WREZ Study Request to WECC:
Revised Draft and Options

January 6, 2009

Technical Committee Webinar

Schedule

- Pre Dec 15 - Staff ideas and feedback
- Dec 15 Tech Committee webinar
- Dec 31 - Deadline for comments on ideas presented on Dec 15 webinar
- Jan 6 Tech Committee webinar
- Jan 9 – Revised proposed request
- Jan 13-14 – Tech Committee recommendation
- Jan 23 – Steering Committee action
- Jan 31 – Submission to WECC

Jan. 6, 2009 Proposal

- Request 1: Near-Term Analysis – RPS Requirements (Reference Case)
- Request 2: Near-Term Analysis – CO2 Reduction Targets
- Request 3: Long-Term Analysis – 33% RPS
- Request 4: Transmission superhighway overlay

Request 1: Near-Term Analysis – RPS Requirements

- Model transmission needs for generation mix reviewed by LSE resource planners
  - Strawman resource case based on WREZ model default values presented to LSE / PUC resource planners on Feb 24-25
  - Expecting the case will comply with existing RPS requirements plus some renewables in non-RPS states/provinces
  - Reference case based on current policy
- Analysis limited to next 10 years
- Sensitivity analysis
  - Energy efficiency
  - Natural gas prices

Request 2: Near-Term Analysis – CO2 Reduction Target

- Model resource mix with higher renewable mix (20-25% penetration) and carbon adder to attain CO2 target reductions
  - Western Climate Initiative (WCI) power sector CO2 reductions ranged 25% to 40%
  - Federal legislation targets
- Renewable energy penetration (20-25%)
  - WECC-wide penetration 8% with 2017 RPS
  - WIRAB 2017 case modeled 15%
  - CA RPS in 2020 at 33%
  - Use WREZ model to identify cost-effective level
- Reviewed by LSE resource planners
- Sensitivity analysis
  - Energy efficiency
  - Carbon adder

Request 3: Long-Term Analysis – 33% RPS and 50% CO2 Reduction

- Model transmission needs for generation mix reviewed by LSE resource planners which achieves 33% renewable penetration and 50% CO2 reduction WECC-wide
  - CA RPS 33% in 2020
  - Obama pledge to reduce GHG 80% by 2050
- Sensitivity analysis
  - Energy efficiency
  - Carbon prices
  - Natural gas prices
  - Generation technology cost

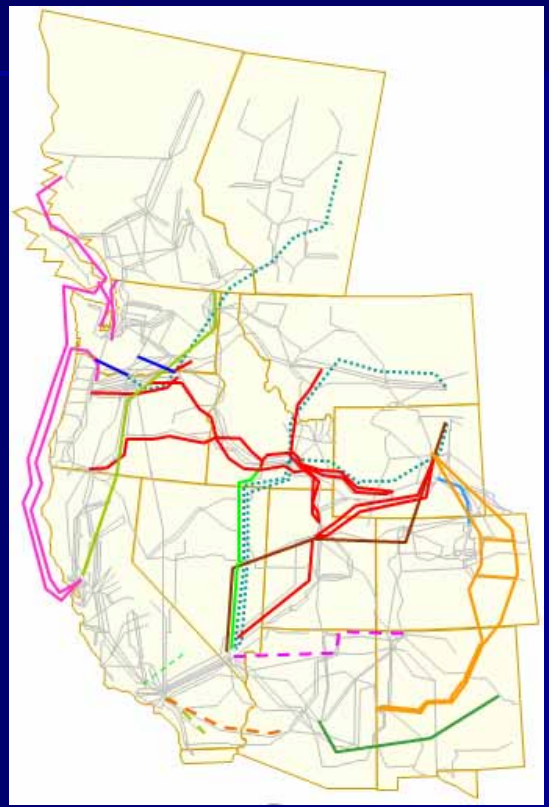
Request 4: Transmission Superhighway Overlay

- Calculate costs and operating savings from a transmission superhighway overlay over long-term
- Evaluate value of overlay assuming
  - Current generation technology costs
  - Changes in renewable generation technology cost
  - Greater energy efficiency
  - Alternative natural gas prices
  - Alternative carbon prices
- Ask WECC to specify precise overlay configuration

