

Incentive Regulation Options for Ontario Power Generation's Prescribed Generation Assets

Stakeholder Meeting Presentation

Prepared for:

Ontario Energy Board

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I. Introduction and Purpose

Power Advisory LLC was retained by the Board to identify and evaluate IRM options for setting payments for OPG's prescribed nuclear and hydroelectric generation facilities.

	Capacity	In-Service Dates
Nuclear Facilities:		
Pickering A	1,030 MW	1971-72
Pickering B	2,064 MW	1983-86
Darlington	3,512 MW	1989-1993
	6,606 MW	
Hydroelectric Facilities:		
Sir Adam Beck I	417 MW	1922
Sir Adam Beck II	1,499 MW	1954
Sir Adam Beck PGS	174 MW	1957-58
DeCew Falls I	23 MW	1898
DeCew Falls II	144 MW	1943, 1948
R. H. Saunders	1,045 MW	1958-59
	3,302 MW	
Total Capacity	9,908 MW	

- Approximately 28% of Ontario capacity
- Approximately 45 percent of Ontario's energy requirements (2010)
- Primarily baseload resources with the exception of the Sir Adam Beck Pump Generating Station

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I. Introduction and Purpose (cont.)

- Ontario Regulation 53/05 provides the Board with discretion as to the "form, methodology, assumptions and calculations" to be applied in setting payment amounts.
- While the Board has applied a cost-of-service methodology in the last two payment reviews, it has clearly expressed its intention to consider IRM approaches, citing a desire to encourage efficiency in OPG's operations and investments with a goal of having an IRM in place for 2015.
- Power Advisory prepared a report to lay the groundwork for consideration of IRM by the Board – and by other stakeholders.
- The report reviews relevant OPG circumstances, identifies potential approaches that reflect those circumstances, and assesses various options by applying a consistent set of criteria.
- A primary objective is to facilitate effective participation in today's stakeholder conference.
- Anticipate that stakeholders will use the report as a starting point, suggesting additions and deletions from the list of options, proposing additional evaluation criteria and perhaps reaching alternative conclusions based on these criteria

II. Regulation and Operation of OPG's Prescribed Generation Facilities

Statutory Guidance, Agreements, and Regulatory Precedent

- *Energy Competition Act, 1998* set in motion the creation of the Ontario electricity market and separated out the generation assets previously owned by Ontario Hydro
- Electricity market opens on April 1, 2002 with OPG prices fixed by the "Market Power Mitigation Agreement"
- O. Reg. 53/05 becomes effective setting initial prices of $49.50 MWh for nuclear production and $33.00/MWh for hydroelectric production up to 1,900 MWh per hour with excess hydroelectric production receiving a market price
- O. Reg. 53/05 provided discretion as noted above but also established several variance and deferral accounts that are effectively excluded from the calculation of payment amounts (as detailed in the Power Advisory report)

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II. Regulation and Operation of OPG's Prescribed Generation Facilities (cont.)

- On August 17, 2005 the Province of Ontario entered into a MOA with OPG that established eight mandates. The first three of these mandates are relevant to IRM:
  - OPG is obligated to operate its existing generation facilities as efficiently and cost-effectively as possible (the first mandate);
  - OPG is obligated to reduce its exposure to risk from its investments in nuclear generation, citing refurbishment of older units in particular, and is expected to operate with a high degree of vigilance when it comes to safety of its nuclear fleet (the second mandate); and
  - OPG is obligated to seek continuous improvement in its nuclear generation business and its internal services (the third mandate)
- The MOA required OPG to benchmark its performance against worldwide CANDU reactors and against the top quartile of all North American reactors with the objective of improving the operation of its nuclear fleet.
- Other aspects of the MOA required OPG to operate with a high degree of accountability and transparency and to operate on a financially sustainable basis – and thus protect the long-term value of its shareholder assets
- O. Reg. 53/05 and the MOA represent meaningful initial steps toward IRM by establishing market-based pricing for hydroelectricity production, mandating pursuit of efficiencies, and requiring performance benchmarking

II. Regulation and Operation of OPG's Prescribed Generation Facilities (cont.)

- Since 2005, the OEB has conducted a policy consultation docket (EB-2006-0064) to consider alternative approaches for setting payment amounts for OPG's prescribed generation facilities

- After considering three approaches (CoS, IRM, and "Regulation by Contract"), the OEB endorsed IRM as the preferred approach, indicating its desire to transition to IRM by setting prices based on CoS at the outset, allowing the Board and other stakeholders to become more familiar with OPG's costs before adopting an IRM framework. The Board also expressed its efficiency goals:

> "Efficiency can be defined in a number of ways. The Board's key focus in this regard is to encourage productivity gains that are enduring and for the benefit of both the regulated company and the consumer. This means that regulated companies have incentives to manage costs while maintaining or improving their service levels."

