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Integration of Renewables: OPA Contract Implications

Ministry of Energy Update

December 3, 2010

OPA and IESO Coordination is Key

- The OPA and IESO must be aligned for renewables integration to be effective
  - Facilitate greater efficiency and provide a better deal for ratepayers
  - Comply with contractual obligations (as required)
- IESO Market Rule changes will have a financial impact on OPA contracted renewable facilities
  - i.e. RES, RESOP, FIT & GEIA
- Key linkage is indemnification in OPA contracts against market rule changes
  - FIT and RES III contracts indemnify Suppliers for Market Rule changes that "materially affect" their project economics (Sec 1.6 in RES III, Section 1.7 in FIT)
- RES I & II contracts do not provide market rule indemnification

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Potential Impacts on Supplier Economics

- Extent of financial impact will depend on many factors:
  - Final details of IESO market rule changes
  - Location and size of facility
  - Extent and type of equipment

- Suppliers will be financially impacted by the proposed market rule changes
  - **Capital costs**: meteorological towers, telemetry equipment
  - **Operational costs**: increased O&M costs (including labour)
  - **Decreased revenue**: foregone energy production during unpaid curtailment

- Decreased revenues from even a small amount of curtailment may have a significant impact on the Suppliers' return

Estimated Financial Impact for Suppliers

- Largest impact on Supplier economics likely to result from curtailment

Proposed Market Rule Obligations	General Impact	Approximate Per Facility Impact		
		10 MW(1)	60 MW(1)	130 MW(1)
Dispatchability	Decreased revenue from more frequent curtailments Impacts varies significantly depending on location There may be some additional O&M costs(2)			
Forecasting met towers located within 5km of each turbine	New met towers may need to be added Cost of met towers is estimated around $100-$150k			
Visibility telemetry equipment to connect to the IESO	Facilities may need to install/upgrade existing telemetry equipment to meet IESO requirements	Minimal financial impact, may need to replace some equipment	Minimal financial impact, may need to replace some equipment	Minimal financial impact, may need to replace some equipment

(1) *Actual financial impact depends on facility specific contract price, capacity factor, geographic location and amount of SBG that occurs in any given year.*

(2) *Some of these costs could be mitigated through IESO actions*

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Ratepayer Perspective

- With SBG and congestion already occurring ratepayers are currently paying for inefficiencies associated with dispatching off nuclear units before wind
  - Difficult to accurately estimate the cost of curtailment as system is very dynamic
  - However, nuclear curtailment results in longer down-times and need for more expensive replacement power, among other impacts:
    - Additional consumer costs from changes in global adjustment and HOEP
    - Environmental cost of gas-fired replacement power
    - Increased wear and tear from manoeuvring nuclear units

- Example shows higher cost of nuclear curtailment over wind curtailment
  - In other specific situations curtailment costs could be higher or lower, but due to "chunkiness" of nuclear resources the costs will always be greater than if wind was used

Resource Curtailed	Estimated Cost of Single Curtailment Event	Estimated Annual Cost of Curtailment With:	
		1100 MW on Grid	5000MW on Grid
Assumptions			
Wind			
Nuclear(1)			

- In sum, proposed Market Rule changes and contract amendments will reduce ratepayer costs for curtailment during SBG and congestion events

(1) Cost estimate is conservative
- Assumes nuclear unit y shutdown for 48hrs
- assumes derates do not result in increased O&M or operational issues
- incremental gas generation to address nuclear units limited ramping ability compared to wind not included

(2) In reality the number of nuclear unit shutdowns would increase at a rate even faster than overall increase in SBG hours

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FIT, GEIA and Market Rule Changes

