



Eastern Interconnection Planning Collaborative

EIPC Gas-Electric Study

Scenario Definitions and Sensitivities Overview Version

Stakeholder Steering Committee

December 20, 2013

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

Acknowledgement and Disclaimer

The EIPC appreciates and acknowledges the support of DOE for the Eastern Interconnections Studies Project

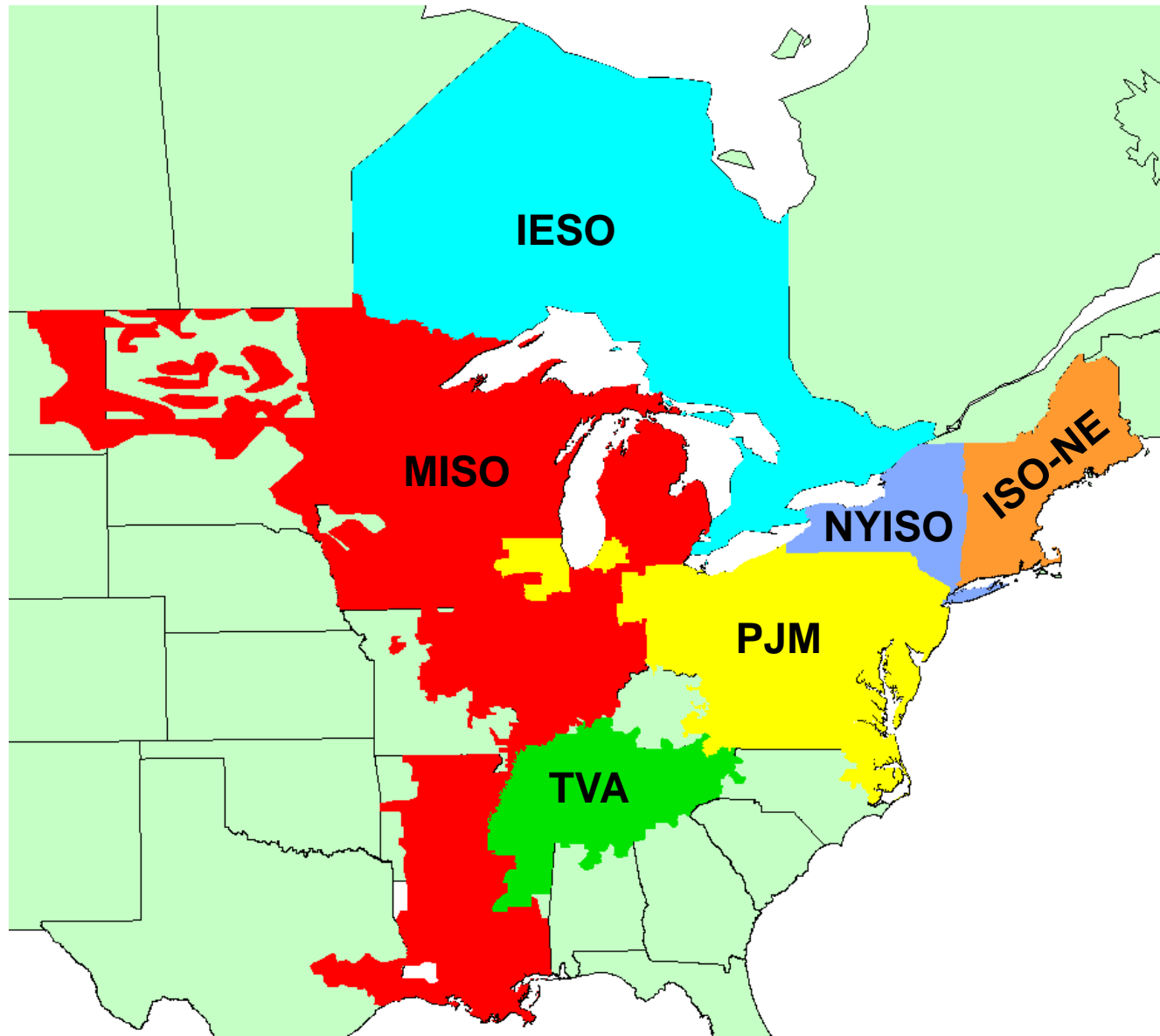
Acknowledgement:

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

Disclaimers:

- ◆ This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Study Region



Three Scenarios

◆ Reference Gas Demand Scenario

- Continuation of current market conditions with reasonably expected changes consistent with PPA resource planning processes

◆ High Gas Demand Scenario

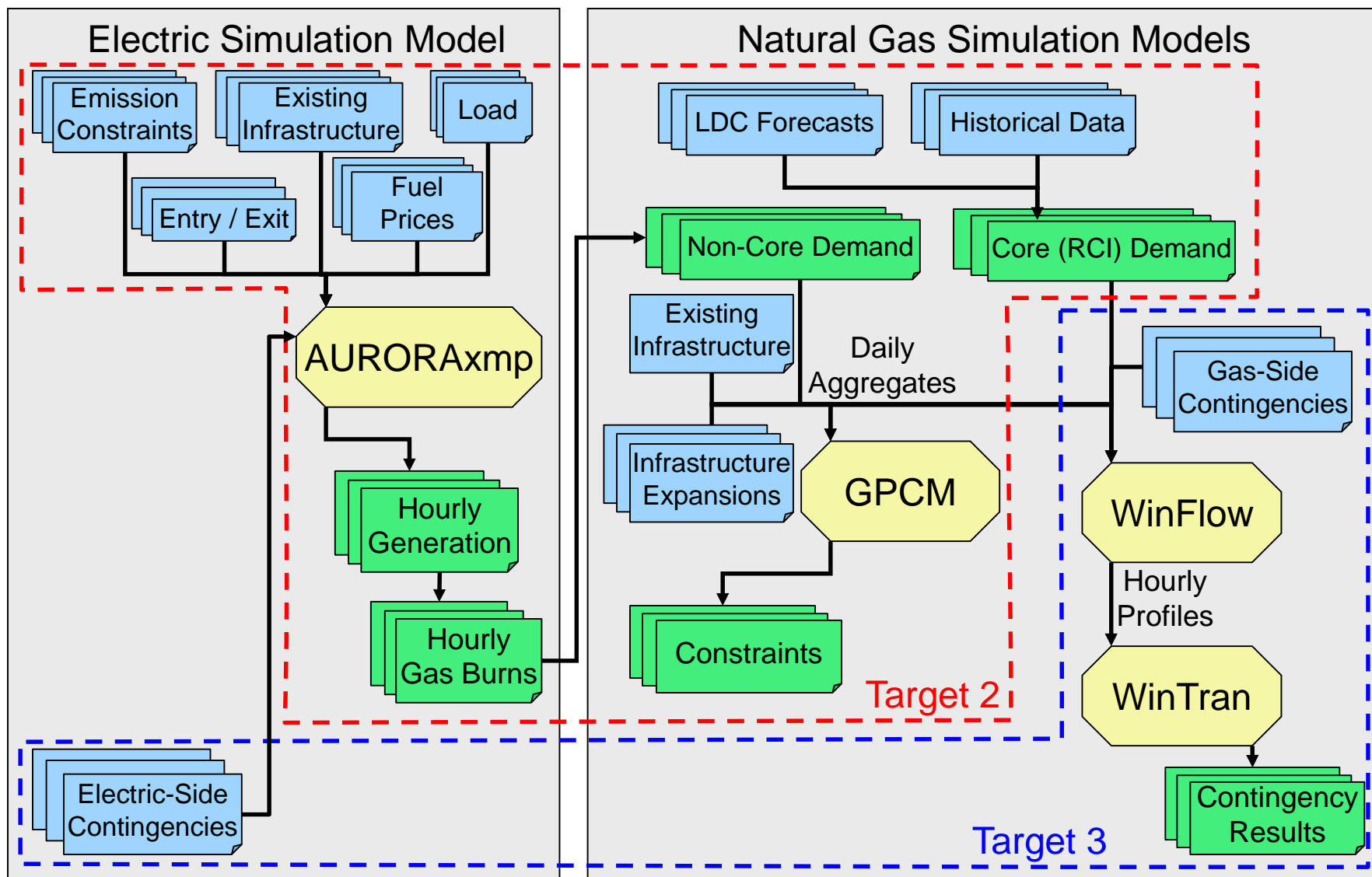
- Lower delivered gas prices, increased coal plant attrition
- Represents a plausible maximum gas demand

