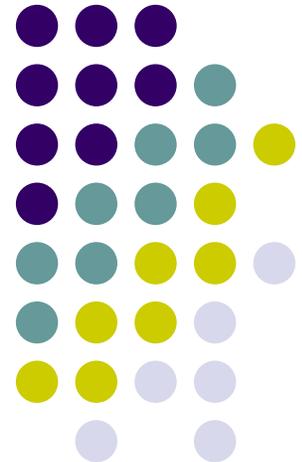# Values for the Productivity Factor, Stretch Factors, and Materiality Threshold for Third Generation Incentive Regulation in Ontario
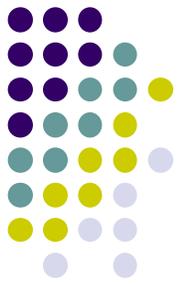
Presentation to Board and Stakeholders

Larry Kaufmann, *Partner*
Pacific Economics Group

Toronto, Ontario
August 5-8, 2008

PEG
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Economic and Litigation Consulting

Introduction

The July 15 Report of the Board established an incentive regulation framework for Ontario distributors, including the broad methodologies to be used for setting productivity factors, stretch factors and capital investment modules

The Report also said the Board would be assisted by further consultation on appropriate values for

- the productivity factor
- stretch factors
- materiality threshold for investment module

This presentation summarizes PEG's views on appropriate values for these parameters

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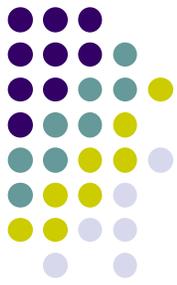Economic and Litigation Consulting
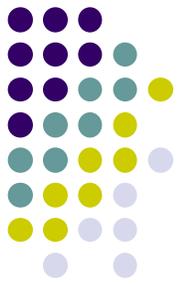
Overview

Main objectives for regulatory framework established in Third Generation Incentive Regulation:

- Sustainable

- Predictable

- Effective

- Practical

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Overview (Con't)

As advisor to Staff, PEG was guided by these objectives in developing its productivity factor and stretch factor recommendations

Intention was to put in place

- Data Sources
- Empirical Tools

That

- Led to reasonable X factors in IRM3
- Can be easily expanded and revised in future IR applications
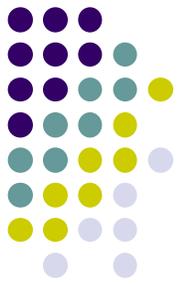
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Overview (Con't)

At the same time, PEG's approach was not set in stone
>>> methods can and *should* evolve over time as
more and better information becomes available

PEG's recommendations therefore designed to provide a
sustainable – but flexible – basis for setting productivity
and stretch factors

Overview (Con't)

Why is flexibility necessary?

- All stakeholders agreed that long-run, sustainable IR model should utilize Ontario data to set productivity and stretch factors

- But *current* recommendations for IRM3 were constrained by lack of available Ontario data necessary to:

  - Estimate reliable, long-run total factor productivity (TFP) trends for Ontario distributors
  - Benchmark total costs of Ontario distributors

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Overview (Con't)

Given data constraints, PEG's approach to developing values for productivity factor and stretch factor parameters was:

- develop most objective and rigorous parameter estimates given currently available information

- make current analysis and methodologies as transparent as possible

- lay groundwork for optimal, sustainable IR model in long run
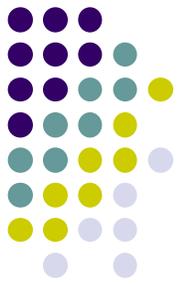
Overview (Con't)

More concretely:

- Use available Ontario data to develop best, feasible TFP and benchmarking estimates for Ontario distributors
- Where necessary, supplement Ontario data with data from the US industry
- Carefully check whether available US data were a reasonable proxy for Ontario data
- Develop straightforward path to greater use of Ontario data as it becomes available

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Overview (Con't)

PEG believes methodology developed in IRM3, and resulting values for productivity and stretch factors, are most consistent with criteria specified at outset of IRM3 and elaborated in Board Report

PEG therefore continues to recommend:
- 0.88% productivity factor
- 0% stretch factor for most efficient distributors
- 0.25% stretch factor for distributors of average efficiency
- 0.5% stretch factor for least efficient distributors

Overview (Con't)

PEG has not undertaken any original analysis regarding the materiality threshold for the capital investment module, but we have reviewed Staff's submission

Staff's analysis

- Addresses "double counting" issue

- Is transparent and has an objective empirical foundation

- Is administratively simple

Productivity Factor

Board Report (p. 12):

"The productivity component of the X-factor…should be derived from objective, data-based analysis that is transparent and replicable. Productivity factors are typically measured using estimates of the long-run trend in TFP growth for the regulated industry."

