

18-Month Outlook Reliability Assessment Methodology

April 9, 2014

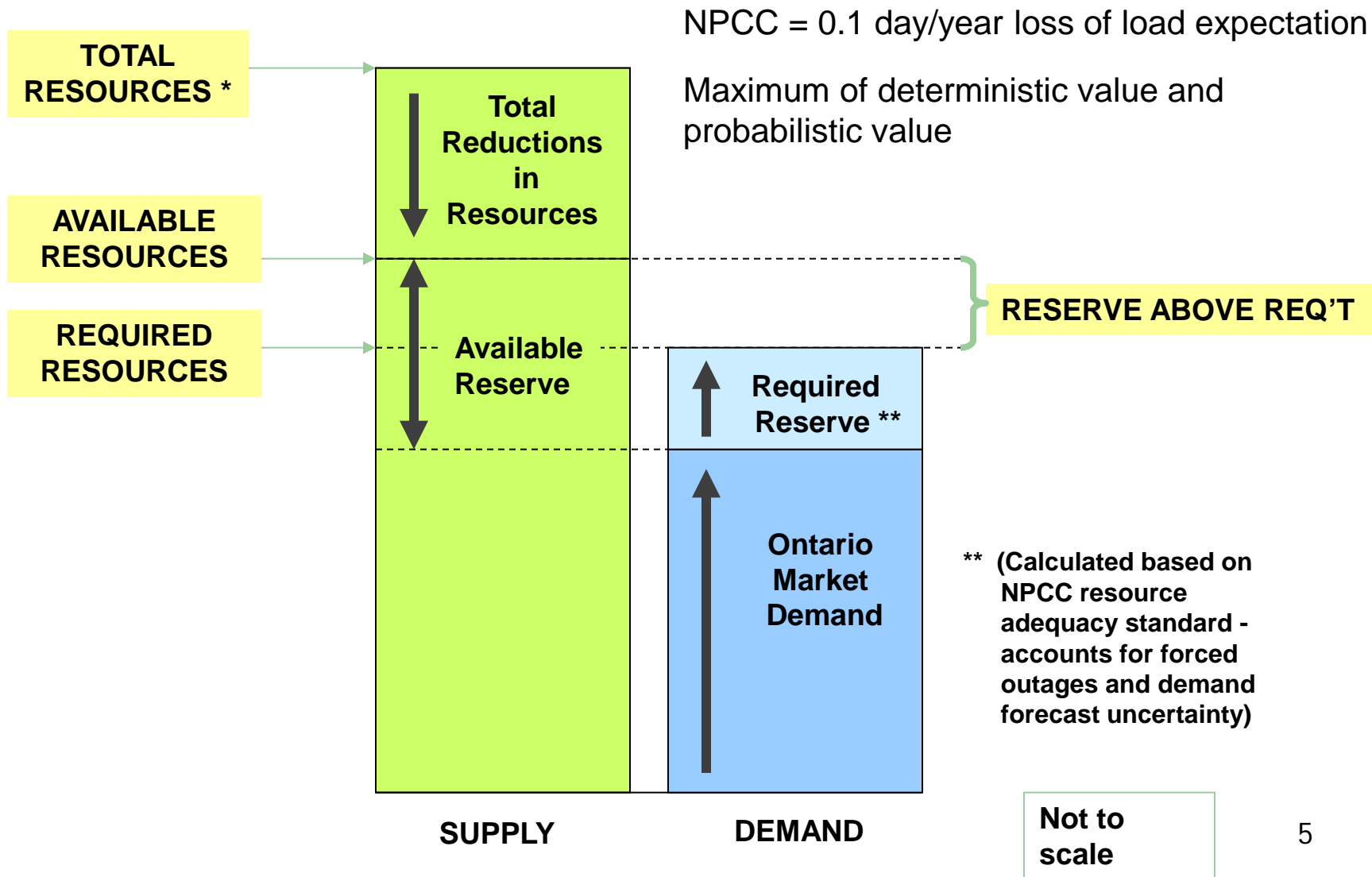


- Purpose of the 18-Month Outlook assessment
- Ontario's reliability assessment criteria
- Demand forecasting
- Scenarios assessed
- Data inputs and assumptions
- Models used
- Types of assessments
- Link: [Forecasts & 18-Month Outlooks](#)

- Publish a forecast of demand
- Report on resource and transmission reliability of the Ontario electricity system
 - Identify projected shortfalls in generation capacity and energy
 - Identify the possibility of any security-related events that could require contingency planning
 - Meet IESO's obligations to relevant standards authorities
- Provide information for MP to act to reschedule outage plans to avoid projected shortfalls
- To report on initiatives being put in place to improve reliability

