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

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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
  - TFP data issues – solution, employ rates data to derive a price-dual as an alternative methodology for TFP
  - Benchmarking data issues – solution, a nonparametric approach such as DEA (which has been done 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?

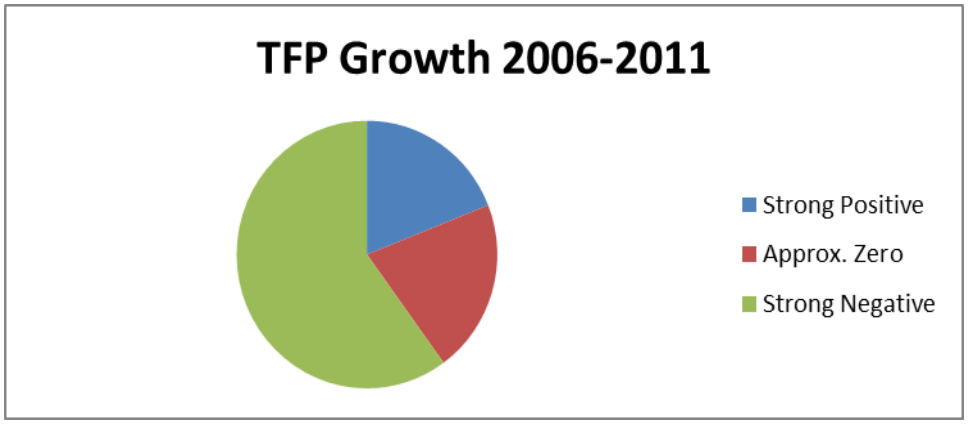
Legacy: Price-Dual TFP Estimates are Consistently Negative

- 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 for 2000 and 2010

	2000		2010		
	OM&A	K	OMOM&A	K	OM&A/K
	$920m	$710m	$1351m	$1805m	75%
LDC1					79%
LDC2					100%
LDC3					50%
Aggregate Labour Capitalization					35%
		130%			
		178%			
		122%			
		84%			
		10%			

Legacy: Diversity in 2011 Capital Additions Shares for selected LDC

	L & Over*	Equip& Materials	CC	Retire
LDC1	31	32	12	74
LDC2	60	34	25	0
LDC3	53	41	215	11
LDC4	25	75	2	19
LDC5	21	16	6	5
LDC6	37	38	26	58
LDC7	46	34	6	0
LDC8	26	67	14	40
LDC9	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

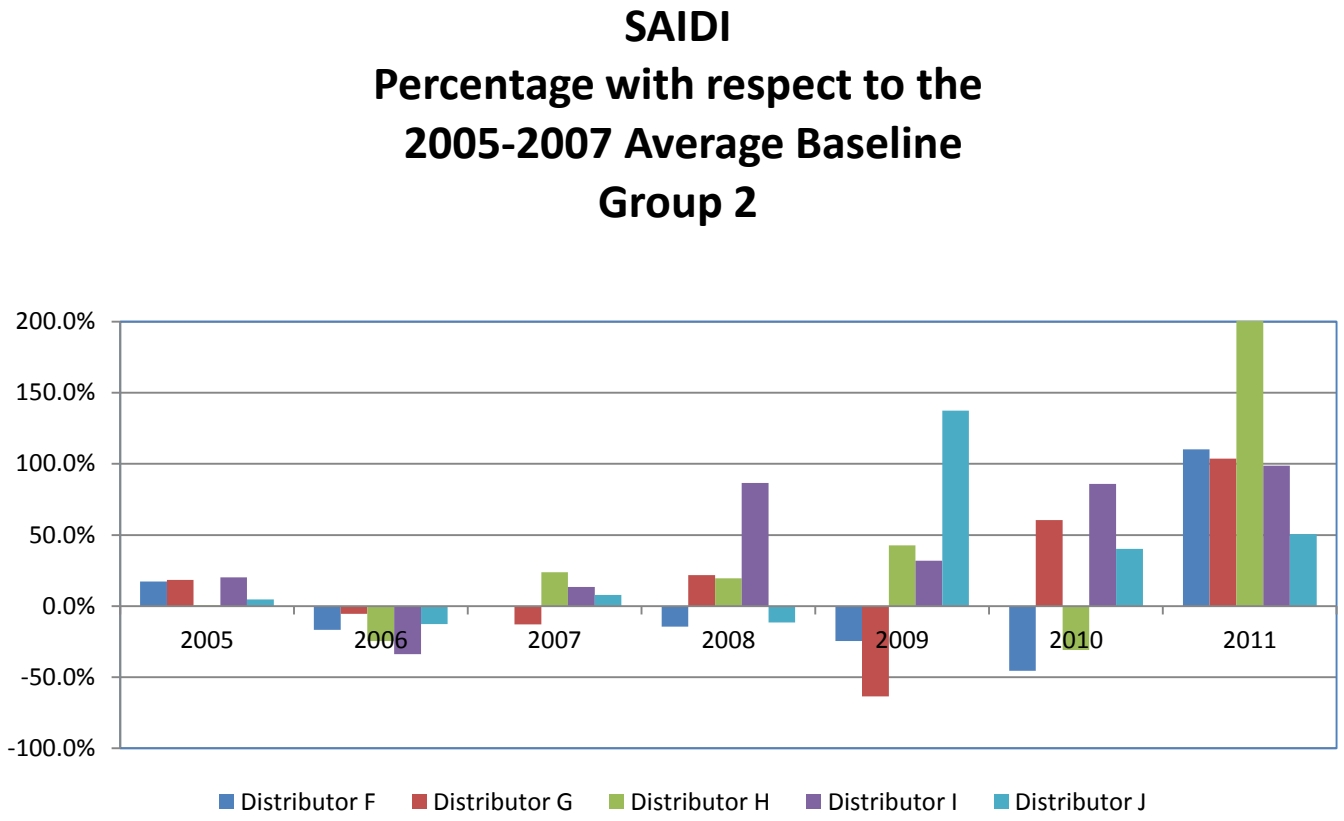
LDC	2006	2007	2008	2009	2010	2011
A	COS	2nd	COS	3rd	3rd	COS
B	COS	2nd	2nd	COS	3rd	3rd
C	COS	2nd	2nd	2nd	2nd	COS