II. Regulation and Operation of OPG's Prescribed Generation Facilities (cont.)

- The OEB has set prices based on CoS in the last two proceedings.

Table 1: Historical OPG Payment Amounts
(Excluding Deferral and Variance Account Recovery)

Methodology	Effective Date	Nuclear Payment ($/MWh)	Hydroelectric Payment ($/MWh)
ECA + MPMA (Prescribed)	May 1 2002	$38.00	$38.00
O. Reg. 53/05 (Prescribed)	April 1 2005	$49.50	$33.00 up to 1900 MWh per hour; market price above 1900 MWh per hour
EB-2007-0905 (Cost-of-Service)	April 1 2008	$52.98	$36.66 with HIM
EB-2010-0008 (Cost-of-Service)	March 1 2011	$51.52	$35.78 with modified HIM to reflect sharing above a cap

- EB-2007-0905 focused on OPG's cost of capital, nuclear O&M expenses, revenues from other business activities including the Bruce lease revenues, variance and deferral accounts, and mitigation in response to weak economic conditions. The Board rejected a two-part rate for nuclear production but approved a hydroelectric incentive mechanism (HIM) that provided OPG with an incentive to increase production above monthly averages when the Ontario market price exceeds the regulated payment amount. Nuclear benchmarking received considerable attention during this proceeding.

- EB-2010-0008 reconsidered the HIM and its operation during 'surplus baseload generation' (SBG) conditions and added a sharing mechanism.

II. Cost and Performance of OPG's Nuclear Facilities

- Designing an IRM for OPG's nuclear facilities requires understanding the starting point, which is their current cost and performance. This allows setting reasonable IRM targets.
- Cost and performance data for OPG's nuclear facilities are available from several sources: The ScottMadden benchmarking study filed with the OEB; OPG's financial reports, and data from the International Atomic Energy Agency. The ScottMadden benchmarking study uses 2008 data and is very useful because it contains direct comparisons between OPG and other nuclear operators.
- The Report reviewed three cost and performance categories: nuclear performance along a range of indicators; OM&A cost structure and capital additions; and staffing and compensation levels.
- The Board has expressed concern with the operating performance of OPG's nuclear fleet.
- The Nuclear Plant Performance Summary table on the next page gives OPG nuclear performance by plant over a recent history. It shows overall Unit Capability Factor declining over that period. Total nuclear output was constant in the first two years and fell in the third. These declines were in part due to scheduled vacuum building outages.

II. Cost and Performance of OPG's Nuclear Facilities

Nuclear Plant Performance Summary					
		Plant			
		Darlington	Pickering A	Pickering B	Totals
Capacity (MW)		3512	1030	2064	6606
Net Generation (TWh)	2010	26.5	5.5	13.7	45.7
	2009	26.0	5.7	15.1	46.8
	2008	28.9	6.4	12.9	46.8
Unit Capability Factor	2010	87.6%	62.4%	76.3%	80.1%
	2009	85.9%	64.2%	84.0%	81.9%
	2008	94.5%	71.8%	71.4%	83.7%

Source: OPG Information Form for 2010, pg. 11

II. Cost and Performance of OPG's Nuclear Facilities (cont.)

- The ScottMadden benchmarking report provides a snapshot comparison of the performance of the OPG nuclear plants on19 indicators and compares it to the performance of other operators of nuclear reactors from the World Association of Nuclear Operators (WANO) and the Electric Utility Cost Group (EUCG). It used 2008 data.
- The performance of OPG's nuclear facilities against these benchmarks can be readily summarized:
  - ✓ The Pickering A and B plants had among the worst, and on some measures the worst, operating records among the plants in these data bases;
  - ✓ Darlington operates consistently above the median in the benchmarking comparisons and on some measures is in the top quartile.
- The table on the next page summarizes the OPG plants' performance on six key indicators from the ScottMadden report. Red shading shows performance in the bottom quartile; yellow shading indicates second quartile; green shading indicates top quartile.
- Both Pickering units are in the bottom quartile on four of these measures; Darlington is in the top quartile on three of them.