- FIT Contracts
  - Contract has a "global curtailment clause" that pays generators their contract price when they are curtailed during a global SBG event
  - However, FIT contracts exacerbate local congestion/oversupply problems
    - They can bid minimum market price (-2000 $/MWh) to avoid local curtailment
      - Results in inefficiencies as other resources (nuclear) are curtailed instead
  - IESO's proposed market rule change to limit offers from intermittent generators together with contract amendments alleviates this situation
    - Indemnification for Market Rule changes in the contract trigger the contract amendments
  - Lenders have already identified the curtailment issues as a risk that makes financing FIT projects more challenging
- GEIA to be treated like FIT Suppliers
  - Ensure consistency and overall system efficiency
  - Curtailment has already been identified as a key issue

RES Suppliers and Market Rule Changes

- RES I and II Contracts have no market rule indemnification clause and, compared to FIT, they have different contract terms, especially around market operation and risk sharing
  - Contract limits Suppliers to offering no less than -1 $/MWh into IESO market
- OPA, IESO and Suppliers have had significant discussions as to the intent and meaning of this clause with respect to curtailment
  - RES Suppliers are adamant they were never intended to be dispatchable facilities
  - Furthermore, a compromise will lead to improved system efficiencies
- OPA is prepared to offer some form of compromise proposal to RES Group
  - OPA pays for local curtailments; RES Suppliers take risk of global curtailment
  - Potentially some additional minor amendments to ensure efficient operation
  - OPA's position is still confidential and has not yet been communicated

Summary of Contract Implications

Contract Type	Current Bid Restrictions ($/MWh)	Market Rule Protection	Proposed Contract Amendments (Resulting From Market Rule Changes)	Comments
RES I/II	-1		Pay for local, not global	• RES suppliers may challenge OPA position to demand full curtailment protection
RES III	-1			
FIT and GEIA	No limit; can offer as low as -2000			
RESOP	No limit and they are not market participants		TBD, potentially depends on outcome of IESO stakeholder engagement (SE-91)	• Nature of these projects (<10MW distribution connected) may result in different treatment – yet to be determined

**Implications for solar (FIT & RESOP) and hydro (HCI & HESA) still to be assessed*

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Conclusions and Next Steps

- OPA needs to engage stakeholders together with the IESO *as soon as possible*
  - Need to discuss contract obligations and resulting amendments together with market rule changes

- Multiple stakeholders have been pushing for a resolution on this issue
  - RES Group becoming impatient
  - FIT Suppliers looking for as well to engage effectively with IESO
  - Lenders have identified they need and certainty
    - Without communication, FIT project financing could be jeopardized

- With a large increase in renewable generation expected to be on the grid in the coming few years, timing for a resolution is becoming critical

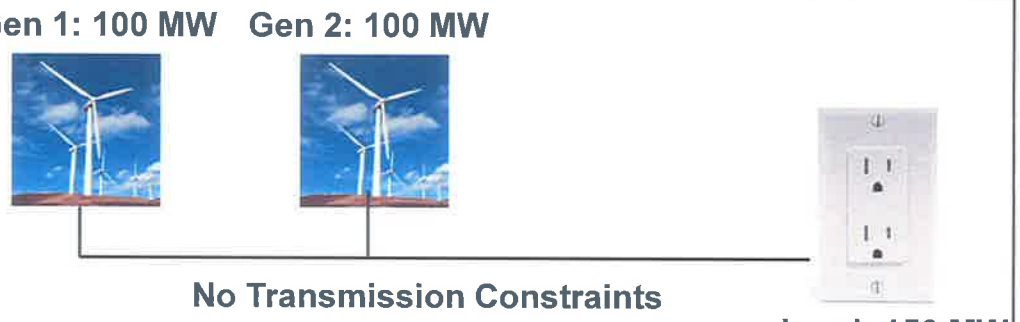
- Effective engagement by both IESO and OPA will lead to smooth stakeholder process

