

PROPOSAL FOR CONTINGENT TRANSMISSION PLANS

September 28, 2010

How should the WECC's RTEP process develop a 10-year transmission plan based upon transmission studies completed over the past several years? This paper explores the notion of a "plan" that consists of a package containing a small number of "contingent plans" that would correspond to a limited number of future states of the world by 2020.

The rationale for developing transmission plans on a contingent basis is based on the following observations.

Contingencies. Insights from TEPPC transmission planning over the past several years indicate that the demand for future transmission expansion in the West is contingent upon a number of important drivers including:

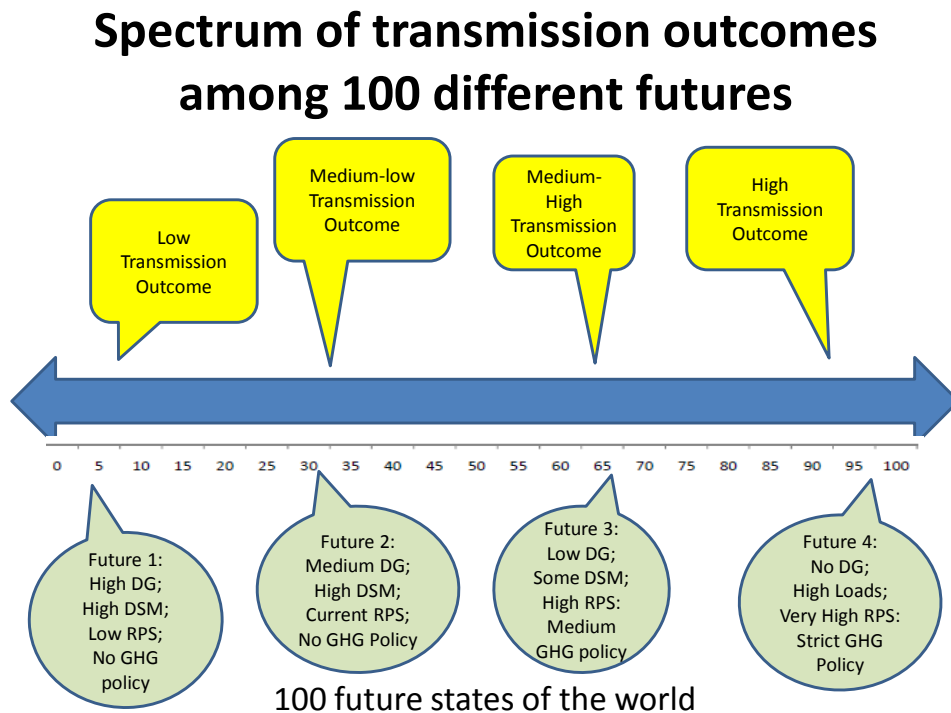
- (1) Levels of state renewable portfolio standards (RPS);
- (2) Development of remote versus local renewable generation;
- (3) Load growth given DSM policies and economic growth;
- (4) Policies to reduce greenhouse gas (GHG) emissions;
- (5) Shifts of innovation and cost competitiveness between wind and solar energy;
- (6) Advances in distributed generation technologies;
- (7) Natural gas supplies and prices;
- (8) States policies restricting renewable energy to instate sources;
- (9) State policy on renewable energy credits (RECs) and delivery requirements;
- (10) Potential constraints linked to water or wildlife resources.

Each of these ten factors have a range of potential values that can increase or decrease in a continuous manner. Even if we assume discrete (0 or 1) variables, the ten factors imply a combination of 100 potential states of the world in different shapes and magnitudes. Developing a transmission plan from such a large range of contingencies can be daunting. One approach to address this problem is to shift the focus on transmission outcomes as discussed below.

Spectrum of Transmission Outcomes. This section proposes an analytical framework to evaluate the appropriate level of aggregate transmission expansion in the Western Interconnection by 2020. Under the assumption of 100 different states of the world as postulated above, we can envision that there is a unique level of transmission expansion in 2020 for each one of these 100 states of the world based on available technology and economic conditions. In theory, we could rank the associated transmission mix for each state of the world across a spectrum ranging from the lowest level of transmission investment to the highest level of transmission investment. The spectrum would identify the entire range of 100 possible transmission outcomes.

