

Dispatch Order for Baseload Generation

Floor Price Focus Group
November 21, 2011



- Introduction
- Market Mechanics
- Baseload Generation Operational Limitations
 - Hydroelectric
 - Nuclear
 - Wind
 - Solar
- Proposal and Next Steps

- Design Principle 10
 - “The IESO may establish various floor prices for offers from baseload generators, i.e. wind, must-run hydro and nuclear, to ensure efficient dispatches during periods of local and/or global surplus baseload generation (SBG) events.”
- Dispatch order for baseload generation will produce real-time outcomes that:
 - Promote market efficiency and cost-effectiveness
 - Minimize environmental impacts
 - Contribute to the development and implementation of government policy

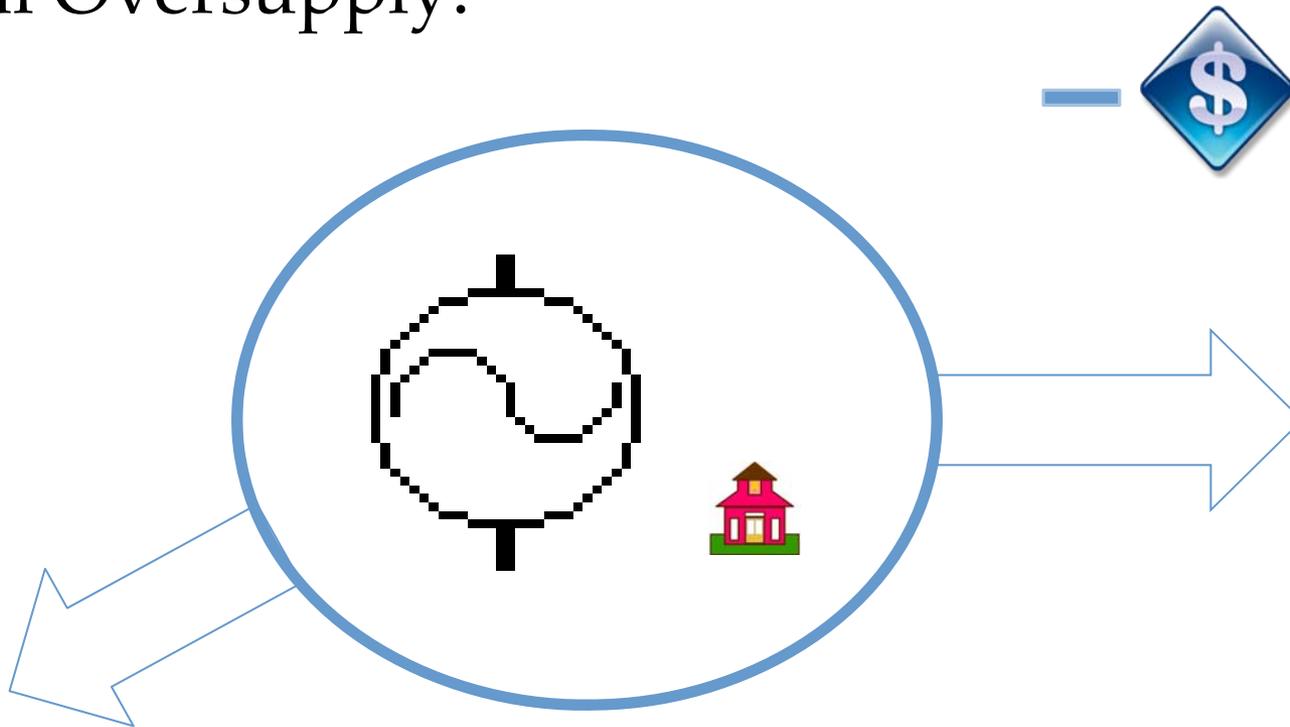
- Discussion paper posted on November 10, “Dispatch Order for Baseload Generation”
 - Seeks to develop a common understanding among stakeholders of the technical, regulatory and public safety implications of baseload generation
 - Proposes a dispatch order but not the mechanism to achieve it
- Floor Prices Focus Group will:
 - Define, generally, the technical and regulatory limitations of baseload generation technologies;
 - Define the relative dispatch order for baseload generation technologies; and,
 - Propose the specific mechanism to achieve the dispatch order.

- To ensure that Market Participants have a full perspective and appreciation for the overall impacts and intent of any market rule changes, the IESO will only bring forward the market rule amendments following the finalization of recommendations completed through the Dispatch Technical Working Group and the Floor Price Focus Group.

