

# Scenarios for Phase II Study: Recommendations from the Scenario Task Force to the SSC

September 26, 2011



# Background

- At July SSC meeting, SSC provided guidance to the Scenario Task Force (STF) on Bookends
- Bookends defined by policy drivers, type of implementation level, and expected transmission build-out:
  - National
  - Regional
  - Other

# Background

- Since then, STF conducted clustering analysis
  - Helped the STF understand similarities, differences and ranges among Future/sensitivity NEEM runs
  - Enabled the STF to determine which NEEM runs to select within each of the three “Bookend groups”
    - National: F2, F5 & F8 NEEM runs
    - Regional: F3 & F6 NEEM runs
    - Other: F1, F4 & F7 NEEM runs

# Background

- STF held an in-person meeting September 12 to discuss proposals and develop a consensus recommendation for the three scenarios
- Clustering analysis, support of various policy drivers, together with SSC guidance, helped the STF to develop its proposal

# Overview of recommendations

1. National Carbon Constraint with Increased EE/DR/DG/SG
2. Regionally Implemented National RPS
3. Business As Usual (BAU)

# Scenario 1: National Carbon Constraint with Increased EE/DR/DG/SG

## Key Characteristics

- Nationally-implemented carbon constraint scenario, driven by a carbon price
  - 42% reduction by 2030
  - Flat CO2 price after 2030
- Increase in EE/DR/DG/SG funded, at least in part, by the carbon revenues
  - 7% higher than F2; same overall load reduction as F8 (largely caused by CO2 price)
- Expected to be largest transmission build-out
  - Interface Capacity Expansion of ~37,000 MW

# National Carbon Constraint with Increased EE/DR/DG/SG NEEM Run

- Requires one new sensitivity of Future 8 base:
  - Flat CO2 price after 2030
  - Harden pipes at OL75 level
- Already includes:
  - CO2 price to achieve 42% reductions in CO2 emissions economy-wide by 2030
  - also meets national 30% RPS goals
  - 7% additional load reduction from F2 due to increased EE/DR/DG/SG; same total load reduction as F4

# National Carbon Constraint with Increased EE/DR/DG/SG Observations

- Conducted clustering analysis on all NEEM runs within National “Bookend Group” – F2, F5, F8
- Two specific NEEM runs proposed by TF members for National Bookend:
  - F2S8 (National Carbon Constraint with flat post-2030 CO2 price)
  - F8B (Combined National Climate & Energy Policy Future) with flat post-2030 CO2 price
- Only material difference – 7% additional EE/DR/DG/SG in F8



# National Carbon Constraint with Increased EE/DR/DG/SG Observations (cont'd)

- STF members agreed it was best to increase EE/DR/DG/SG in National Bookend, rather than regional or BAU
- Reached consensus on national carbon constraint scenario with 7% additional EE/DR/DG/SG & flat CO2 price after 2030
- STF advised by technical experts that it would be simpler and more accurate to run the desired scenario as a new sensitivity of F8, rather than F2

# National Carbon Constraint with Increased EE/DR/DG/SG Justification

- Carbon Constraint futures (F2 & F8) are a true Bookend
  - Greatest emissions reductions
  - Largest expected transmission build-out
- Robust transmission build-out
  - Should accommodate Futures 2, 5 & 8
- Achieves same overall load reduction as F4 (12% from the CO2 price, and 7% from additional EE/DR/DG/SG)

# National Carbon Constraint with Increased EE/DR/DG/SG Justification (cont'd)

- Increased EE/DR/DG/SG in this scenario enabled agreement on the BAU as Scenario 3 (instead of using F4)
- Actual load reduction is less than the “low load” sensitivity in Future 2 (F2S5)
- Flat CO2 price after 2030 makes scenario more realistic

# Scenario 2: Regionally Implemented National RPS

## Key Characteristics

- National 30% (by 2030) Renewable Portfolio Standard, implemented regionally
- Same qualifying resources and other RPS-related assumptions as F6 base case
- Expected to be smaller transmission build-out
  - Aggregate Interface Capacity Expansion of approx. 3,000 MW

# Regionally Implemented National RPS

## NEEM RUN

- Future 6, Sensitivity 10
  - F6 Base case with “hardened” OL25 transfer limits
- Includes “super-regions” (no transmission expansions allowed between super-regions)
  - enables these regions to aim to meet RPS using local resources first

# Regionally Implemented National RPS Observations

- Conducted clustering analysis on all NEEM runs within Regional “Bookend Group” – F3, F6
- Three NEEM runs were proposed by TF members:
  - F6S10: National RPS – State/Regional Implementation with transmission limits hardened at OL25 level
  - F3S7: Federal Carbon Constraint – Regional Implementation, with flat post-2030 CO2 price
  - F3S11: Federal Carbon Constraint – Regional Implementation, with extra-low renewables capital costs
- After discussing these options, and deciding that Federal Carbon constraint would entail use of a national CO2 price, STF decided to use different policy driver (RPS) in regional scenario, to achieve a broader range of information from Phase II

# Regionally Implemented National RPS Justification

- Enables wider variety of policy drivers to be studied in Phase II
- Robust transmission build-out for this scenario – F6S10 has similar total transmission expansion increases to F3
- Coal generation retirements are *much* lower than most F3 sensitivities (important to some stakeholders which helped to achieve consensus)
- Greater diversity (than F3) in generation mix

# Scenario 3: Business As Usual

## Key Characteristics

- Includes specific planned new generation and transmission additions
- Includes additions and retirements based on current laws and regulations



# Business As Usual NEEM Run

- Future 1, Sensitivity 3
  - F1 base case with baseline infrastructure transfer limits and revised inputs related to updated information on EPA regulations

# Business As Usual Observations

- Conducted clustering analysis on all NEEM runs within remaining “Bookend Group” – F1, F4, F7
- Two NEEM runs were proposed by TF members:
  - F1S3: BAU with revised EPA regs assumptions
  - F4B: High EE/DR/DG/SG Future base case
- After discussing these options, and deciding that the National scenario would include increased EE/DR/DG/SG, STF reached consensus on using the BAU as the third scenario

# Business As Usual Justification

- Will provide information about baseline infrastructure
- Will serve as a useful reference case to compare against other scenarios
- BAU has a significant number of retirements and new builds – will provide information on transmission development that may be needed within NEEM regions for system reliability
- Represents a true bookend – very little change in this scenario vs. significant policy changes in other two scenarios

# Comparing 2030 Capacity Mix (GW/%)

	National Carbon	Regional RPS	BAU
Coal	17/2%	178/18%	199/22%
On-Shore Wind	263/28%	159/16%	68/8%
Off-Shore Wind	2/0%	38/4%	2/0%
Other renewables	73/8%	101/10%	69/8%
Nuclear	135/15%	105/11%	105/12%
Natural gas	264/29%	326/33%	368/41%
PS + DR	170/18%	88/9%	88/10%

# Summary

- Overall, the three scenarios recommended would support a very diverse set of regional or national policy goals:
  - National CO2 reduction
  - Regionally-implemented RPS
  - Increased EE/DR/DG/SG
  - Business as usual
  - Large transmission builds
  - Small transmission builds

# Summary (cont'd)

- More renewable generation
- Less renewable generation
- More coal retirements
- Less coal retirements
- More nuclear generation
- Less nuclear generation
- Many different combinations of generation and transmission types, placements, and quantities

# Questions?