ONTARIO ENERGY BOARD

IN THE MATTER OF the *Electricity Act*, 1998, S.O. 1998, c. 15, Schedule A;

AND IN THE MATTER OF an Application made collectively by entities that have renewable energy supply procurement contracts with the Ontario Power Authority in respect of wind generation facilities for an Order revoking certain amendments to the market rules and referring the amendments back to the Independent Electricity System Operator for further consideration.

EVIDENCE OF THE INDEPENDENT ELECTRICITY SYSTEM OPERATOR (IESO)

Overview

1. The mandate of the IESO is to reliably and efficiently operate the IESO-controlled grid and the IESO-administered market. In order to do so, the IESO must have the tools necessary to constantly match demand and supply while at the same time operating within the transmission and other constraints on the system and meeting reliability standards.

2. Ontario's electricity system has changed dramatically over the past several years and will continue to see significant change in the years ahead. The most significant change results from the increase in renewable generation, consisting overwhelmingly of wind. By the end of May 2014, there will be approximately 8,200 MWs of wind and solar generation connected to Ontario's electricity system, representing close to 50% of the installed baseload capacity. By 2018, that number will rise to over 10,000 MWs.

3. The IESO now faces three issues as a result of increased renewables and other factors. First, there is the significant problem of surplus baseload generation (SBG). Without better tools, managing SBG will cost the Ontario electricity system hundreds of millions of dollars in 2014 alone.

4. Second, wind generation is highly variable. This variability presents operating challenges which, if not met effectively, impose costs as well as affect reliability.

5. Third, sub-optimal management of SBG results in increased use of fossil fuels and unnecessary CO_2 emissions.

6. At present, renewable generators are not integrated into the IESO's primary management tool, the 5-minute security constrained dispatch and, because of the nature of their contracts with the Ontario Power Authority (OPA), are not responsive to

market prices. All other mainline generators - nuclear, gas and hydroelectric resources – are included in 5-minute dispatch and respond to market prices.

7. It is now necessary to include all mainline generation, including renewables, into the dispatch fleet. The new Market Rules under review in this proceeding do that by making renewables subject to 5-minute dispatch and by setting floor prices for renewable generators and flexible nuclear (Flexible Nuclear) generation which will permit appropriate operation of the dispatch system.

8. The new Market Rules will result in hundreds of millions of dollars of system cost savings, enable the IESO to better manage variability and ensure system reliability, and significantly reduce CO_2 emissions in Ontario.

9. The new Market Rules result in renewable generators being subject to the same dispatch mechanism as all other like generators and result in renewable generators joining all other mainline generators in being responsive to market prices.

10. The new Market Rules also apply to Flexible Nuclear, which includes more Flexible Nuclear generation recently introduced by Bruce Nuclear. By manoeuvring Flexible Nuclear in advance of renewables, which the new Market Rules provide for, significantly less renewable generation will be dispatched than would otherwise have been the case.

11. There is no doubt that the IESO requires new tools to manage the issues it is facing. There are no alternatives to the new Market Rules which achieve the necessary objectives.

12. The Applicants in this proceeding have asserted that the new Market Rules are inconsistent with the purposes set out in section 1 of the *Electricity Act, 1998,* S.O. 1998, c. 15, Schedule A (*Electricity Act*); are inconsistent with government policy regarding renewable generation and unduly discriminate against renewable generators.

13. The IESO has listened carefully to the Applicants' concerns, but believes:

    a. the Applicants improperly rely on only those purposes which promote renewable resources and unrestricted access to the grid. Further, other purpose set out in the *Electricity Act* necessitate consideration of the requirement for efficient use of electricity in a manner consistent with the policies of the Government of Ontario, ensuring reliability of electricity supply, and to protect the interests of consumers with respect to prices. The IESO believes that a balanced reading of section 1 of the *Electricity Act* strongly supports the implementation of the new Market Rules;

    b. the Government of Ontario is well aware of, and clearly agrees with the need for, the new Market Rules; and

    c. the new Market Rules treat renewable generators fairly and put them on the same footing as other baseload generators – subject to dispatch and responsive to market prices which will enable appropriate dispatch.

14. Given the growth of renewable generation in Ontario, and its significant contribution to the problem of SBG and increased variability, it is neither fair, nor feasible, to continue

to exempt renewable generation from the dispatch regime to which other generators are subject. The costs to the electricity system, and to ratepayers, plus the operational challenges and the adverse environmental impacts are, in the estimation of the IESO, unacceptable.

15. The essence of the Applicants' complaint is that the new Market Rules have a cost to them in the form of lost revenues under their contracts with the OPA. The IESO is not a party to those contracts and has not designed Market Rules or operated the electricity system with regard to the impact of the Market Rules on market participants' contract revenues. To the extent that the Applicants are of the view that these impacts are either contrary to the terms of their contracts or contrary to representations made to them by the government, the IESO believes that their remedy, if any, is to be found in the negotiations they are presently engaged in with the OPA.

Please describe the role of the IESO

16. The IESO is established pursuant to the *Electricity Act*. The mandate of the IESO, inter alia, is to direct the operation and maintain the reliability of the IESO-controlled grid and to operate the IESO-administered markets. The IESO does so with a view to achieving the efficient and reliable operation of the power system.

Please describe the operating fundamentals of the IESO-controlled grid

17. Electricity is a product that has to be consumed at the same instant as it is manufactured. This means that the amount being produced has to be constantly adjusted in real time to match the demand. While some generators can more easily ramp their output up and down, others are not well suited to do so. In transporting electricity, there are strict limits on the flows that can be reliably transported between locations on the transmission system, meaning that the available generation in one part of the system may not be deliverable to meet the demand in another area. The electricity system operator must use the system assets available to balance supply and demand, within these constraints, in the most reliable and efficient manner.

18. Ensuring reliable supply to consumers also requires the system operator to be prepared to respond to contingencies on the system such as the automatic disconnection of equipment, transmission and/or generation. When these events occur the operator calls on operating reserves to ensure the supply and demand balance continues while simultaneously respecting the system capabilities.

19. The essence of reliable operations is ensuring a continuous supply for consumers while respecting the limitations of the grid. This means always adjusting to produce/consume just the right amount of power from the available generation/load (adequacy), taking into account that it has to be instantaneously delivered to just the right places within the limits of the available transmission facilities (security).

20. The essence of efficient operations is making the best use of available resources and transmission to supply consumers reliably in the most economic way possible.

21. Overlaid on all of this is the fact that as a system operator, the IESO is required to maintain strict adherence to the reliability standards established by the North American

Electric Reliability Corporation (NERC) and the Northeast Power Coordinating Council (NPCC) in order to ensure the reliable operation of not only the Ontario power system, but all of the power systems to which Ontario is connected.

Power System Characteristics and Maintenance

22. Efficient operation of the electricity market requires that the demand and reserve requirements of the system be met with the lowest cost resources, given the bids and offers submitted and applicable constraints on the IESO-controlled grid. The dual goals of market efficiency and system reliability require the solution of a constrained optimization problem: minimizing the cost of generation and operating reserves, while always meeting required demand and security constraints.

23. In Ontario's electricity market there are two models - the constrained and the unconstrained. Each model produces a schedule for each facility based on a set of constraints. Because there are two different models with different constraints, there are two schedules - the constrained and the unconstrained, and these schedules can differ for any resource at any time.

24. The unconstrained model is a simple model whose primary purpose is twofold - to determine the uniform clearing prices for energy and operating reserves and to establish for each resource an unconstrained schedule. It ignores many key physical constraints and represents the transmission network as one perfect conductor to which all load, generation and interties to neighbouring markets are attached. Network constraints (such as the ability to transfer power from one area of the Province to another area) within Ontario are ignored and all supply offers and demand bids are assumed to be located at the same location.

25. On the other hand, the constrained model is used to determine how much energy is required from each resource to meet demand and operating reserve requirements. The constrained model recognizes physical constraints such as transmission limits, the distributed nature of transmission losses, real generator ramping constraints, and other conditions on the power system. The constrained runs are used to produce physical dispatches that vary for each resource in the network.

26. It is important to note that both the constrained and unconstrained models determine the lowest cost solution to meet the demand, each using somewhat different sets of constraints.

27. The IESO currently commits and dispatches resources used to maintain the balance in Ontario's electricity system in three timeframes:

    a. **Operational Scheduling and Unit Commitment:** Unit commitment addresses the scheduling and commitment of certain generation to meet expected energy demand, reserve, and interchange requirements over a period spanning several hours to a day. In this context, generating units may require several hours to start up and reach specified operating levels. This commitment process begins day-ahead and completes the hour prior to the dispatch hour. As a result, the appropriate level of economic unit commitment sets the foundation for the economic and reliable operation of the system in real-time.

b. **Load Following and Dispatch:** The load-following timeframe covers the 5-minute interval in which generating units are economically dispatched, subject to operational and cost constraints, to follow forecasted variations in demand from interval to interval. This load-following is typically provided by dispatching generating units that are already online, or quick-starting units that can respond on short notice, or by starting generating units according to a predetermined commitment schedule described above. In the Ontario electricity markets, security constrained economic dispatch signals are sent on regular 5-minute intervals.

c. **Regulation:** Continuously responding to the second-to-second fluctuations in the supply and demand balance is regulation control, also known as frequency control. In the case of generators, signals are sent by an automatic generation control (AGC) system to one or more contracted facilities to increase or decrease output to match the change in load. Changes in demand during the regulation timeframe are generally not predicted or scheduled in advance and must be followed by online regulation capacity that is already synchronized to the grid.

