% > Mean
Purple = 100% > Mean

Legacy: Compared to a 2005-2007 Baseline, SAIDI Performance has Progressively and Significantly Degraded for a Number of LDCs



Legacy: Customer Service Valuations

- Willingness to Pay (WTP) and to Accept Compensation (WTA)
  - Researchers, Regulators, and Utilities in North America and in Europe have used WTP/WTA studies for decades
  - for electricity distributors, such survey-based analyses gauge the value that different classes of customers place on service improvements, degradations, number of outages, length of outages, etc
- Ofgem and NVE have both employed WTP and/or WTA for a decade to value service not supplied and gauge the efficiency of O&M and capital
- The Board has conducted its own WTP and WTA study by Pollara in 2010
- We have employed these results as inputs to an adjusted TFP estimate

Legacy: Customer Service Valuations

- Pollara finds **42 %** of residential customers would pay for improvement
  - Among yes, $16.2 per bill or $192.4 per year;
  - Gives overall average across all Ontario customers of **$82**
- Ofgem finds **46 %** of residential customers would pay for improvement
  - Ofgem finds WTP per customer is **$93** (for 1 hr. improvement in 2002) Ofgem reports business customers value such an improvement at 7% to 10% of their distribution bill, or $8,888 across all classes
- Pollara finds Ont. customers place a high value on service reliability
  - **57 %** would not be unwilling to accept any compensation in return for degraded service
  - For those accepting compensation for degradation, the value offered was **$27.9 per bill** or **$334.2 per year**; this would be the **minimum value** in converting to an overall residential customer average

Legacy: TFP Estimates are not Customer-centric and do not reflect Expressed Valuations for Ontario Customers

- Board's treatment of output is LDC-centric not customers-centric
- It is clear that customers do not value the lines, only the power (contrary to LDCs which have costs whether power is supplied or not)
- Reliability-adjusted TFP is one approach to more accurately reflect LDCs' performance from the perspective of the rate-payer and not just the number of new connections, megawatts supplied, or peak reached
- OEB Pollara and Ofgem's WTP/WTA provide similar estimates of service valuations

Legacy: TFP Estimates are not Customer-centric and do not reflect Expressed Valuations for Ontario Customers

- Ontario customers value interruptions in that service as greater losses than they value improvements
- Residential customers value degradation at a minimum of **$27.85/mo,** quite close to their average distribution bill of **$28.38/mo** (2009)
- I have adjusted TFP for reliability, using reported changes in service reliability together with the Pollara WTP and WTA for improvements and degradations, respectively,
- These "customer valued" improvements/decrements were then weighted with changes in the quantity of LDCs' outputs

Legacy: Line Losses, Factor Input Weights, and Distribution Costs

- Line Losses are a substantial share of distribution costs
  - can be over 20% of total distribution costs
  - can be more than $150/customer/year
- Losses vary substantially among seemingly similar LDCs
  - by more than $80 per customer per year
- Losses vary depending on regulatory incentives and prices of electricity

Legacy: Incentives, Line Losses and Cost per Customer

- Line loss data for 3 Ontario LDCs 1988 to 2011

	Utility A Kitchener-Wilmot		Utility B Enersource		Utility C Toronto Hydro		kWh Price
1988	3.7		4.8	$91	3.7		0.0411
1997	2.3		3.1		2.3	$55	0.0581
2005	2.1	$56	2.9	$138	2.9	$119	0.1013
2009	3.3		3.1		3.8	$116	0.0830
2010	3.5	$66	3.0		3.5		0.0861
2011	3.3		3.2		3.5		0.0935

Legacy: Line Losses and Total Factor Productivity

- Inclusion of losses can materially impact TFP growth
  - E.g., over 2000-2011, incorporating losses would have lowered average TFP growth for 1 LDC from 1.9 per year to 1.2 per year

- Board's decision in 1st Generation in 2000 employed a 4-factor estimate of TFP
  - In 1st Generation, *one half* of the 0.8 annual average increase in TFP over 1988-1997 was due to the improvement in losses

- Ignoring losses is a non-green policy; loss inclusion in TFP would be rationally green and customer centric

Imperatives: Over the Past 5 and 10 Years, Sector-wide, Absolute Productivity has Degraded Significantly

- The price-dual and both quantity-based estimates are similar:
  - about -2.4 percent per year

- All three estimates indicate a decline in LDCs' productivity of over *12 percent since the start of 2nd Generation IR*

Imperatives: DEA Analysis over 1988-2011, 2000-2011 and 2006-2011 finds that the Efficiency Frontiers have Clearly Degraded

Based on DEA, I find that the pre-restructuring Ontario electricity industry frontier has degraded. Technical efficiency for the pre-restructuring frontier distributors has fallen consistently. This degradation tends to make frontier LDCs less distinguishable from the interior LDCs that operated off the frontier. Allocative efficiency for these pre-restructuring frontier firms has also degraded. This degradation is significant, falling by more than 20 percent. These findings are consistent with the incentives offered by OM&A-only benchmarking.