PEG believes our recommended value for the productivity factor is consistent with these objectives
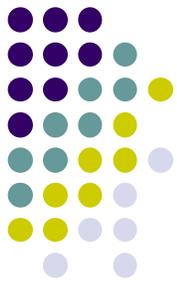
Productivity Factor (Con't)

PEG considered three sources of information for setting industry TFP trends

1. 1988-97 TFP estimates from IRM1 in Ontario
2. 1988-2006 index-based TFP measures for US industry
3. 2002-06 index-based TFP measures for Ontario industry

>>> Ontario industry data not available 1998-2001, therefore could not estimate TFP growth for period starting before 2002

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Productivity Factor (Con't)

Four years of TFP growth for Ontario distributors (*i.e.* 2002-06) not long enough to compute reliable, long-run TFP trend

Empirical evidence from IRM1 supports this view

- 0.86% TFP growth computed for Ontario industry between 1988-97, but
    - Avg. TFP growth = -0.1% in 1988-93
    - Avg. TFP growth = 2.05% in 1993-97

>>> Slow TFP growth rate in first half of sample not representative of overall 1988-97 period or the final 1.25% productivity factor approved in IRM1

Productivity Factor (Con't)

<u>Why is four years not enough data for computing a productivity factor?</u>

TFP often quite variable from year-to-year, TFP must be measured over a sufficiently long period to balance out fluctuations to obtain good estimate of underlying, long-term trend

10 years is generally accepted rule of thumb for estimating long-run TFP trend in regulatory proceedings

No regulator has ever used only four years of energy industry TFP growth to determine a productivity factor

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Productivity Factor (Con't)

Because there was insufficient Ontario data for setting productivity factor for IRM3, PEG evaluated US data

We compared TFP growth for US and Ontario industries in available years to see whether data from US distributors would be an acceptable proxy

Necessary to make some assumptions about Ontario TFP growth during 1997-2002 "missing years"

PEG considered four scenarios

Table 12

Comparison of US and Ontario Electricity Distribution TFP Growth

	TFP Growth				
	Ontario 1 [a]	Ontario 2 [b]	Ontario 3 [c]	Ontario 4 [d]	United States
1988	1.000	1.000	1.000	1.000	1.000
1989	0.999	0.999	0.999	0.999	1.020
1990	0.998	0.998	0.998	0.998	1.022
1991	0.997	0.997	0.997	0.997	1.012
1992	0.996	0.996	0.996	0.996	1.020
1993	0.995	0.995	0.995	0.995	1.005
1994	1.016	1.016	1.016	1.016	1.015
1995	1.037	1.037	1.037	1.037	1.033
1996	1.059	1.059	1.059	1.059	1.038
1997	1.080	1.080	1.080	1.080	1.060
1998	1.080	1.092	1.099	1.103	1.060
1999	1.080	1.104	1.117	1.126	1.066
2000	1.080	1.116	1.136	1.149	1.088
2001	1.080	1.129	1.156	1.173	1.107
2002	1.080	1.141	1.175	1.197	1.119
2003	1.081	1.141	1.175	1.197	1.109
2004	1.081	1.141	1.175	1.197	1.136
2005	1.081	1.141	1.176	1.197	1.139
2006	1.081	1.141	1.176	1.198	1.138
1988 - 2006	0.43%	0.74%	0.90%	1.00%	0.72%
1988 - 1993	-0.09%	-0.09%	-0.09%	-0.09%	0.09%
1993 - 1997	2.05%	2.05%	2.05%	2.05%	1.33%
1997 - 2002	0.00%	1.09%	1.68%	2.05%	1.09%
2002 - 2006	0.01%	0.01%	0.01%	0.01%	0.41%

