



Eastern Interconnection Planning Collaborative

EIPC Gas-Electric Study

Target 1 & 2 Update Target 4 Kick-Off

Stakeholder Steering Committee
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LEVITAN & ASSOCIATES, INC.
MARKET DESIGN, ECONOMICS AND POWER SYSTEMS

Acknowledgement and Disclaimer

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Acknowledgement:

- ◆ This material is based upon work supported by the Department of Energy, National Energy Technology Laboratory, under Award Number DE-OE0000343.

Disclaimers:

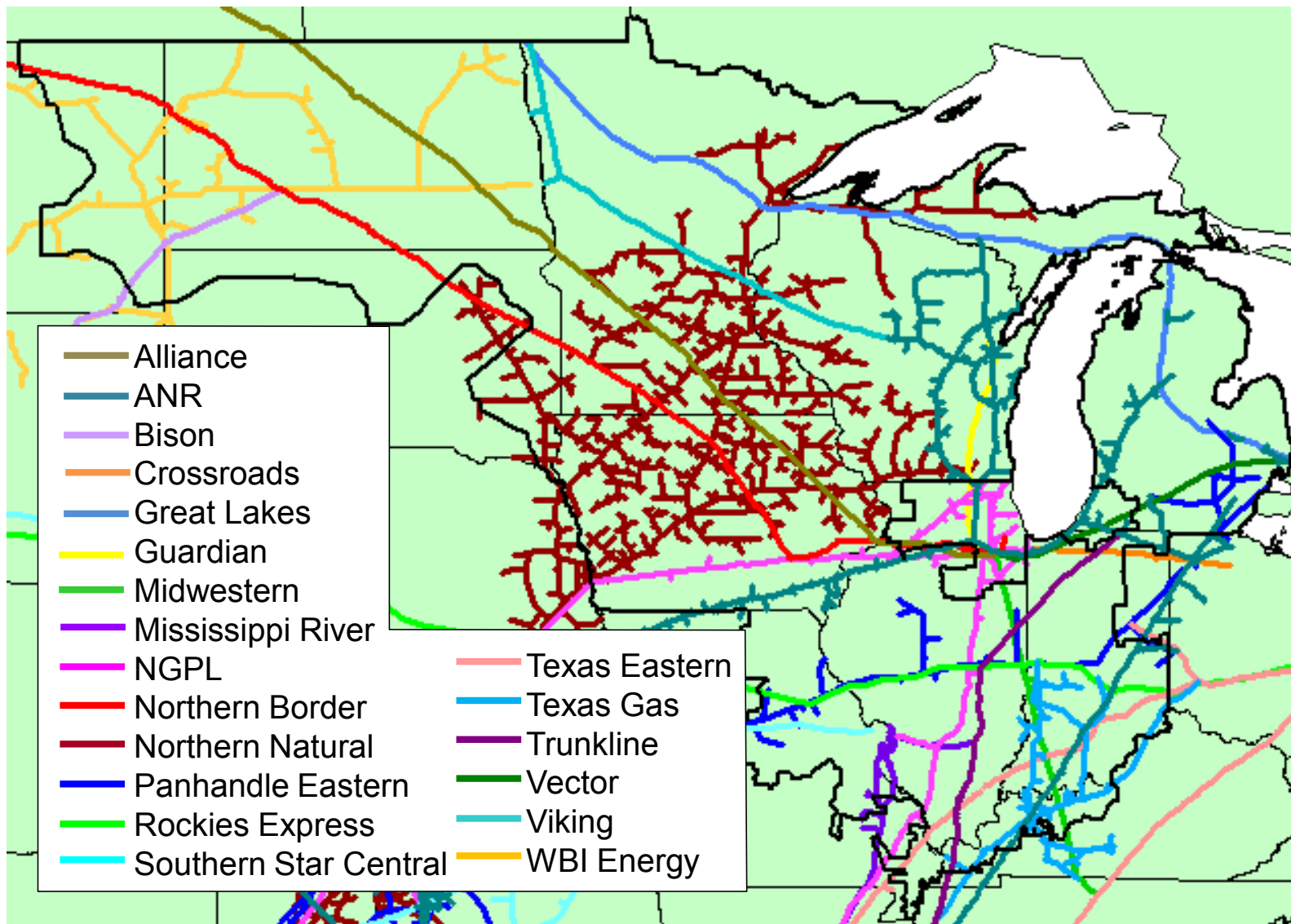
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Target 1 Status

