

TO: EIPC Stakeholder Steering Committee (SSC)
FROM: SSC Scenario Task Force
RE: Recommended scenarios for Phase II
DATE: September 19, 2011

The Scenario Task Force held three conference calls in August 2011 and one in-person meeting in September 2011. By the end of the September meeting, the Task Force had preliminarily decided on the three scenarios they recommend for study in Phase II of the EIPC project, pending SSC approval.

A. Three recommended scenarios for Phase II Study

1. Nationally Implemented Federal Carbon Constraint with Increased EE/DR Scenario

Description

The Task Force members agreed that the National Bookend should involve a nationally-implemented carbon constraint scenario, driven by a carbon price, as well as moderate increases in EE/DR/DG/SG, for which costs to consumers are assumed to be partially offset by the carbon revenues.

To define this desired scenario in terms of the Phase I Futures and Sensitivities, the Task Force proposed a new sensitivity of Future 8, the Combined National Climate and Energy Policy Future, which includes the CO₂ price to achieve 42% reductions in CO₂ emissions throughout the economy by 2030, but which flattens that CO₂ price after 2030. This sensitivity will also newly incorporate the hardened pipes used in the later Future 8 sensitivities (OL75).

This Future 8 approach would require one new NEEM run to develop the inputs needed for Phase II. Task Force members also discussed whether an additional NEEM run may be needed to correct for perceived generation and/or transmission anomalies from the original Phase I NEEM run (i.e. unrealistic clustering of gas or wind generation in particular locations). The NEEM/Transmission sub-team agreed to examine the issues and provide the guidance on such adjustments for the SSC's consideration. Depending on what is decided, an additional NEEM run may be needed for this purpose.

Discussion and Justification

The Scenario Task Force originally considered the following two approaches for defining the National Bookend:

- A new sensitivity of Future 8, the Combined National Climate and Energy Policy Future, which includes the CO₂ price to achieve 42% reductions by 2030 but which flattens that price after 2030. This sensitivity will also newly incorporate the hardened pipes used in the later Future 8 sensitivities (OL75).

- A modified version of Future 2, Federal Carbon Constraint -- National Implementation, Sensitivity 8, which includes a flat CO2 price after 2030, adjusted to include an approximately 7% further load reduction due to increased adoption of EE/DR/DG/SG. (This 7% would bring Future 2's EE/DR/DG/SG impact to that of Future 8.)

In both cases, an additional NEEM run may be needed to correct anomalies.

The Task Force determined that these two approaches to defining this scenario would be, essentially, the same, both in terms of the inputs used for the NEEM runs, and in terms of their results. Both approaches would require at least one new NEEM run in order to generate the inputs for Phase II study. After discussions with CRA and other technical experts, it was determined that the first approach – running a new sensitivity of Future 8, with a flat CO2 price after 2030 (and hardened transfer limits) - was the preferred option. The Future 8 approach would require only one NEEM run to achieve the desired scenario, while the Future 2 approach would require either additional NEEM runs to re-optimize transfer capability, or a sacrifice of consistency and/or accuracy since the hardened pipes in Future 2 would not correlate with the load level with a 7% EE/DR/DG/SG adjustment

This National Bookend scenario is expected to result in the most expansive transmission build-out of the three scenarios. The expected transmission build-out for this scenario should be robust enough to accommodate Future 5 (National RPS) as well as Futures 2 and 8.

Additionally, the Future 4 EE/DR/DG/SG levels are achieved in this scenario. The inclusion of these features of Future 4 was deemed reasonable because complementary policies are likely in any carbon reduction program and the actual load reduction is less than the low load sensitivity in Future 2 (F2S5). Agreement on this point was important to gaining support for the “package” of three scenarios being recommended to the SSC. Many stakeholders originally preferred to see Future 4 studied as one of the three scenarios, instead of the BAU. Incorporating the increased EE/DR/DG/SG policy goals into the National scenario enabled agreement on the BAU as one of the scenarios.

The Task Force agreed that, as described, the scenario should include a flat carbon price after 2030 because stakeholders perceived assumptions about the original post-2030 carbon price to be unrealistic.