◆ Low Gas Demand Scenario

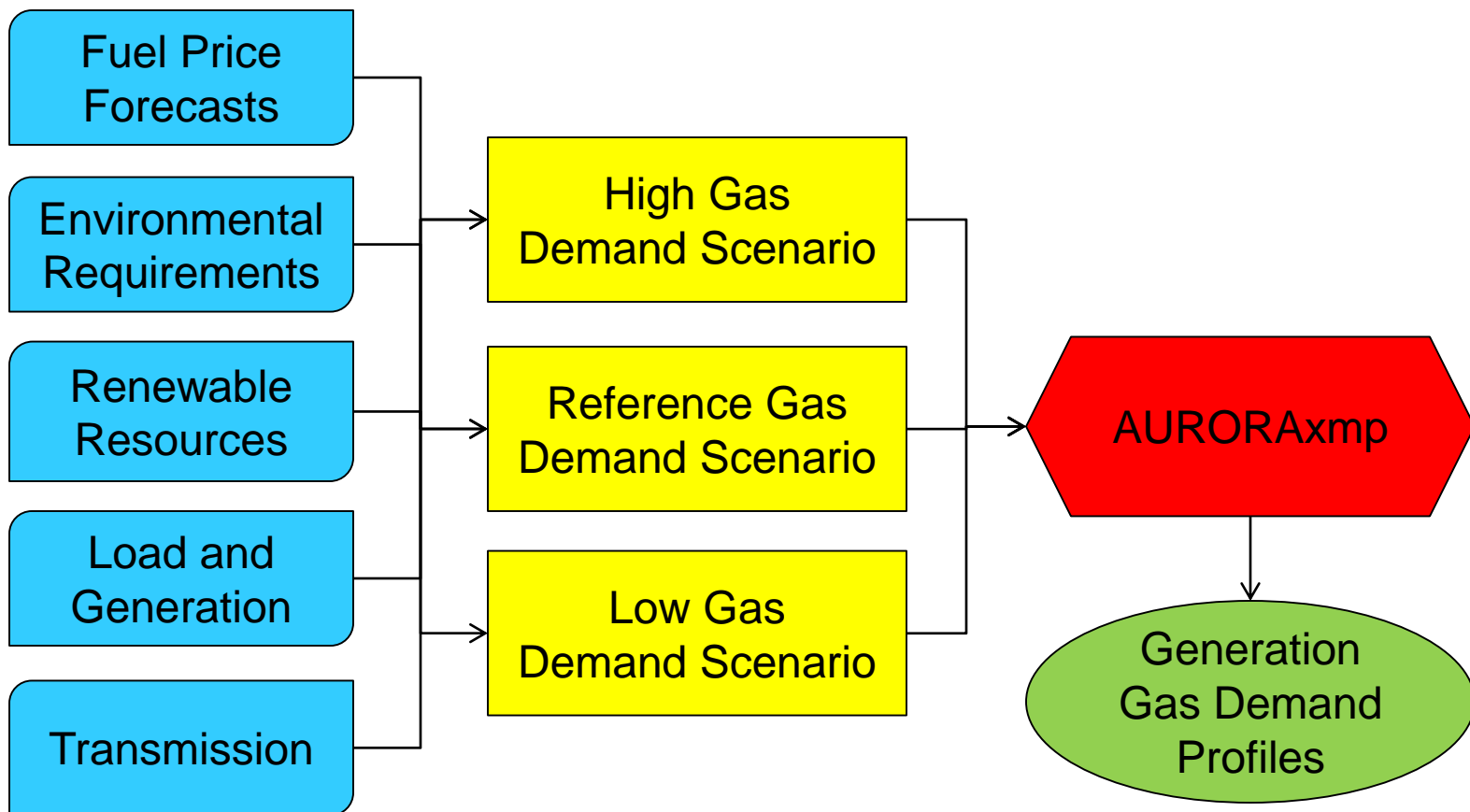
- Higher delivered gas prices, slower electricity demand growth, higher-than-expected growth in renewables
- Represents a plausible minimum gas demand