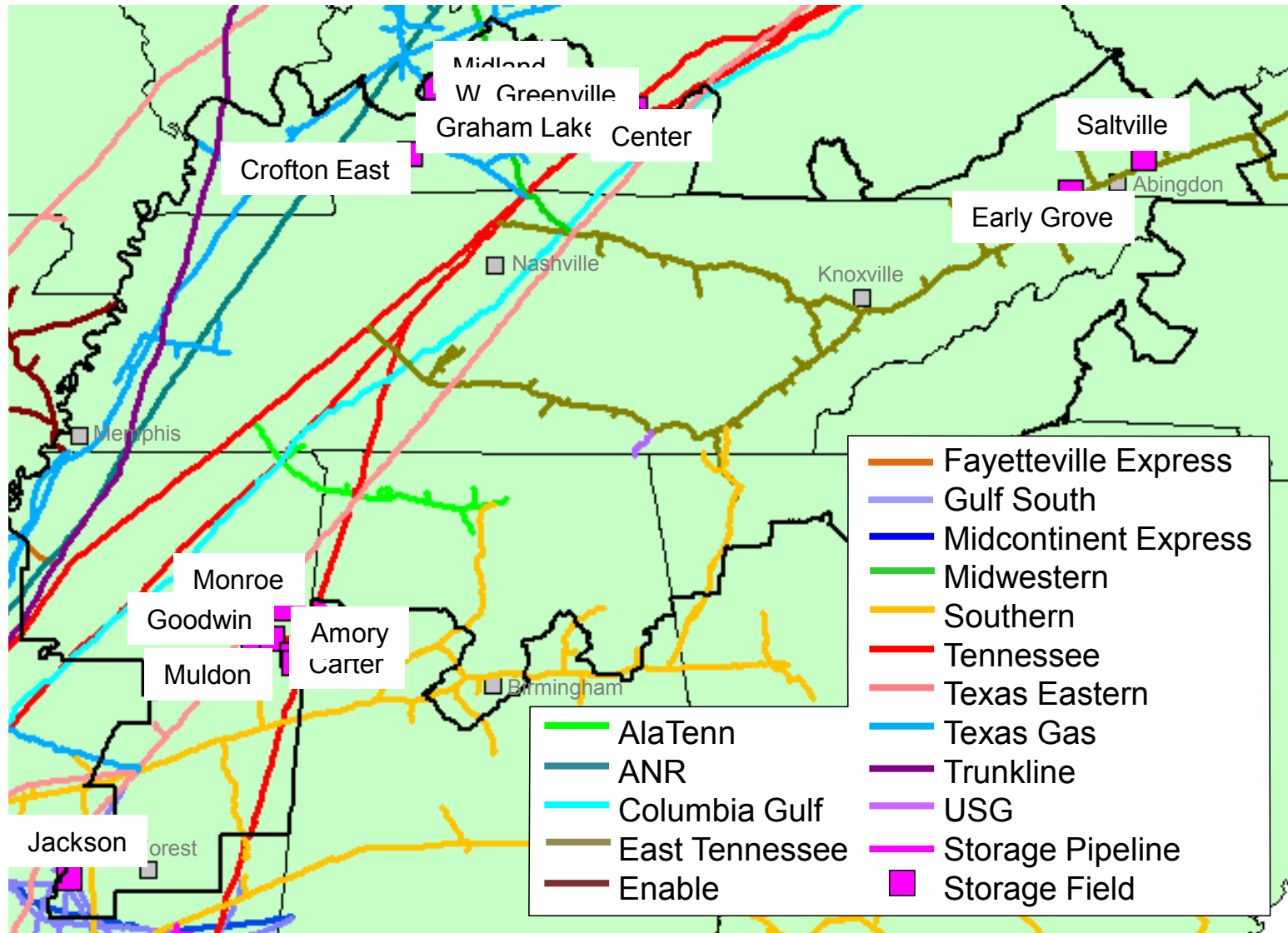
Report Review Schedule

- ◆ LAI is in the process of finalizing the Draft Report
- ◆ Draft Report due to be delivered to stakeholders: 2/21/14
- ◆ Comments on Draft Report due from stakeholders: 3/14/14