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
F	3.25	2.31	2.76	2.37	2.09	1.51	5.83	2.77
G	2.08	1.66	1.53	2.14	0.64	2.82	3.58	1.76
H	0.48	0.36	0.59	0.57	0.68	0.33	2.02	0.48
I	1.76	0.97	1.66	2.73	1.93	2.72	2.91	1.46
J	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
  - Finds WTP per customer is **$93** (for 1 hr improvement in 2002) - business customers value such an improvement at 7% to 10% of their distribution bill, or $8,888 across all classes
- Pollara finds Ontario 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 service as greater losses than they value improvements
- Residential customers value degradation at a minimum of **$27.85/month**, quite close to the average distribution bill of **$28.38/month** (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		Utility B		Utility C		$/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%/year to 1.2%/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
Distributor 2	-11.2	6
Distributor 3	-7.3	-17
Distributor 4	-3.5	20
Distributor 5	3.1	-7
Distributor 6	6.5	23
Distributor 7	54.7	39

The Board's proposed 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%
Avg	0.7%

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

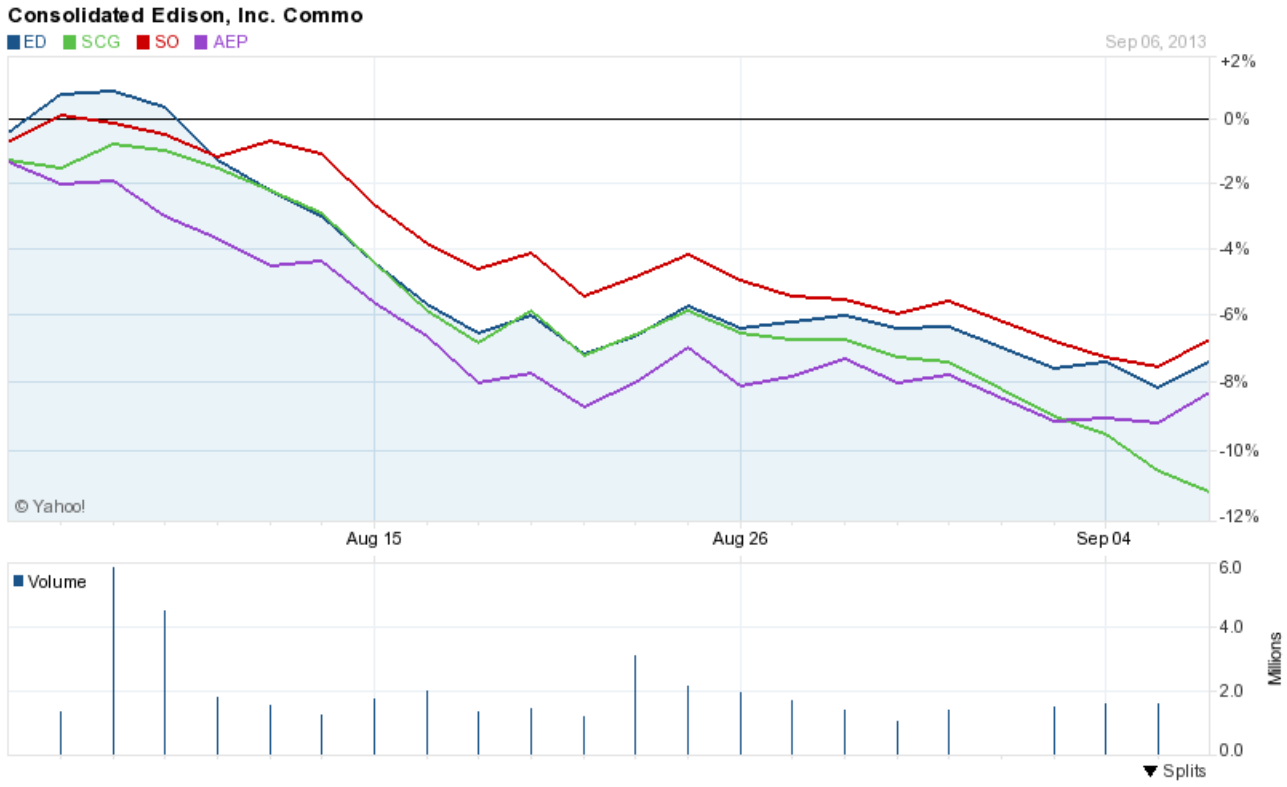
Utility	2007	2008	2009	2010	2011
A	8.17	-0.12	9.13	0.02	-1.00
B	0.57	-0.76	0.06	16.25	0.42

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