	Difference between Ontario and US TFP Growth Rates			
	Ontario 1 [a]	Ontario 2 [b]	Ontario 3 [c]	Ontario 4 [d]
1988 - 2006	-0.28%	0.02%	0.18%	0.29%
1988 - 1993	-0.19%	-0.19%	-0.19%	-0.19%
1993 - 1997	0.72%	0.72%	0.72%	0.72%
1997 - 2002	-1.09%	0.00%	0.58%	0.96%
2002 - 2006	-0.40%	-0.40%	-0.40%	-0.40%

[a]Assumes 0% TFP growth 1997 - 2002.
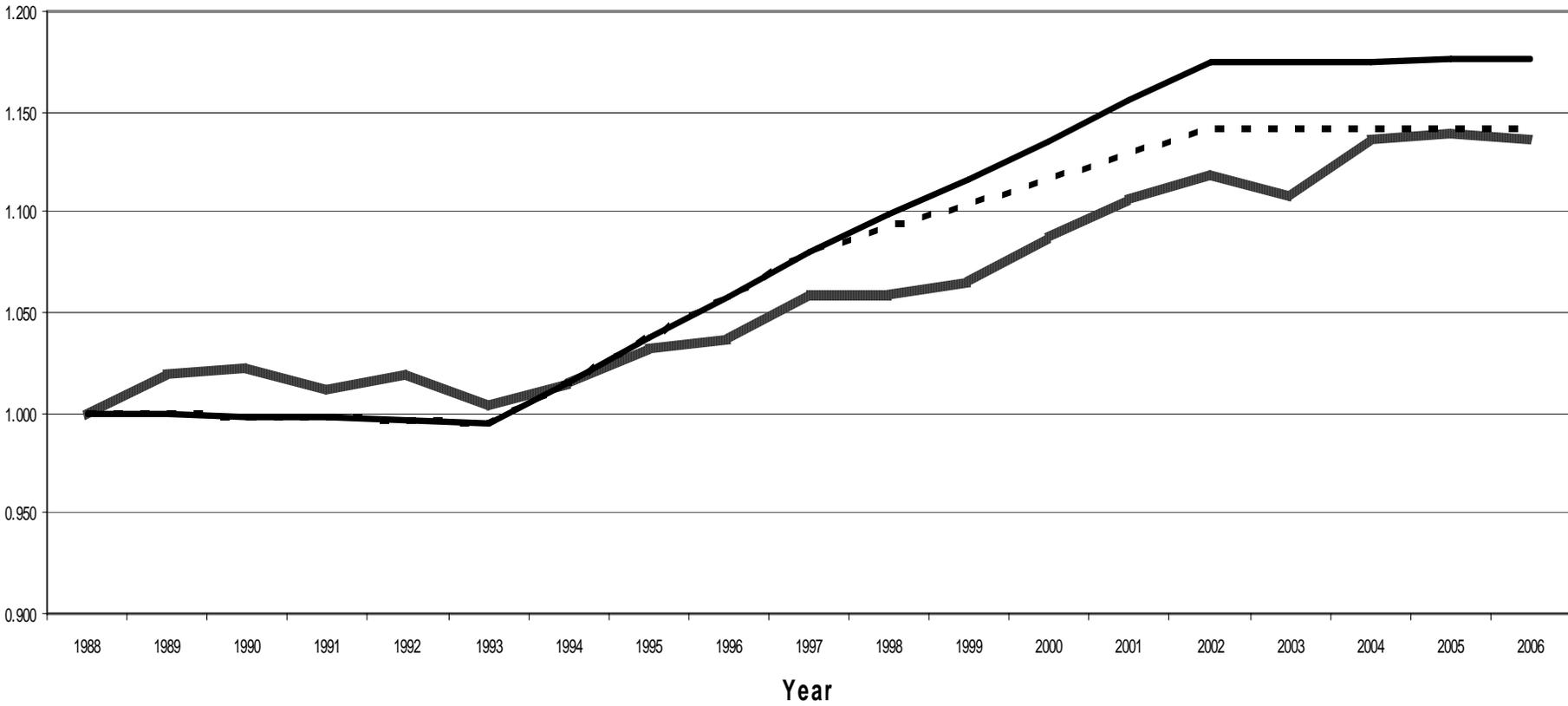[b]Assumes Ontario TFP growth equal to US TFP growth 1997 - 2002.
[c]Assumes Ontario TFP growth 1997 - 2002 maintains proportion relative to US TFP growth from 1993 - 1997.
[d]Assumes TFP growth 1997 - 2002 matches 2.05% rate as in 1993 - 1997.

