Proposed WREZ Study Request to WECC/TEPPC 2009 Work Plan

The Western Governors' Association's Western Renewable Energy Zone (WREZ) project submits this study request to the Western Electricity Coordinating Council's (WECC) Transmission Expansion Planning Policy Committee (TEPPC) for modeling and analysis in its 2009 work plan. The WREZ project makes this request as part of its mandate to identify conceptual transmission plans for developable renewable resource zones across the Western Interconnection. WREZ is interested in understanding three core issues:

- The transmission needed across the Western Interconnection to deliver power from preferred Renewable Energy Zones (REZs) to loads in a 10-year study period;
- The transmission needed across the Western Interconnection to deliver power from preferred REZs to loads in a long-term time horizon (e.g., 20 years) assuming renewable energy rises to 33 percent of total generation; and
- The economics and technical feasibility of building a very high voltage overlay in the Western Interconnection to move high levels of renewable generation from preferred REZs.

WREZ Study Request to TEPPC 2009 Work Plan

Resource Cases

The WREZ project proposes three resource cases be modeled and evaluated with sensitivity analysis. The analysis should incorporate both capital and variable costs of producing and delivering power to load in order to be of value for stakeholders interested in the relative impact of the various cases on electricity costs. The WREZ project will assist WECC in defining inputs such as preferred REZs and assumed changes in technology costs.

Resource Case 1: Near-Term Analysis of RPS Requirements. This case would model a resource mix reviewed by LSE resource planners that meets existing renewable portfolio standards (RPS) ten-years in the future. This case would serve as a reference case for other scenarios. Sensitivity analysis would be performed on: a) energy efficiency, b) carbon prices to reduce carbon dioxide (CO2) emissions, and c) natural gas prices.

Resource Case 2: Near-Term Analysis with Carbon Constraints. This case increases the renewable penetration higher than Resource Case 1 to reflect the trend of rising RPS targets and emerging policies to reduce greenhouse gas (GHG) emissions. The resource mix in Case 2 would set renewable energy penetration to 25%. This renewable

benchmark would be higher than existing RPS requirements,[1] higher than the 15% penetration level modeled by TEPPC in 2008,[2] but lower than the levels in the Western Wind and Solar Integration Study[3] being conducted by the National Renewable Energy Laboratory. The 25% renewable energy target anticipates the need for low-carbon generation to meet future GHG policies. The Western Climate Initiative (WCI) seeks to establish a regional cap and trade system to reduce GHG emissions 15% by 2020 relative to 2005 levels. WCI analysis indicates that GHG emissions in the western power sector could be reduced 25% to 40%. New federal legislation may match or possibly exceed the WCI targets. Sensitivity analysis of the carbon constrained resource mix would be performed on: a) energy efficiency, b) carbon prices to reduce CO2 emissions by 25% to 40%, and c) natural gas prices.

Resource Case 3: Long-Term Analysis. This case proposes a long-term analysis extending 20-years into the future. The purpose is to analyze the resource and transmission options in a longer time frame than the current 10-year planning horizon since capital investments in the power sector have a very long productive life. This case anticipates a resource mix based on recent trends in public policy. The resource mix in Case 3 assumes a 33% renewable energy penetration level and a 50% reduction of CO2 emissions in the Western Interconnection. The 33% renewable energy target recognizes the established RPS goal in California and the recent announcement by the California Governor to make that goal a RPS statutory requirement. This renewable target is also motivated by the prospect of a federal RPS that could lead to greater renewable generation in the West to meet the demand for renewable energy in other regions of the U.S. The demand for western renewable energy would also complement a long-term GHG policy. President-elect Obama made a campaign pledge to reduce GHG 80% by 2050. The Case 3 target for 50% reduction in CO2 emissions represents an interim target for the power sector consistent with the Obama GHG pledge. Sensitivity analysis would

[1] Current RPS requirements across eight states in WECC result in a renewable penetration level WECC-wide about 8% in 2017 and 12% in 2020.

[2] In 2008, the Western Interconnection Regional Advisory Body (WIRAB) requested that TEPPC study a high renewable penetration level. A 15% renewable penetration level was subsequently selected in the TEPPC review process to enable WECC to respond to a request by the North American Electric Reliability Corporation (NERC) to study a 15% renewables scenario for its Long Term Resource Assessment (LTRA). TEPPC modeled a series of cases (WIRAB cases) in 2008 that assumed a 15% renewable resource mix.