Imperatives: the Board's Efficiency Estimates are at Significant Variance with My DEA Estimates and 40 Years of Capital Data

	PEG	Cronin
Distributor 1	-18.3	-30
Horizon		
Distributor 2	-11.2	6
Burlington		
Distributor 3	-7.3	-17
Hydro Ottawa		
Distributor 4	-3.5	20
Enersource		
Distributor 5	3.1	-7
Orilla		
Distributor 6	6.5	23
Milton		
Distributor 7	54.7	39
Toronto Hydro		

The Board's benchmarking is biased and will lead to penalizing more efficient LDCs and rewarding more inefficient LDCs

Imperatives: Properly Estimated IPI has More Muted Volatility and Averages 0.7% over 2002-2011

- Lower Volatility compared with the 8, 9, 16, and 20+ percent annual distribution rates increases for some LDCs
- And smaller average rate increases than the 3.4 percent average increases approved by the Board
- My estimated 3-factor IPI

2003	-0.8%
2004	0.1%
2005	-1.6%
2006	3.4%
2007	3.2%
2008	0.2%
2009	0.1%
2010	1.2%
2011	0.4%
Average	**0.7%**

Imperatives: Existing Rate Volatility, Two Selected LDCs' Approved Distribution Rates

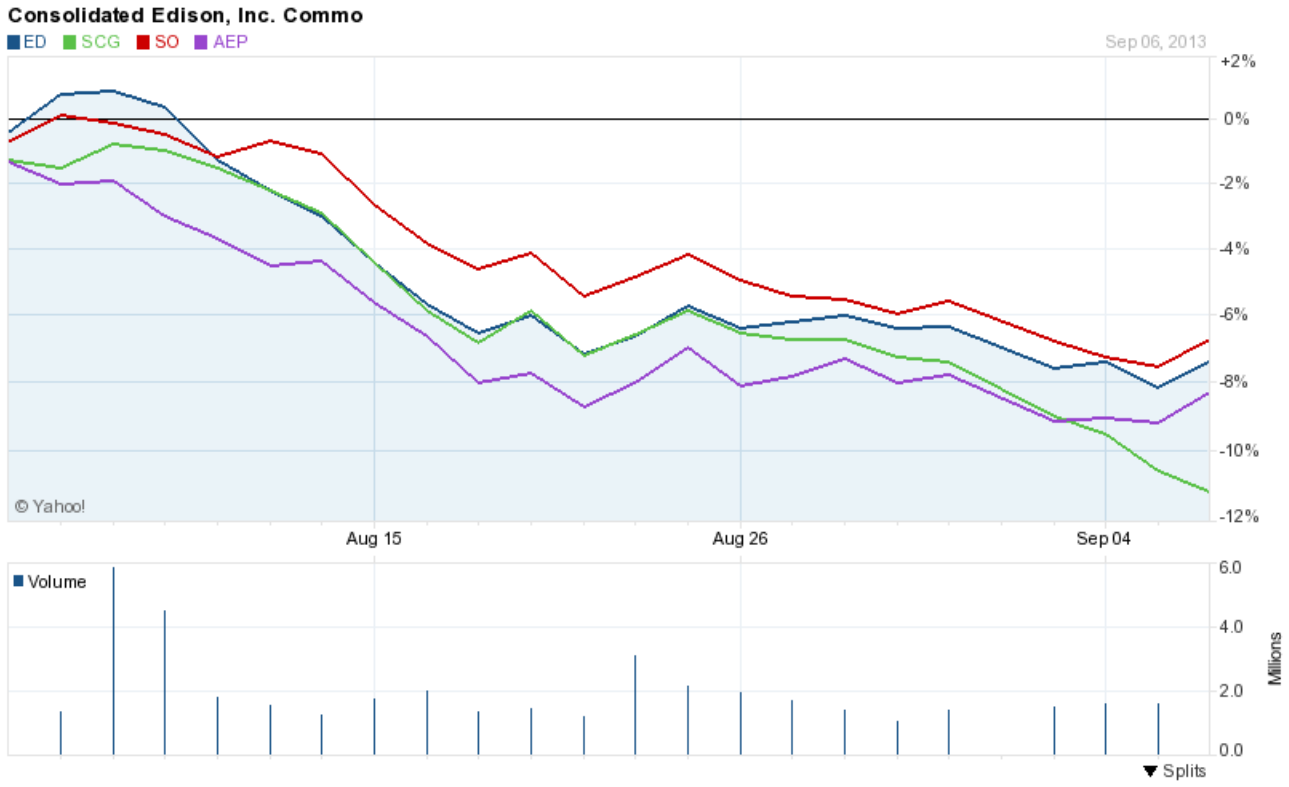
Utility	2007	2008	2009	2010	2011
A	8.17	-0.12	9.13	0.02	-1.00
B	0.57	-0.76	0.06	16.25	0.42

Term: "Three-On, One-Off"

- Produces delayed, time-shifted, rate increases
- Weakened productivity gains
- Actual sequence was highly diverse with COS, 2nd and 3rd IRM terms occurring simultaneously
- Some individual LDCs experienced multiple rate mechanisms in just 3 to 4 years

Imperatives: CBOE Interest Rate 10-Year T

Imperatives: Major US LDCs' Share Prices



Imperatives: Board Should Approve a Properly Specified IPI including Capital and Capital Costs

- Capital is about 50 percent of total costs
- Next 5 years will likely see a significant rise in interest rates
- Not including properly specified capital costs in IPI would be analogous to imposing a negative K-factor and leave LDCs insufficient funds for investment
- Board's 2-factor IPI is inconsistent with IR principles