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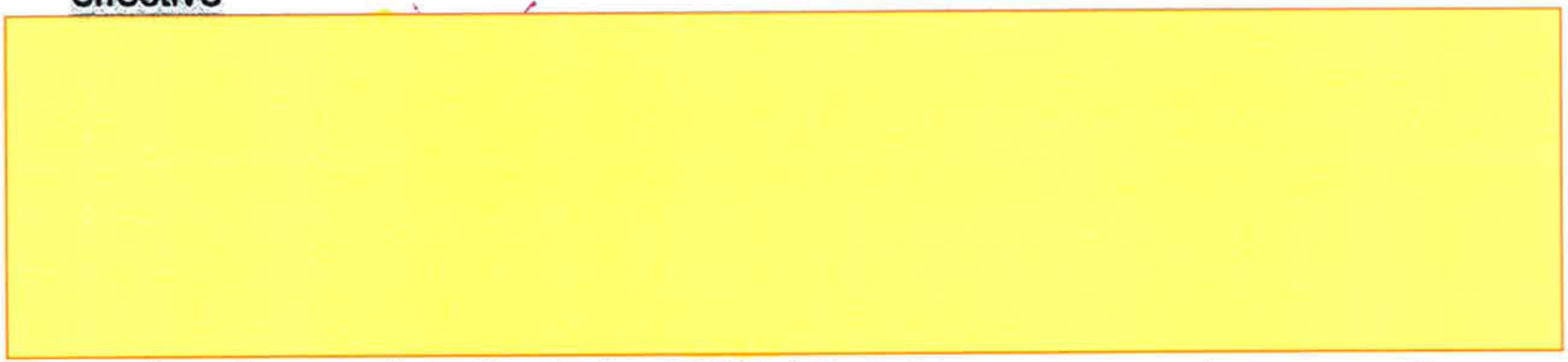
Integration of Renewables: RES and FIT Contracts

