



Integration of Renewables: RES and FIT Contracts

Ministry of Energy Update

November 25, 2010

Integrating Renewables into the IESO Market

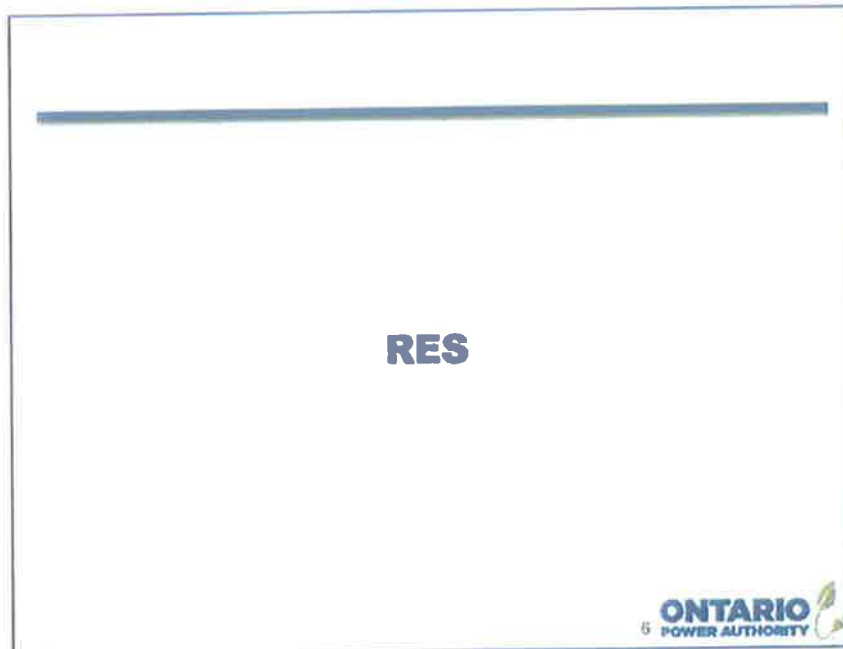
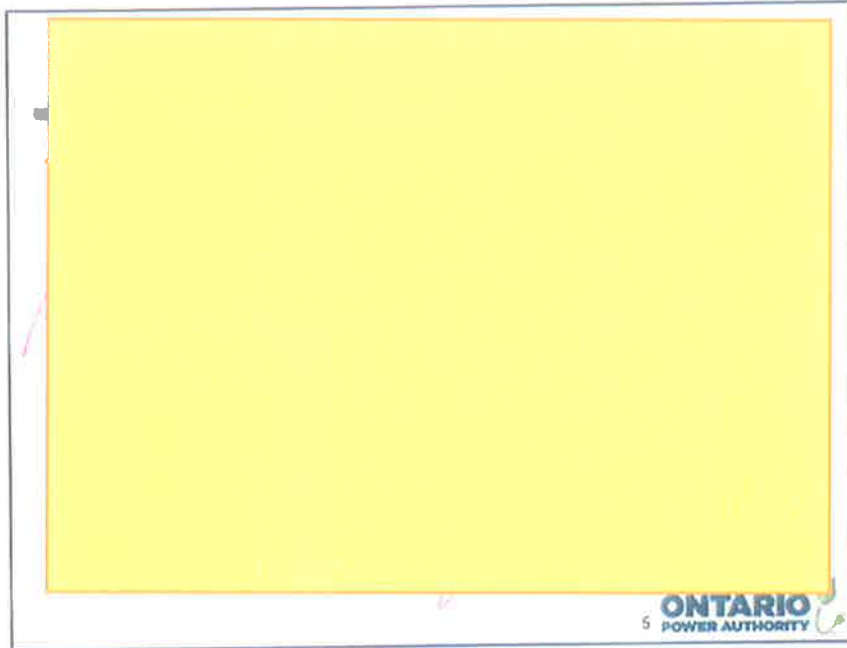
- In order to integrate the extensive growth of renewables (FIT) on the system, the IESO is exploring a number of market rule changes