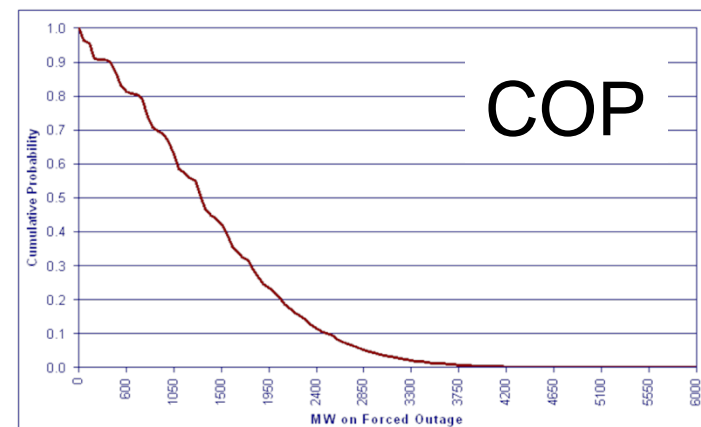
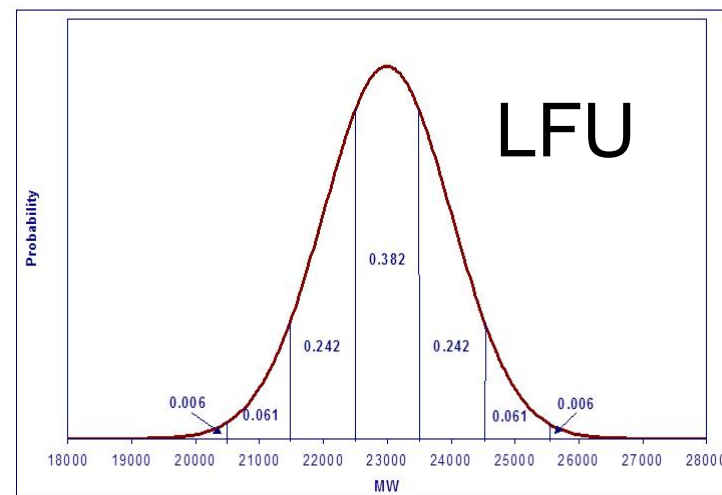
- Models represent the relationship between electricity demand and:
 - Weather (temperature, humidity, wind speed, cloud cover)
 - Calendar variables (days of the week, holidays)
 - Economics (employment, population, industrial activity)
- Models also include the impacts of:
 - Conservation (reducing end-use consumption)
 - Embedded generation (reduces the need for grid-supplied electricity)
 - Price Impacts (reduces demand during peak times)
- Demand Measures (DR3, Peaksaver & Dispatchable Loads)
 - Treated as resources and are not part of the demand forecast

Resource Assessment Criteria



Planning Reserve requirements

- Probabilistic requirement based on NPCC criteria:
 - 0.1 day/year Loss of load expectation in 10 year
 - Load forecast uncertainty
 - Cumulative outage probability
- Deterministic requirement:
 - Operating reserve
 - Load forecast uncertainty
 - Additional contingency allowance
- The Outlook uses the greater of these two values for each week



Four Scenarios:

- Firm scenario for Normal Weather and Extreme Weather
- Planned scenario for Normal Weather and Extreme Weather
- **Firm scenario** includes existing generation and future projects that have a high certainty of being realized
- **Planned scenario** includes all planned projects
- All four scenarios analyzed in the Capacity Assessment

- Thermal Generators
 - Market Participant (MP) submitted ratings & seasonal derates
 - Planned outages in Integrated Outage Management System (IOMS)
 - Changes to existing facilities
- Hydroelectric Generators
 - Monthly historical production and OR schedules
 - MP submitted energy capability

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Historical Hydroelectric Median Values (MW)	6,089	6,097	5,923	5,878	5,911	5,788	5,718	5,403	4,980	5,390	5,762	6,158

- Variable Generators (Wind & Solar)
 - Modeled as capacity contribution at time of peak based on historical production data and/or simulated historical data

- Wind Capacity Credit (WCC)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WCC (% of Installed Capacity)	33.4%	33.4%	26.0%	21.1%	20.4%	13.6%	13.6%	13.6%	15.9%	21.6%	28.9%	33.4%