Modeling System Interactions

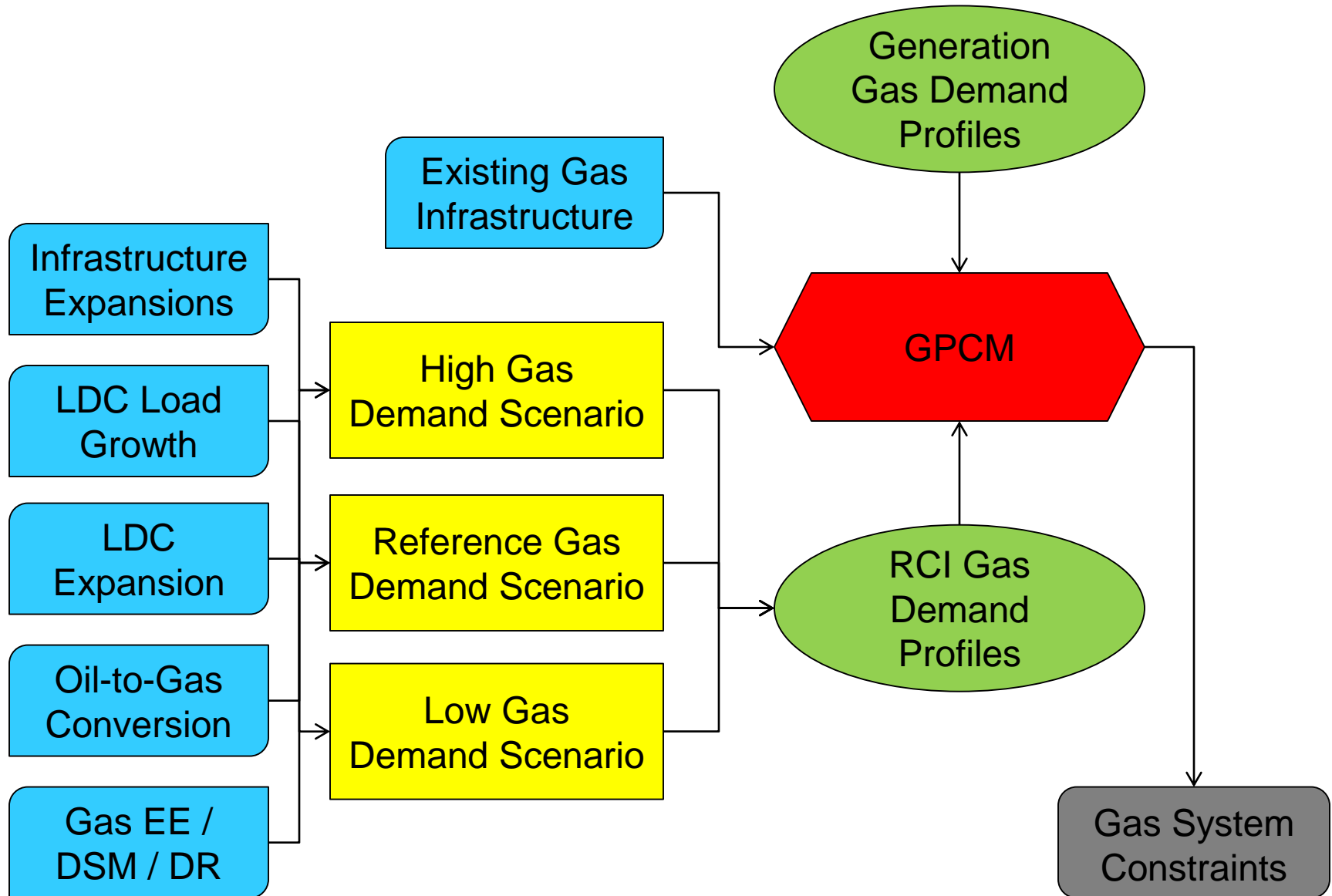
Scenarios & Sensitivities – High-Level Overview