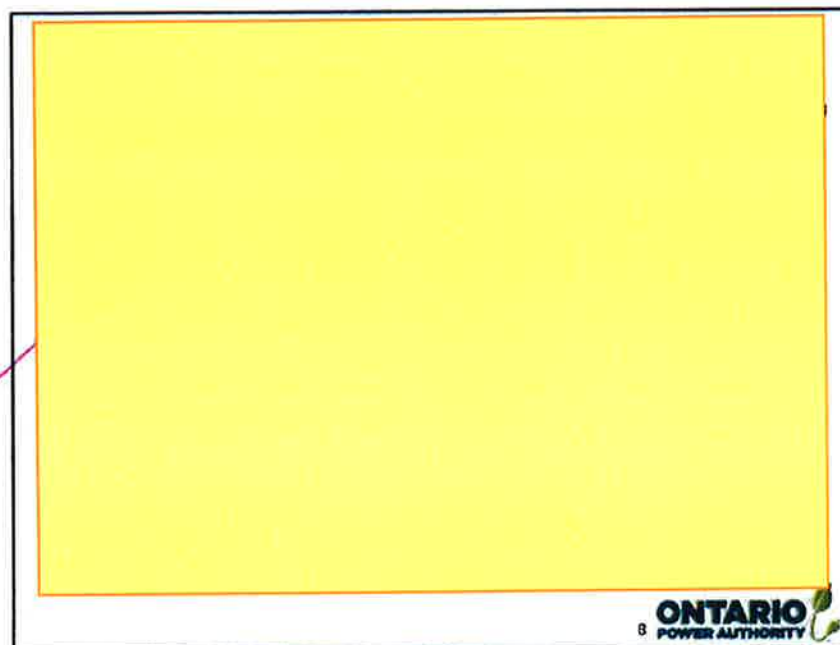
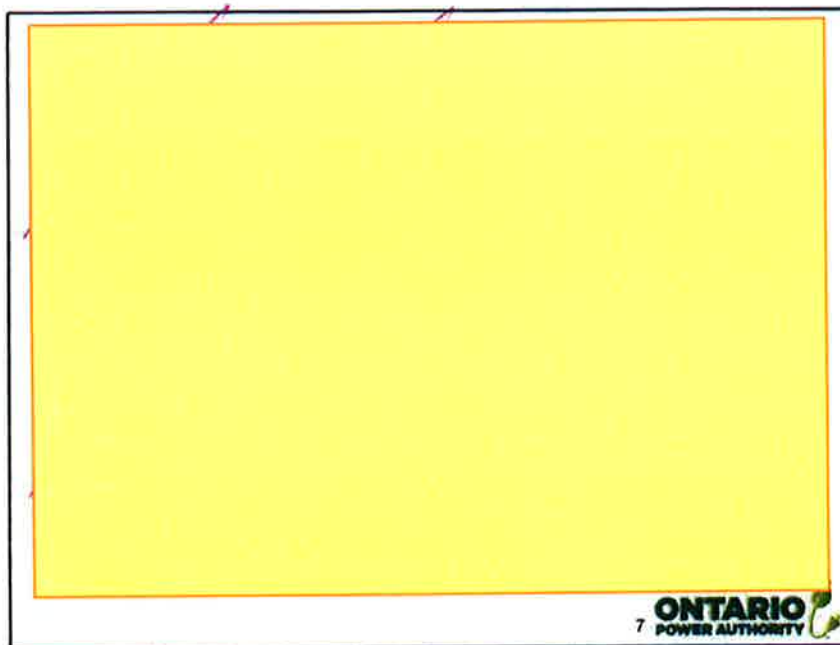