[3] The Western Wind and Solar Integration Study (WWSIS) assumes 30% wind energy plus 5% solar energy level in the WestConnect footprint, and a 20% wind energy level and 3% solar energy level in the rest of the Western Interconnection. The primary goal of the WWSIS is to evaluate the operational impacts of high levels of wind and solar energy in the power system, and the penetration levels studied were purposely set high to test the system.

be performed on: a) energy efficiency; b) carbon prices to reduce CO2 emissions by 50%; c) natural gas prices; and d) changes in technology.[4]

Expansion Cases

The WREZ project proposes four expansion cases that model the additional transmission needed to alleviate significant congestion in the three resource cases. The WREZ project requests that the analysis of the expansion cases consider the efficient scaling of transmission investments to match the long-term build out of Renewable Energy Zones. Transmission expansion should be scaled to increase transfer capacity through least cost investments and minimal environmental impacts over the long-term. Examples of scaling transmission expansion would include: incremental improvements to the existing system (e.g. adding new conductors to existing towers and transformers); adding new facilities in existing corridors; and, when establishing new transmission corridors, preserving options for future expanded transfer capacity by acquiring sufficient right-of-way space for expansion and building larger voltage tower structures to accommodate additional circuits in the future. The analysis should identify the additional cost of preserving the option to increase transfer capacity on needed new lines.[5] The objective is to avoid the prospect of building multiple lower capacity transmission lines across multiple right-of-ways to carry power that could be delivered by a higher capacity transmission line on a single right-of-way.

Expansion Case 1: Transmission expansion needed to alleviate significant congestion in Resource Case 1.

Expansion Case 2: Transmission expansion needed to alleviate significant congestion in Resource Case 2.

Expansion Case 3: Transmission expansion needed to alleviate significant congestion in Resource Case 3.

Expansion Case 4: Western Transmission Superhighway Network. Model a transmission superhighway overlay that would be used to test the economics of the transmission assumptions under the resource mix and sensitivity analysis specified in Resource Case 3. There are multiple transmission voltage options for a superhighway transmission overlay including double circuit 500 kV lines, very high voltage DC lines,

[4] We will look to credible unbiased sources such as the National Renewable Energy Laboratory for information on technology induced changes to the cost of electricity generated from Renewable Energy Zones.

[5] For example, if modeling shows that adding a 345 kV line would be advantageous to solve transmission congestion resulting from the addition of new renewable generation in a REZ, then the analysis should include the incremental cost of preserving the option to increase the transfer capacity of that new line to a higher level, e.g., 765 kV.

and 765 kV AC lines.[6] The high voltage overlay would reflect the general location of the currently-proposed mega transmission projects with some adjustments as necessary.

WREZ Study Request and the WECC Criteria

The WREZ study request meets WECC's criteria for accepting study requests:

a) *What portion of the interconnected system will be considered by the study?*
   - The WREZ study request covers the entire Western Interconnection.

b) *Does the request raise fundamental design issues of interest to multiple parties?*
   - Yes. The request is made by the WREZ project that includes representatives of Western Governors and Premiers, PUCs, utilities, environmental NGOs, generation developers, and transmission developers throughout the interconnection.

c) *Does the request raise policy issues of national, regional or state interest; for example, access to renewable power, and location of both conventional and renewable resources?*
   - Yes. The issues to be raised in the study request address state/provincial interests, interconnection-wide interests, and national interests.

d) *Can the objectives of the study be met by other studies by clustering or combination?*
   - The WREZ request can provide the foundation for WECC to evaluate additional anticipated study requests.

e) *Will the study provide information of broad value to customers, regulators, transmission providers, etc.?*
   - Yes. The study results will be valuable to LSEs when evaluating resource options, to PUCs when considering integrated resource plans and LSE procurement plans, to transmission developers, to state and federal agencies charged with designating transmission corridors and permitting proposed transmission, to NGOs and the public when developing positions on important issues, and to state and provincial policy makers.

f) *Can similar requests for studies or scenarios be represented generically if the projects are generally electrically equivalent?*
   - Yes. The WREZ request is not asking for review of specific proposed projects.

g) *Can requests be aggregated into energy or load aggregation zones with generic transmission expansion between?*

---

[6] TEPPC is planning a Long-Term Transmission Planning Seminar on February 2-3, 2009 that will explore some of the technical issues associated with very high voltage transmission systems. This seminar will help inform and guide the technical parameters for the appropriate type of transmission overlay to model in Expansion Case 4.

- Yes. The WREZ project will provide specific aggregated generation information from Renewable Energy Zones.

h) *Does the study request require the use of production cost simulation or can it be better addressed through technical studies such as power flow and stability analysis?*
   - The study request will require the use or product cost simulations.