Modeling Systems Overview – Electric-Side



Modeling System Overview – Gas-Side



Reference Gas Demand Scenario Definition (1)

◆ Fuel Price Forecasts

- Based on EIA Short-Term and Annual Energy Outlooks
- Gas: Basis differentials from Henry Hub developed using GPCM
- Oil: West Texas Intermediate benchmark, product prices adjusted to reflect transport costs, *et al*
- Coal: Basis differentials from supply basins based on current transport costs to consuming region
- Nuclear: Based on NYMEX uranium (U_3O_8) futures

◆ Environmental Requirements

- NO_x and SO_2 emission allowances remain continuation of CAIR, state programs
- RGGI maintains current footprint
- MATS remains in effect; retirements consistent with PPA resource planning models

Reference Gas Demand Scenario Definition (2)

- ◆ Renewable Resources
 - Renewable energy resources from PPA resource planning models, consistent with Roll-up Report

- ◆ Electric Load and Generation
 - Consistent with Roll-up Report
 - Load forecast also including DR and EE
 - Generator additions and deactivations / retirements

- ◆ Electric Transmission
 - Seasonal transfer limits consistent with Roll-up Report

Reference Gas Demand Scenario Definition (3)

- ◆ Residential/Commercial/Industrial (RCI) Demand
 - Infrastructure Expansions: Identify planned natural gas / pipeline / storage projects to serve LDCs, additional expansion projects added where load forecast exceeds current contract levels
 - LDC Load Growth: Based on filed IRPs and load forecasts, supplemented by other public data
 - LDC Expansion and Oil-to-Gas Conversion: Based on state planning initiatives to provide gas service to new customers, including fleet conversion to LNG/CNG
 - EE/DSM/DR: Based on state planning initiatives to reduce gas demand
 - State planning initiatives will be compared to filed load forecasts to avoid double-counting

High Gas Demand Scenario Definition

- ◆ Incremental generation retirements based on PPA-identified “at-risk” generation or “Conceptual” retirements in NERC 2013 LTRA
 - NERC-based units selected generically based on average capacity factor, age, emissions reduction equipment
 - Incremental retired units replaced MW-for-MW by gas-fired CCs / GTs
- ◆ Henry Hub gas price reduced by \$1.00/MMBtu as starting decrement
 - Other fuel prices not changed, will impact parity ratios
- ◆ Increase electric demand to reflect elasticity based on historic relationship to price
- ◆ RCI demand scaling factors based on AEO “High Oil and Gas Resource Case”

Low Gas Demand Scenario Definition

- ◆ Henry Hub gas price increased by ~\$1.00/MMBtu as starting increment
 - Other fuel prices not changed, will impact parity ratios
- ◆ Decrease electric demand to reflect elasticity based on historic relationship to price
- ◆ Increased renewable resources in lieu of gas-fired generation
 - Coupled with increased electric and/or gas EE/DSM/DR
 - Renewable buildout based on Phase I Study Future 6: National RPS – State/Regional Implementation
- ◆ RCI demand scaling factors based on AEO “High Demand Technology Case”

Array of 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

Potential Sensitivity Variables

- ◆ Renewable or DR/EE penetration
- ◆ Delivered gas prices
- ◆ Changes to coal deactivations
- ◆ Nuclear retirements or delayed restarts
- ◆ Postponement or cancellation of transmission projects
- ◆ LDC growth due to conversions
- ◆ Gas drilling technology progress
- ◆ More restrictive EPA / state safeguards on fracking
- ◆ LNG exports
- ◆ Economic growth or stagnation
- ◆ Changes in operating reserves / other ancillaries