FIT

Existing FIT Curtailment Mechanism

- FIT currently has a mechanism to incent curtailment during global oversupply
 - If 1hr pre-dispatch price falls below \$5/MWh or the IESO has published an "over generation advisory" and a generator receives a dispatch order
 - If Suppliers choose to avail themselves under the right conditions, they will receive their full contract price for the lost production
 - Generators can also decide not to curtail and be exposed to negative prices (which will be deducted from their contract price)
- However, FIT resources have no incentive to be curtailed during local oversupply as there is no payment for lost production
 - They are not exposed to any negative local price or other penalties/incentives vis-à-vis local oversupply/congestion
 - The expectation is that most generators would "run away" from local oversupply by offering minimum market price of ~2,000 \$/MWh
 - This results in inefficiencies as other resources (nuclear, hydro) will be dispatched off instead





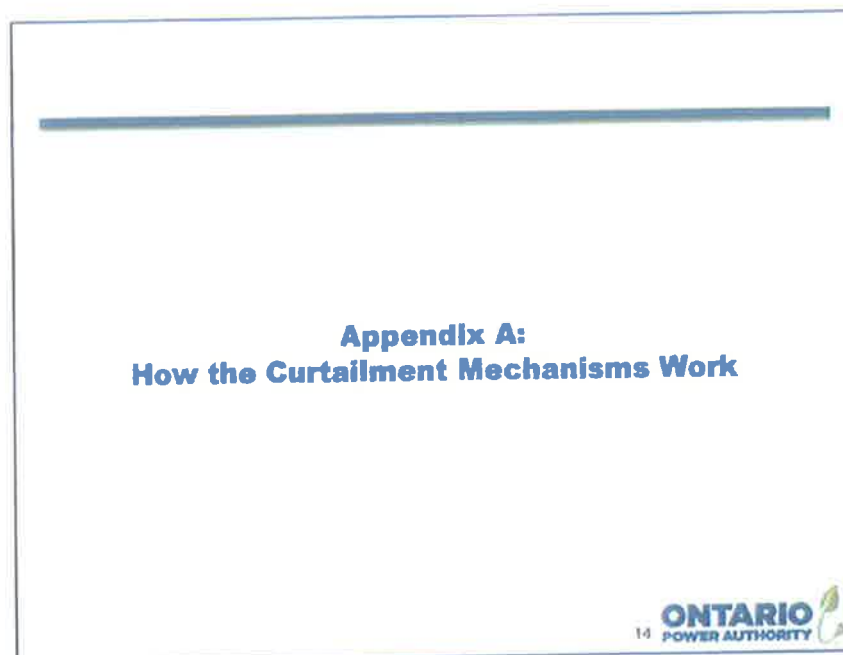
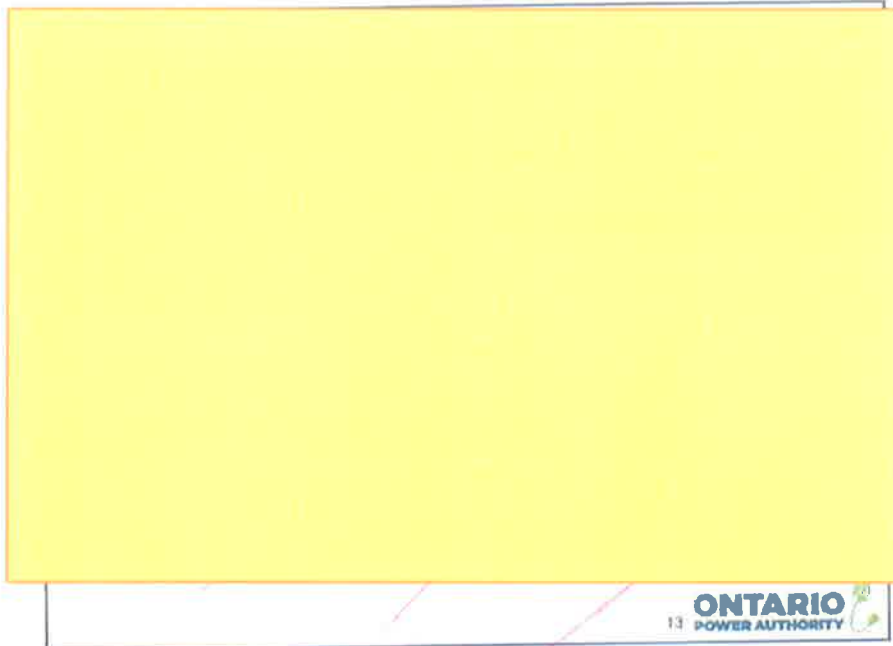
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RES Group Proposal