Ministry of Energy Update

November 29, 2010

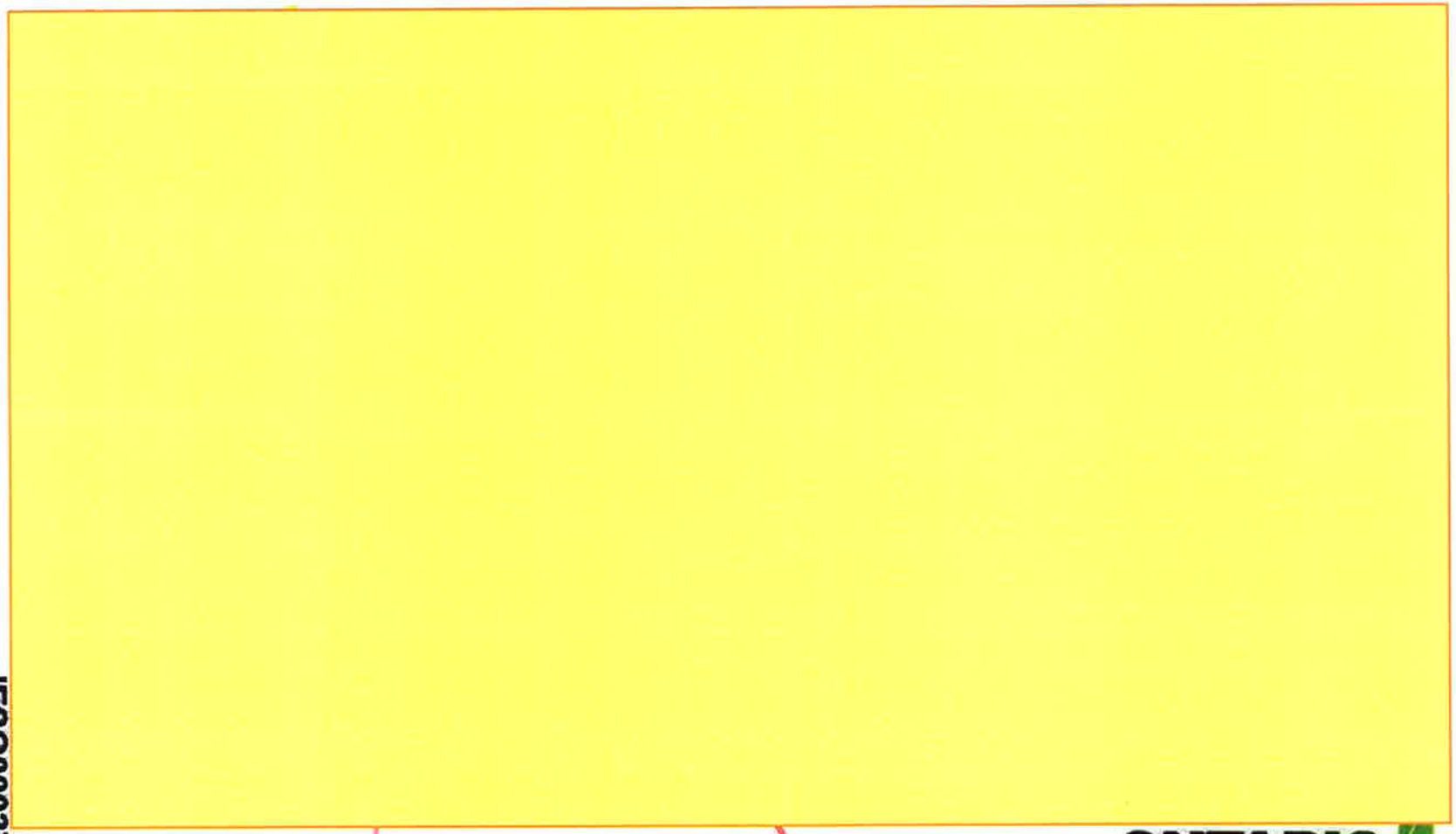
OPA and IESO Coordination is Key

- The OPA and IESO must be aligned for renewables integration to be effective



  - Suppliers participation in the IESO stakeholder engagement process will be far more productive if the OPA provides clear indication of how contracts will be treated
    - RES Group recently sent letters to IESO and OPA highlighting the need for coordinated action on this issue

Potential Impacts on Supplier Economics



Estimated Financial Impact for Suppliers

- Largest impact on Supplier economics likely to result from curtailment

New Market Rule Obligations	General Impact	Per facility impact ($): 5 – 20 MW	Per facility impact ($): 20 – 80 MW	Per facility impact ($): 80 MW +
Dispatchability				
Forecasting: met towers located within 5km of each turbine				
Visibility: telemetry equipment to connect to the IESO				

Estimated Financial Impact for OPA

[redacted]

- Very hard to estimate given the various permutations but as an example Solving a 4 hour (XXX MW) oversupply/congestion problem with nuclear is significantly more costly:
  - Estimated costs of wind curtailment: $XXXXXXXX
  - Estimated cost of nuclear curtailment including replacement power: $XXXXXXXX