Creating a large number of plans linked to every contingency would be overwhelming and not particularly useful for decision makers. To be useful, the "plan" must reduce the

abundant amount of information to a small number of comprehensible alternatives. One option is to create a small number of plans (e.g. 3 to 4 plans) that are grounded upon a set of underlying assumptions of the future state of the world. Each plan would be contingent upon the underlying assumptions in that state of the world. The relationship between alternative future states and different transmission outcomes is illustrated below.



RTEP may or may not want to identify a preferred contingent plan. Some may want to select the batch of assumptions most likely to occur ten years in the future. Others may prefer to support a plan that reflects specific policy goals. These different perspectives can be considered and explored in future discussions.

Probabilities. An attempt to assign probability levels for each of the ten factors identified above would be difficult to quantify and any conclusions would have a low degree of confidence. Rather than focusing on the probability of these key assumptions, it would be more useful to focus on the outcomes for transmission development. Categories of future transmission development could be three categories such as small, medium and large. The different input assumptions would be matched up with the three categories of transmission outcomes. TEPPC would not have to assign probability parameters to the inputs or outputs. TEPPC would simply be responsible for identifying the conditions that leads to three levels of transmission expansion. Different people may have their own opinions about the probability or likelihood of a given set of assumptions driving transmission expansion.

TEPPC Studies. TEPPC will need to develop a plan or contingent plans based on the findings from existing and previous studies. TEPPC study results from 2008 to 2010 will be the primary basis to construct a transmission plan or contingent plans. TEPPC’s prior studies in 2008 and 2009 served to identify congestion under different scenarios but modeled only a few cases in which new transmission lines were added to the grid. Additionally the 2008 and 2009 studies did not undertake an economic analysis of the capital costs of different cases. New studies being pursued in 2010 are providing significantly more cases of transmission expansion and evaluation of the capital and operating costs. Three groups of TEPPC studies will probably serve as benchmarks within the spectrum of transmission outcomes.

The SPSC’s High DSM 2020 case will provide insight on a lower level of WECC-wide transmission outcomes. The high DSM policies will reduce loads relative to the Reference Case, lower the level of renewables needed to meet RPS requirements, and likely reduce the demand for new transmission.

The SPSC’s 2020 Reference Case and Base Case will likely tell us something about a medium level of WECC-wide transmission expansion. The Reference Case represents the current path or business as usual future since it assumes current utility plans and existing RPS policies. One of the key drivers for new transmission is to deliver renewable energy to the coastal states to meet RPS requirements. Closely related to the 2020 Reference Case are the set of 2019 Resource Relocation Cases. The 2019 Relocation Cases shift 12,000 GWh of resources out of California to eight different locations across the West and evaluates different transmission expansion options for each resource shift. Findings being developed by TEPPC may illuminate some of the most promising and economical transmission opportunities.

The WREZ project’s 2029 case with 33% renewable penetration would serve as the benchmark for a very high level of transmission expansion. This case was originally designed to explore the potential need for a transmission superhighway and postulated very high levels of renewable development in the major hubs identified by the WREZ project. Even though this case is set for the year 2029, it articulates a potential future that could be adjusted and configured with targets in 2020 that are on the path to meet the 2029 resource and transmission outcome.

Illustrative Contingent Plans. To further illustrate the contingent transmission plan approach, the table below identifies three potential contingent plans: (1) Low Transmission 2020 Future; (2) Medium Transmission 2020 Future; and (3) High Transmission 2020 Future. Each contingent plan is grounded in a set of assumptions that serve as drivers for the amount of transmission needed in 2020. The first column in the table lists the set of assumptions for each contingent plan. The second column identifies specific cases that have been modeled by TEPPC over the past 3 years that matches up with the assumptions. The third column describes in general terms the expected transmission expansion under the contingent plan.