Source: ScottMadden report

II. Cost and Performance of OPG's Nuclear Facilities (cont.)

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	OPG Performance 2008				
	Top Quartile	Median	Pickering A	Pickering B	Darlington
Reliability					
WANO NPI (Index)	96.19	62.46	60.84	60.93	95.67
2-Year Forced Loss Rate (%)	0.68	3.79	37.9	18.19	0.93
2-Year Unit Capability Factor (%)	90.97	84.31	56.6	73.17	91.99
Value for Money					
3-Year Total Generating Costs per MWh ($/Net MWh)	$ 28.66	$ 32.31	$ 92.27	$ 58.68	$ 30.08
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)	$ 18.06	$ 21.28	$ 82.62	$ 50.95	$ 25.10
3-year Fuel Costs per MWh ($/Net MWh)	$ 5.02	$ 5.37	$ 2.64	$ 2.68	$ 2.62

Source: ScottMadden report

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II. Cost and Performance of OPG's Nuclear Facilities (cont.)

- The Report reviewed OPG's OM&A and capital budgets and noted that the Board accepted them in the most recent hearing (EB-2010-0008).
- OPG's budget included some OM&A expenditures for the Darlington Refurbishment Project. This is the most important capital project being planned by OPG. Power Advisory noted that any IRM that extends through the period of this project must account for it.
- The Board has expressed concern about both the number of staff and their compensation levels.
- Phase 2 of the ScottMadden report presented benchmark data on staffing levels using the EUCG data base.
- The table on the next page compares normalized staffing levels for the three OPG nuclear plants against benchmarking data from the ScottMadden report. The comparison is to the mean of the lowest quartile and the mean of the median. The data are normalized by dividing the staff levels at each plant by the number of units.
- In almost all of the functional areas listed, OPG staffing levels are above the mean of the median, in some cases well above. The only functional area where OPG was consistently below the median of the mean was training. It was well above in larger and crucial areas like plant operations and management and support.

Data source: ScottMadden report

II. Cost and Performance of OPG's Nuclear Facilities (cont.)

Functional Area	Mean of Lowest Quartile	Mean of Median	Pickering A	Pickering B	Darlington
	(Staff count per unit)				
Configuration Management	23.7	36.6	72.3	61.8	55.1
Equipment Reliability	29.7	40.5	101.9	69.2	74.2
Loss Prevention	23.5	32.1	24.2	34.5	33.5
Materials and Services	14.6	21.7	40.9	41.2	40.2
Nuclear Fuel	4.9	8.5	12.5	12	10
Operate Plant	118.6	133.4	261.6	182.4	205.9
Management and Support	37.7	56.5	131.3	114.1	117.6
Training	22.2	31.7	15.9	25.9	26.2
Work Management	127.6	147.2	290.4	197.9	205.9
Total	**403.5**	**508.3**	**962**	**738.8**	**768.3**

Data source: ScottMadden report

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II. Cost and Performance of OPG's Hydroelectric Facilities

- In 2010, OPG's regulated hydroelectric facilities represented approximately 9.5 percent of Ontario's total capacity and 12.5 percent of net electricity generation
- The contribution to Ontario's electricity market is more significant:
  - They are low-cost renewable energy resources that contribute to the reliability of Ontario's electricity system. Annual contributions are dependent on water levels.
  - The pumped storage facility at Sir Adam Beck helps restrain the Hourly Ontario Energy Prices (HOEP) when demand is greatest.
  - To the extent that OPG's hydroelectric (and nuclear) facilities produce energy during these hours, the market-clearing price will be lower than it otherwise would have been.
  - The Sir Adam Beck PGS is also used to provide automatic generation control (AGC) services and to help to mitigate the potential impact of SBG on Ontario consumers and on the dispatch of nuclear generation facilities
- The performance of the Sir Adam Beck PGS reflects the manner in which it is operated.
  - The storage capability of the PGS is used based on the comparative economics of the pump/generate cycle regardless of whether or not SBG is anticipated.
  - As a result, the Sir Adam Beck PGS requires more frequent maintenance activities as it serves multiple roles that require more frequent starts and stops than a conventional hydroelectric facility.