Comparative TFP Experience
US and Ontario Power Distributors
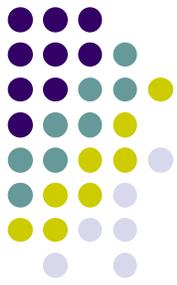
Productivity Factor (Con't)

PEG concluded that TFP growth for US distributors is a reasonable, but not perfect, proxy for contemporaneous Ontario distributor trends

We therefore used US distributor trends as basis for IRM3 productivity factor

US sample period ended in 2006

Issue: What "start date" should we use to determine sample years used for estimating TFP growth?

Productivity Factor (Con't)

In general, "start date" for estimating TFP growth should not be distorted by transitory factors that can distort measured output growth and (to a lesser extent) input quantity growth

Transitory factors, by definition, will not be representative of long-run trends

Most important transitory factors:

- Weather (heating degree days, cooling degree days)
- Overall economic activity (*e.g.* unemployment rate)

Productivity (Con't)

PEG used statistical analysis to estimate impact of heating degree days, cooling degree days, and unemployment rate on measured TFP growth

We then examined which year was most similar to 2006 in terms of the overall magnitude of these factors on measured TFP
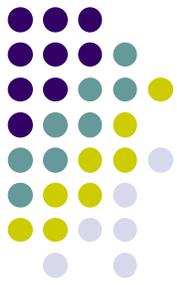
Analysis determined that 1995 was most similar to 2006 and therefore the "start date" which was least likely to distort measured TFP growth because of the transitory impact of weather or economic activity

>>>> Average TFP growth over 1995-2006 = 0.88%

Recommended productivity factor for IRM3

Table 13

Start Date Analysis for Determining Long Run TFP Trend

Year	Heating Degree Days	Cooling Degree Days	Unemployment Rate	% Difference from 2006 Conditions
1990	4,016	1,260	5.6	-1.44%
1991	4,200	1,331	6.9	-1.62%
1992	4,441	1,040	7.5	-3.07%
1993	4,700	1,218	6.9	-1.72%
1994	4,483	1,220	6.1	-1.50%
1995	4,531	1,293	5.6	-0.87%
1996	4,713	1,180	5.4	-1.13%
1997	4,542	1,156	4.9	-1.08%
1998	3,951	1,410	4.5	-0.18%
1999	4,169	1,297	4.2	-0.25%
2000	4,460	1,229	4.0	-0.17%
2001	4,223	1,245	4.7	-0.79%
2002	4,284	1,393	5.8	-0.75%
2003	4,460	1,290	6.0	-1.15%
2004	4,224	1,260	5.5	-1.20%
2005	4,290	1,232	5.1	-1.02%
2006	4,315	1,397	4.6	0.00%

Coefficients	lhdd	lcdd	lur
Parameters	0.0352	0.0563	-0.0309
T-statistic	5.0607	7.6498	-1.8291

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Productivity Factor (Con't)

Some stakeholders expressed concerns regarding PEG's recommended productivity factor

1. Not enough weight on Ontario and/or recent experience

2. Ignores increasing cost pressures in Ontario

3. Inherent slowdown in TFP over time

4. Precedents in Ontario

5. Choice of outputs in PEG's TFP study

6. "Start date" analysis should consider entire TFP cycle, not just individual year

Productivity Factor (Con't)

<u>Ontario Experience</u>

PEG's recommendations considered, and objectively evaluated, <u>all</u> available TFP evidence for Ontario industry

Our report detailed several reasons why an objective review does not support the use of 2002-06 Ontario TFP trends for IRM3 (*e.g.* pp 4-5,30-31,43-46)
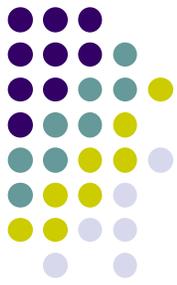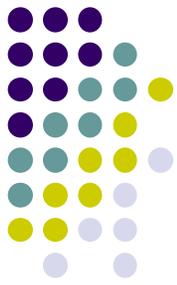
Productivity Factor (Con't)