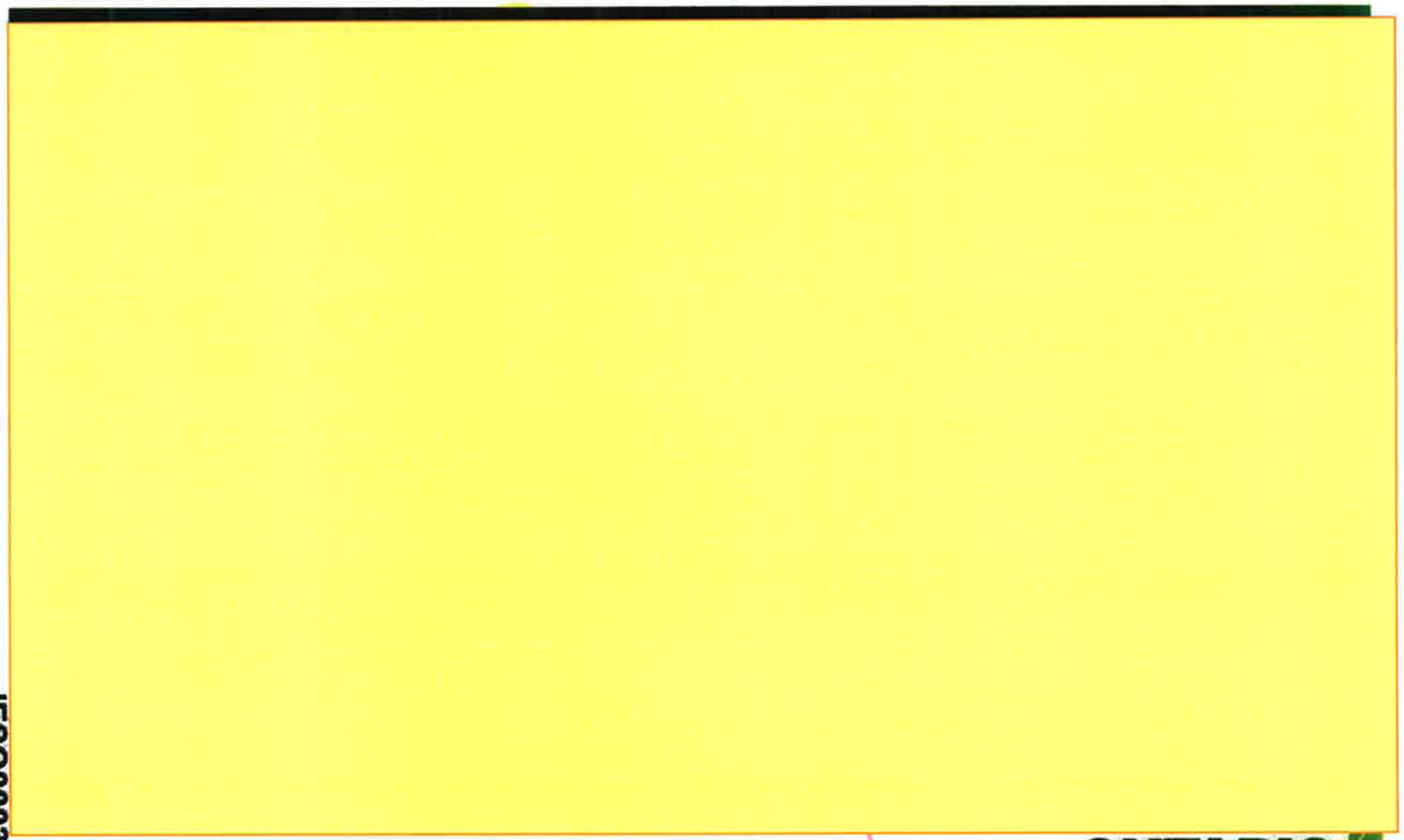
[redacted]