II. Cost and Performance of OPG's Hydroelectric Facilities (cont.)

- Each of the six hydroelectric facilities has been operating for at least five decades.
  - As the facilities age, greater capital investment is required to sustain the facilities
  - Preventative maintenance and periodic replacement of components can often extend the useful lives of hydroelectric facilities for many years.
  - OPG has an asset management program that monitors asset condition and determines the operations and maintenance activities, as well as any capital improvements that are necessary.
  - The Sir Adam Beck 1 units are in the midst of a multi-year rehabilitation project that began in 2007.
- The Board's payment-setting policy accounts for the impact of varying water conditions on OPG's revenues through a variance account.
- SBG conditions present a particular challenge to operations and to the design of an incentive mechanism
  - There are operational limits and consequences associated with the use of hydroelectric facilities to respond to SBG conditions.
  - OEB currently relies on an after-the-fact review of OPG's operations during SBG conditions. Customers essentially pay for foregone hydrolelectric production that results from water spills as the impact of reduced production is captured through a variance account.

IRM Basics

Objective: Provide a regulated utility with a financial incentive to achieve sustainable efficiency gains, without adversely affecting the quality of service.

Approach: After establishing prices based on the CoS, weaken the link between prices (and/or revenues) and costs during the term of the plan. For a price-cap approach, prices increase at the rate of inflation less "x" an estimate of the industry productivity trend and occasionally s a utility-specific "stretch" component.

Types: Broad-based (applying to all or a significant subset of clearly defined and measurable business activities) or targeted (encourages a specific behavior, e.g., shifting production to peak hours). Targeted incentives involve measurement of performance against a "benchmark".

Risk-Mitigation:

Earnings-sharing mechanisms, "exogenous" factor adjustments, and off-ramps provide protection against unanticipated outcomes.

Design, Implementation and Performance Measurement Challenges:

Estimating the industry productivity trend is rife with data and methodological challenges; benchmarks also present definitional and target challenges. Periodic (typically, annual) filings to measure the results and establish the incentive can be controversial despite best efforts to define the mechanism carefully.

IRM For Generation

- There is limited experience in designing IRM for generation business units
- Many governments have decided that the best way to pursue efficiency gains in the generation sector is to restructure the industry and rely directly on competition
- Competitive forces are relied upon even where generation continues to be regulated as utilities conduct competitive solicitations to acquire new resources and participate in regional wholesale markets
- There are no theoretical reasons why a broad-based IRM can not be adopted for a generation business unit, although there are some important design considerations:
  - Direct assignment of costs to the generation unit is preferred over allocations wherever possible
  - The design should reflect the fact that wholesale electricity prices and fuel input prices are likely to be determined by competitive market forces and may be significantly beyond the control of the generation owner.
- Targeted incentives designed to increase the production or availability of a unit, group of similar units or an entire portfolio have been implemented.
- Many utilities participate in industry benchmarking studies in an effort to identify opportunities for efficiency improvements.

Evaluation Criteria For OPG IRM Options: Outcome Goals

1. Promote Efficiency: refers to the goal of operating OPG's facilities in an efficient, cost-effective manner, seeking continuous improvement in their operation as well as in centralized support services that are allocated to the nuclear and hydroelectric businesses. These efficiencies are to be enduring and sustainable and contribute to the lowest reasonable price of electricity. Major capital additions should also be accomplished efficiently from both a budgetary and timeliness perspective.

2. Contribute to Lower Electricity Bills: refers to the goal that OPG's nuclear and hydroelectric facilities be available to provide electricity to the Ontario market when such production provides the greatest value to retail consumers and that facilities, such as the Sir Adam Beck PGS that have a degree of operational flexibility, be operated in a manner that contributes to this same goal. Cost-effective expansions of hydroelectric facilities will also contribute to lower electricity bills. Lower nuclear costs allow lower regulated prices for the nuclear facilities, which contribute directly to lower electricity bills by reducing charges to the Global Adjustment.

3. Preserve OPG's Financial Integrity: refers to the goal of maintaining OPG's access to capital markets on reasonable terms, and avoiding risks to OPG's financial wellbeing that might result from its nuclear generation investments and any other extraordinary events.

4. Preserve the Reliability and Safety of OPG's Facilities: refers to the goal of ensuring an adequate supply of electricity for as many hours of the year as possible given the extraordinary contribution of production from OPG's facilities to Ontario's requirements, the imperative that OPG's hydroelectric and nuclear facilities be safely operated, and the goal of minimizing adverse impacts on the environment.

5. Preserve the Value of OPG's Facilities for Future Use: refers to the goal of operating, maintaining, and investing in OPG's hydroelectric and nuclear facilities in a manner that extends their useful life for as long as can be economically achieved and maintains the quality of their performance in the years following the IRM term.

