

Background

Scenario Analysis Initiative: Objective

- Analysis of “what if the region’s electric system followed this particular technology path or that one...”
 - If New England pursued one or another technology for the next period, what could we expect in terms of various outcomes:
 - Economic impacts
 - Reliability impacts
 - Environmental impacts
- Analysis designed to inform stakeholders and policymakers for their own discussions of preferred outcomes
- Scenario Analysis did not attempt to:
 - Develop a least-cost plan
 - Prepare a multi-year present worth analysis
 - Develop consensus on a preferred approach

Study Scope

- Scope is broad and includes many assumptions
 - Envisioned a single future snap-shot year
 - Far enough into the future to avoid question: “how did we get here?”
 - Presumably beyond the year 2020
 - Specific load level considered: 35,000 MW (peak load)
 - Capacity Requirement: Approx. 39,000 MW
 - Energy Efficiency and Demand Response are viewed as resources
- Open process allowed various stakeholders the opportunity to advocate for metrics of importance to them
- Initial attempt by the ISO to report out results
 - Stakeholders will be able to use results on their own

Seven Scenarios and Sensitivity Analyses

	A	B	C	D	E	F	G	H	I	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	X	X	X	X			X	X	X		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	X	X	X		X	X	X	X	X		
3 Nuclear — 5,400 MW	X	X	X	X			X	X	X		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	X	X	X	X			X	X	X	X	
5 Natural gas (combined cycle) — 5,400 MW	X	X	X	X			X	X	X		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	X	X	X	X			X	X	X		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	X	X	X	X			X	X	X		X

Stakeholder Input

- Plenary meetings
 - Review scope of work, assumptions, and results
- Technical experts provided comments/information
 - Fuel forecasts
 - Need for additional natural gas infrastructure
 - Profiles of wind, photo-voltaic (PV), and energy efficiency resources

Stakeholder Input (continued)

- Open Stakeholder Meetings held to discuss detailed technical issues
 - Power Supply Planning Committee
 - Assumptions and data inputs
 - Modeling characteristics, capital and dispatch costs
 - Demand Response Working Group
 - Energy efficiency and demand response costs and characteristics
 - Environmental Advisory Group
 - Emission modeling and rates, environmental metrics
 - Transmission Owners Working Group
 - Transmission and distribution conceptual costs
 - Metrics Working Group
 - Type and format of Scenario Analysis information to be provided

Types of Analyses Performed

- Production Simulations
 - Provide individual and total production costs for resources
 - Calculate wholesale energy costs to consumers
 - Determine gross energy revenues to resources
 - Show air emissions
- Operable Capacity Analysis
 - Evaluate need for fuel diversity
 - Use methodology similar to RSP06
- Conceptual Electrical Transmission Needs
 - Develop cost for generic transmission expansion
 - Determine representative \$/MW-mile for transmission expansion

Types of Analyses Performed (continued)

- Conceptual Electrical Distribution Needs
 - Develop cost for generic distribution system expansion
- Conceptual Expansion of Wholesale and Local Distribution Natural Gas Delivery Systems
 - Develop cost for generic expansion of natural gas delivery system
- Physical Resource Needs for Land and Water Use
- Economic Analysis
 - Revenue support from energy markets in comparison to capital costs

Summary of Metrics for Comparing the Scenarios

Economic	Reliability	Environmental
Systemwide production costs ^(a) (billion \$)	Systemwide energy mix (MWh; % MWh by fuel)	Total systemwide emissions of SO ₂ and NO _x (1,000 tons) and CO ₂ (million tons)
Energy supply duration curves for marginal clearing price	Systemwide capacity mix (MW by fuel)	Total systemwide NO _x emissions for the 10 highest peak-load summer days (tons)
Annual revenue requirements (ARR) for expansion resources ^(b) (billion \$; \$/kW-year)	Total units of fossil fuel burned (Quadrillion Btus consumed; MWh of production)	Total systemwide emissions of CO ₂ (million tons)
Net wholesale electric energy market revenues for expansion resources (million \$; \$/kW-year)	Exposure to fuel-supply disruption (MW) (operable capacity analysis)	CO ₂ emissions compared with Regional Greenhouse Gas Initiative allocation ^(c) (million tons; compliance/ noncompliance)
Load-serving entity expenses for wholesale electric energy based on hourly New England marginal clearing prices (billion \$; \$/MWh)		Mercury emissions (lbs)
Generic capital costs for expansion (\$/kW)		Cooling water use (gal/minute)
Generic transmission expansion costs (\$/scenario; \$/MW-hour)		Amount of incremental land used (acres)
Generic distribution expansion costs (\$/MW-hour)		Renewable energy contribution (MWh;% MWh)
Costs for generic expansion of gas-delivery system (\$)		

(a) The systemwide production cost is the sum of the annual production costs (i.e., the fuel and emissions-related operating costs) for every resource to produce power in each hour of the simulated year.

(b) The annual revenue requirement (capital cost X the annual revenue requirement rate) captures all non-fuel-related costs including the recovery of capital costs, other operating costs, taxes, and other expenses.

Overview of Results

- Approximately 75 Metrics for over 50 Scenarios
 - Economics
 - Reliability
 - Environmental
- Study results derived from:
 - Production Simulations
 - Operable Capacity Analysis
 - Research of various quantities
 - Calculations
- Several main themes and results will be discussed today
- Further postings of information will also be discussed