<u>Ontario Experience</u>

1. Identifiable downward biases in available TFP evidence

   - lack of volumes in IRM1 TFP estimate
   - anomalous output decline in Ontario in 2006

2. Lack of historical capital additions data

3. Transitional cost pressures in 2002-06 may not persist on ongoing, *rate of change* basis

4. As discussed, four years not long enough period to compute reliable TFP estimate

   >> supported by actual TFP trends estimated for Ontario in 1988-93 vs. 1993-97

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Productivity Factor (Con't)

Increasing Cost Pressures

Claimed that there will be ongoing cost pressures similar to those in 2002-06

But no evidence has been presented that these cost pressures will be sustained on a rate of change basis and therefore relevant to rate *adjustments* rather than rate *levels* established at rebasing

Other factors may also create or accelerate downward cost pressures during IRM3

- Merger savings
- Operational benefits from smart meters
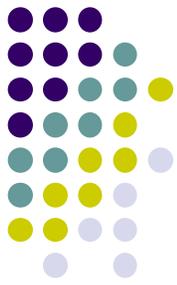
Productivity Factor (Con't)

Inherent Slowdown in TFP Growth

Argued that the lower TFP growth for US distributors in 2002-06 also demonstrates that industry TFP is slowing

But this ignores the role of changing pension contributions on the US industry's growth – a transitory and not long-run factor

Generally slowing TFP growth is also contradicted by Ontario TFP experience (*i.e.* TFP growth greater in 93-97 than 88-93)

>> Both factors demonstrate the importance, and necessity, of measuring TFP over a long enough period so that it is not distorted by short-term fluctuations

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Productivity Factor (Con't)

OEB Precedents

IRM1 put greater weight on recent TFP trends, and it is argued that this precedent should also apply in IRM3

But placing more weight on recent TFP trends was a one-time decision that the Board did not repeat in

- Enbridge targeted PBR
- Union Gas PBR
- IRM2
- Most recent Gas IRM

Ontario precedents for productivity factors have therefore been quite varied, not "bound" by what was done in first IR plan

PEG's method for recommending a TFP trend provides a more rigorous and transparent method for calculating the TFP trend
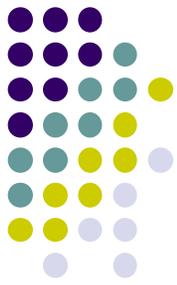
Productivity Factor (Con't)

<u>Choice of Outputs in TFP Study</u>

Argued that peak demand should be added as an output and is necessary to correct biases in TFP estimate

In fact, adding peak demand for Ontario over 2002-2006 period will *introduce* biases and not "correct errors"

Why?

- 2002 very hot summer >> unusually high peak demand
- 2006 very mild summer >> unusually low peak demand
- Computing growth rate between 2002-06 therefore leads to large measured declines in "output" and TFP, but these declines are due entirely to the vagaries of weather and not indicative of long-run trends
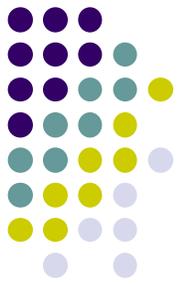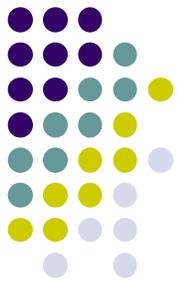
Productivity Factor (Con't)

<u>Choice of Outputs (Con't)</u>

In terms of long-term sustainable framework, it has also been suggested that there should be a long-run project to estimate TFP using new, MVA-km based outputs

This recommendation is conceptually unsound

In a TFP study used in a price indexing PBR plan, appropriate outputs are billing determinants, not an engineering based notional output with no connection to distributor revenues

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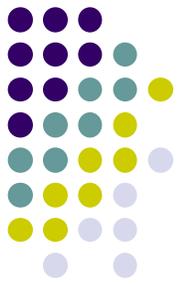# Productivity Factor (Con't)

<u>Start Date Analysis</u>

Claimed that PEG's start date analysis is flawed because it searches for a single year that is similar to the end of sample, rather than searching for an entire period that is likely to be representative of the future

But this critique rests on an *assumption* of persistent cyclical behavior in TFP growth

>>> no evidence to support such a pattern in TFP growth
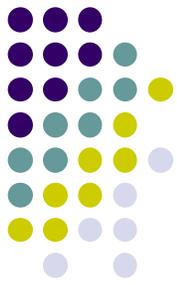
Productivity Factor (Con't)