How is Ontario's electricity system changing?

28. Investments that are either now underway or are contractually committed are introducing high penetrations of new technologies, with significantly different operating characteristics, into the Ontario power system. The investments in green energy have increased the amount of baseload resources, predominately with wind resources which are highly variable. This is dramatically altering the operational characteristics of the domestic power system. At the same time, the familiar reliance on flexible coal-fired units is being lost, new and existing facilities are being called on to meet new operating challenges.

29. Wind generation has become a mainline resource on the Ontario power system. Since March 2006, over 2000 MW of wind generation has been added to the Ontario electricity system, of which more than 1700 MW is directly connected to the IESO-controlled grid:

- Renewable Energy Supply Contracts (RES) I: 305 MW of wind generation
- RES II: 778 MW of wind generation
- RES III: 425 MW of wind generation
- Feed-in Tariff (FIT): 214 MW of wind generation

As indicated in the table below, by the end of 2014, the total wind and solar generation connected to the transmission and distribution networks in Ontario is expected to reach approximately 8,200 MW, representing close to 50% of the installed baseload capacity. By 2018, renewable generation on the system is expected to rise to over 10,000MW.

	Jan 2013	Jan 2014	Jan 2015	Jan 2016	Jan 2017	Jan 2018
Transmission Wind and Solar	1723	2186	5531	6831	7161	7961
Wind	1723	2186	5151	6351	6581	7381
Solar	0	0	380	480	580	580
Embedded Wind and Solar	962	1870	2680	2815	2915	3015
Wind	338	508	705	740	740	740
Solar	624	1362	1975	2075	2175	2275
Total Wind and Solar	**2685**	**4056**	**8211**	**9646**	**10076**	**10976**

30. An additional change is the increasing proportion of generation connecting to the distribution system. This embedded generation is beyond the control of the IESO.

31. Maintaining the reliable and efficient operation of the grid and continuing to improve the electricity system means making the changes required by the fundamentally different asset set that is now coming into service.

32. Ensuring reliable and efficient operations, while delivering value from Ontario's investment in transforming the provincial power system, requires action in three specific areas:

    a. managing SBG at the provincial level;

    b. managing SBG at the regional level; and

    c. addressing operational needs such as ramping requirements, forecasting of variable resources and co-ordination with distribution connected generation.

What is SBG and what issues does it raise for the IESO?

33. Baseload generation consists of generation whose fuel will be lost if generation is reduced or interrupted (e.g. wind, hydroelectric without storage, solar, nuclear) plus any generation that must stay on line for technical or regulatory reasons.

34. SBG occurs when electricity production from baseload facilities is greater than Ontario demand. Currently, beyond export transactions undertaken by market participants, there are limited options other than to lower output from baseload generators in order to maintain the balance between supply and demand. SBG, in addition to impacting reliability, imposes significant costs on the system and the environment. Inefficient operation results in higher-than-optimal costs. Non-optimized dispatch can also result in the excessive operation of fossil fuel resources.

35. Since market opening, most of the generation on the IESO-controlled grid was actively controlled through the 5-minute economic security constrained economic dispatch which takes full advantage of the operational flexibility available from resources while respecting their technical operating characteristics. The mainline generators included in the 5-minute dispatch today are nuclear, gas, coal and hydro-electric resources, but not wind and solar.

36. By 2009, Ontario had 1,100MW of wind online from RES I and II wind generation and over 400MW committed as a result of RES III. The FIT program had also been introduced as a result of the *Green Energy Act, 2009*. It was clear that the power system would undergo a major transformation and the associated operational issues had to be addressed.

37. At the same time, the impacts of the recession resulted in a significant drop in demand for electricity, which has persisted. On the cusp of the continent's biggest investment in variable renewable generation through Ontario's FIT program and with no significant load growth expected, the concerns for managing the system efficiently, reliably and in an environmentally prudent manner necessitated changes to the way the system is operated.

What tools does the IESO presently have at its disposal to manage SBG?

38. Export trades through the market can help manage some SBG conditions. When exports are not sufficient and/or when the SBG condition occurs in a local region, without export capability, the IESO is required to reduce generation to balance supply and demand. As discussed below, there are significant risks that SBG cannot be managed through exports. In real time, the IESO will cut imports to the extent possible.

39. Under current practices, if significant SBG is forecasted days in advance, the IESO will request the OEFC, the holder of the NUG contracts, to determine if the NUGs can be curtailed in advance.

40. Wind and solar generators are not actively dispatched in real time. The IESO will dispatch hydro electrical plants, which may result in the spilling of water, and/or institute a nuclear unit shutdown or reduction in output. Both of these options are coarse solutions in that they require a large MW manoeuvre, often extending beyond a sporadic and changing surplus situation.

41. The following two graphs demonstrate the consequences of addressing SBG by curtailing nuclear production. Because nuclear units cannot regularly adjust their output and must be reduced in coarse blocks, there is inevitably over curtailment, shown as the blue shaded area on the graph below. As an example, in the first graph, hydroelectric generation is used to fill in the energy needed to meet the load when nuclear is over curtailed. Using that water overnight means it may no longer be available as normal for generation over the peak period later in the day. Without the water that was used to run the hydroelectric generation overnight, additional gas generation must be run to meet the peak periods, as illustrated in the yellow shaded areas. This situation is exacerbated when, as shown in the second graph, a nuclear unit is required to be shutdown to manage a large SBG event.

Figure 1:

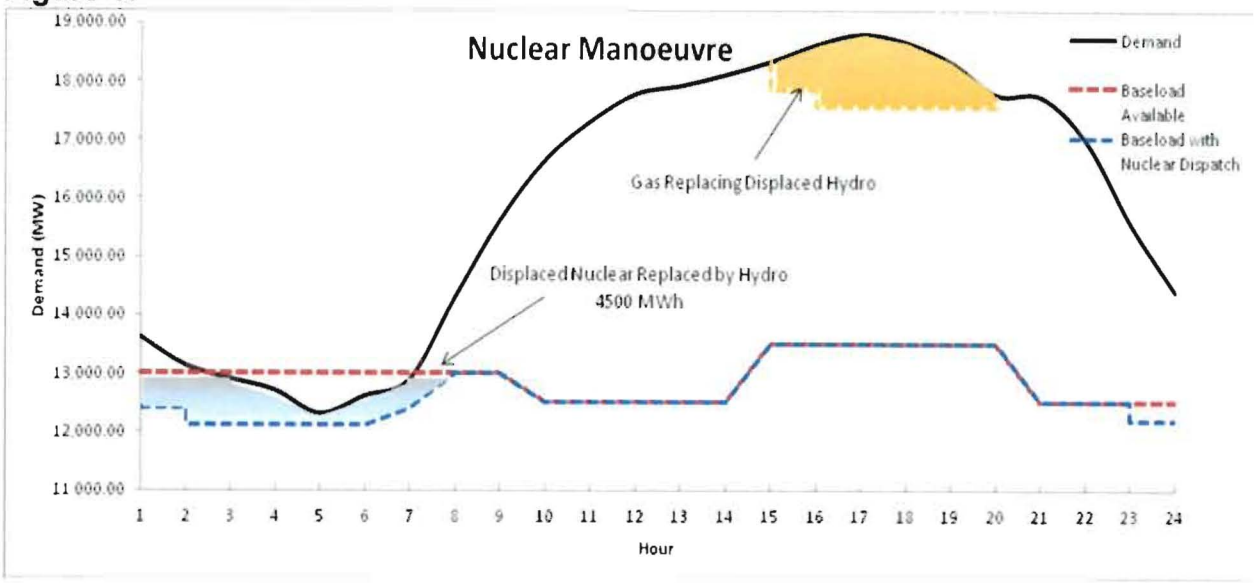
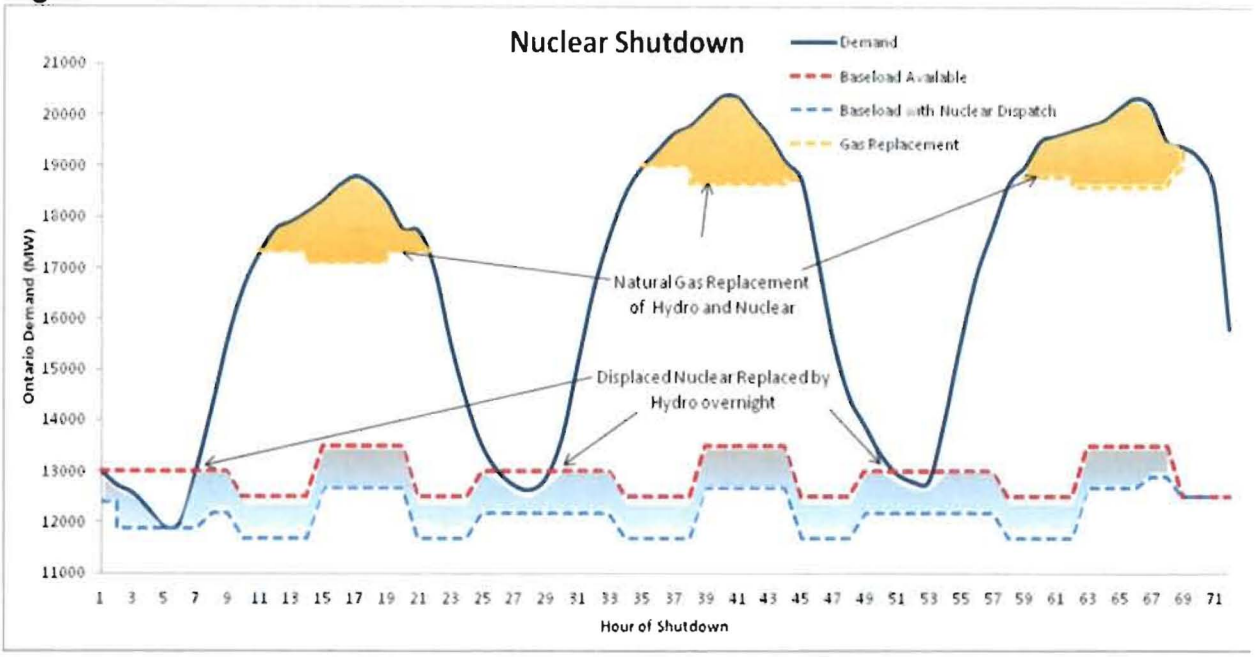
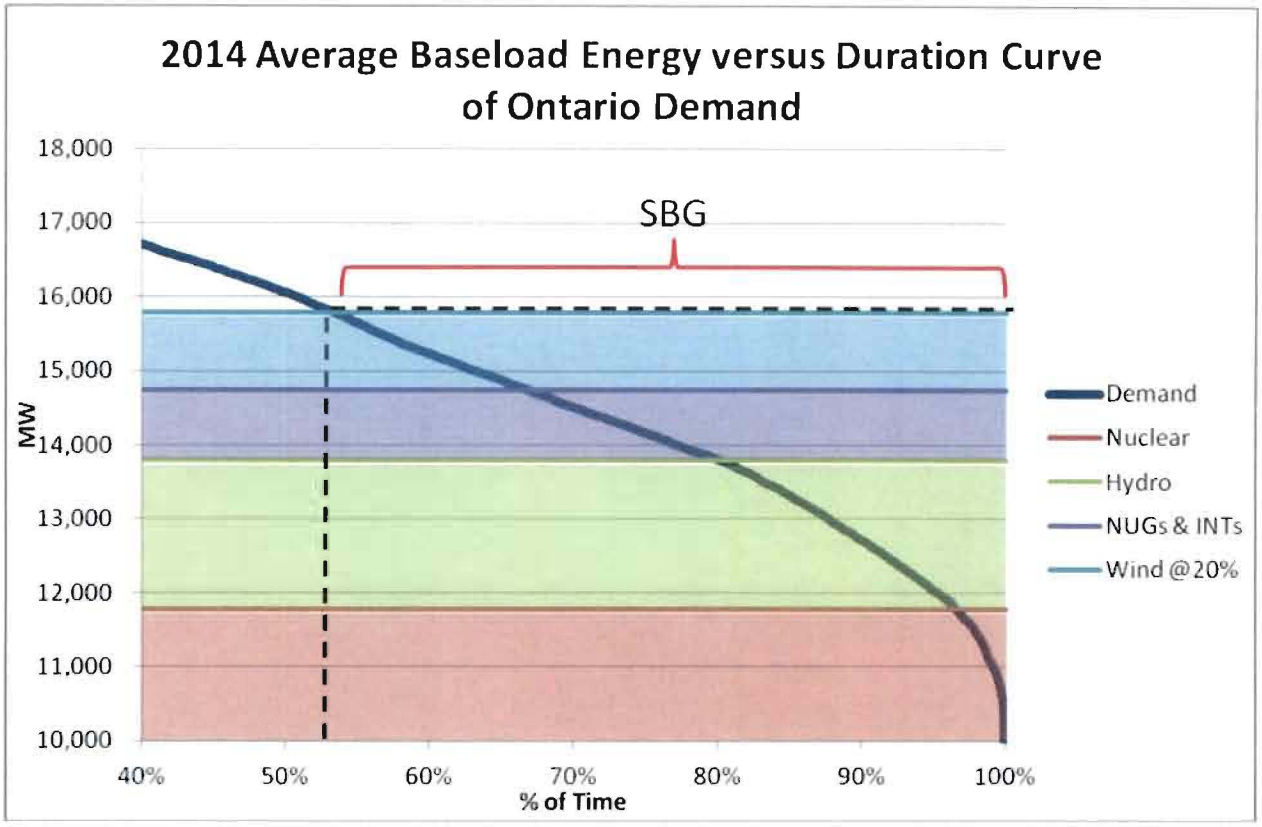


Figure 2:



42. In both cases the result is a clean and inexpensive fuel being replaced by a much more expensive and carbon emitting fuel. Dispatching the generation fleet to match the black line would be the more efficient and environmentally friendly way to operate the system.

What is the IESO's forecast of SBG?



43. The chart above illustrates our best forecast of potential global surplus at the end of 2014. Any time the total stacked generation is above the demand curve Ontario would be exposed to a global surplus situation.

44. The demand is shown as a duration curve of hourly demand forecast. As illustrated in this graph, the demand is expected to be above the average amount of baseload generation 54% of the time. This means that the IESO would be in a global surplus situation 46% of the time in 2014 given the average output of these baseload resources with the assumptions noted below.

45. The generation, other than with respect to wind, is represented by the average output expected in 2014. The data accounts for planned outages and derates to all units. The wind is shown at a value which represents a 20% capacity factor on the amount of installed wind expected at the end of 2014.

46. We have seen on occasion wind output in excess of 95% of capacity. If wind were to operate at an average capacity factor of 50%, at the end of 2014 the exposure to SBG would exist 69% of the time.

47. Exposure to SBG occurs when high wind output coincides with lower demands. A 50% wind output would not be a concern at peak demand times. However, output of wind, as noted, is highly variable. A 50% output has occurred 1936 hours in the last 12 months (22%), predominantly in the lower demand periods

What are the costs of managing SBG without the new Market Rules

48. In January, 2012, the IESO estimated that without better tools to manage SBG, the economic and environmental costs to Ontario would be significant and would increase over time:

Year	Replacement Costs	CO_2 Emissions
2012	$126M	1.1Mt
2013	$251M	2.2Mt
2014	$330M	3.0Mt
2015	$422M	4.3Mt

Is local surplus also a problem?

49. Whereas global surplus concerns the supply and demand balance across the province, local surplus occurs within a smaller portion of the grid bound by a restrictive transmission interface(s).

50. Not all of the tools available to address global surplus are available to manage local surplus. For example, surplus issues in the northwest cannot be addressed by maneuvering nuclear facilities in the southwest.

51. Additionally, Ontario has made investment decisions knowing that maximum output from renewable generation will at times exceed available local transmission capacity. Aside from cost considerations, this requires the operator to have adequate tools to manage dispatch when renewables output exceeds the local transmission capacity.

52. The IESO has not attempted to quantify costs associated with local surplus, although such costs undoubtedly exist. Given the many variables and uncertainties, a useful estimate is not feasible.

What are the operational challenges resulting from increasing variable generation?

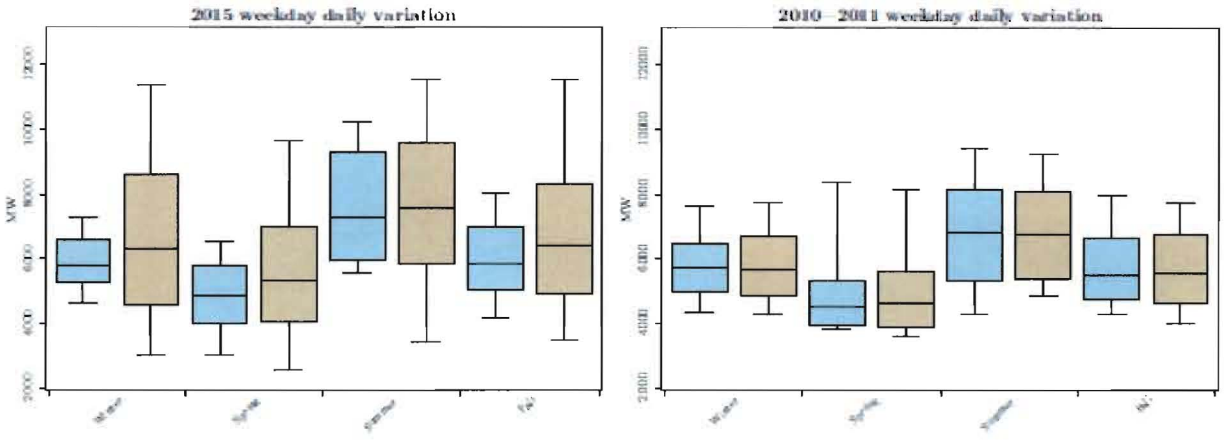
53. With output governed by ambient environmental conditions, wind and solar generation output is by definition 'variable'. Its output changes with every shift in the winds or as every cloud passes by. The system operator needs to incorporate this variability into the planning and operation of the grid. The increased variability of renewable generation requires increased system flexibility to react to and incorporate output changes. However, with the retirement of coal, the system has been losing flexibility.