- Three primary reasons to dispatch baseload generators:
 - Global oversupply (SBG)
 - Local oversupply (congestion)
 - Operational needs (ramping)
- IESO two-schedule (constrained and unconstrained) market design can create different incentives than a market based on a locational marginal price

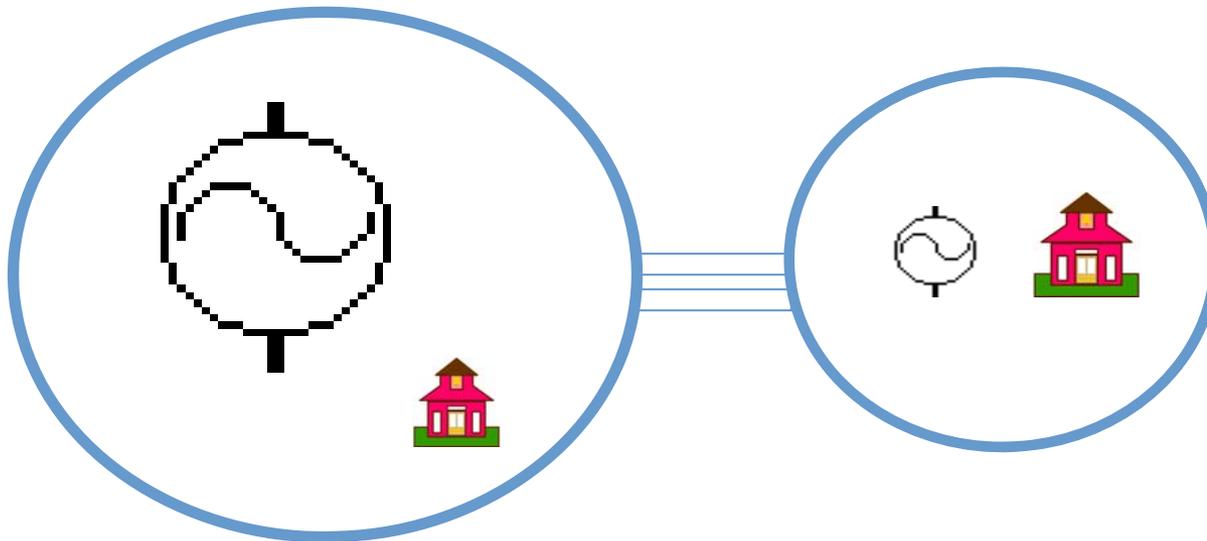
- Global oversupply
 - Demand in Ontario is lower than the amount of baseload generation that is online and which wants to continue to run
 - Market Clearing Price is typically negative, meaning that all online generators are willing to pay in order to stay online for economic, equipment, regulatory or safety reasons
 - Generation must be reduced, ideally by generators with:
 - most manoeuvrability
 - highest marginal fuel cost
 - least environmental impact
 - greatest regulatory flexibility

Global Oversupply:



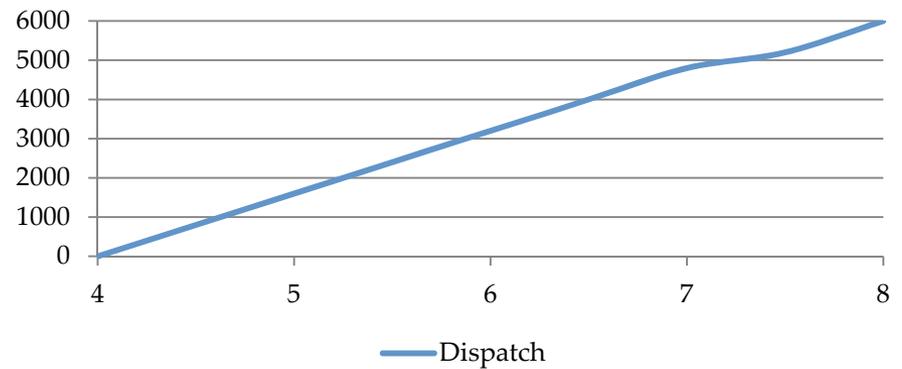
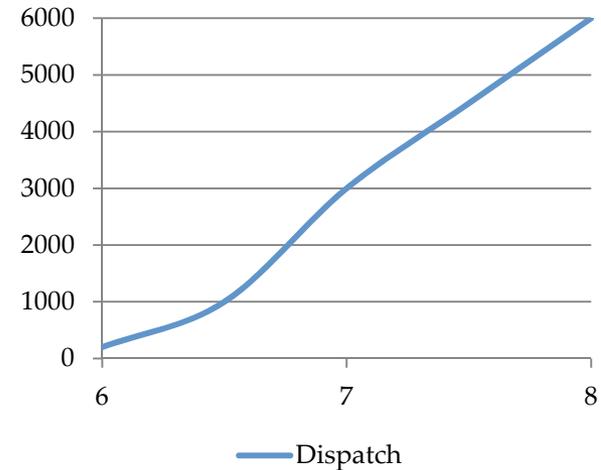
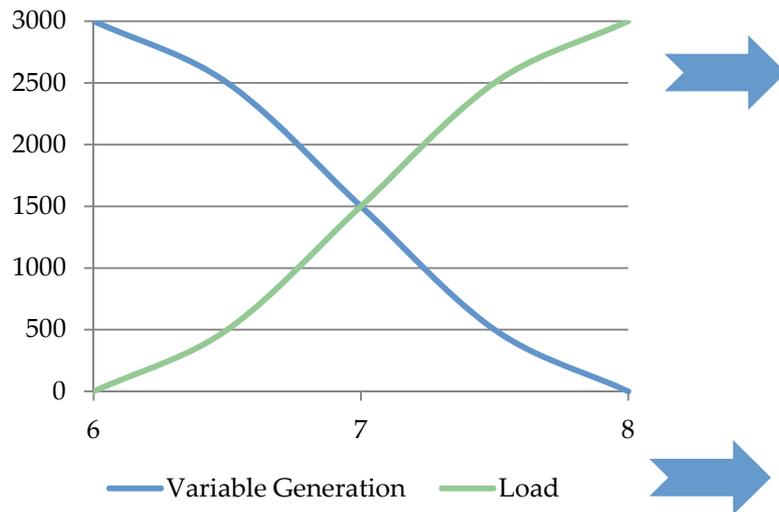
- Local oversupply:
 - Evident when the generation within a specific region on the grid exceeds the local demand as well as the capability for transmission facilities to carry away the excess power
 - Transmission system operation must respect the limits on transmission facilities to avoid equipment damage and maintain electric stability
 - Similar to global oversupply except that the diversity of resources to resolve oversupply is more limited