Evaluation Criteria For OPG IRM Options: Implementation Goals

6. Ensure Accountability and Transparency: refers to a goal held by many regulatory authorities and government entities that they conduct their business in a manner that facilitates public review and oversight, subject to any constraints imposed for security purposes.

7. Preclude Unintended Consequences: refers to the potential for IRM approaches to provide an opportunity for gaming the mechanism or otherwise resulting in outcomes that were not anticipated during the design and implementation phases.

8. Ease and Cost of Implementation: refers to the goal of selecting an IRM that relies on information that can be readily (and accurately) compiled such that the resources required to implement the mechanism are relatively insignificant when compared to the potential benefits. Further, the costs of implementing the IRM plan, both with respect to the development of new measurement systems and the regulatory costs of subsequent price adjustment proceedings (relative to the continuation of a CoS approach or alternative IRM approaches), should be considered.

IV. IRM For OPG's Nuclear Facilities

Nuclear IRM Goals

- Consistent with the Memorandum of Agreement (MOA) between OPG and its sole Shareholder, and OPG's corporate objectives, the mission of nuclear operations is to generate clean, safe, low-cost electricity through dependable performance.

- This mission points to objectives in three areas of performance: safety, electricity generation, and cost. Further, OPG has established four cornerstone values: Safety; Reliability; Human Performance; and, Value for Money.

- An IRM for OPG nuclear should aim to improve the performance of its nuclear fleet.

- Ontario consumers will benefit if OPG's nuclear business operates efficiently and at low cost. The lower the price paid to OPG for its nuclear output, the lower the GA, benefiting consumers.

- OPG's nuclear fleet is needed to continue to provide a reliable electricity supply to meet a significant fraction of Ontario's needs. An IRM must not provide incentives for cost efficiencies that can jeopardize continued reliability of service.

- OPG should have incentives to manage the DRP's cost and schedule to achieve efficiencies.

IV. IRM For OPG's Nuclear Facilities (cont.)

OPG Nuclear Initiatives

- Part 2 of the ScottMadden Report described OPG's development of a top-down gap-based business plan to improve its performance. In EB-2010-0008, OPG filed a 2010-2014 Business Plan that incorporated the targets developed in the ScottMadden study.

- The Business Plan developed 30 initiatives in the 4 cornerstone value areas: 6 in Safety, 9 in Reliability, 6 in Human Performance and 9 in Value for Money. Seven of these were identified as Key Initiatives.

- The table below duplicates the table for 2008 and adds the hypothetical performance of the OPG nuclear plants if the OPG achieves the targets in the Business Plan.

	OPG Performance 2008					OPG Hypothetical Performance 2014		
	Top Quartile	Median	Pickering A	Pickering B	Darlington	Pickering A	Pickering B	Darlington
Reliability								
WANO NPI (Index)	96.19	62.46	60.84	60.93	95.67	70.9	81.3	98.80
2-Year Forced Loss Rate (%)	0.68	3.79	37.9	18.19	0.93	4.00	4.00	1.25
2-Year Unit Capability Factor (%)	90.97	84.31	56.6	73.17	91.99	84.3	81.00	93.30
Value for Money								
3-Year Total Generating Costs per MWh ($/Net MWh)	$ 28.66	$ 32.31	$ 92.27	$ 58.68	$ 30.08	$ 70.81	$ 64.80	36.75
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)	$ 18.06	$ 21.28	$ 82.62	$ 50.95	$ 25.10	$ 60.07	$ 52.47	25.82
3-year Fuel Costs per MWh ($/Net MWh)	$ 5.02	$ 5.37	$ 2.64	$ 2.68	$ 2.62	$ 7.45	$ 6.01	5.43

Source: ScottMadden Report, Phase 2

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IV. IRM For OPG's Nuclear Facilities (cont.)

Developing IRM Options for Nuclear Facilities

- Power Advisory could find no examples of IRM applied to a generation-only company, and none designed only for nuclear operations. Power Advisory explored several options, all of which are variants of one of the IRM approaches mentioned earlier: a Price Cap IRM or a targeted IRM.

- Price caps have the advantage that stakeholders in the Ontario market, including customers, distributors, transmitters, and the regulator, now have extensive experience with this form of regulation. This is an overall approach, tying all of the activities of the nuclear business into one IRM scheme.