54. Variability from the renewable fleet stresses the system and places a greater burden on <u>all</u> resources to accommodate regular and sometimes extreme fluctuation in output. Studies conducted by the University of Toronto confirmed that the variability to be faced by the IESO in operating the power system will increase dramatically with the increase in variable generation. As illustrated below, the combined variation of load and wind (shown by the beige box-whisker plots) in 2015 will be much greater than for load only (shown by the blue plots). The same pattern is apparent for variation in ramp requirements; variability in ramp requirements increases substantially with the increase in wind generation in 2015. Additionally, the combined variability that will need to be

managed with Ontario's new supply mix in 2015 far exceeds that experienced in 2010-2011.

55. The top and bottom of the boxes represent the 90th and 10th percentile values respectively. The "whiskers" extending above and below the boxes show the full range of variability.

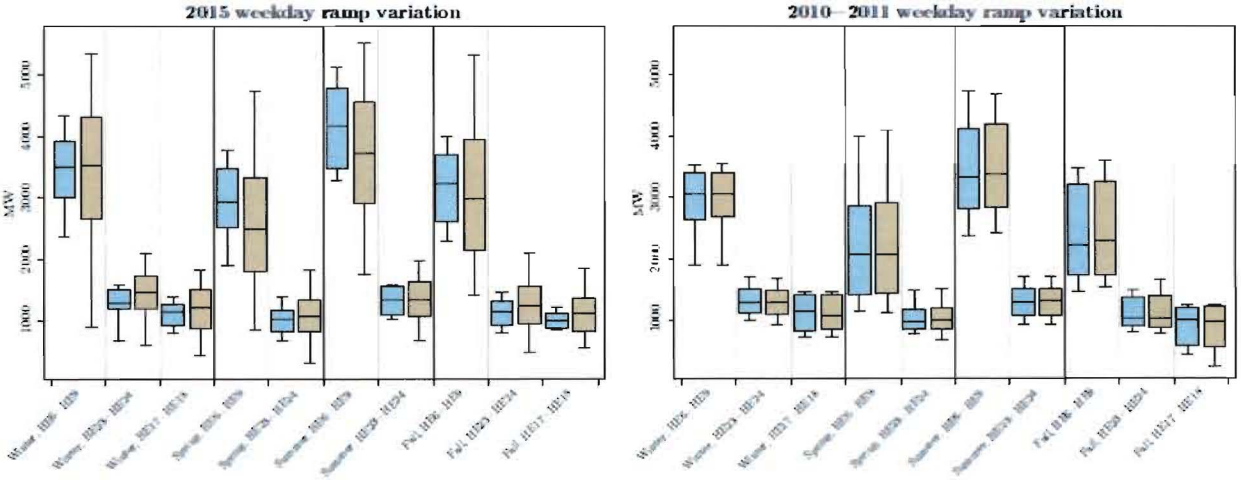
2015 Weekday Daily Load Variation (load only *(blue)* and load net of wind *(beige)* with 2010 data for comparison



(a) 2015 weekday daily variation, split by season

(b) 2010-2011 weekday daily variation, split by season

2015 Weekday Ramp Variation (load only *(blue)* and load net of wind *(beige)* with 2010 data for comparison



(a) 2015 weekday ramp variations, split by season

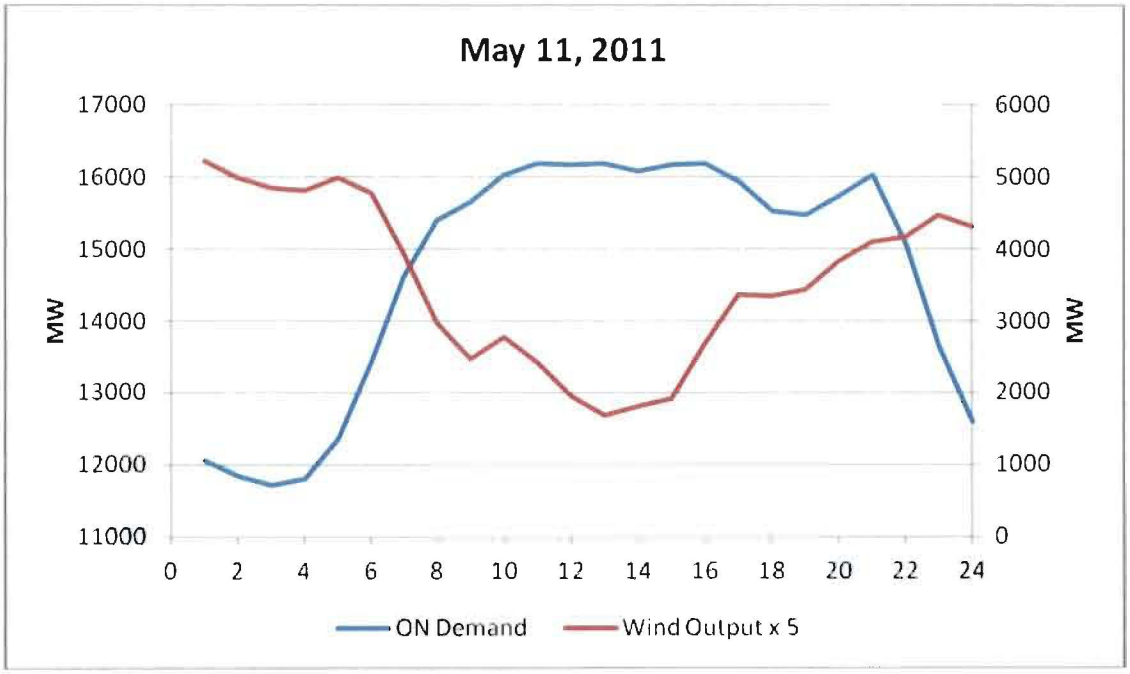
(b) 2010-2011 weekday ramp variations, split by season

56. As the system operator, the IESO needs to address not just the averages across the system, but also the high and low extremes that can be experienced at any time. The

existing fleet of wind resources (predominately RES) have seen outputs at less than 1% to more than 95% capacity including rapid changes in output between the extremes.

57. As shown above, the increased variability also impacts ramping requirements. While good progress is being made on wind forecasting, which will help predict the variability of the resource, ramping requirements are an example of the growing operational issues that will need to be addressed to support reliable and efficient operations, and to increase the value delivered from Ontario's renewables investment.

58. As illustrated in the example below, it is not unusual for the wind to fall off in the morning at the same time as the morning load picks up – adding substantially to the need to increase output required from other generation as the wind falls off. The following graph shows actual demand data from May 11, 2011, with actual wind output for that day scaled to the equivalent output from the wind generation expected to be in-service by 2016.



59. In this example, the increase in demand that the system operator faces over the morning is over 4,000MW – the blue line. At the same time the wind output is falling off by about 3,000MW – for a total change of 7,000MW. On line resources may not have the ramping capability to manage this increased variability and in order to manage this scenario, the operator needs to be able to proactively dispatch both wind and the other resources on the system.

60. As a further example, on May 27, 2012 the wind output changed 500MW over less than 30 minutes. Scaled to an expected 8100 MW wind fleet, this would mean a change in

output of over 2400 MW. Again, with this level of volatility, reliable operation depends on proactive management of the wind fleet.

61. Wind and solar investment is expected to exceed 10,000MW in 2018. Of this amount, about 3000 MW is expected to be connected to the distribution system and therefore beyond operational control by the IESO. The variability in these embedded renewable resources must also be managed with the resources that are dispatched by the IESO.

What is an intermittent generator and why are the existing rules applicable to them inadequate?

62. As defined in the Market Rules, an "*intermittent generator* means a *generation* facility located within the IESO control area that generates on an intermittent basis as a result of factors beyond the control of the *generator*". Wind generators are currently classified as intermittent generators in the IESO-administered market because the variable nature of their fuel source – wind – is beyond their control. While the generator may not be able to control the wind, output is otherwise highly controllable.

63. The vast majority of intermittent generators currently registered as market participants with the IESO are wind and solar generation, totalling approximately 90% of the total MWs.

64. Intermittent generators, like any other generators participating in the IESO-administered markets, are required to submit "dispatch data" which is defined as "the *offer, bids, self-schedules* and estimates of *intermittent generation* required to be submitted to the *IESO* in accordance with Chapter 7 and used by the IESO to determine physical operations and physical *market prices*."

65. For an intermittent generator, dispatch data also includes the specification of a price, in $/MWh, at and below which the registered market participant reasonably expects to reduce its energy output to zero (Ch 7, sec 3.4.4A).

66. Prior to the actual hour of operation, the IESO uses dispatch data to create a schedule called the pre-dispatch schedule which forms the basis for many operational decisions such as finalizing unit commitment, schedules for imports/exports and determining the approximate generation level of other generators in the province.

67. When an intermittent generator submits its dispatch data, it is not awaiting dispatch signals from the IESO, but it is informing the IESO of its expected generation in a given hour, provided that the market price is above their submitted price. As noted above, under the Market Rules the price submitted with its dispatch data identifies the point at which the generator reasonably expects to reduce its output to 0 MW.