Local Oversupply:



- Operational Needs:
 - Variable nature of renewable generation can lead to operational difficulties, particularly when its output trends in a direction different than that of demand
 - Example:
 - If wind decreases over the morning hours when load increases, other generation is required to not only meet the increasing demand but also to replace the supply that is being lost from the wind fleet
 - In these instances, it may be necessary to reduce the output from wind generation a few hours in advance in order to avoid oversupply conditions

- Operational Needs:



- From August to September, the IESO completed research through:
 - Meetings with generators and equipment manufacturers representing nuclear, hydroelectric, wind, and solar; and,
 - Internal IESO analysis of historic data.
- Research addressed the following topics:
 - Dispatch flexibility and manoeuvrability;
 - Technical or equipment-related limitations;
 - Risks to environmental quality or public safety; and
 - Regulatory restrictions on operations.
- The results of the research are presented in the discussion paper and outlined in the slides that follow.

- Flexibility
 - Must “spill water” and opportunity to generate electricity from spilled water is lost
- Technical or Equipment Limitations
 - Forbidden regions
 - Thermal cycle stress
 - Sluice gates not built for frequent dispatch
- Environmental or Public Safety Concerns
 - Visual inspections of spillways required
- Regulatory Restrictions
 - Mandatory Water Management Plans can be restrictive

- Flexibility
 - Liquid zone control capability or Condenser Steam Discharge Valve (but not both)
 - Complete shutdown is required otherwise
- Technical or Equipment Limitations
 - Dispatch magnitudes from liquid zone control highly dependent on reactivity
 - Shutdown lasts between 48 and 96 hours
- Environmental or Public Safety Concerns
 - None if operating procedures and policies respected
- Regulatory Restrictions
 - Must operate within the terms of their CNSC licence and procedures
 - Ministry of Environment enforces limits on lake temperature

- Flexibility
 - Pitching blades, whereby opportunity to generate electricity from wind is lost
- Technical or Equipment Limitations
 - Blade braking may introduce dust in the nacelle
 - Pitching in high winds may introduce stress on turbine
 - ‘Hard Stops’ may do increased damage to turbine
- Public Safety Concerns
 - None
- Regulatory Restrictions
 - No evidence of increased noise levels due to blade pitching

- Flexibility
 - Dispatch achieved through inverter control, whereby opportunity to generate electricity from sunlight is lost
- Technical or Equipment Limitations
 - Dispatch is less impactful on inverters when incident sunlight is less and available output is lower
 - Large manoeuvres may increase inverter temperature, leading to automatic shutdown
- Environmental or Public Safety Concerns
 - None
- Regulatory Restrictions
 - None

Based on results of research, the IESO proposes that the relative dispatch order for baseload generation should be:

1. Wind and solar generators; then
2. Hydroelectric; then
3. Nuclear

In all cases regulatory, technical, and public safety concerns will be respected regardless of the associated economic consequences of such dispatch action.

The IESO is seeking stakeholder feedback through the following questions:

- Do you agree with the limitations outlined in the Dispatch Order for Baseload Generation discussion paper?
- Are there limitations that were not identified in the Dispatch Order for Baseload Generation Discussion Paper?
- Are there other factors that should be considered when determining a dispatch order for baseload generation?

- Once the limitations of baseload generators, and relative dispatch order have been defined, the Floor Prices Focus Group will discuss the specific mechanism to implement the dispatch order, including dispatch distribution.
- The next meeting of the Floor Price Focus Group is planned for January 2012
 - Stakeholder feedback is required by December 19th, 2011