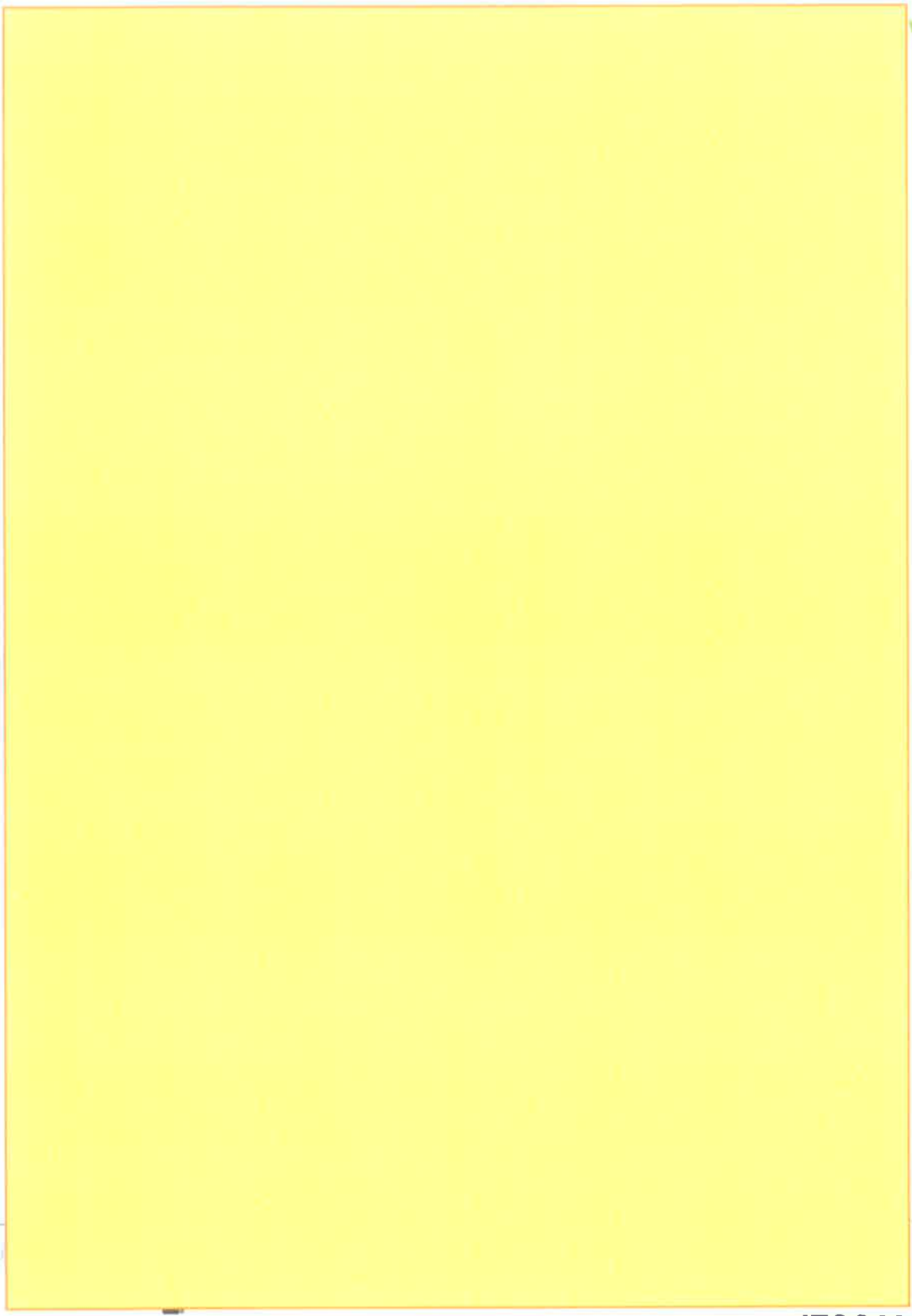
hydro.

FIT, GEIA and Market Rule Changes

- FIT Contracts
  - Some costs of market rule changes may likely flow through contracts
  - Curtailment clause will also likely be amended to:
    - Incent efficient participation in the market, and
    - Incorporate IESO's proposed limit on offers from intermittent generators
  - Lenders have already identified the current gap between existing curtailment clause and IESO's renewables integration as a risk that may result in less financing sources being available for FIT Suppliers
    - Proposed changes will therefore be welcomed by Suppliers and financing community
  - Ensure consistency and overall system efficiency

RES Suppliers and Market Rule Changes





Appendix A:
Additional Contract Details

FIT

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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

