Northwest **Power** and **Conservation** Council

February 4, 2014

MEMORANDUM

TO: Power Committee Members

FROM: Ben Kujala

SUBJECT: WECC 10 and 20 year transmission plans

The 2013 Western Electricity Coordinating Council (WECC) Interconnection-wide Transmission Plan is an assessment of the Western transmission system under a wide variety of possible futures. This plan focuses on the future need to expand the transmission system to meet load as well as policy requirements, such as renewable portfolio standards.

WECC's most recent transmission plan modeled the response of the transmission system to several scenarios of particular interest to the Northwest. One scenario examined a WECC-wide drought. Another examined robust development of Demand-Side Management, Distributed Generation and Energy Efficiency resources. There was also an examination of the impact of intermittent generation (e.g., wind, solar) on the transmission system.

Keegan Moyer, WECC's Manager of Transmission Expansion Planning will give the Committee Members an overview of the 2013 WECC Interconnection-wide Transmission Plan and discuss the work in-progress on the next Transmission Plan.

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WECC 2013 Interconnection-Wide Transmission Plan

Northwest Power and Conservation Council

February 11, 2014 - Portland, OR

Keegan Moyer
Manager, Transmission Expansion Planning

Today's Discussion

- WECC and TEPPC background
- 2013 Plan
- Recent happenings…
- Discussion and questions

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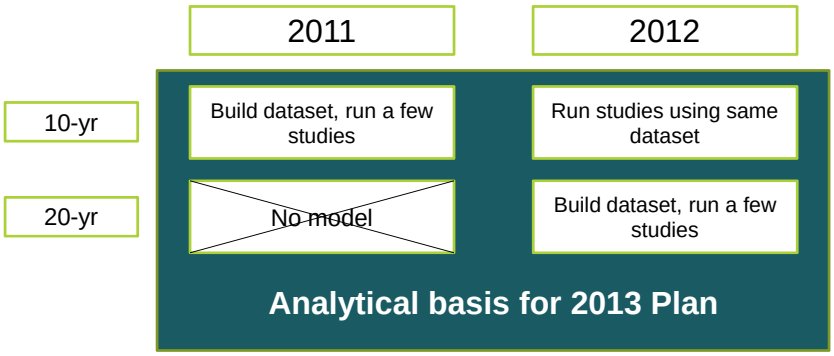
Biennial study cycle that culminates in a transmission plan



WECC performed over 80 studies in 2011 and 2012

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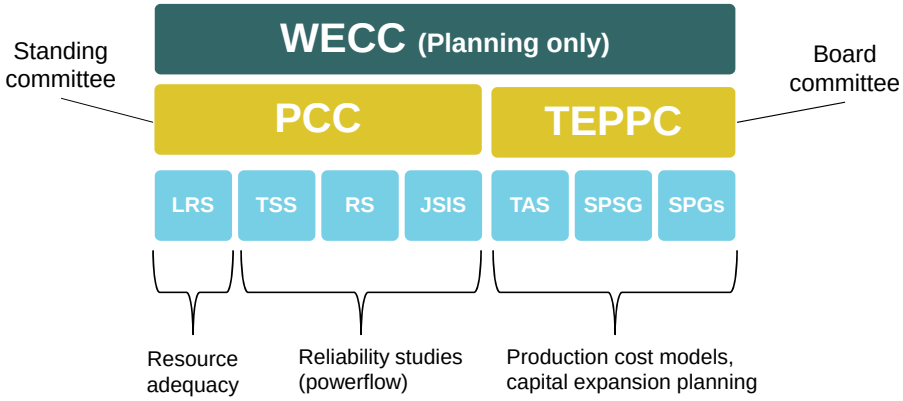
WECC Transmission Planning Groups



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TEPPC = Transmission Expansion Planning and Policy Committee

Purpose

1. Oversee and maintain public planning database and models
2. Facilitate and coordinate Interconnection-wide planning processes
3. Guide, improve and conduct economic planning analyses for the Western Interconnection
4. Prepare Interconnection-wide Transmission Plans