Appendix A:
Oversupply Overview

Understanding Oversupply and Congestion

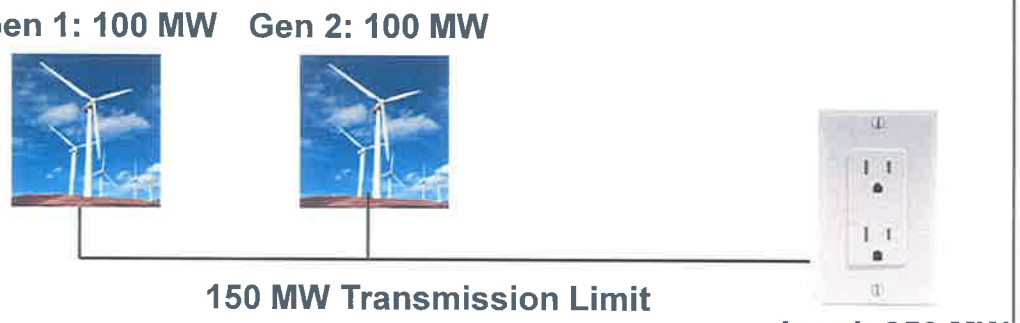
Global oversupply is generally driven by general lack of demand affecting substantially all of the system

In this example, there is 50 MW of *oversupply* result from having more supply than demand



Local curtailment can also be driven by general lack of demand and/or by transmission limits

In this example, there is 50 MW of *congestion* due to transmission limits



Oversupply is affected by the lack of balance between supply and demand, which are driven by many factors

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Oversupply: A temporal issue here to stay?

- Oversupply is looming in the near term as more resources come on line
  - Ontario's nuclear capacity alone is often sufficient to meet demand overnight

- Relief is possible in the "bathtub years" but…
  - Surplus Baseload Generation (SBG) likely to remain as a problem
  - Currently during surplus baseload (oversupply) situations, generators are dispatched off according to the price they bid into the IESO market
    - To continue running in oversupply situations generators may bid prices down to -2,000 $/MWh price floor
      - OPA Contracts need to provide the right incentives to motivate efficient market behaviour through either (a) exposure to negative prices or (b) offer restrictions
    - The IESO's planned introduction of dispatch protocols for intermittent generation could improve this situation
      - IESO is exploring changes to dispatching protocols during oversupply situations – modification of 5-minute economic merit order dispatch to incorporate longer-term issues (akin to an administrative dispatch)

Examining Trade-offs

Nuclear

- Long shutdown/return times (2-3 days)
- Highly complex operations to manoeuvre
- Greater likelihood of breakdown or error
- Limited dispatch granularity (i.e. entire unit has to be shut down – high minimum load)
- Impacts operations and maintenance, unit longevity

Water

- Less complex than nuclear but regulatory restrictions are growing
- Safety concerns related to spilling and hydro operation
- Some dispatch granularity

Wind

- Operationally less complex with fewer limitations
- Unknown/Little safety or regulatory concerns
- Greatest potential for dispatch granularity

All resources will rightfully claim that dispatch has a wear and tear impact

The Economics of Curtailment

Wind Curtailment Cost		Other Resources Curtailment Costs
Payment to OPG and small Hydro for Production	=	Payment to OPG and small Hydro for Production
+ Payment to OPG Nuclear for Production	=	+ Payment to OPG Nuke for Production or Curtailment (through increased rates)
+ Payment to Bruce Nuclear for Production	=	+ Equivalent Payments to Bruce Nuclear for Lost Production
+ Curtailment Payment to Wind Suppliers for a Few Consecutive Hours of Curtailment	=	+ Payment to Wind Suppliers for Production
	<	+ Cost of Natural Gas Production (or imports) to Offset Lost Nuclear Production
	<	+ Environmental Impacts of Using Natural Gas (or imports) to Offset Lost Nuclear Production
Total Costs of Paying for Wind Curtailment	<	Total Costs of Not Paying for Wind Curtailment

Bruce Nuclear gets paid whether it operates or not, and due to the longer down-times for nuclear, replacement gas production is needed, resulting in higher costs.

It is therefore more cost-effective to pay for wind to curtail than paying for nuclear or hydro curtailment.

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