2017 Economic Study

Scope Of Work

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One Economic Study Request Was Made in 2017

- One request for an Economic Study was submitted to the ISO in 2017
  - Request from the Conservation Law Foundation (CLF)
  - Presented to the PAC on April 19, 2017
- The goal of CLF's request is to determine whether there are viable system topologies other than those analyzed in the 2016 Economic Study Scenario 3 (2016 Scenario 3) with similar total system emissions but at a lower Relative Annual Resource Cost than projected for the 2016 Scenario 3
- The purpose of today's presentation is to discuss high-level scope of work, assumptions and schedule for the 2017 Economic Study

Scope of Work of the 2017 Economic Study

- CLF requested three scenarios:
  - Each scenario will model the year 2030
  - Each scenario represents an incremental change from Scenario 3 of the 2016 Economic Study
    - Scenario 3 of the 2016 Economic Study is the "RPS-plus scenario": generation fleet meets existing Renewable Portfolio Standards (RPS) and new renewable/clean energy resources are added above the existing RPS requirements
  - 2017 Scenario A: change in mix of new renewable/clean energy resources, with emphasis on energy efficiency and off-shore wind
  - 2017 Scenario B: change in mix of new renewable/clean energy resources, with emphasis on on-shore wind
  - 2017 Scenario C: replacement of some of the base load nuclear generation with renewable/clean energy resources

The 2017 Study Will Reflect the Same Basic Assumptions That Were Used in the 2016 Study

- Gross demand, solar photovoltaic (PV), and energy-efficiency (EE) forecasts summarized in the ISO's *2016 Capacity, Energy, Load, and Transmission (CELT) Report* are used to establish net load for 2025. The quantities for 2030 assume growth continuing at the same rate for 2025 compared with 2024.
  - Additional PV and EE assumptions were made in the 2016 Scenario 3.
- A representative installed reserve margin of 14% above the gross 50/50 peak load net of behind-the-meter (BTM) PV is assumed to meet the net Installed Capacity Requirement.
- The fleet of supply and demand resources expected as of 2019/2020 using the results of the Forward Capacity Auction #10 (FCA #10) is reflected in the simulations. These cleared resources include renewables (i.e., biofuel, landfill gas, and other fuels), central station PV; coal-, oil-, and gas-fired generators; nuclear; hydroelectric and pumped-storage resources; and external capacity contracts, which will have capacity supply obligations from June 1, 2019, to May 31, 2020. Retired resources known as of FCA #10 are also removed from the simulation data bases.
  - Additional Active Demand Resources (DR), storage, plug-in hybrid electric vehicles (PHEV) and imports assumptions were made in the 2016 Scenario 3.

The 2017 Study Will Reflect the Same Basic Assumptions That Were Used in the 2016 Study, cont.

- FCM and energy-only generators are simulated at their summer seasonal claimed capabilities and then reduced to reflect forced outages and average daily unavailabilities of generators.
- The as-planned transmission system is used for estimating the system's transfer limits for internal and external interfaces under constrained conditions. The 2030 internal and external transmission-interface transfer capabilities are based on the values established for 2025 for regional planning studies.
- US Energy Information Administration (EIA) fuel-price forecasts with reference projections to 2030, are used for estimating costs to produce electric energy. Monthly multipliers have been applied to the EIA forecasted natural gas price to reflect seasonal adjustment.
- Prices for the Regional Greenhouse Gas Initiative carbon dioxide (CO_2) emission allowances and allowances for other environmental emissions are specified at $24/ton for 2030 and used for estimating the costs to produce electric energy.

The 2017 Scenarios Represent Incremental Changes from the Third Scenario Used in the 2016 Study

Year 2030	Gross Demand	Energy Efficiency	Behind The Meter PV (Nameplate)	Utility PV (Nameplate)	Supply and Demand Resources	Retirements	On-Shore Wind (Nameplate)	Off-Shore Wind (Nameplate)	Battery Storage	PHEV	Add. Imports from HQ and NB
2016 - Scenario 3 (Reference)	Based on 2016 CELT Forecast	7,009 MW	6,000 MW	6,000 MW	FCA 10 - Excl. RTEG Add 1,000 MW of Active DR	All oldest Oil/Coal by 2030 approx. 5,600 MW	4,800 MW	2,483 MW	2,500 MW	4.2 Millions	2,000 MW
2017 - Scenario A (Change from 2016 – Scenario 3)		Increased by 2,000 MW	Increased by 2,000 MW	Reduced by 2,000 MW			Reduced by 2,800 MW	Increased by 1,000 MW			Reduced by 1,000 MW
2017 - Scenario B (Change from 2016 – Scenario 3)		Reduced to 2016 CELT forecast approx. 2,300 MW reduction	Reduced to reach target of 4,000 MW approx. 2,000 MW reduction	Reduced to FCA #10 amounts approx. 5,800 MW reduction	Remove additional active DR		Increased to reach target of 7,000 MW approx. 2,200 MW increase		Remove battery storage	Remove PHEV	Reduced by 1,000 MW
2017 - Scenario C (Change from 2016 – Scenario 3)						Remove an additional 2,122 MW of nuclear generation	Amount determined necessary to replace 2/3 of energy production lost from additional retirements	Amount determined necessary to replace 1/3 of energy production lost from additional retirements			

The 2017 Study Will Use the Same Profiles That Were Used in the 2016 Study

- Load profiles (load shape and daily peak) reflect behind-the-meter resources, mainly PV and EE resources.
- Wind and PV profiles use hourly profiles developed by the National Renewable Energy Lab (NREL) compatible with the hourly system loads used in the GridView simulations.
- Profiles for charging plug-in hybrid electric vehicles (PHEVs) model charging at night.
- The storage and discharge of energy by pumped-storage generation and battery systems are designed to flatten the net load profile after all PV (BTM and non-BTM), wind energy, and PHEVs are accounted for.
- Hydro generation profiles and energy delivery transfers (imports) for existing ties are developed using historical diurnal profiles for 2013, 2014, and 2015.
  - Additional imports from Hydro-Quebec and New Brunswick are modeled to smooth out the loads affected by renewables.
- Trigger prices for reducing imports, hydro production, wind generators, and PV outputs are assumed to decrease their production during times of oversupply (called “spilling”) and to respect transmission system limitations.

The 2017 Study Will Produce Similar Key Metrics to Those Produced in the 2016 Study

- Economic results
  - Total energy production by resource/fuel type
  - Systemwide production costs
  - Average locational marginal prices
  - Load-serving entity energy expenses and congestion
- High order-of-magnitude cost estimates for transmission development
- Relative Annual Resource Costs
  - Using the 2016 Scenario 3 as a reference
- Environmental results
  - Carbon dioxide emissions
  - Renewable resource spillage

Next Steps of the 2017 Economic Study

- The 2017 Economic Study will have lower priority than Phase II of the 2016 Economic Study (NEPOOL Scenario Analysis)
  - The schedule is TBD
- Study process
  - Finalize detailed assumptions based on preliminary analysis
  - Present draft results
  - Present final results and draft report
  - Post final report