2. Regionally Implemented National RPS Scenario

Description

Task Force members agreed that the Regional Bookend should be defined by Future 6, the National RPS Regional Implementation Future – specifically F6S10, the hardened transfer limit (OL25) sensitivity. This

scenario would entail a national 30% Renewable Portfolio Standard, with super-regions designed to enable regions to attempt to meet the goals using local resources first.

As stated, the F6S10 NEEM run would be used to provide the inputs for Phase II of the study. Task Force members also discussed whether an additional NEEM run may be needed to correct for perceived generation and/or transmission anomalies from the original Phase I NEEM run (i.e. unrealistic clustering of gas or wind generation in particular locations). The NEEM/Transmission sub-team agreed to examine the issues and provide the guidance on such adjustments for the SSC's consideration. Depending on what is decided, an additional NEEM run may be needed for this purpose.

Discussion and Justification

Task Force members considered both Future 6 and Future 3 (Federal Carbon Constraint – Regional Implementation) for the Regional Bookend, but settled on F6S10 for several reasons.

The proposed Regional Scenario (F6S10) has similar total transmission expansion increases to F3 (regionally implemented Carbon Constraint), which would imply a measure of robustness in terms of the transmission build-out. However, the different generation mix and location for these two NEEM runs produced different transfer limits between the NEEM regions.

The different supply mix was an important reason why the Task Force selected Future 6 over Future 3. Future 6 entails significantly greater diversity in terms of the mix of generation resources to be built and energy produced, with resource builds in coal, gas, wind, nuclear, hydro, offshore wind and other renewable technologies. The higher levels of offshore wind seen in F6S10 were particularly important to some Task Force members. Additionally, some Task Force members would have found it problematic to recommend F3, which, like the proposed national carbon constraint scenario, involves very significant coal retirements. Task Force members found F6 preferable both for the diverse generation mix, and for the fact that its generation mix would bring greater generation variety to the entire set of three scenarios.

Additionally, Task Force members supported the selection of Future 6 because, in combination with the other scenarios, it would allow for greater variety of the policy drivers. Some Task Force members stated that, given that only three scenarios could be selected, they would prefer to see variety, rather than consistency, in terms of the policy options studied. Others pointed out that with the decision to use Future 8 or Future 2 with increased EE/DR/DG/SG for the national bookend scenario, comparability between regionally and nationally implemented scenarios was less viable. Moreover, States are more likely to enact higher RPS requirements than to embark on carbon regulation.

3. Business As Usual Scenario

Description

Task Force members agreed that the most appropriate bookend for the third scenario would be Business As Usual, since, in contrast to the other Futures, there would be very little policy change or transmission expansion. The NEEM run recommended by the task force was F1S3, the BAU sensitivity revised to more accurately reflect the impact of EPA regulations from the Business-as-Usual (BAU) future.

As stated, the F1S3 NEEM run would be used to provide the inputs for Phase II of the study. Task Force members also discussed whether an additional NEEM run may be needed to correct for perceived generation and/or transmission anomalies from the original Phase I NEEM run (i.e. unrealistic clustering of gas or wind generation in particular locations). The NEEM/Transmission sub-team agreed to examine the issues and provide the guidance on such adjustments for the SSC's consideration. Depending on what is decided, an additional NEEM run may be needed for this purpose.

Discussion and Justification

Task Force members considered both the BAU Future and Future 4 for this scenario. Once it was clear that the policy goals of Future 4 could be accommodated within the Federal Carbon Constraint scenario, Task Force members coalesced around using this sensitivity as a reference case for scenario analysis.

This scenario starts with the Baseline Infrastructure assets that were determined by the SSC's process. These represent planned additions and those that meet current laws and regulations. While the SSC decided not to expand NEEM transfer limits, the BAU has a significant number of retirements and new builds that will likely necessitate some transmission development within the NEEM regions to ensure continued system reliability. As such, the BAU will provide valuable transmission information to stakeholders.

B. Discussion and Process Involved in Decisionmaking

During the July 28-29 SSC meeting, the STF took guidance from the SSC to focus the scope of its work on three bookend categories: National, Regional, and Other. In addition, the SSC directed the Task Force to seek an appropriate range in terms of policy drivers (RPS, Carbon Price, CES, etc.), generation mix and expected transmission profile.