68. When the price in the pre-dispatch is below the price submitted by the intermittent generator, the IESO expects, consistent with its submission, that the generator will reduce its output to zero if the price in real time is also below their offer price, and therefore the intermittent generator will not be scheduled to generate in pre-dispatch. If the intermittent generator is not scheduled in pre-dispatch but subsequently generates in real time, IESO system operators may have to quickly and without warning direct some other generation to reduce output in order to avoid over generation, violating

transmission limits or other operational concerns. This unforeseen circumstance can cause significant disruption to both the system and generators.

69. As the RES generators came into service, many, if not all, were offering minus $1 but were not reducing their output when that price was indicated. This was causing significant disruption in the operation of the system. While reducing the offer price to minus $2,000, as permitted for intermittent generators, would deal with the problem of not complying with pre-dispatch offers, it essentially permits intermittent generators to avoid economic dispatch entirely.

70. The RES generators are able to behave in this way because of the structure of their contracts with the OPA. The RES generators receive the contracted rate of payment from the OPA for all energy produced. The RES generators do not settle with the IESO;[1] settlement with respect to energy from the RES generators occurs between the IESO and the OPA. So, for example, when there is a clearing price of minus $10, the OPA pays the IESO $10 for each MWh produced by the RES generator, and in addition pays the full contract rate to the RES generator. The OPA then passes on both of these costs to the consumer through the Global Adjustment. Since the OPA/ratepayer pays the $10 plus the contract payment, the RES generator is insulated from the market price and is incented to generate at all times regardless of its marginal cost or the market price.

What is Stakeholder Engagement-91 (SE-91)?

71. Even before significant quantities of FIT resources were being contracted, the IESO recognized that its tools and rules were inadequate to support efficient and reliable operations in the face of local and global surpluses. With that in mind, the IESO created SE-91. SE-91 is an open stakeholder consultation in which all feedback and communication is published and input is considered during the IESO's decision and rule making process.

72. SE-91 focused on creating solutions to manage the 3 key concerns associated with increasing quantities of variable generation: Global surplus, local surplus and operational issues such as ramping.

73. The IESO's report *Integrating Variable Generation in Ontario* consolidated the IESO's analysis of the impacts of the changing electricity system and was an impetus for undertaking the SE-91 process. It demonstrated that consistent with growing experience in other jurisdictions Ontario needed to have all mainline resources operate actively in the market; i.e. to be dispatchable. This included those resources which had been expected to operate passively. Operation of those resources as intermittents was no longer feasible if the IESO was to achieve efficient and reliable operations.

74. SE-91 ultimately resulted in the Market Rules which are the subject of this proceeding.

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[1] The OPA is the metered market participant for all RES except the Enbridge Underwood facility. The settlement arrangements between the IESO and the Enbridge Underwood facility, however, produce the same outcome.

What is Flexible Nuclear Generation?

75. Prior to the spring of 2012, the SE-91 discussions around dispatch were primarily focussed on renewable generation. As a practical matter, given then existing limitations on nuclear facilities, it was not expected that SE-91 would propose nuclear shutdowns as a practical means of managing SBG.

76. However in the spring of 2012, Bruce Power advised the IESO that to assist in managing SBG it was increasing its capability to manoeuvre its nuclear units. This Flexible Nuclear capability would give the IESO additional flexibility which, when available, would significantly reduce the potential dispatch of wind. This flexibility is achieved by diverting a proportion of the steam produced by the reactor away from the generator through Condenser Steam Discharge Valves (CSDVs), and discharging that heat into the lake.

77. Bruce Power has stated that they will have the ability to manoeuvre up to a combined 2,400 MW when all Bruce A and B units are in operation (~300MW for each of 8 units). The exact amount available will vary from time to time based on prevailing operational, technical and regulatory restrictions and the IESO expects that only some portion of the 2400 MW will be available at any particular time. At this point the IESO does not have the operating experience to be confident of the amount which will be available on an ongoing basis – that will be dependent on demonstrated predictable performance in light of significant environmental constraints and operating protocols.

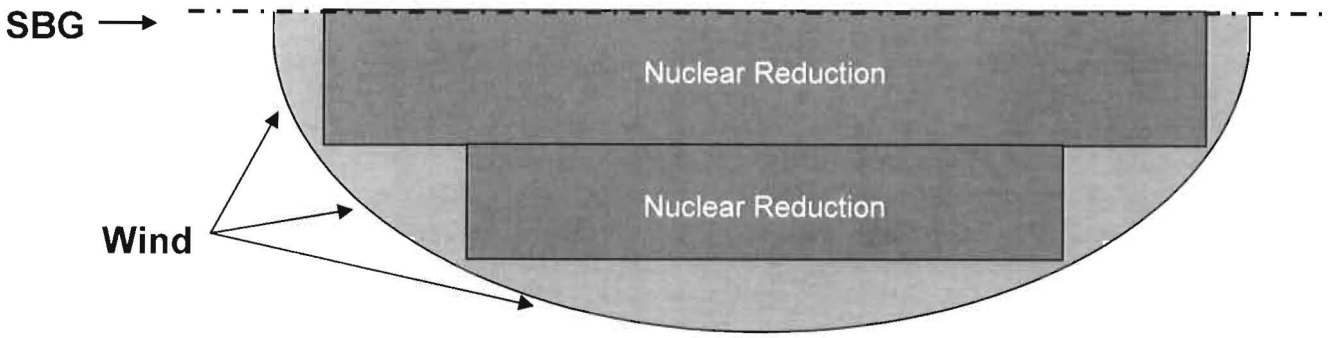
78. For example, all maneuvering is dependent on the plant meeting regulatory and environmental restrictions such as those under the Thermal Effluent Environmental Program (TEEP). When a nuclear unit reduces its output through CSDVs, it increases the amount of waste heat that must be cooled through the use of cooling water from the lake. This water, called thermal effluent, is then returned to the lake at a higher temperature. Thermal effluent is subject to Canadian and provincial laws and regulations (e.g. under the *Fisheries Act*) and can severely impact the amount of maneuvering available at any one time.

79. Once Bruce Power advised the IESO of their increased capability to manoeuvre their units, Flexible Nuclear was incorporated into SE-91.

How Can Flexible Nuclear and Variable Generation Work Together?

80. Under the new dispatch and floor price rules, Flexible Nuclear, in combination with wind dispatch, can be a particularly effective method of addressing SBG. It allows for greater use of nuclear assets to manage SBG. Not only can it assist in managing SBG, but it also results in significantly less recourse to variable generation. This cooperative capability can be used in addressing SBG conditions, as detailed below:

Economic Dispatch Outcome



81. As illustrated, anticipating a period of SBG, CSDVs would be operated to reduce the output from nuclear generation. In this illustration two units could be reduced without overcurtailing during the SBG period.

82. Other resources (including wind) will fill in the differences based on 5-minute economic dispatch.

83. The IESO has estimated the costs of not having better tools to manage SBG, assuming Flexible Nuclear is in place. Depending on the actual availability of Flexible Nuclear in real time, the savings from integrating variable generation into the 5-minute dispatch will range from, $70 million to $200 million in 2014 alone.

Please describe, in general terms, what the amendments will do.

84. For the reasons outlined above, the IESO needs, and these Market Rules provide, the capability to operate the Ontario power system reliably by integrating grid-connected variable generation into the IESO's automated 5-minute, security-constrained economic dispatch system. Without integration into these tools, and exposed to 10,700 MW of wind and solar variability by 2018, reliable and economic operation of the power system is, at best, highly compromised and likely not feasible.

Please describe each of the new rules.

MR-00381-R02: Dispatching Variable Generation

85. This rule amends the Market Rules in order to incorporate dispatch on a 5-minute economic basis, for all variable generators that are registered market participants, and to integrate centralized forecasts into the dispatch process.

MR-00381-R03: Floor Prices for Variable and Nuclear Generation

86. This rule amends the Market Rules to allow the IESO Board to establish floor prices for variable generators (i.e. wind and solar) that are registered market participants, as well as Flexible Nuclear generation. Both types of generators must offer their energy at a price equal to or higher than the floor price set. As noted in the material considered by the IESO Board when making this rule, the nuclear floor price has been established at minus $5 and the floor price for the variable generators is expected to be in or about minus $10. The IESO believes these prices are reasonable proxies for marginal costs and, with the floor price for Flexible Nuclear set higher, will significantly reduce recourse to wind dispatch.

MR-00381-R04: Market Schedule and Congestion Management Settlement Credits for Variable Generation

87. This rule specifies the use of a 5-minute forecast in the IESO's determination of the market schedule and price, and subsequently the market schedule quantity for each facility to be used for settlement purposes, including congestion management settlement credits for variable generators that are registered market participants.

MR-00381-R05: Tie Breaking for Variable Generation

88. This rule obligates the IESO to apply a uniform penalty factor and to randomly determine a daily dispatch order for variable generators that are registered market participants. Given the proposal to implement a uniform floor price for all variable generators, if all variable generators were to offer at the floor price, or one or more variable generators offer a common price above the floor price, absent transmission constraints the existing tie breaking methodology would dispatch them in the same order every time based on their penalty factors. This approach ensures a random distribution of dispatch that addresses the variable generator's concerns relating to the current lack of 'dispatch sharing' amongst these generators. In addition, the amendment obligates the IESO to regularly update and publish the daily dispatch order.