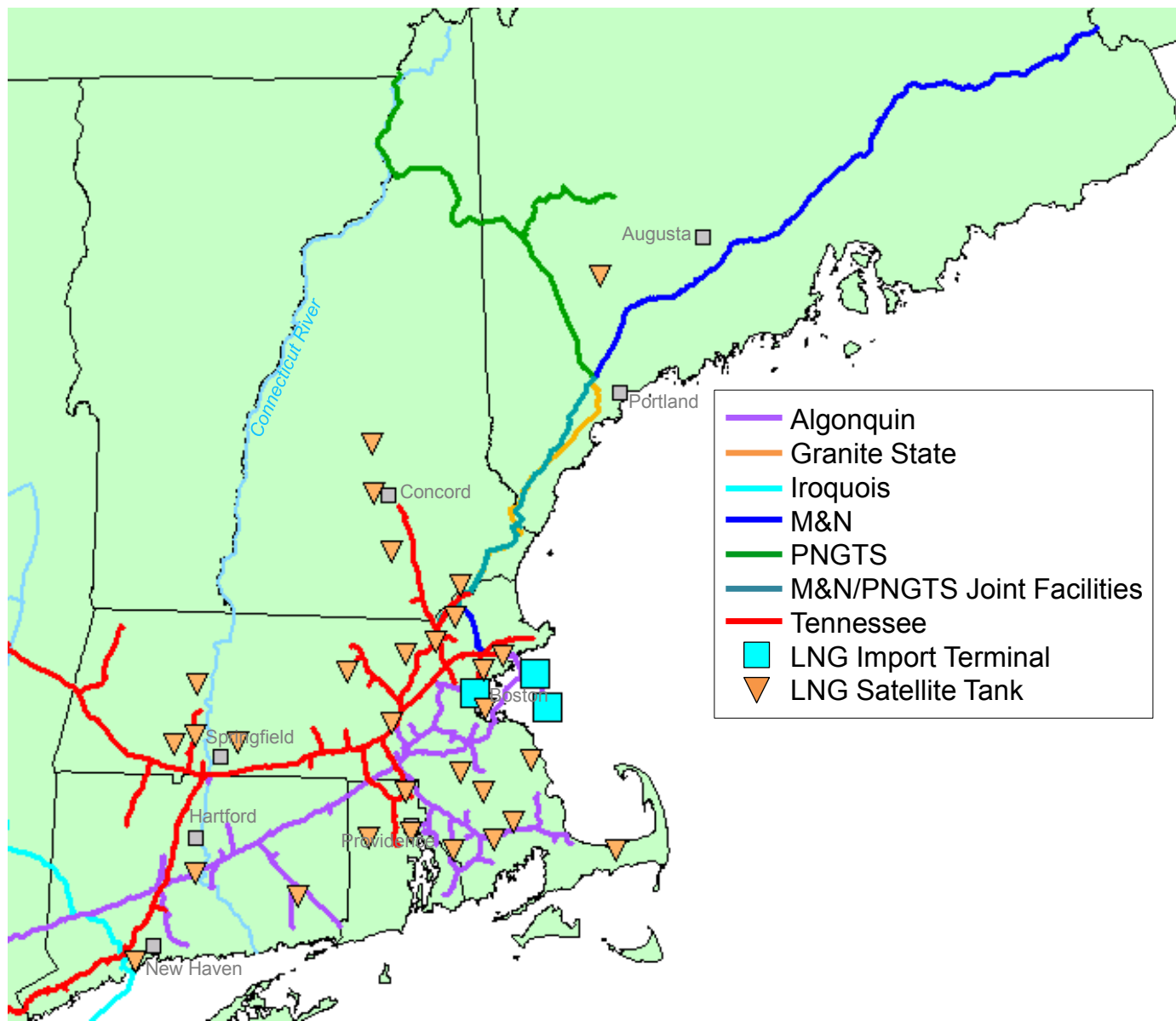
Sample Map: MISO Interstate Pipelines



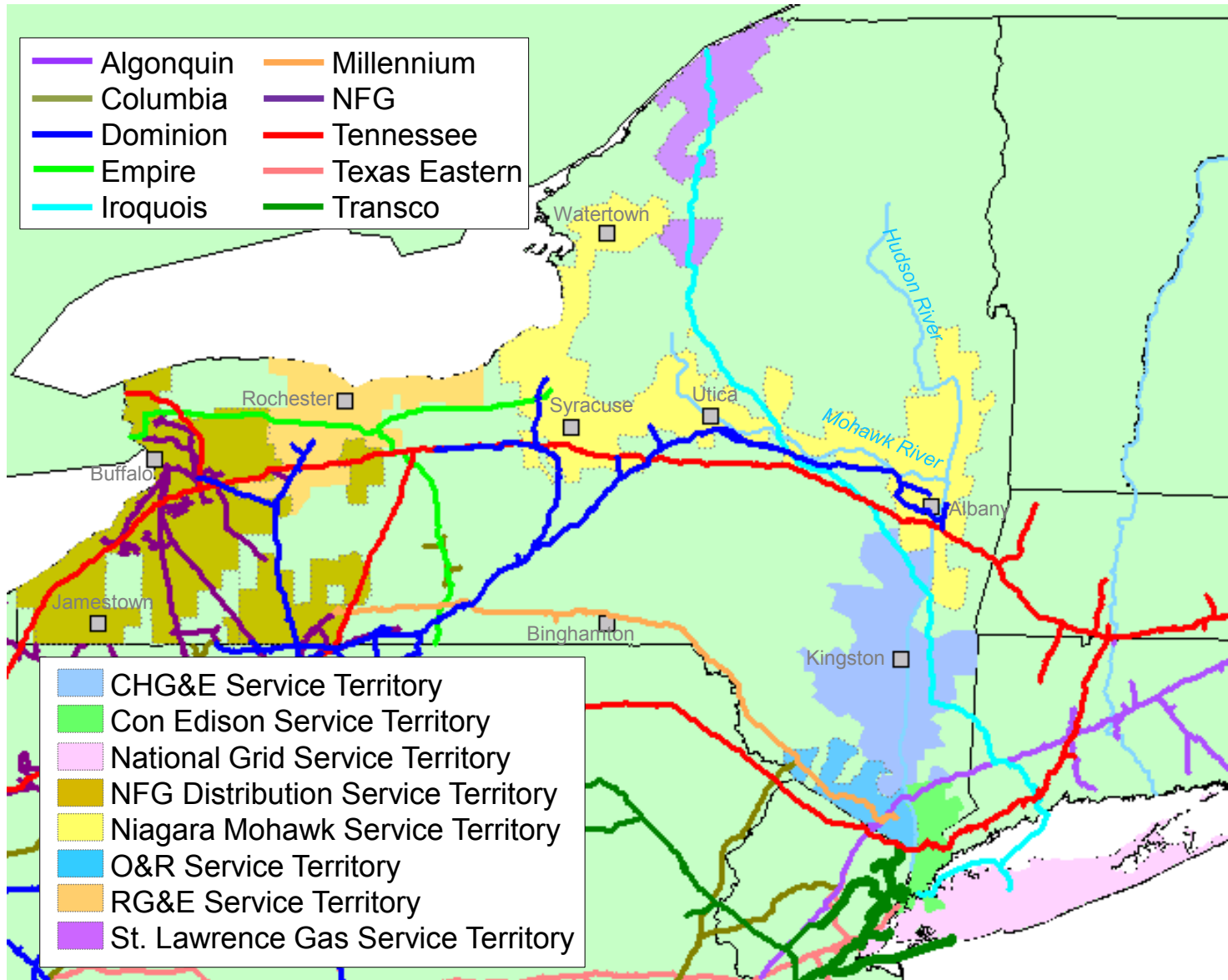
Sample Map: TVA Underground Storage



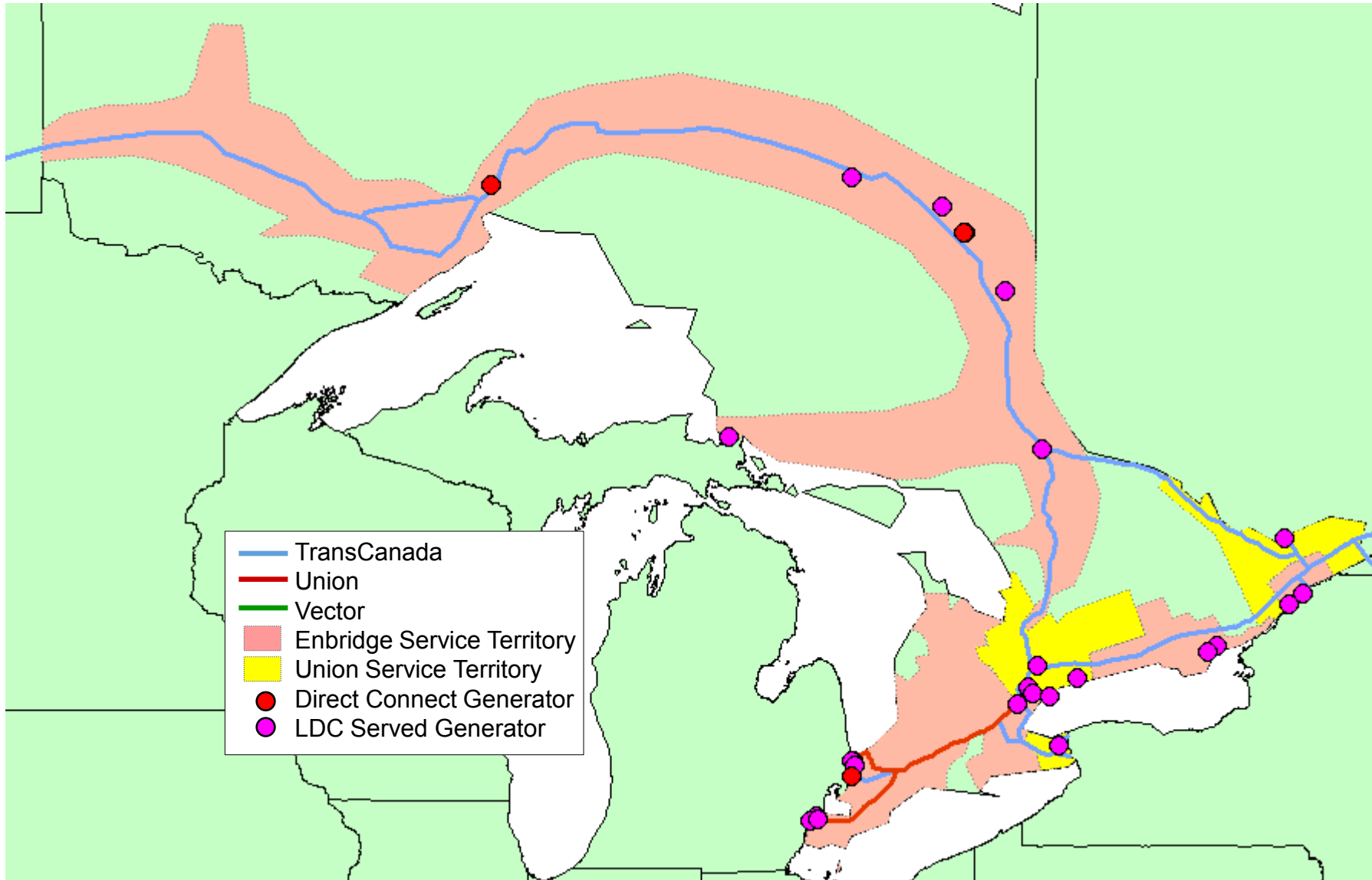
Sample Map: ISO-NE LNG Storage



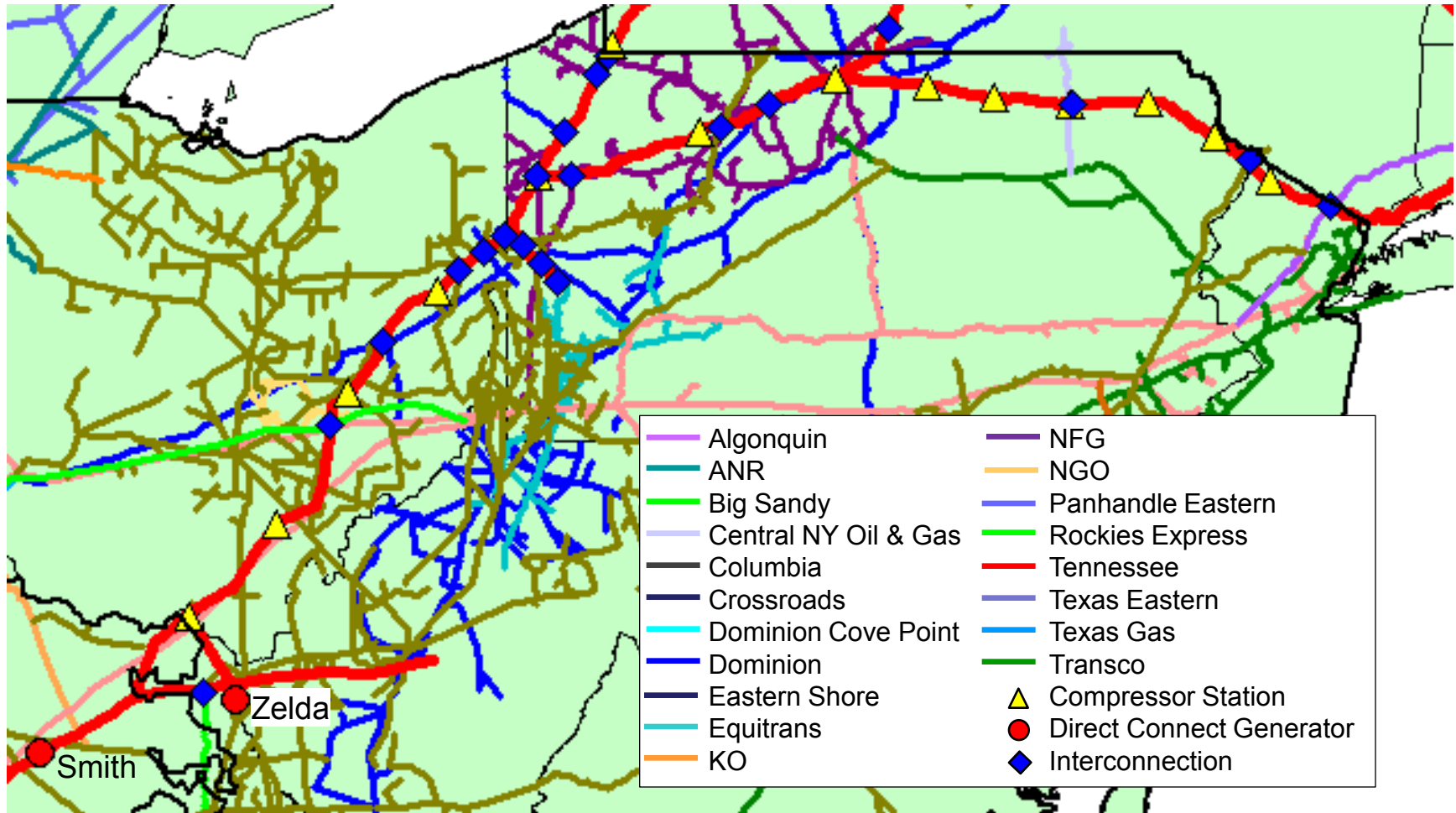
Sample Map: NYISO LDCs



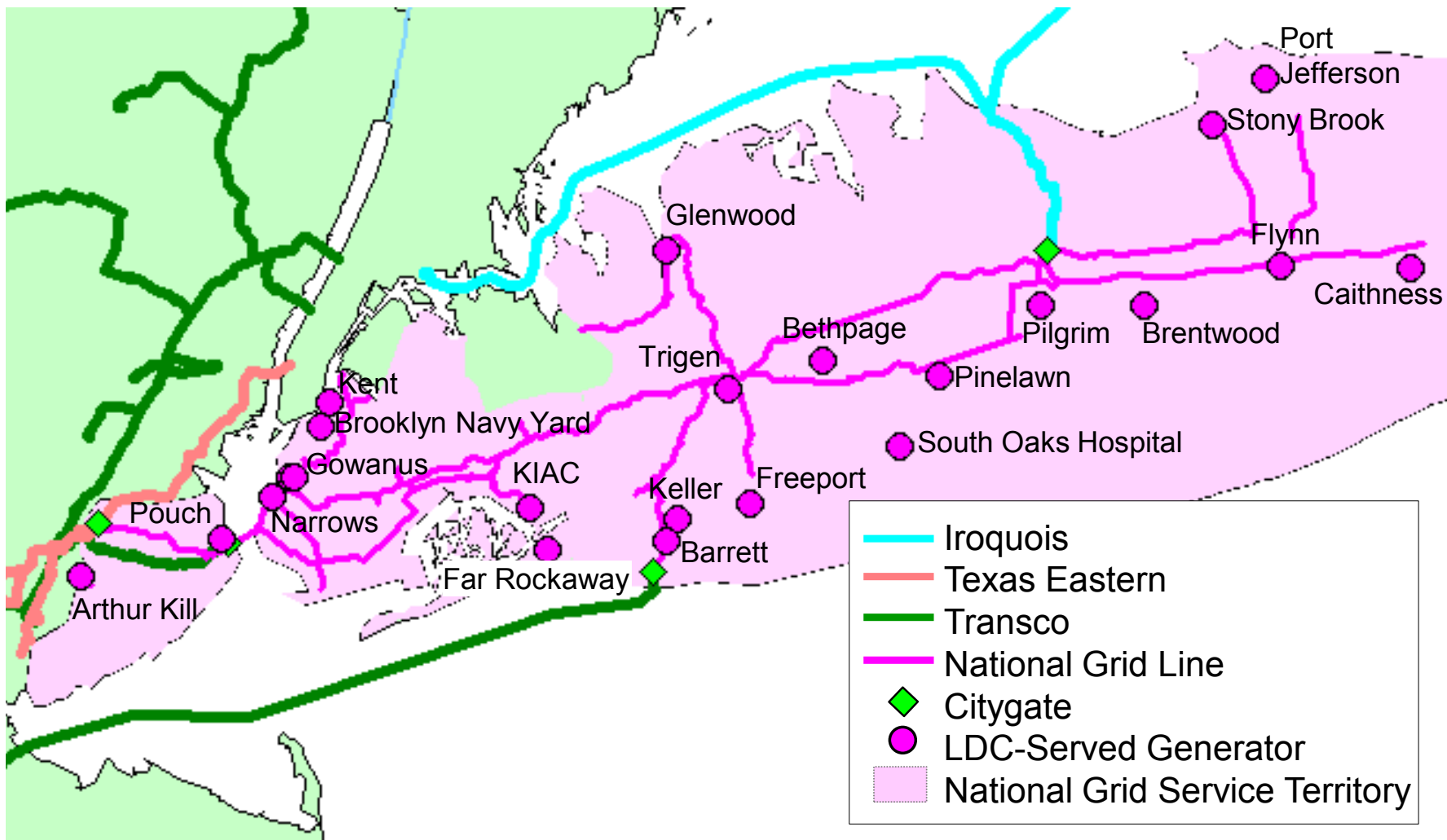
Sample Map: IESO Gas-Fired Generators



Sample Map: Tennessee Gas Pipeline in PJM



Sample Map: National Grid LDC



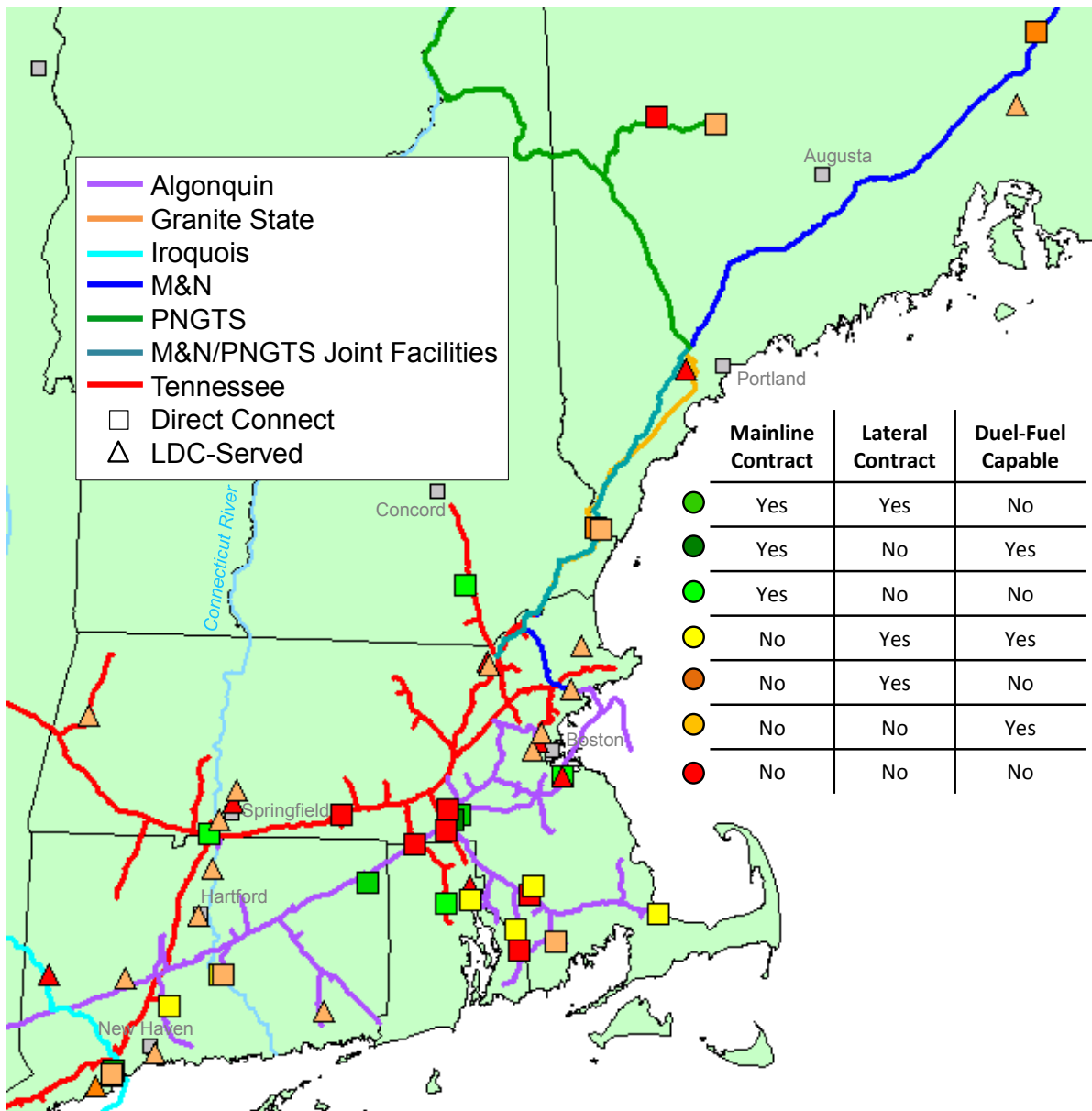
Pipeline and LDC Service Options

- ◆ Many pipelines and LDCs have specific service options targeted to electric generators (typically non-firm), inclining enhanced service