RES

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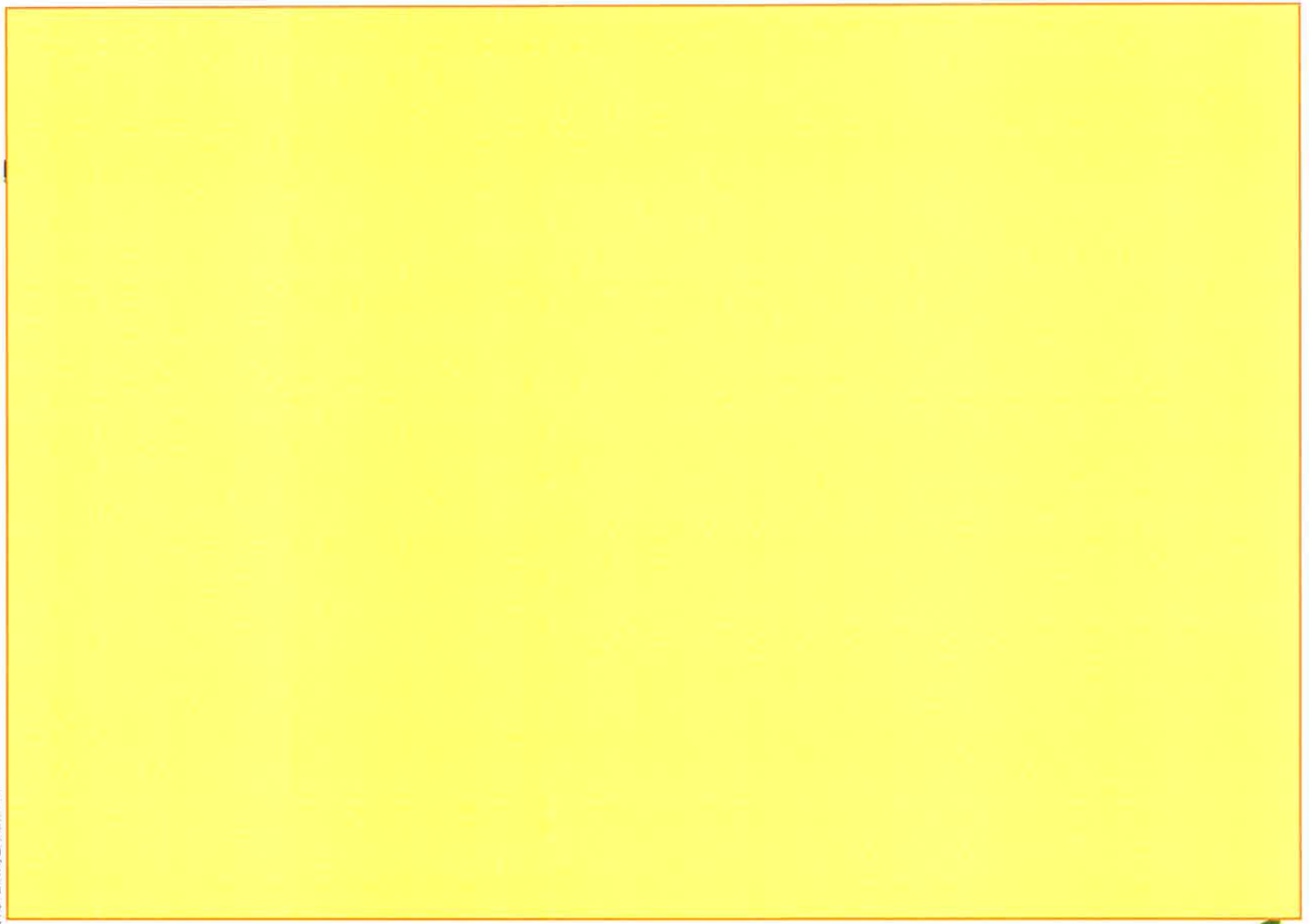