- The price cap formula is given by
  $P_{t+1} = P_t * (1 + GPI - x + z)$, where
  P_{t+1} is the price in year t + 1, P_t is the price in year t, *GPI* is the expected percentage change in an appropriate price index, *x* his a productivity offset and may include a "stretch" factor, expressed as a percentage; and, *z* is an allowance for any exogenous factors (z-factors) defined as part of the IRM plan, expressed as a percentage impact on prices. All of these variables are key in setting rates. The x factor has the most focus, because it represents the overall potential for efficiency.

- A targeted IRM can address specific aspects of OPG's performance and provide incentives for improvement.

- The options can be assessed against the eight criteria developed in the Report.

- We develop six options, numbered N1 to N6. These options are not necessarily mutually exclusive; some could be combined with or be add-ons to other options.

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IV. IRM For OPG's Nuclear Facilities (cont.)

IRM Options for Nuclear Facilities

- **Option N1. Price Cap with Aggregate Performance Indicator** This option uses the price cap formula given above. It uses statistical and econometric analyses to estimate performance indicators leading to an x-factor. The first step is to estimate total factor productivity (TFP) growth for the industry; the second is to establish the x-factor to be applied to OPG's nuclear facilities. This approach requires both a good estimate of TFP and a reliable benchmarking study to establish OPG's performance level relative to the industry benchmark.

- **Option N2. Price Cap with Future Price Based on Target Achievement**. In effect in this case, the price is computed by the regulator on the assumption that OPG can achieve the targets. For example, if the target is to reduce the forced loss rate (FLR), the output could be calculated as the output produced at an achievable level of productivity improvement. The price is obtained by dividing the revenue requirement by the assumed output. The targets could be based on, or draw from, targets developed by OPG in its business planning processes.

- **Option N3. Price Cap with Initial Price Based on Efficiency Improvements**. In the two previous IRM regimes, it is assumed that the regulator holds a rate hearing for the base year and bases the first-year rates on the cost of service. In this option, the base year rates would assume that targets would be met. The Board acted in this manner in EB-2010-0008 by rejecting OPG's argument that it should reduce its projected output to account for major unforeseen events.

IV. IRM For OPG's Nuclear Facilities (cont.)

IRM Options for Nuclear Facilities

- **Option N4. Specific Performance Targets.** Specific performance targets could be added to the broader price cap mechanism of Options 1 or 3. This mechanism would focus on achievement of a given level of performance with respect to some indicator. It could be a production indicator like total output or UCF or it could target other aspects of service quality. Achievement of the target would produce a specified payment. This option could be used to focus on the Pickering units, which have poor performance metrics.

- **Option N5. IRM for DRP Capital Expenditures**. The DRP will be a major capital project and expenditures would be placed in a deferral account. The Board can review these before they are placed into rate base. The Board has expressed interest in discussing performance incentives. These could have the nature of specific performance targets related to the cost and timing of the DRP.

- **Option N6. Earnings Sharing Mechanism**. Earnings sharing mechanisms mitigate IRM risk for the producer and cost risk for the consumer. If the IRM regime has too severe a negative impact on OPG's overall profitability , and earnings sharing mechanism would restore some of its profitability. The symmetry of the earnings sharing mechanism would benefit consumers by returning some of OPG's excessive profit if the IRM regime allows OPG to earn them.

- **Assessment of Options**: The table on the next page contains Power Advisory's assessment of these six options against the eight criteria developed in Section 3.

IV. IRM For OPG's Nuclear Facilities (cont.)

Assessment of Options

	Efficiency	Lower Bills	Financial	Reliability	Future Use	Transparency	Unintended Consequences	Implementation Ease
N1:Price Cap: aggregates	1	1	2	2.5	4	3	2	5
N2:Price based on specific targets	1	1	2	2.5	2	1	4	4
N3:Price Cap: efficiency	1	1	2	2.5	4	1	3	4
N4:Specific performance targets	2	2.5	2	2.5	4	1	3	3
N5:IRM for DRP	2	1	2	3	2	3	3	3
N6:Earnings sharing mechanism	4	3	3.5	3	3	1	3.5	3

Where:

1 = Positive
2 = Moderately Positive
3 = Neutral
4 = Moderately Negative
5 = Negative

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IV. IRM For OPG's Nuclear Facilities (cont.)

Conclusions

- Overall performance of the OPG nuclear fleet is poor compared to other nuclear operators.
- Some form of IRM should be applied to the nuclear facilities to provide increased incentives for performance improvements.
- If an overall IRM regime is chosen, consideration should be given to adding a mechanism that will provide incentives for improvement on key specific performance metrics, such as UCF or FLR for the Pickering units.