- ◆ Common practice to resolve monthly and/or daily imbalances through cashouts
 - Steep penalties for unauthorized overpulls during Operational Flow Orders (OFOs): \$10-\$100/Dth + electric/gas price multiplier
- ◆ Non-firm customers can be interrupted or curtailed on short notice to maintain system integrity
- ◆ LDCs in PJM, NYISO, and ISO-NE have backup fuel provisions / requirements
- ◆ Tariffs require even hourly takes; LDCs have discretion to allow flexibility when warranted by operating conditions
- ◆ Character of storage options similar to pipeline service options

Generator Contracting Practices

- ◆ Most 15+ MW gas-fired generators rely on non-firm service for pipeline and local transportation across the Study Region
 - Exceptions include electric utilities and new gas-fired generation in Ontario, including FT commitments on Union or Enbridge
- ◆ Generators typically rely on third-party marketers / suppliers for deliveries to the citygate or fieldgate
 - Many involve Asset Management Agreements
- ◆ Operating conditions during the heating season expose gas-fired generators to curtailment / interruption, particularly during cold snaps (e.g., January 2014)

Sample Map: New England Contracting Practices



Secondary Market Assessment Findings

- ◆ Gas marketers are the most active purchasers of released capacity
- ◆ Electric generators generally do not hold primary or secondary entitlements
- ◆ Nearly all transactions are recallable by the primary entitlement holder
- ◆ Capacity is generally transacted along traditional flows of gas from producing regions to high demand areas
- ◆ Capacity releases are generally short-term in nature

Target 2

Scenarios & Sensitivities

Three Scenarios

- ◆ Reference Gas Demand Scenario
 - Continuation of current market conditions with reasonably expected changes consistent with PPA resource planning
- ◆ High Gas Demand Scenario
 - Lower delivered gas prices, increased coal plant attrition
 - Represents a plausible maximum gas demand
- ◆ Low Gas Demand Scenario
 - Higher delivered gas prices, slower electricity demand growth, higher-than-expected growth in renewables
 - Represents a plausible minimum gas demand

Case Sensitivities

- ◆ Applied to one or more of the three Scenarios
- ◆ Developed by changing a single independent variable
- ◆ Multiple sensitivities could be combined to test multiple factors simultaneously
- ◆ Suggested factor variations should represent relatively small excursions around key uncertainty factors rather than paradigm shifts