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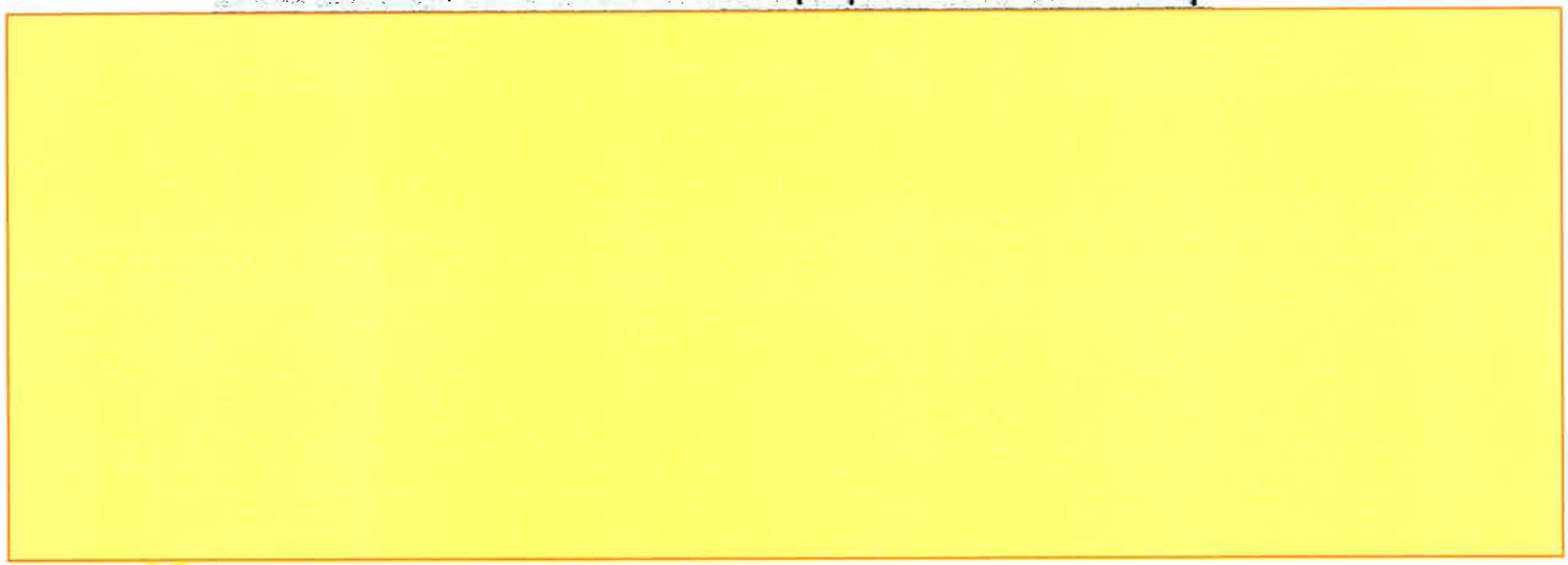
Financial Impact of Curtailing RES Suppliers

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

Appendix B:
How the Curtailment Mechanisms Work

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	

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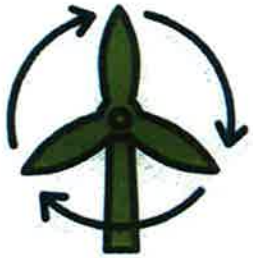
FIT Scenario #2 - Global and Local Oversupply

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

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

OR



Supplier Offer	-60
Local Price	-50
HOEP	-50
Curtailment	No
Net Revenues	85
Facility continues to produce but negative HOEP is deducted from contract price	

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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

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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

Current FIT Contract

Supplier Offer	-40
Nodal Price	10
HOEP	-50
Curtailment	No
Net Revenues	85

Facility will likely not be curtailed but will have negative HOEP deducted from Contract Price

Imperfect incentive that Contract Price is reduced despite there being a local need

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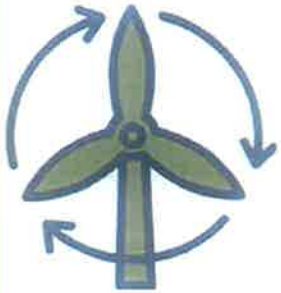
RES Scenario #1 - No Oversupply

- 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

Current RES Contract

Supplier Offer	-1
Local Price	-50
HOEP	10
Curtailment	Yes
Net Revenues	0

Facility dispatched off by the IESO. Receives nothing.