V. IRM For OPG's Hydroelectric Facilities

General IRM Goals

- Ontario will benefit to the extent that OPG's hydroelectric business operates efficiently and its facilities generate as much electricity as they are capable of producing when it is most needed (i.e., during peak periods) while maintaining safe (from the perspective of both OPG's employees and the general public) and environmentally sensitive operations.

- Any incentive to produce electricity should be aligned with likely customer benefits, giving due consideration to the impact on the GA and SBG as costs that are ultimately borne by electricity consumers.

- OPG should be encouraged to explore opportunities for economic additions to the capacity of its prescribed hydroelectric facilities.

- While cost savings are always important, it is essential that OPG continue to adequately maintain and invest necessary capital in its aging hydroelectric facilities to ensure that they remain available as low-cost renewable sources of electricity for as long as possible.

- Although the Board did not find any particular efficiency or O&M cost level concerns during EB-2010-0008, perhaps due to the capital-intensive nature of hydroelectric costs, the potential for IRM in this area is addressed.

Note: These goals are consistent with internal OPG goals and specific performance measures. [PA Report, p. 68-69]

V. IRM For OPG's Hydroelectric Facilities (cont.)

The Current Hydroelectric Incentive Mechanism (HIM)

- In its current form, the HIM encourages OPG to shift production from lower-price to higher-price periods by relying on the Sir Adam Beck PGS:

$$\text{Payment} = MWh_{avg} \times \text{Regulated Rate} + (MWh - MWh_{avg}) \times HOEP$$

- There is sharing between OPG and customers above a capped HIM amount with the capped amount reflected as a reduction in OPG's revenue requirements.

- The strength of the incentive depends on the price differential between peak and off-peak hours as OPG must purchase electricity during off-peak hours to replenish the PGS reservoir. The decision-making calculus is complicated by the fact that OPG's operations will influence the market price.

- There are two complicating factors:

    1) The Global Adjustment will increase as peak period HOEPs are reduced, thus mitigating the benefits from shifting production to peak periods.
    2) OPG is required to maximize pumping during SBG conditions to mitigate adverse impacts.

V. IRM For OPG's Hydroelectric Facilities (cont.)

Specific Hydroelectricity IRM Goals

1. Incent behavior that reduces the total cost of electricity to Ontario consumers, recognizing the contribution to the GA and any other factors in this regard;
2. Consistent with (1), maximize production during periods when electricity prices are highest;
3. Consistent with (1), shift production from off-peak to peak periods when doing so contributes to a lower total cost of electricity to Ontario consumers;
4. Maximize pumping to the Sir Adam Beck PGS when SBG conditions are present and storage isn't full;
5. Maximize availability factors, but not in a manner that degrades future production or reliability;
6. Minimize Equivalent Forced Outage Rate (EFOR) factors, but not in a manner that degrades future production or reliability;
7. Invest in incremental hydroelectric capacity when it is economical to do so; and
8. Sustain the value of OPG's regulated hydroelectric assets, taking actions as necessary to preserve this value for the anticipated remaining life of the assets.

V. IRM For OPG's Hydroelectric Facilities (cont.)

Hydroelectric IRM Options

H1: Extend and/or Modify the Existing HIM: retain the existing incentive but revisit the sharing mechanism as the OPG payment and customer benefits are driven by factors that are largely beyond its control (HOEP and GA).

H2: Shaping the OPG Hydroelectric Payment: use rate design to increase the regulated price during peak periods and decrease it during off-peak hours for all facilities or for the Sir Adam Beck PGS.

H3: Availability and EFOR Incentives: can be combined with other options but only if OPG has the ability to take actions that increase availability during peak periods without adverse performance impacts.

H4: Incentives to Maximize "Other Revenues": provide an opportunity for OPG to share in other revenues from ancillary services.

H5: Price Cap Approach: a traditional price cap approach with an accommodation for large CAPEX projects.

H6: O&M Efficiency Incentive: a narrow incentive focused only on O&M costs.

Service Quality Measures: a public safety measure related to the number of safety incidents

V. IRM For OPG's Hydroelectric Facilities (cont.)

Assessment of Options

	Efficiency	Lower Bills	Financial	Reliability	Future Use	Transparency	Unintended Consequences	Implementation Ease
H1: HIM	1	2	3	3	4	1	2	1
H2: Shaped Payments	2	2	3.5	3	3	4	4	5
H3: Availability & EFOR	1	2	2	3	2	1	2	3.5
H4: Other Revenues	2	2	2	3	3.5	2.5	3.5	1
H5:Price Cap	2	3	2.5	3.5	3.5	3	4	4.5
H6: O&M	2	2	2	3.5	3.5	3	4	3.5

Where:

1 = Positive
2 = Moderately Positive
3 = Neutral
4 = Moderately Negative
5 = Negative

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V. IRM For OPG's Hydroelectric Facilities (cont.)