MR-00381-R06: Publication Requirements: 5-Minute Forecast for Variable Generation

89. This rule obligates the IESO to provide a confidential 5-minute forecast for all intervals of the previous dispatch hour to each registered market participant operating variable generation facilities directly connected to the IESO-controlled grid, as well as those embedded variable resources that are registered market participants, following each dispatch hour. As this operating forecast is not produced by the generator, the generator requires it in order to verify its revenues.

Why is a floor price necessary?

90. Active dispatch of all mainline resources will only work in co-ordination with appropriate offers. In an open competitive market, all generators would have a price below which they would not be willing to operate given their marginal costs. When generators offer and respond to market prices that are reflective of their marginal costs, the result is an efficient, least cost electricity product for the province.

91. Whether being actively dispatched or passively responding to market signals, a generator should want to run when the energy price is greater than the costs of running and conversely should want to reduce their output when the price is insufficient to cover those costs. If every generator offered (and operated) at their own marginal cost, then subject to operating constraints, the result would be the most economical, optimal and equitable dispatch for the province.

92. The RES Generators maintain that under their contracts with the OPA they need not submit an offer price higher than minus $2,000 and are therefore entitled to run all the time. As they are paid by the OPA for all generation output, and as discussed above, they are in effect completely insulated from having to respond to the market price. With the RES generators not being financially driven to respond to their marginal costs due to the insulation they receive through their contract, the generation fleet in Ontario is being operated in a suboptimal state.

93. The current contract design for Flexible Nuclear and the RES generators is a simple structure that insulates these generators from the market price in that they are guaranteed a certain $/MWH regardless of the market price when they are running. Due to this contract provision, the market can see offers as low as minus $2000 for which the generator is not at all accountable. They can offer at minus $2000, driving the market price to minus $2000, resulting in other generators having to pay as high as $2000 to produce each MWh of electricity, while the insulated generator is paid its contracted $/MWh.

94. In the case of the RES Generators, their claim in this proceeding is for preferential access to the transmission system to the exclusion of other generators. That circumstance would not be efficient in any economic sense; rather it reflects their claim that their OPA contracts protect them from any exposure to market prices. The IESO's floor prices for variable generators and Flexible Nuclear generation would eliminate this preferential access and put all generators, regardless of type, on a consistent footing under Ontario's market design.

95. Floor prices are required to correct the inefficiency and preferential access created by circumstances, in this case contracts, where some generators are not responsive to market prices. The IESO floor prices on offers from variable and Flexible Nuclear generators are established to support appropriate market outcomes consistent with reasonable marginal costs for each technology.

96. The FIT contract design is similar, but slightly different than the RES generators. FIT resources are exposed to the market price when the price is negative and they are running, but are not required to be responsive to local SBG market conditions. As a result, FIT resources can offer as low as minus $2000 when anticipating local SBG

conditions, impairing the IESO's ability to manage the supply/demand balance in the area.

Don't the Applicants already have a floor price specified in their contracts?

97. A central issue foundational to these proceedings, but not addressed by the Applicants, derives from a long-festering disagreement over a specific clause in the publicly available OPA/RES Generation contracts – a disagreement that centres around the RES Generators' alleged right, as asserted in this proceeding, to offer the negative Maximum Market Clearing Price of minus $2000, to ensure that they generate. The OPA contends that a clause in the OPA/RES Generation contracts actually requires the RES Generators to offer a price of not less than minus $1/MWh.

98. The clause in question reads as follows:

> **3.2 Delivery of Electricity and Related Products**
> The Supplier shall meet the requirements of the IMO Market Rules including the provision of dispatch data for Contract Energy and Contract Related Products required to include these services in the IMO-Administered Markets at no less than minus $1.00 per MWh and no more than the Supplier's variable cost for generating same. ...

99. Unfortunately, this dispute between the RES generators and the OPA regarding the meaning of this provision has not been resolved. In addition to the other reasons why a floor price is necessary, as the RES Generators are not respecting the minus $1 floor price, a market rule specifying a floor price is required for them.

100. If the RES Generators were to respect the minus $1 for dispatch purposes, the anticipated minus $10 floor price for variable generators under the new Market Rule places no restriction whatsoever on the RES Generators.

Included amongst the Applicants are RES III Generators. Aren't the RES III Generators contractually protected from any material economic changes arising from market rule changes?

101. Yes. In the case of the RES III generators, and the FIT and Samsung generators, their OPA contracts contain specific provisions requiring them to comply with Market Rules as they may be amended from time to time and providing that the contracts be amended to compensate the generator for a change in the IESO Market Rules when such change has the effect of "materially affecting the supplier's economics as contemplated hereunder prior to the introduction of such change". The IESO assumes, without any direct knowledge, that the RES III generators participating in this application have met the timelines required to invoke this contract protection and thus do not require any protection from the new Market Rules. If they have not, any harm they allege is not caused by the new Market Rules, but by their failure to assert their contractual rights.

102. Section 1.6 of the RES III contracts provide:

Section 1.6 IESO Market Rules and Statutes

Unless otherwise expressly stipulated, any reference in this Agreement to the IESO Market Rules or to a statute or to a regulation or rule promulgated under a statute or to any provision of a statute, regulation or rule shall be a reference to the IESO Market Rules, statute, regulation, rule or provision as amended, re-enacted or replaced from time to time. In the event of any conflict or inconsistency with the IESO Market Rules and the terms of this Agreement, the IESO Market Rules shall govern to the extent of such conflict or inconsistency. **To the extent that there is a change in the IESO Market Rules following the date hereof, which such change has the effect of materially affecting the Supplier's economics as contemplated hereunder prior to the introduction of such change, then:**

(a) either Party upon becoming aware of the consequences of such change shall promptly notify the other Party;

(b) **the Parties** and, at the Buyer's discretion, those Other Suppliers that are required by the Buyer to participate, **shall engage in good faith negotiations to amend this Agreement and the respective agreements of those Other Suppliers on the basis that such amendments together with the change in the IESO Market Rules will substantially reflect the economics as contemplated hereunder of the Supplier and, at the Buyer's discretion, those Other Suppliers, prior to the introduction of such change in the IESO Market Rules...**[Emphasis added.]

103. It is to be noted that each RES III Applicant is an affiliate of a RES I or RES II Applicant.

104. As with the RES III contracts, the contracts of the RES I and RES II Generators expressly provide that they will be subject to the Market Rules as they may be amended from time to time.

Why do you not need a floor price for all generators?

105. The IESO has not applied floor prices to the remaining fleet of generation, as they do not have the same protection from market price and are economically driven to offer consistent with their marginal cost.

106. The following generators are assumed to operate to prices more reflective of their marginal cost:

- Non-Prescribed generation owned by OPG is 100% exposed to the market price. If price drops below their cost they are running at a loss and are better off reducing output, as they do, when technically able. As an example, if you assume the water that the OPG asset uses has a rental fee of $10, absent any other costs, they would be better off reducing whenever technically

feasible, in every interval that the price is below $10. The generator therefore offers its price at $10 to provide appropriate signals to the market and to respond to market conditions.

- The Clean Energy Supply (CES) contract is a contract structure that does not interfere with the derivation of a unique price representative of marginal cost for each CES resource. Although the CES contract includes a monthly revenue requirement payment, the CES generator has exposure to market price that drives its offer behaviour in the real-time market to be reflective of their marginal cost. By way of example, a CES generator that has a $50 marginal cost (given its heat rate and the price of gas), would be expected to offer not less than that cost. If the generator were to offer less than their marginal cost and the price clear below their marginal cost, payments made by the IESO (through both the real-time energy settlement and the guarantee programs) will reflect the lower price and their contract payment will remain the same resulting in a net loss to the generator.

- The prescribed asset payment structures are a combination of the OEB approved rate design and the market. This contract structure drives a price-exposed offer strategy that responds to market prices. As an example, the hydro electric generator looks at its costs based on the rate period versus their forecasted output over the same period. If, for that rate period, the rate were to be calculated at $40 the generator has an opportunity to earn more or less than $40 by shaping its production in response to market prices. The rate payment calculation assumes that every MWh produced in a given month was paid the IESO's simple average of HOEP for that month, which incents the generator to load weight its production in the highest priced hours earning it revenue greater than the prescribed rate. The reverse is also true, where if they have more energy in the low priced hours they would earn less. This exposure/opportunity creates a generator offer structure that is reactive to the prevailing market price.

107. Conversely, the IESO has identified 3 generator types where contract provisions eliminate the need for similar internally derived marginal cost prices. These include: Non-Utility Generators (NUGs), renewables (RES I, II, III and FIT) and Flexible Nuclear. The contracts held by these parties eliminate some or all of the price exposure other generators in the market have and in turn the driver to offer in a way that is reflective of their marginal costs. These resources can largely run without any accountability to the market price or their impact on such, and as a result inappropriately force other generators which are accountable to the market price to operate (or not) when not efficient to do so. In other words, a price exposed resource with the same or lower marginal cost cannot compete against or gain access to the system when its competitor with equal or higher marginal costs has no exposure or accountability to the prevailing settlement price. The new Market Rules apply to each of these generators.