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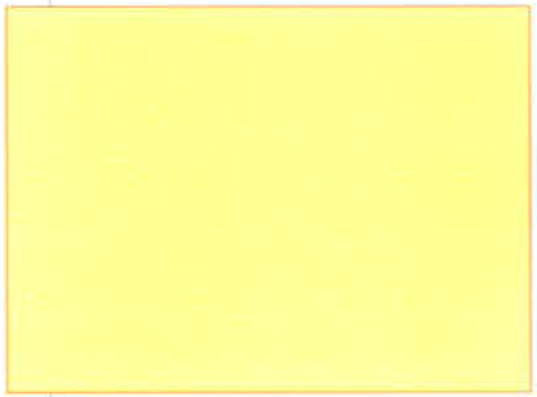
RES Scenario #3 - Global and Local Oversupply

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

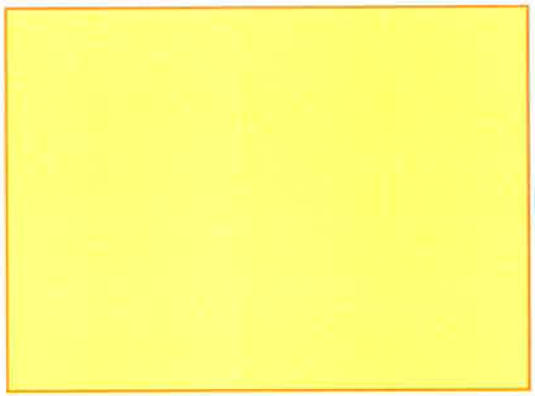


Supplier Offer	-1
Local Price	-50
HOEP	-50
Curtailment	Yes
Net Revenues	0

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	

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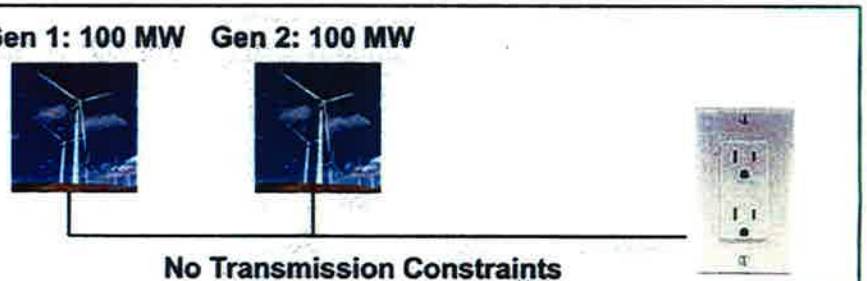
Appendix B:
Oversupply Overview

Understanding Oversupply and Congestion

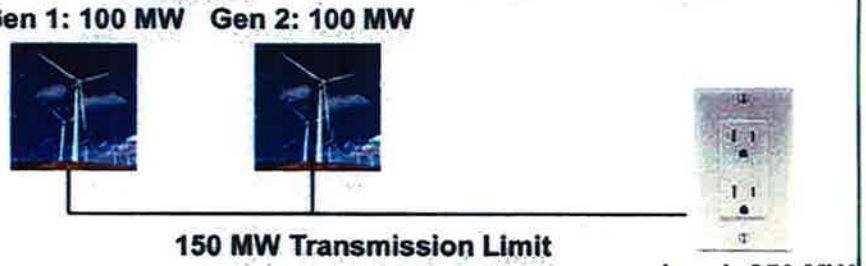
Global oversupply is generally driven by general lack of demand affecting substantially all of the system