Conclusions

- Some form of HIM should be retained to preserve market incentives
- Consider Availability or EFOR incentives if OPG has reasonable actions that it can take to improve availability when they have the greatest value
- These options are less cumbersome and achieve the same objectives as shaping the payment
- Consider exempting OPG from payment of the WMSC if it strengthens the HIM incentive
- The current approach to reviewing OPG's actions during SBG conditions is a reasonable alternative to overly complicating the HIM to address this issue
- A price cap is reasonable, particularly if a similar mechanism is adopted for OPG's nuclear operations. The mechanism should accommodate large construction projects.
- Service quality measures do not seem to be necessary at this time

VI. Conclusions and Recommendations

General Conclusions

- IRM should be applied to OPG's regulated nuclear and hydroelectric businesses.
- The benchmarking analyses that have been performed indicate that OPG's nuclear units have performed poorly, and dramatically so with respect to the Pickering units.
- The IRM should include all nuclear units in order to focus on efficiency improvements across the fleet and to avoid any incentive to shift costs among units.
- Further, the ScottMadden benchmarking results indicate that improvements in this performance can be achieved by OPG actions and are not entirely beyond the control of OPG, although certain challenges related to the condition of the units have been acknowledged.
- With respect to the hydroelectric business, the existing HIM has been working fairly well although there are concerns as to whether more could be done to mitigate the potential adverse consequences that result from SBG conditions.
- These conditions are largely beyond OPG's control and Power Advisory has not identified an improvement to the mechanism that would address this issue in a straightforward manner.
- Hydroelectric cost efficiencies have not been a major concern although a price cap mechanism may be successful in generating incremental O&MA efficiencies.

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VI. Conclusions and Recommendations (cont.)

Recommendations – Nuclear Operations

1. Establish the cast-off prices based on the cost-of-service, reflecting a modest increase in the Unit Capability Factor (UCF) of the Pickering units.

2. Adopt price determination method Option N2, with OM&A and other cost efficiencies and increased production reflected in the calculation of prices in years 2 through the end of the IRM term (assumed to be at least four years in total).

3. Consider an additional incremental targeted incentive(s) directed toward continuous improvements in UCF and Forced Loss Rates (FLRs) at the Pickering and Darlington plants, considered as separate plants and thus potentially resulting in a reward for progress made in one plant being partially offset by a penalty for a degradation of performance at the other plant.

4. Establish a variance account for the DRP, with an incentive mechanism that is aligned with any cost and completion date incentives that are in place for the Engineering, Procurement and Construction (EPC) contractor and other key vendors.

5. Provide for timely recovery of existing fixed costs for Darlington units while they are out of service; fixed costs attributable to the refurbishment would be placed in a deferral account for recovery after the units return to service.

Recommendations – Hydroelectric Operations

6. Establish a traditional price cap mechanism (Option H5) with a modest "x-factor" that encourages cost efficiencies without threatening the continued future availability of OPG's prescribed hydroelectric facilities;

7. Retain the HIM (Option H1), with incentive payments that are proportionate to the benefits that are reflected in customer bills, thus retaining the existing sharing above a capped amount approach; and

8. Continue the practice of after-the-fact reviews of OPG's performance during SBG conditions, making adjustments to a variance account if it determines that OPG could have reasonably taken actions to mitigate the impact of SBG conditions.

VI. Conclusions and Recommendations (cont.)

Recommendations – Financial Performance

9. Implement an earnings-sharing mechanism (Option N6) that applies to the entirety of OPG's prescribed facility operations with a relatively broad deadband (e.g., plus or minus 250 basis points) around the authorized return and symmetrical sharing above and below the deadband;

10. Incorporate a z-factor to account for the potential for the impact of extraordinary exogenous events that are beyond the control of OPG management and were not foreseen when the plan was implemented; and

11. Implement an off-ramp that terminates the IRM should OPG's financial performance be so impaired as to threaten OPG's ability to attract capital to finance its construction budget on reasonable terms.

9. Implement management and employee compensation-based incentives that align the interests of OPG's employees with any new incentive structure.

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