- OPA, IESO and RES Group have been working together on this issue
 - In the summer, OPA received latest proposal from RES Group

- OPA committed to continue to work on the issue and get back to Suppliers on results of joint IESO & OPA activities aimed at improving the integration of renewable resources

CONCLUSIONS



FIT Scenario #1 - No Oversupply

- FIT Contract Price is 135 \$/MWh
- Supplier Bids -40 \$/MWh into IESO market
- Local Price and HOEP are >0
- No curtailment under these conditions



Supplier Offer	-40
Local Price	10
HOEP	10
Curtailment	No
Net Revenue	135
Facility operates and receives Contract Price	



FIT Scenario #2 - Global and Local Oversupply

- FIT Contract Price is 135 \$/MWh
- Local Price = -50 \$/MWh
- HOEP = -50 \$/MWh



Supplier Offer	-40
Local Price	-50
HOEP	-50
Curtailment	Yes
Net Revenue	135
Facility dispatched off by the IESO. Receives full contract price for lost production	

OR



Supplier Offer	-50
Local Price	-50
HOEP	-50
Curtailment	No
Net Revenue	30
Facility continues to produce but negative HOEP is deducted from contract price	



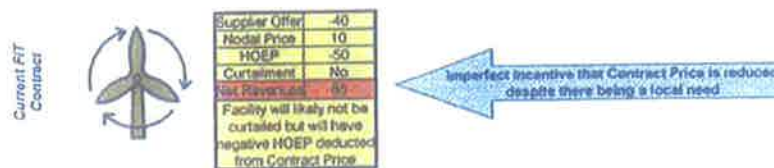
FIT Scenario #3 - Local Oversupply Only

- FIT Contract Price is 135 \$/MWh
- Mixed curtailment under these conditions
- Local Price = -50 \$/MWh and HOEP are > 0 \$/MWh



FIT Scenario #4 - Global Oversupply Only; Local Need

- FIT Contract Price is 135 \$/MWh
- No curtailment under these conditions
- Local Price > 0 \$/MWh and HOEP = -50 \$/MWh



RES Scenario #1 - No Oversupply

- RES Contract Price is 96 \$/MWh
- Supplier Bids -1 \$/MWh
- No curtailment under these conditions
- Local Price and HOEP are >0 \$/MWh



Supplier Offer	-1
Local Price	10
HOEP	10
Curtailment	No
Net Revenues	96
Facility operates and receives Contract Price	

RES Scenario #2 - Local Oversupply Only

- Contract Price is 96 \$/MWh
- Curtailment under these conditions
- Local Price = -50 \$/MWh and HOEP are > 0 \$/MWh

Curtail RES
Contract



Supplier Offer	-1
Local Price	-50
HOEP	10
Curtailment	Yes
Net Revenues	0
Facility dispatched off by the IESO. Receives nothing.	



RES Scenario #3 - Global and Local Oversupply

- Contract Price is 96 \$/MWh
- Local Price = -50 \$/MWh and HOEP = -50 \$/MWh



Supplier Offer	-1
Local Price	-50
HOEP	-50
Curtailment	Yes
Net Revenues	0
Facility dispatched off by the IESO. If specific conditions are met reflecting global oversupply there is no Contract Payment for lost production.	

RES Scenario #4 - Global Oversupply Only, Local Need

- Contract Price is 96 \$/MWh
- No curtailment under these conditions
- Local Price > 0 \$/MWh and HOEP = - 50 \$/MWh



Supplier Offer	-1
Local Price	10
HOEP	-50
Curtailment	No
Net Revenues	96
Facility operates and receives Contract Price	

Appendix B: 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.

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 incorporating 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 on operations and maintenance and longevity of units

Water

- * Less complex than nuclear but regulatory restrictions are growing
- * Safety concerns related to spill 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



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.