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

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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 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

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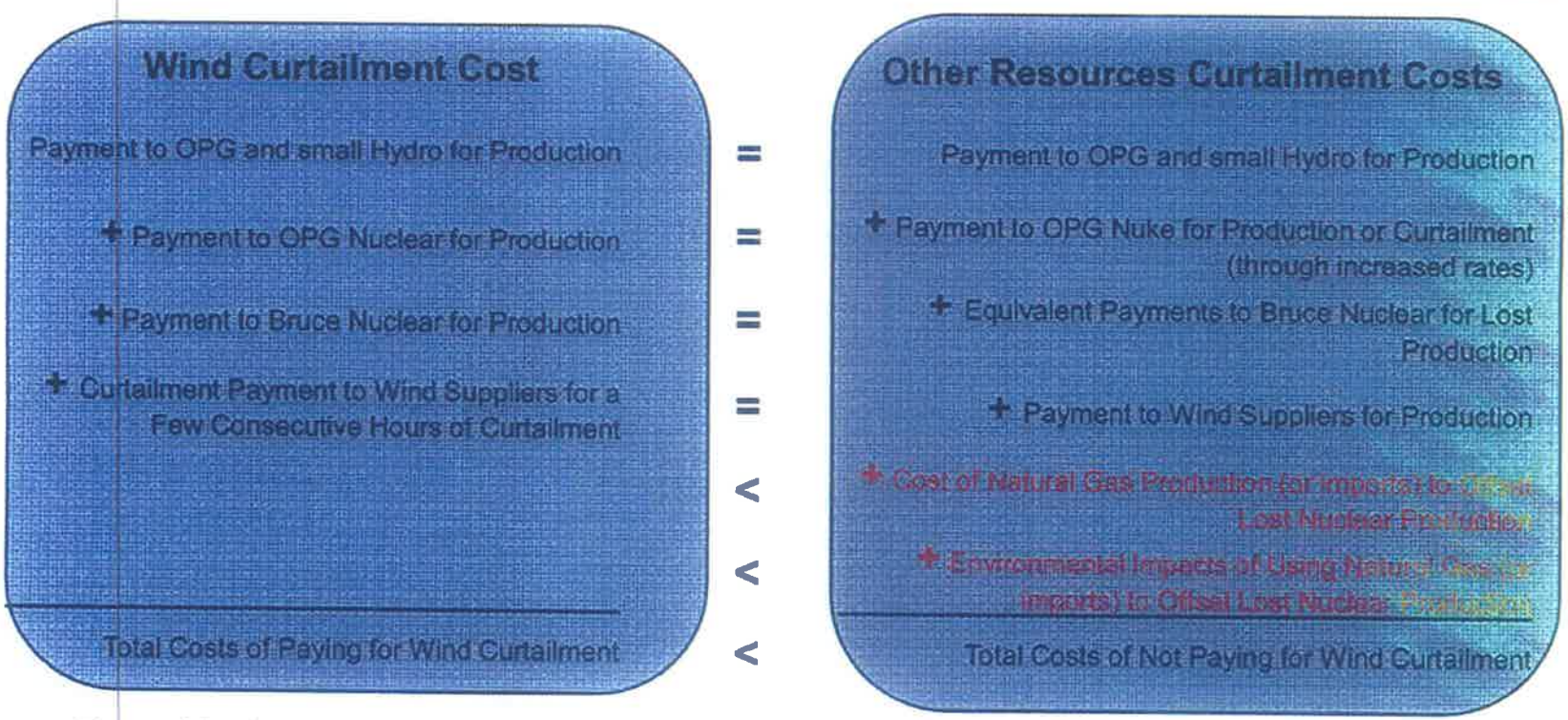
The Economics of Curtailment



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.

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