Reference Gas Demand Scenario - Sensitivities

- ◆ Significant substitution of renewable energy technology for conventional gas-fired additions
- ◆ Significant substitution of renewables and electric DR/EE for conventional gas-fired additions
- ◆ Significant substitution of different renewable technologies and locations for conventional gas-fired additions, including energy storage
- ◆ Significantly higher or lower delivered natural gas prices
- ◆ Material changes to the expected deactivation of coal plants and the retirement and/or the delayed restart of nuclear units

High Gas Demand Scenario - Sensitivities (1)

- ◆ Additional coal retirements plus the retirement of Indian Point 2/3, a significant delay in the anticipated restart of nuclear units in Ontario
- ◆ Additional coal and nuclear retirements – oil retirements in New England, plus the postponement / cancellation of certain proposed transmission projects including Northern Pass Transmission, other

High Gas Demand Scenario - Sensitivities (2)

- ◆ Increased LDC load growth attributable to increased oil-to-gas conversions (including transportation fleet conversions)
- ◆ Substantially lower delivered commodity gas prices due to E&P technology progress and shale gas economics
- ◆ Greater economic activity over the 5- or 10-year period

Low Gas Demand Scenario - Sensitivities (1)

- ◆ ~25% or ~ 50% substitution of wind / other renewables for newly-proposed gas-fired combined cycle or gas turbine plants
- ◆ Increased electric- and gas-side EE/DR, including potential increase in dispatchable gas-side DR during the Peak Heating Season
- ◆ Increased renewables penetration, including 1,000 MW of hydro imports from Quebec to Ontario and additional hydro-by-wire into New York and/or New England
- ◆ New environmental restrictions that materially increase wellhead natural gas prices in shale producing basins

Low Gas Demand Scenario - Sensitivities (2)

- ◆ Increased renewable penetration rate coupled with increased EE/DR penetration
- ◆ Increased LNG exports, e.g., along the Gulf of Mexico or Atlantic Seaboard
- ◆ Prolonged economic stagnation over the 5- or 10-year period

Sensitivity Milestone Dates

- ◆ Written Input from Stakeholders on Target 2 Sensitivities: 2/21/14
- ◆ Final Stakeholder Written Comments: 3/11/14
- ◆ SSC Webinars: 2/28/14 and 3/21/14

Target 4 Kick-Off

Review Dual Fuel Capability

Liquid Fuel Utilization

- ◆ For dual fuel capable generators in the Study Region, determine:
 - Plant operational characteristics (typical/maximum usage)
 - Backup fuel capability (fuel quality, tank capacity)
 - Backup fuel replenishment logistics (resupply arrangements, limits on resupply availability, sustainability, *etc.*)
- ◆ LAI may contact generators to supplement public/PPA data
- ◆ LAI will leverage the analysis performed in 2013 for NYISO and expand to the entire Study Region
- ◆ CEII data will not be available in Target 4 deliverable

Dual Fuel Capabilities of New Entry Units

- ◆ Research operating characteristics of dual fueled gas turbines
 - Maximum output, heat rates on natural gas versus liquid fuels
 - Throttling restrictions during fuel switching
 - Operational considerations that discourage switching
 - Regulatory emission limits and fuel use constraints
 - Siting concerns
- ◆ Address fundamental costs of installing and maintaining dual fuel capability
 - Incremental capital costs
 - Efficiency losses
 - Secondary costs (taxes, insurance, fuel maintenance, *etc.*)

Petroleum Fuel Market Assessment

- ◆ Review existing regional liquid fuel infrastructure
 - What backup fuels are generators using?
 - Fuel specifications by generator type
 - Identify resupply options for each fuel type (truck, barge, pipelines, etc.)
 - Map locations of petroleum infrastructure in the Study Region
- ◆ Availability of liquid fuels to supplement gas supplies during peak demand conditions
 - Backup fuel demand levels
 - Effects on seasonal constraints

Pressure-Sensing and Fuel-Switching Capabilities

- ◆ Assess the response of gas-only combustion turbines when gas supply pressures fall below design levels
- ◆ Assess the ability to switch to liquid back-up fuel automatically in the event of a low gas pressure signal
 - Information from major manufacturers of aero-derivative and frame gas turbines
 - NERC GADS data for insight on deratings or trips caused by changes in gas pressure or fuel composition
 - Operational experience from generators on a confidential basis

Fuel Assurance Options

- ◆ Incremental dual fuel capability versus pipeline transportation capacity expansion
- ◆ Impediments to fuel switching versus reliance on firm transportation service
 - Availability and cost of firm transportation service across Study Region
 - Pipeline congestion patterns
 - FERC/NEB-approved imbalance resolution costs and penalties
- ◆ Alternative pipeline services: no-notice service, Park and Loan, and interruptible storage service
- ◆ Cost / benefit analysis

Target 4 Schedule

- ◆ Status update at June SSC meeting
- ◆ Draft Report to stakeholders: 7/25/14
- ◆ Comments due from stakeholders: 8/15/14