CONTINGENT TRANSMISSION PLANS -- EXAMPLES		
Assumptions consistent with transmission outcome	Supporting TEPPC Cases	Transmission Expansion
Contingent Plan 1: Low Transmission 2020 Future (Local resources only, high DSM)		
<p>Loads – Low load growth due to (a) gains from DSM policies, and/or(b) slow economic growth</p> <p>RPS – States backslide on current RPS targets (below 15% penetration WECC-wide) due to: (a) cost caps, and/or (b) political decisions to lower targets (e.g. CA drops 33% RPS to 20%; other states lower targets)</p> <p>Local v. Remote – utilities develop local resources b/c (a) lower cost, (b) uncertainty in transmission, (c) state restrictions for econ development (e.g., and/or (d) RPS compliance via REC trading.</p> <p>Renewable mix – solar and PV contribute a significant portion of the WECC-wide renewables portfolio (e.g. large CSP and PV in AZ, CA, NV, NM)</p> <p>GHG – No enactment of binding GHG policies impacting the electric sector</p> <p>Natural gas – abundant supply and low stable prices</p>	<p>2020 High DSM case</p> <p>2017 Heavy Solar case</p>	<p>All or a portion of the Foundational Projects built</p> <p>and</p> <p>No Potential Projects built</p>
Contingent Plan 2: Medium 2020 Transmission Future (Some remote resources)		
<p>Loads – Average load growth with (a) below DSM economic potential, and (b) modest economic growth</p> <p>RPS – States meet current RPS targets (15% penetration WECC-wide); no federal RPS (e.g. CA retains 33% RPS)</p> <p>Local v. Remote – Local renewables first choice for most utilities but some remote development occurs (e.g., CA imports 25% to 30% of its renewables; PacifiCorp meets its plans to use WY wind; rest of WECC relies on local renewables)</p> <p>Renewable mix – No change in current solar v. wind economics and no further advances in PV</p> <p>GHG – Potential mild GHG policies that can be attained with current renewable development and modest shifting from coal to natural gas</p> <p>Natural gas – could remain abundant or follow historical cycles with periods of scarcity</p>	<p>2020 Reference Case or 2020 Base Case (with BA loads);</p> <p>2019 Relocation Cases with 8 potential areas for export to CA</p> <p>2017 Heavy wind case</p> <p>2020 Carbon Reduction Case with modest GHG reductions</p>	<p>All Foundational Projects built</p> <p>and</p> <p>2-3 Potential Projects built</p>
Contingent Plan 3: High 2020 Transmission Future (Transformational with high renewables and low carbon emissions)		
<p>Loads – High load growth with (a) minimal DSM implementation, and/or (b) high economic growth that offsets DSM gains</p> <p>RPS – States raise RPS targets (25%-33% penetration WECC-wide); and/or federal RPS above state levels and creates export market outside of West</p> <p>Local v. Remote – Local renewables exhausted requiring large amounts of remote renewables (e.g., Large development in WY, MT, CO, NM, AZ, AB, BC)</p> <p>Renewable mix – No change in current solar v. wind economics and no further advances in PV</p> <p>GHG – Aggressive GHG targets requiring shift of (a) coal to gas, and (b) high level of renewables to reduce gas</p> <p>Natural gas – rising scarcity with limits on shale gas and rising gas prices</p>	<p>2029 Case with 33% renewables and large transmission expansion</p> <p>2020 Carbon Reduction Case resulting in high GHG reductions</p>	<p>All Foundational Projects built</p> <p>and</p> <p>Large number (6-10) of Potential Projects built</p>

Potential Outline:

Western Interconnection Regional Transmission Plan for 2020

Executive Summary

- I. Introduction
- II. Contingent Transmission Plans: Assumptions and Methodology
 - A. Drivers for transmission expansion
 - B. Plans based on contingent futures
 - C. Caveats
 1. Snapshot from the perspective of 2010
 2. Not a construction plan
 3. Ultimate decisions makers on transmission projects are the project sponsors, investors, state regulators
- III. Contingent Plan 1: Low Transmission Future in 2020
 - A. Assumptions for state of the world under Plan 1
 - B. TEPPC studies
 - C. Transmission expansion under the Low Transmission Future
- IV. Contingent Plan 2: Medium Transmission Future in 2020
 - A. Assumptions for state of the world
 - B. TEPPC studies
 - C. Transmission expansion under the Low Transmission Future
- V. Contingent Plan 3: High Transmission Future in 2020
 - A. Assumptions for state of the world under Plan 1
 - B. TEPPC studies
 - C. Transmission expansion under the Low Transmission Future
- VI. The Preferred Plan identified in 2010
 - A. Majority or consensus view
 - B. Minority views