108. The NUG generators can have an impact on SBG when the output of a NUG is not one for one with the consumption of an industrial load to which they are connected. At the time of Market opening, NUG generators who held contracts with the OEFC effective April 1, 1999 and which survived the market commencement date were registered as *transitional scheduling generators* (TSG). TSGs are required to submit a forecast of

their output as their dispatch data. As the name suggests, this was a means to transition these generators into the market and upon expiration of its contract, each generator is required to reregister with the IESO as something other than the TSG (Ch. 7 Section 2.2.23). Upon the expiration of the OEFC contract the OPA may or may not choose to recontract the generator. These new contracts are intended to be based on existing contract structure, specifically the deeming structure, within the CES contract style. As these shrinking number of resources migrate to the anticipated structure they are not expected to operate in their historical manner and would operate under a regime where their behaviour is reflective of marginal cost.

109. As evidenced with the renewables integration program which began in 2008, changes often take time and the changes that the IESO and OPA have initiated with the NUGs are no different. Unlike renewables however, the NUGs are a shrinking concern because as their contracts expire, most of which expire within the next few years, these resources, if they continue to operate, will have to operate under a different set of Rules and amended contracts which are market responsive. In the meantime, a NUG protocol to limit NUG output to prevent nuclear shutdown during SBG has been adopted by the IESO and the OEFC and compensation during those instances is limited, to the knowledge of the IESO. This protocol is a small step towards the ongoing work on a more complete integration of NUGs into the marketplace. However if the assumptions stated above do not materialize the IESO would consider similar market rule amendments for these assets.

Do these rules apply to other generators, or just the Applicants in this proceeding?

110. These rules apply to several other generators, including the Applicants. These include grid-connected solar generation, the flexible portion of nuclear generation and all other grid-connected wind generators.

111. All of these generator types must comply to the dispatch and floor price rules consistent with their technical capability:

- Wind resources will operate to a floor price. (In fact, the rule will specify two floor prices. The purpose of this is, at the request of the variable generators, to minimize instances of complete shutdown.)

- Solar resources will operate to a single floor price; and

- Nuclear operators will operate to a single floor price for their flexible component, which will be defined by their technical limitations.

112. Contrary to the Applicants' assertion, compliance with these Market Rules by Flexible Nuclear is <u>not</u> voluntary. The reference in the rule to "at the sole discretion of the flexible nuclear generator" in MR-00381-R03 refers to the fact that the Flexible Nuclear generator is the party making the determination of the amount of Flexible Nuclear capacity that is available at any particular point in time due to technical and/or regulatory limitations. For example, if TEEP limits restrict the amount of heat that can be discharged through the CSDVs into the lake, it will be Bruce Power that makes that determination.

What alternatives, if any, did you consider?

113. A number of options were considered for their potential to assist in managing provincial and regional SBG, and in managing the growing variability affecting system operations. The options included measures other than market rule amendments and included measures beyond the control of the IESO. Notwithstanding, the IESO considered whether they were preferable alternatives.

114. Two principal criteria were applied when evaluating each option:

    a. assets should be operated efficiently – make the best appropriate use of each asset type. This includes recognizing and respecting the technical characteristics of the assets that will constitute the Ontario power system as it changes through 2015 and beyond, and continuing to examine the need for, and effectiveness of, alternate ways to use existing assets (e.g. gas conversion); and

    b. options should be effective in managing provincial and regional SBG, and in managing the growing variability affecting system operations, while reducing cost and environmental impacts.

115. A summary of the options considered is set out below.

Comparison of Options - Managing SBG and Variability

Options	Assists in Mitigating Provincial SBG	Assists in Mitigating Regional SBG	Assists in Managing Variability	2014 Cost *(Compared to Status Quo)*	2014 Emissions *(Compared to Status Quo)*
Status Quo (Nuclear/Hydro)	✓ Until overtaken by increasing wind volumes	✗	✗	Status Quo amount is $330 M	Status Quo amount is 3.0 Mt
Seasonal Nuclear Shutdown				*Increase of $42 M*	*Increase of 0.4 MT*
Reduced Reactor Power				*Increase over Status Quo*	
Pickering Life Management				*Increased in the short term for potential savings in future years*	
Wind/Solar 5-Minute Dispatch	✓	✓	✓	*Savings of $201 M*	*Savings of 1.8 Mt*
Aggressive Hydroelectric Spill	✓ Limited (by spill capability)	✗	✗ Worsens (lost flexibility)	*Increase over Status Quo*	
Pause on FiT*	✓ Limited	✓ Limited	✗	*Same as Status Quo plus any cancellation costs**	*Same as Status Quo**
Incentive Based Consumer Rates	✓ Varies with terms and uptake	✓ Varies with terms and uptake	✓ Varies with terms and uptake	Not estimated	
Peaking Gas and Gas Conversion	✗	✗	✓ When not in SBG	*Not estimated - increase over status quo likely*	
Storage	✓ Limited (by size)	✓ Largely dependent on design & location	✓	Requires further assessment	
Contracted Exports	Requires further assessment				

*Assumes FIT investment is limited to amounts forecasted to be in-service in 2014

Status Quo - Real Time Nuclear Reduction/Shutdown and Hydroelectric Spill

116. Based on forecasts, day ahead or day at hand nuclear reductions/shutdowns and/or hydro electric spill is directed to manage global and, where applicable, local over supply. This assumed that equipment and environmental constraints do not reduce the current manoeuvring capability provided by Bruce Nuclear, but also did not incorporate Flexible Nuclear. However, Flexible Nuclear, as noted above, has been incorporated into the more current analysis of the benefits of incorporating renewables into 5-minute dispatch.

Seasonal Nuclear Shutdown

117. Using longer term forecasts to identify substantial SBG conditions, plan weeks in advance for the complete shutdown of one or more nuclear units for an extended period to assist in the management of the forecasted SBG. Nuclear units, when shutdown must remain offline for 72 hours.

Extended Operation at Reduced Reactor Power

118. Similar to 'seasonal shutdowns', using longer term forecasts to identify substantial SBG conditions, plan the reduction of one or more nuclear units using a reactor power reduction strategy to assist in the management of SBG. This will provide approximately 300 MW per unit, but must be planned in advanced and the units must be held at the lower reactor power for an extended period of time, likely measured in weeks.

Life Management at Pickering

119. Working within the limited hours of operational life at Pickering, the temporary removal of one of the expiring units from service now to be reinstated to service when its partner unit expires. This will extend the operation of two additional Pickering units.

Delay the Restart of Bruce Units 1 & 2

120. This option has been discussed with Bruce Power, the OPA and Ministry staff, and contemplates short delays. Any potential benefits would not be ongoing.

Integrated 5-Minute Renewable Dispatch

121. This option would result in renewable dispatch on the same 5-minute dispatch platform as all other dispatchable resources. 2014 would be the first complete year for fully integrated dispatch of grid-connected wind and solar generation.

122. Wind and solar are technically capable of responding to 5-minute dispatch with very few restrictions. When wind and solar output is contributing to the SBG, the incorporation of that generation into the economic dispatch would permit real-time response to actual conditions to precisely manage SBG (provincial and regional) and operational/ramp needs.

Aggressive Hydroelectric Spill

123. This option is similar to the nuclear reactor power reduction option. Using longer term forecasts to identify substantial SBG conditions, plan an aggressive spill strategy beyond the norms of today to assist in the management of SBG. This option would be limited to those areas where the spill strategy was within the current Ministry of Natural Resources regulations.

Accelerated NUG Re-contracting

124. This option calls for the early re-negotiation of NUG contracts prior to their expiration date. The OPA is currently negotiating with NUG contracted parties as their contracts expire, with an aim to provide incentives to reduce generation in times of surplus by making them more responsive to market signals. Assuming economic outcomes could be achieved through early renegotiation, NUG and renewable operations could be made more complementary.

Pause On FIT

125. This option is to delay the commissioning date of a portion of the currently contracted FIT resources and/or pausing on contracting any additional FIT projects. This is a time limited option for those renewable resources which are "paused". However, the issues associated with operation of the resources that are currently on the system, and any that remain in the pipeline, will still have to be addressed through one of the other options presented. A further option is to cancel any contracts that have not committed to capital expenditures; however this will come with associated costs to the ratepayer.

Incentive Based Consumer Rates

126. This option assumes lower electricity rates for wholesale consumers intended to shift their consumption to lower demand periods. While incentive-based consumer rates do assist in managing provincial and, with locational rates, regional surplus, they can only assist to the levels contracted. Uncertain volume and dependability presents some risk with this option. This option does little, if anything, to assist in managing the operational needs created by the increasing volumes of variable generation unless programs are specifically developed for that purpose. It is possible that lower emissions could result if this option is used and the load is able to be supplied by clean resources that would otherwise be curtailed or spilled. While the IESO has not performed the calculations, this option would likely result in higher costs to non-participating ratepayers.

Peaking Gas and Gas Conversion

127. This option considers the procurement of new peaking gas facilities and the conversion of existing coal facilities to gas. Both could assist with and should be considered for addressing operational needs, keeping in mind that any gas operation at times of surplus will exacerbate the SBG issue. In contrast to peaking gas and gas conversion of coal units, combined cycle gas plants have higher minimum loads and higher run times, providing less flexibility for the system and higher potential to exacerbate SBG conditions.