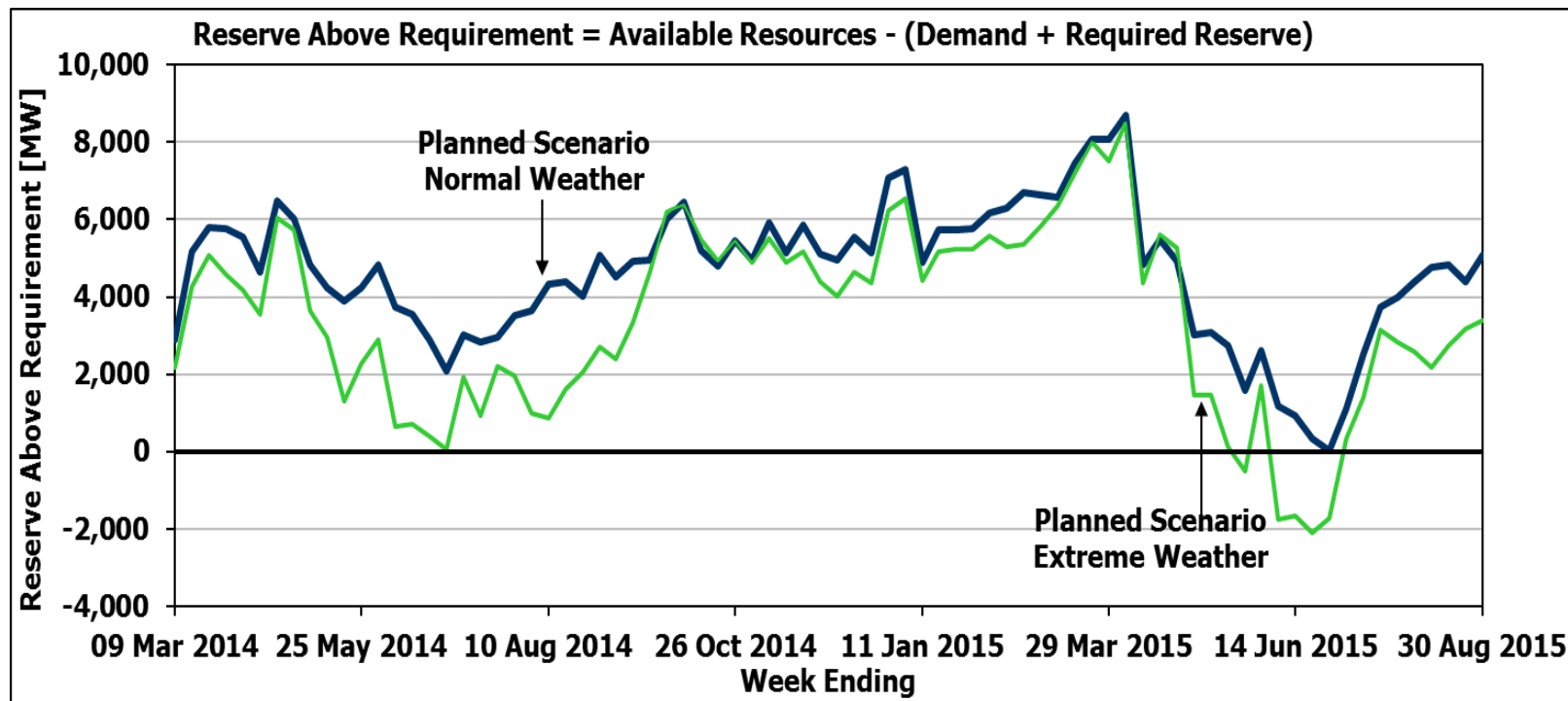
- Solar Capacity Credit (SCC)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SCC (% of Installed Capacity)	0.0%	0.0%	0.0%	28.0%	54.0%	34.0%	34.0%	34.0%	6.0%	1.0%	0.0%	0.0%

- Future Projects:
 - MP/OPA updates on in-service dates

- Major Interface Operating Security Limits (OSL)
- Impact of planned outages on OSLs of major interfaces
 - Transmission facilities 115 kV and higher
 - Outage duration longer than 5 days
- Transmission constrained generation and the associated reserve are subtracted from the Available Resources
- Interconnection transfer capability with neighbours is not relied on

- Reserve Above Requirement (RAR) = Available Resources minus Required Resources



- Purpose
 - Assess whether the resources available over 18-month horizon are sufficient to supply the forecast energy demand and OR requirements
- Why
 - changing resource mix: increasing penetration of variable energy resources, higher reliance on energy limited resources
 - evolving demand profiles influenced by conservation and embedded generation

- Hourly granularity study
- Hourly zonal demand forecast distributed across the load buses in each zone
- System operating reserve requirements included
- Resources represented in detail with their operating characteristics and limitations
- Nodal representation of the Ontario transmission system

- Resource

Other	← Bio-fuel, Demand Response
Wind and Solar	← Hourly profiles - Variable Generation Modeling tool
Gas	← Heat rate curves and fuel price
Dispatchable Load	← Historical P-Q Data
Hydro	← Min/Max MW (capacity) and energy constraints
Nuclear	← Historical Price-Quantity (P-Q) data

- The transmission adequacy assessment:
 - forecasts any reduction in transmission capacity brought about by specific transmission outages
 - identifies any security-related events on the ICG that could require contingency planning by the MPs or IESO
 - identifies identify the areas of the ICG where, for the conditions forecast in the planning period, the projected normal or extreme weather loading is expected to approach or exceed the capability of the transmission facilities.

- 18-Month Outlook building blocks
 - Demand Forecast
 - Capacity assessment
 - Energy Assessment
 - Transmission Assessment
- data provided by the MPs and owners of new facilities is critical to assessment accuracy
- http://www.ieso.ca/Documents/marketReports/Methodology_RTAA_2014feb.pdf