

Basic Power System Operation – Today’s Power System

Ontario’s Interconnected High Voltage Power System is designed to withstand:

- Recognized faults (phase to ground, phase to phase, etc.) on transmission equipment such as lines, transformers, and breakers
 - Failure of a 230 KV line during outage conditions could result in up to 600 MW of load loss, a 500 KV transmission line failure could result in loss of up to 1500 MW of generation
 - If the failure causes reductions in operating security limits sufficient control actions exist on the power system to return the GRID to a safe operating posture in 30 minutes; in extreme (emergency) cases the GRID has to be returned to a safe posture within 15 minutes of the fault
- Sudden loss (removal from service) of single generators and/or groups of generators based on the largest single recognized contingency
 - The System is designed to respect the instantaneous loss of a single Darlington generator (over 900 MW).
 - Sufficient operating reserve exists on the system to replace the largest generation failure within 10 minutes
- Unplanned or manual removal of loads, transmission or generation based on recognized largest single contingency

Ontario’s Interconnected High Voltage Power System designed to operate:

- With Automatic Generation Control (AGC) to correct minute to minute variation in loads or generation
 - Approximately 100 MW (+/- 100 MW) of generation with a ramp rate of **50 MW/minute** is available to ensure generation output (plus scheduled transactions) matches “short term” (fluctuating) load requirements
- With load and generation “balancing” to ensure that variations in loads and or generation that occur over longer periods of time (5 minute to 2 hours or longer) are corrected by dispatching generators and/or specific loads to their economic operating point. The goal is to match “scheduled generation” and “scheduled load” while respecting operating reserve requirements and system security limits
 - Every 5 minutes the IESO determines if the load is trending higher or lower than expected and redispaches the generators and/or specific load on the margin to ensure load and generation balances are maintained while respecting operating reserve requirements and transmission security limits

Ontario Interconnected High Voltage System - Impact of Additional 150 MW of Wind Generation

- No significant impact on transmission contingencies – if required sufficient control actions (reactive compensation, generation rejection, etc.) are built into project to ensure GRID security is maintained following recognized contingencies including manual removal of equipment from service.
- No impact on operating reserve requirement – smaller than largest generator contingency therefore no additional operating reserve requirement
- To- date wind generation projects have not increased the AGC requirement on the system. In fact the IESO now contracts for a lower quantity of AGC than when the IESO Market first opened.
- The complexity of Load and Generation “balancing” is not expected to increase significantly as more wind generation is placed on the System. Geographic diversity reduces probability of load balancing issues.
- The OPA Integrated Power System Plan (IPSP) indicates a commitment requirement of 1251 MW of wind generation by 2010 bringing the total “ installed” wind capacity to 1646 MW. During the same period the IPSP indicates a 4267 MW commitment requirement for new gas generation based on the Supply Mix Directive; that is maintaining the availability to use natural gas capacity at peak times and the need to ensure sufficient generation is available to meet the total resource requirement in Ontario. The IPSP supports **both** new wind generation projects and new gas generation projects.

New Wind Generation –is the Equivalent Gas Generation Required for System Security

- IPSP report *does not require* 1 MW of gas generation to be built for every MW of wind generation installed
- New wind generation does not increase 10 minute operating reserve requirements or reduce system security limits. New wind generation can be placed in-service without causing significant system concerns
- **Only in an electrical island would there be a need for quick ramping generators to match changes in wind generation. This situation does not exist for wind farms as they are grid connected.**

Author

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