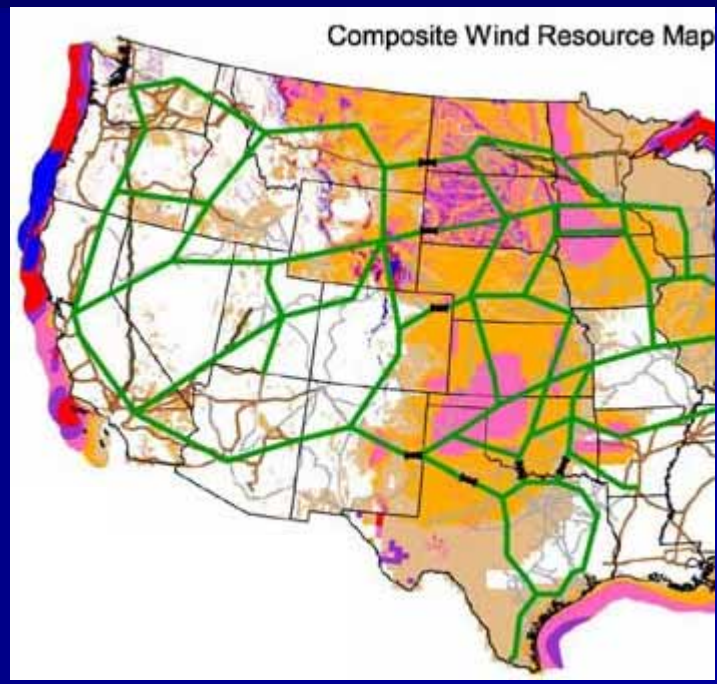
Alternative Views on Very High Voltage Overlay

(Note significant overlaps; ask WECC determine exact study configuration)

One vision of a 765 kV overlay in the Western Interconnection



Major existing transmission proposals (from WECC)