<u>Start Date Analysis (Con't)</u>

Examining the cyclical behavior of past TFP is also too informationally demanding and not practical for implementation

>>> would need to know entire TFP "cycle" and where the industry was in that cycle to make a productivity factor recommendation

PEG's start date analysis is more transparent, and is also robust for different statistical specifications (*i.e.* non-linear time trends)
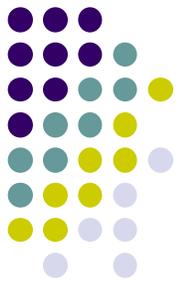
Productivity Factor (Con't)

Considering all available evidence, PEG believes 0.88% remains the best estimate for the productivity factor

The alternative recommended value of 0.55% is "the midpoint of…a reasonable range of TFP growth rates"

Compared with this alternative, PEG believes our estimate is more consistent with the criteria laid out in the Board report *i.e.:*

- more clearly "derived from objective, data-based analysis"
- more transparent
- more replicable

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Stretch Factor

Board Report (p. 12):

"The stretch factor component of the X-factor is intended to reflect the incremental productivity gains that firms are expected to achieve under IR and is a common feature of IR plans. These expected productivity gains can vary by company and depend on the efficiency of a given company at the outset of the IR plan."

Stretch Factor (Con't)

PEG's stretch factor recommendations are consistent with this framework outlined in the Board report

PEG recommended three stretch factors, which "vary by company and depend on the efficiency a given company at the outset" of IRM3

Stretch factors are:

- Same for all distributors within an efficiency "cohort"
- Different among cohorts
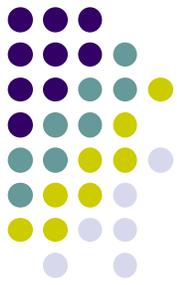- Larger for less efficient cohorts

Stretch Factors (Con't)

Determination of Cohorts

Group I: Significantly superior and in top quartile on unit cost index ranking

Group III: Statistically inferior and in bottom quartile on unit cost index ranking

Group II: All others

Stretch Factors (Con't)

Determining the *values* of "the incremental productivity gains that firms are expected to achieve under IR" is a more forward-looking exercise than estimating a productivity factor, which is reasonably and conventionally derived using historical TFP trends

Some Commissions have even likened the stretch component of the X factor to a "future productivity factor," to distinguish it from the more historically-based productivity factor *per se*
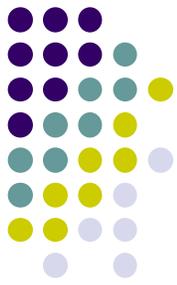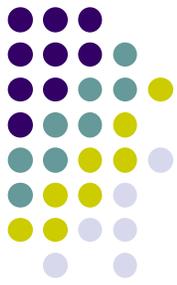
Stretch Factors (Con't)

But caution should be exercised when setting forward-looking "stretch" goals

- Benchmarking studies are useful for understanding firms' comparative cost performance, and setting stretch targets, but there are uncertainties associated with even the most rigorous benchmarking study

- Understanding of firms' comparative cost performance and potential for "incremental productivity gains" likely to increase as regulators gain experience with benchmarking

>>> relatively modest stretch factors likely to be more appropriate in early benchmarking applications
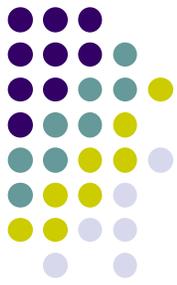
Stretch Factors (Con't)

In practice, nearly all approved stretch factor values in North America have been based on judgment

Approved stretch factors vary from 0 to 1%

Three explicit stretch factors approved to date in Ontario

- 0.25% for all distributors in IRM1

- 0.47% for Consumers (Enbridge) Gas

- 0.5% for Union Gas
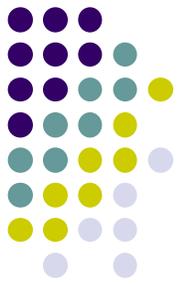
Stretch Factors (Con't)

PEG recommended the following values for stretch factors

Group	Consumer Dividend
I	0
II	0.25%
III	0.5%

Zero stretch factor value reasonable for firms in Group I

- already demonstrably superior performers
- limited potential to achieve "incremental productivity gains" in excess of productivity factor