To develop these recommendations, the Task Force held three calls and one in-person meeting. The calls mainly focused on the "clustering" approach. This involved analyzing all of the Phase I NEEM runs, determining how they behaved across a range of variables, and determining where the relevant "clusters" were. This helped the group ensure that the NEEM runs selected to define the three scenarios both achieved the desired level of variation across key variables and, as appropriate, are similar enough to other NEEM runs to indicate a measure of robustness. The Task Force also worked to incorporate cost data into their discussions and the clustering analysis as it became available, including EIPC's high-level transmission cost analyses and the Modeling Work Group's post-processing estimates of increased

EE/DR/DG/SG in Futures 4 and 8, nuclear uprate costs in Future 7, and renewables and other integration costs.

Numerous graphs, tables, memoranda and other analyses were produced and discussed within the Task Force. Though the group did not develop joint conclusions about the data, the Task Force members utilized the information individually and within their sectors to develop proposals and/or formulate positions on those proposals. The Task Force shared some of the results of their clustering analysis and proposal development during the SSC webinar on September 9.

The group first narrowed the 76 runs down to approx. one run per future (or per Bookend, in the case of the National Futures) for the sake of discussion on their final call. Then some sectors used the results of this discussion to develop proposals for discussion at the in-person meeting on September 12.

Ultimately, at the in-person meeting the Task Force reached consensus on the three scenarios described in this memo. The Task Force believes this scenario set represents 'Bookends' which are well-balanced in terms of policy goals, levels of implementation, transmission build-outs, and total costs, and they recommend that the SSC adopt these three scenarios for the Phase II analysis.

	1. National Carbon Constraint Scenario	2. Regionally Implemented National RPS Scenario	3. Business as Usual Scenario
Brief Description	<p>The Task Force recommends a federal carbon constraint scenario that includes more aggressive EE/DR/DG adoption than the base case, with program costs partially offset by carbon price revenues (though these cost flows will not actually be modeled).</p> <p>This scenario can be accomplished with essentially the same results, in terms of Future and Sensitivity runs, in two different ways:</p> <p>1) As a sensitivity of Future 8, the Combined Climate and Energy Policy Future, which includes a carbon price as well as significant levels of EE/DR/DG adoption. This scenario would involve modifying the carbon price so that it remains flat after 2030, and hardening the pipes as previously agreed upon by the SSC (using the transfer limits of the OL75 sensitivity; approx. 37,000 MW of increased transfer capability). This option has been recommended by CRA and other technical experts.)</p> <p>2) As a modification of Future 2 National Carbon Constraint, Sensitivity 8 (the post-2030 flat carbon price sensitivity), adjusted to include a 7% lower load forecast which would represent the increased adoption of EE/DR/DG/SG envisioned for this scenario.</p> <p>Interface expansion in this case is correlated to expansion signals of other Phase 1 Futures (2 and 5), allowing for the flexibility to accommodate other policies that may result.</p>	<p>The hardened expanded transfer limit sensitivity of Future 6 (F6S10) is proposed to be used as a regional case for scenario analysis.</p> <p>Interface expansion in this case is correlated to expansion signals of Future 3, allowing for the flexibility to accommodate other policies that may result.</p> <p>This future is recommended because it reflects a varied generation mix, that adds off-shore wind, and more other renewables. It also includes significant great diversity of resource builds, including gas, renewables, hydro, coal, etc. and energy production.</p>	<p>The revised BAU (F1S3) is proposed to be used as a reference case for scenario analysis.</p> <p>This plan starts with the Base Line Infrastructure assets that were approved by the SSC.</p> <p>BAU NEEM results show significant retirements and new builds where it's anticipated that Phase II PA analysis will likely result in transmission expansions within NEEM bubbles.</p>