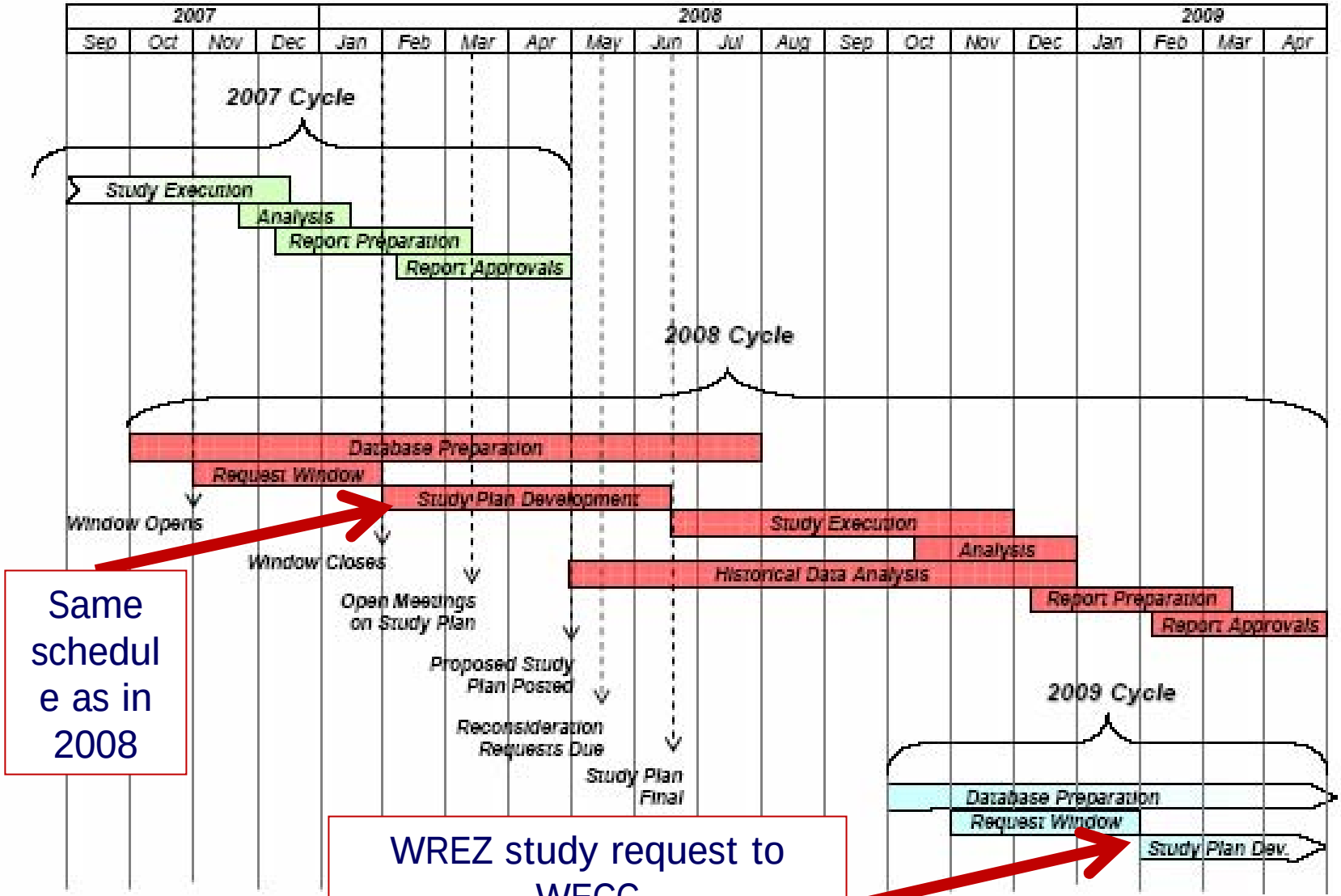


AEP's vision of a U.S. 765 kV grid

Background – WECC's TEPPC Study Requests and Transmission Planning

- WECC's TEPPC solicits stakeholder requests for modeling regional transmission scenarios/projects.
- TEPPC study requests need to be submitted by Jan. 31 to be part of the study cycle for 2009.
- Details of the WREZ study request can be refined and integrated with other study requests during the TEPPC review process (Feb.- Apr.)

Synchronized Study Timeline



Same schedule as in 2008

WREZ study request to WECC

WECC Criteria

- *(a) What portion of the interconnected system will be considered by the study?*
- *(b) Does the request raise fundamental design issues of interest to multiple parties?*
- *(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?*
- *(d) Can the objectives of the study be met by other studies by clustering or combination?*
- *(e) Will the study provide information of broad value to customers, regulators, transmission providers, etc.?*

WECC Criteria – cont.

- *(f) Can similar requests for studies or scenarios be represented generically if the projects are generally electrically equivalent?*
- *(g) Can requests be aggregated into energy or load aggregation zones with generic transmission expansion between?*
- *(f) 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?*

BOTTOM LINE:

- *WREZ request fits well with WECC criteria*
- *WREZ request can be coordinated with WEIL group request to increase chances WECC will execute request*

Comments & Issues (1)

1. Concern that LSE planners will be reluctant to provide responses on their renewable energy preferences.
   - WREZ project develop strawman case using WREZ model
   - Present to LSE/PUC planners at Feb. 24-25 meeting and seek feedback

Comments & Issues (2 & 3)

2. Propose a higher renewable penetration scenario such as the 30-35% range in NREL's Western Wind and Solar Integration Study?
3. New laws likely in the future that the WREZ scenarios may want to explore (e.g. higher RPS, national RPS, carbon constraints)
   - Revised requests with higher renewables levels
     - Near term 20-25%; Long term 33%
   - CO2 reduction targets added
     - Near term 25-40%; Long term 50%

Comments & Issues (4 & 5)

4. Do we need an energy efficiency scenario?
   - Energy efficiency included in sensitivity analysis
5. Higher level of renewables could push gas prices higher or lower in long term
   - Gas prices not endogenous to model, set by assumption. Perform sensitivity analysis with different gas prices.

Comments & Issues (6 & 7)

6. Technology changes affect capital costs, not dispatch of resources.
   - Analysis incorporates both operating and capital costs. Interested in how technology changes impacts total costs.
7. What is the basis for the 33% renewables penetration? Should not be presumed going into the TC meeting unless there is a WECC-wide basis for the number.
   - The 33% renewables level was based of the CA RPS in 2020. Highest state level across WECC. Potential future target of other states/provinces or federal policy.

Comments & Issues (8)

8. Why select a 20-year long-term analysis?
   - Want to analyze the resource / transmission options in a longer term than current practice of 10 years. Capital investments are very long term lasting 30-40 years. The 20-year time frame is an arbitrary doubling of the current 10 year time frame.

Comments & Issues (9)

9. The expansion case of a western transmission superhighway network only assumes increases of renewable generation based on the WREZ charter. There is insufficient information to perform a transmission overlay. The determination of the resource mix needs to be more holistic to be of value, i.e. will there be changes to the traditional fleet (retirements, new nuclear, coal, gas, etc.)
   - The WREZ charter does not restrict the request to study a transmission overlay.