Storage

128. Storage technologies can play a variety of roles: short term storage can be an effective means of managing short-term fluctuations in generation and load, and seasonal storage can be valuable in managing extended surpluses. Ontario has little to no natural seasonal storage potential, but there are potential advantages of seasonal storage opportunities with neighbouring jurisdictions (i.e. Manitoba, Newfoundland and Quebec). Short term storage is currently relatively expensive but various technologies are undergoing considerable development and prices are expected to decline over the next several years.

Contracted Exports

129. This option would seek to strike agreements with external jurisdictions to provide relief in times of SBG by exporting to those jurisdictions. The IESO has significant doubts about the feasibility and efficacy of this option, including in terms of regional surplus and operational needs, and whether other jurisdictions can be counted on to require imports at times when Ontario is experiencing SBG.

What was your conclusion regarding possible alternatives?

130. In considering these options, it is to be noted that many have limited or no benefits, require future investments, have associated adverse impacts or will not assist with the management of the identified operational issues.

131. The integrated 5-minute renewable dispatch is the preferred option because of the environmental and cost savings achieved through this option, and because of the ability to address other operational issues.

132. As noted above, subsequent to conducting the analysis of the various alternatives outlined above, the IESO looked at the further alternative of Flexible Nuclear when it became available in the spring of 2012. Specifically, the IESO estimated the savings from integrating variable generation into the 5-minute dispatch against a status quo which includes Flexible Nuclear. The addition of Flexible Nuclear capability does not make any of the other options more effective, from a cost savings perspective or from an operational perspective, than the integrated 5-minute dispatch option. Even with the Flexible Nuclear in place, this option yields substantial savings and benefits, ranging from approximately $70 million to $200 million in 2014 alone.

133. For all of the reasons discussed above, the status quo is not an acceptable option. The costs and environmental impacts of doing nothing are, in the IESO's estimation, not acceptable and operation of the system with only the existing tools would be highly compromised and likely not feasible.

Is the issue of integration of wind generation into the dispatch system unique to Ontario?

134. Many other North American jurisdictions with high levels of renewable penetration, for example the New York Independent System Operator and the Electric Reliability Council of Texas, are also integrating their variable generation into the real-time economic dispatch. While each of these systems has unique characteristics, and thus

there will not be one universal approach, none of these system operators permit the situation whereby variable generators are not subject to any form of dispatch. It is widely recognized that as variable generation increases, it must be integrated into the economic dispatch regime.

Please explain how the amendments are consistent with the objectives set out in the Electricity Act.

135. The IESO and this Board are required to balance all of the relevant statutory objectives, including all purposes of the *Electricity Act*, in carrying out their respective mandates.

136. Contrary to the Applicants' assertions, the IESO's objectives are not limited to promoting the use of cleaner energy sources and technologies, and providing generators with non-discriminatory access to transmission and distribution systems in Ontario[2]. Rather, the IESO must also consider the following other purposes and objectives as set out in the *Electricity Act*:

> 1. The purposes of this Act are,
>
> (a) to ensure the adequacy, safety, sustainability and reliability of electricity supply in Ontario through responsible planning and management of electricity resources, supply and demand;
>
> (b) to encourage electricity conservation and the efficient use of electricity in a manner consistent with the policies of the Government of Ontario;
>
> (c) to facilitate load management in a manner consistent with the policies of the Government of Ontario;
>
> ...
>
> (f) to protect the interests of consumers with respect to prices and the adequacy, reliability and quality of electricity service;
>
> (g) to promote economic efficiency and sustainability in the generation, transmission, distribution and sale of electricity;
>
> (h) to ensure that Ontario Hydro's debt is repaid in a prudent manner and that the burden of debt repayment is fairly distributed;
>
> (i) to facilitate the maintenance of a financially viable electricity industry; and
>
> (j) to protect corridor land so that it remains available for uses that benefit the public, while recognizing the primacy of transmission uses.

[2] See Application at paragraphs 8, 15 and 42.

137. The objectives set out in s. 1 of the *Electricity Act* apply to a number of agencies with different roles and mandates and not every objective will have the same application or achievability for each of these agencies.

138. The IESO has listened to the concerns of the Applicants, but believes the Applicants have not taken a balanced approach. For instance, in referencing the purpose to promote the increased use of cleaner energy sources and technologies,[3] they fail to acknowledge that without the market rule changes made by the IESO, the electricity system will continue to be more costly and to produce more emissions than necessary in its operation. They also ignore the urgent need for tools to ensure the continued reliability of the system.

Are the Market Rule amendments consistent with the Ontario Government's policy on renewables?

139. The Applicants assert that the amendments would be inconsistent with Ontario government policy. The IESO believes this is incorrect. This matter has been under discussion with government representatives throughout the timespan of the SE-91 Renewables Integration stakeholder discussions.

140. At no time has the government suggested to the IESO that proceeding with the changes now embodied in the Market Rules would in any way conflict with government policy – in fact to the contrary. The operational requirements were accepted as necessary, and the cost and environmental benefits associated with the market rule changes were seen as desirable. The policy of the Government has never been that the new Market Rules are inconsistent with its policy to promote renewable generation. Rather, the policy of the Government on the impact of the new Market Rules on renewable generation is reflected in their support for the new Market Rules and in the framework approved by the Government for the OPA's contract negotiations with variable generators. The IESO understands that some of those negotiations have been successfully concluded.

Does the IESO have a role in resolving the contract issues between the Applicants and the OPA?

141. The role of the IESO is to direct the operation of the IESO-controlled grid and IESO-administered markets and maintain the reliability of the IESO-controlled grid. It is also in the purview of the IESO to create new Market Rules and amend existing Market Rules as necessary to ensure the efficient and reliable operation of the electricity system.

142. It is **not** the role of the IESO to make long term decisions about generation procurement or to enter into contracts relating to the procurement of electricity supply and capacity in or outside of Ontario. That is a statutorily mandated power of the OPA, subject to government directives.[4]

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[3] Application at paragraphs 15 to 20.

[4] Ontario *Electricity Act* at subsection 25.2(5)(a).

143. Accordingly, the decision as to whether, and if so to what extent, the achievement of the OPA's objectives regarding renewable generation suggests adjustment of the terms of those contracts, rests exclusively with the OPA and the government.

144. Moreover, the IESO is not in possession of the information necessary to determine whether the financial consequences to renewable generators are such as to warrant adjustment to the terms of their contracts. The IESO, for example, is not privy to all of the terms of the financial arrangements between renewable generators and the OPA. At no time has any RES Generator communicated to the IESO what effect, if any, the new rules would have on its profitability or its ability to achieve its investment objectives.

145. The IESO has supported the ongoing discussions between the Applicants and the OPA:

    a. through the SE-91 process, advising all interested parties of the nature of the amendments being considered by the IESO;

    b. establishing a timeline for the SE-91 process which provided the OPA and affected generators with ample opportunity to conduct their discussions prior to the new rules coming into effect;

    c. reminding all parties, on a regular basis, of the pressing need for the IESO to proceed with the new rules without undue delay; and

    d. providing technical advice to assist the parties in their discussions.

What about the Applicants' complaint that the IESO compensates other generators for behavioural changes?

146. The Applicants assert that the IESO compensates other market participants for changing bidding behaviour and sacrificing their economic interests in order to provide societal benefits.

147. The assertion that the IESO requires market participants to change bidding behaviour and the assertion that the IESO provides compensation for any societal benefit are incorrect.

148. The IESO does not compensate generators for changing offering behaviour. The IESO makes payments to certain market participants who provide certain operating capabilities or services which can only be provided at a cost to the generator.

149. With respect to the IESO's generator cost guarantee (GCG) programs and reliability must run (RMR) contracts the basic principle is one of cost recovery. In the case of the GCG programs, participants are kept whole for any incremental costs associated with their commitment to generate. In the case of the RMR, again the IESO is compensating for the costs associated with the generator guaranteeing the availability of the facility and not for any forgone production at the facility. In either case, the IESO does not direct or incent any specific offer behaviour and it is anticipated that all offers would be consistent with the marginal cost of operating the facility.

150. Neither conservation nor demand management is within the purview of the IESO and no such programs exist within the IESO administered markets.

What about the complaint that the amendments discriminate by favouring the OPA?

151. The Applicants submit that the rule amendments discriminate in favour of the OPA. This is not correct. In considering the need to proceed with new Market Rules and what these rules should be, the IESO was not influenced by any changes to the relative financial positions of the Applicants and the OPA. The IESO has not considered financial consequences to market participants under their contracts with other market participants or third parties when developing Market Rules and making dispatch decisions.

152. Additionally, the OPA is a pass through agency. All of the costs of procurement incurred by the OPA are reflected in the global adjustment and paid by ratepayers, and reductions to these costs do not accrue to the benefit of the OPA itself.

Conclusion

153. Consistent with its mandate, and consistent with the purposes of the *Electricity Act*, the IESO approved the Market Rules in order to capture substantial reliability, consumer cost and environmental benefits. In the estimation of the IESO, it would be inordinately costly, environmentally damaging and not operationally feasible to continue without a solution to SBG and the operational challenges presented by the increasing amounts of variable generation on the system. The Applicants are not being subjected to any rules which are not applicable to like generators. There are also no alternatives which provide a superior outcome to the new Market Rules. Whether, and the extent to which, the Applicants' contractual rights or expectations should result in an adjustment to their contracts with the OPA, is a matter to be resolved between them and the OPA.