Stretch Factors (Con't)

Positive stretch factors are reasonable for firms in Groups II and III

- PEG's benchmarking study finds evidence of significant productivity differences, and thus potential for incremental productivity gains, among firms in industry

- Argument that stretch factors are warranted only in "first generation" IR not persuasive
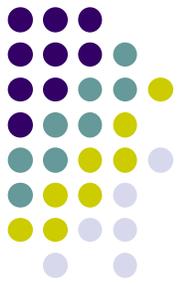
Stretch Factors (Con't)

True that the theoretical rationale for stretch factors is that IR creates stronger incentives compared with cost of service regulation

But theory never says stretch factors should only be implemented one time (*i.e.* in first IR plan) and then be removed

Theory also consistent with the idea that stretch factors should persist for many years after transition from cost of service regulation

>>Importance of long-term initiatives, and associated potential stream of long-term benefits

Stretch Factors (Con't)

Also considerable evidence from regulated industries that "incremental productivity gains" compared with history are sustained for more than a decade after regulatory reform

Example: US railroads; TFP growth in excess of 5% per annum more than 20 years after reform, compared with essentially flat TFP before

Similar evidence for energy distributors in the UK and, to a lesser extent, Australia

Stretch Factors (Con't)

Precedents also overwhelmingly support the use of stretch factors more than a decade after switch from pure cost of service regulation

- Massachusetts
  - Boston Gas – 15 years
  - Bay State Gas – 15 years
    >> PEG supported both
- Germany – 15 years
- UK – Ofwat, more than 20 years

PEG not aware of <u>any</u> plans that have eliminated stretch factor after expiration of first IR plan, although some companies have proposed this

Stretch Factors (Con't)

PEG's recommended stretch factor values for Groups II and III explicitly tied to Ontario precedents

- Most companies will be in Group II and have a stretch factor (0.25%) equal to the value approved for all distributors in IRM1

- Highest stretch factor in IRM3 is equal to the maximum stretch factor (0.5%) approved to date in Ontario (Union Gas PBR)

Stretch Factors (Con't)

PEG's recommended stretch factor values ultimately based on judgment

However, we believe a judgment grounded in Board precedent is prudent since this is the first time benchmarking has been used to set stretch factors for different cohorts of firms

A more data-based, objective approach may become warranted in the future as experience with benchmarking and understanding of comparative cost differences increases
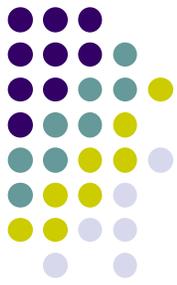
Materiality Threshold

PEG did not make any recommendations on the materiality threshold for the capital investment module

We have also not undertaken any independent analysis of the issue

However, PEG has emphasized that an implicit adjustment for capital expenditures already exists in the price adjustment formula

Greater historical capex >>> lower TFP growth

>>> more rapid price escalation

Materiality Thresholds (Con't)

Explicit and additional adjustments for capex are rare in price indexing plans

Nevertheless, adjustments could be warranted if a company's future capex under indexing is well above what is reflected in historical, industry trends

But even if this is true, any additional capex adjustment should ensure that there is no "double counting" of capex costs (once through the basic IR price indexing formula, a second time through the module)

Materiality Threshold (Con't)

PEG has examined Staff's submission on the materiality threshold

We believe it:

- Controls for double counting
- Has a transparent and objective empirical foundation
- Is administratively simple

Therefore significant merit in Staff's range for the materiality threshold, but it should be noted that PEG has not evaluated any alternative threshold proposals put forward by stakeholders and therefore does not endorse any particular proposal at this time
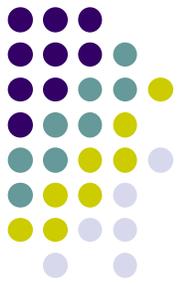
Conclusion

PEG continues to recommend the following values for IR parameters:

- 0.88% productivity factor
- 0% stretch factor for most efficient distributors
- 0.25% stretch factor for distributors of average efficiency
- 0.5% stretch factor for least efficient distributors

We also believe Staff's submission on the materiality threshold has a strong empirical foundation and will be relatively easy to administer

PEG

Pacific Economics Group, LLC
Economic and Litigation Consulting