	1. National Carbon Constraint Scenario	2. Regionally Implemented National RPS Scenario	3. Business as Usual Scenario
Policy Driver(s)	Combined national policies that achieve the goals of the National CO2 & RPS Futures with additional EE/DR/SG/DG.	National RPS policy with regional implementation.	EPA Regulations (as revised and modeled in B1S3). State RPS and Energy Efficiency Mandates
Expected Transmission Build-out	This scenario would likely yield the most expansive transmission build-out. The Phase 1 results indicate an Aggregate Interface Capacity Expansion of ~37,000-40,000 MW. In addition, significant transmission expansions within many NEEM bubbles are anticipated in Phase II analysis.	This scenario would likely yield a significantly “smaller” transmission build-out than the National Carbon Constraint scenario. The Phase I results indicate an Aggregate Interface Capacity Expansion of approx. 3,000 MW. In addition, significant transmission expansions within many NEEM bubbles is anticipated in Phase II analysis.	The Phase I results indicated little to no Aggregate Interface Expansion. Moderate transmission expansions within many NEEM bubbles are anticipated in Phase II analysis.
Clustering of Generation amount, type and location	Generation amounts by NEEM region and types that were forecasted by the F8S1 (using the new sensitivity for flat CO2 price after 2030) <u>or</u> F2S8 NEEM run, with possible modifications for anomalies (e.g. over-clustering of gas in Wisconsin and/or wind generation in one MISO region).	Generation amounts by NEEM region and types that were forecasted by the F6S10 NEEM run with possible modifications for anomalies (e.g. over-clustering of wind generation in one MISO region).	Generation amounts by NEEM region and types that were forecasted by NEEM run for revised BAU (F1S3).
Load amount and location	Load per NEEM bubble from F8 sensitivity.	Load per NEEM bubble from F6 sensitivity.	Load per NEEM bubble for the revised BAU run.
What existing NEEM run(s) would represent this scenario?	This scenario would require a new NEEM run, as discussed below.	F6S10.	Revised BAU Run (F1S3).
If a new NEEM run would be needed, please describe it here	At least one NEEM run would be needed for this case. After considering the options (F2S8 and F8) the Task Force determined that the most efficient and accurate way to model the desired	An additional NEEM run may be used to correct for anomalies, as recommended by the NEEM/Transmission subteam and approved by the SSC.	An additional NEEM run may be used to correct for anomalies, as recommended by the NEEM/Transmission subteam and approved by the SSC.

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NEEM Run, cont'd	<p>scenario would be as a new Future 8 sensitivity.</p> <p>Therefore the new NEEM run needed for this scenario would be a modification of F8S1, with a flat carbon price after 2030 and hardened transmission limits (using the previously agreed-upon TLH methodology with OL75).</p> <p>This NEEM run, or any additional NEEM runs, may also be used to correct for anomalies, as recommended by the NEEM/Transmission subteam and approved by the SSC.</p>		
Justification why should this be one of the three scenarios?	<p>The proposed National Carbon Constraint Scenario gives valuable information related to a nationally-implemented Carbon Constraint policy with consideration for increased EE/DR/DG/SG (7% more load reduction). Modeling the modifications as suggested, in either option, will show the effect of a more aggressive EE/DR/DG/SG policy and the resulting cost impacts. Either option also includes significant additions of renewable energy (beyond the 30% target in the national renewable future) and significant load reductions.</p> <p>Transmission developments derived from this future are likely to support a variety of different policy futures, including the goals of the National RPS future (F5).</p> <p>The Task Force believes that a post-2030 flat Carbon price sensitivity should be used as stakeholders believe the assumptions about the post-2030 Carbon price are not realistic.</p>	<p>The proposed Regional Scenario (F6S10) has similar transmission transfer increases to F3 (Regional Carbon Constraint), but some different paths reflecting different sources of supply. An advantage of F6 is that it has greater diversity of generation resources with significant resource builds in coal, gas, wind, nuclear, hydro, offshore wind and other renewable technologies.</p> <p>Choosing this scenario provides greater policy diversity between scenarios to be studied than using Future 3.</p>	<p>The SSC and EISPC expended significant effort to derive commonly agreed to assumptions for a BAU future. This future represents planned additions, as well as meeting current laws and regulations.</p> <p>While the SSC decided not to expand NEEM transfer limits, the BAU has a significant number of retirements and new builds that will likely necessitate some internal transmission development to ensure continued system reliability. As such, the BAU will provide valuable transmission information to stakeholders.</p>