Stakeholders

- Consumer Advocates
- State and Provincial Officials
- Transmission Owners, Operators, and Developers
- Generator Owners, Operators, and Developers
- Load-Serving Entities
- Subregional Planning Groups
- Environmental Advocates
- Technology Advocates
- Tribal Representatives
- Federal Agencies

2013 Interconnection-Wide Plan
Key Messages

- Interconnection-wide perspective of the transmission system under a wide variety of futures
  - 10-Year: Bottom-up approach, impact of near-term decisions
  - 20-Year: Top-down, drivers of energy futures
- Stakeholder-driven and approved
- Informational, not instructions or orders
- Limitations in scope and intended uses
- The Plan and WECC's reliability mission

Understanding the impacts of decisions, not determining what should be done

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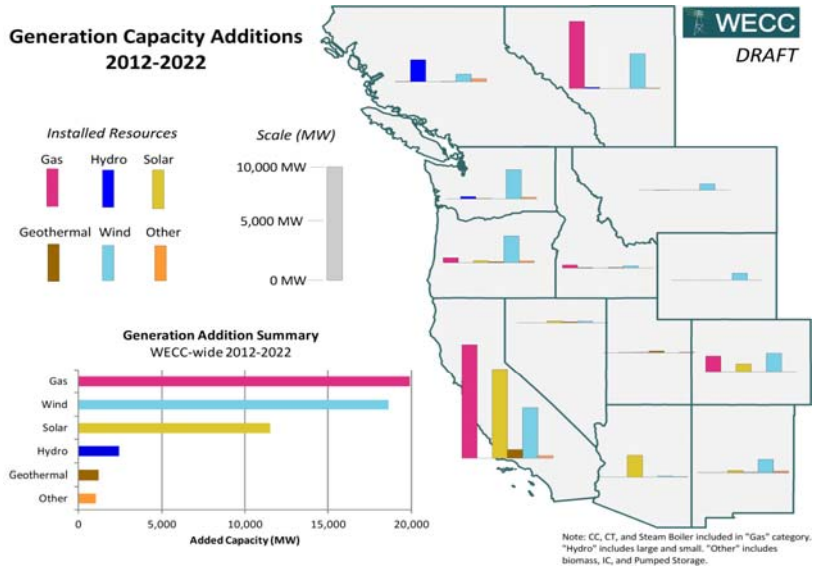
10-Year Study Timeframe

Focus: Common Case

"TEPPC 2022 Common Case represents an "expected" future for the Western Interconnection based on recent trends and plans"

"…serves as a starting point for the other 10-year studies"

Primarily Wind and Gas Added in Next 10-Years



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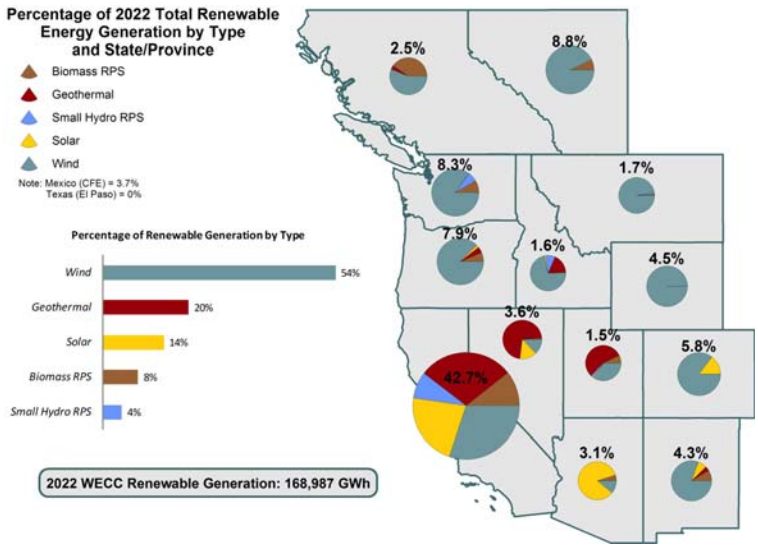
The Common Case is a Enacted Policy Compliant Future



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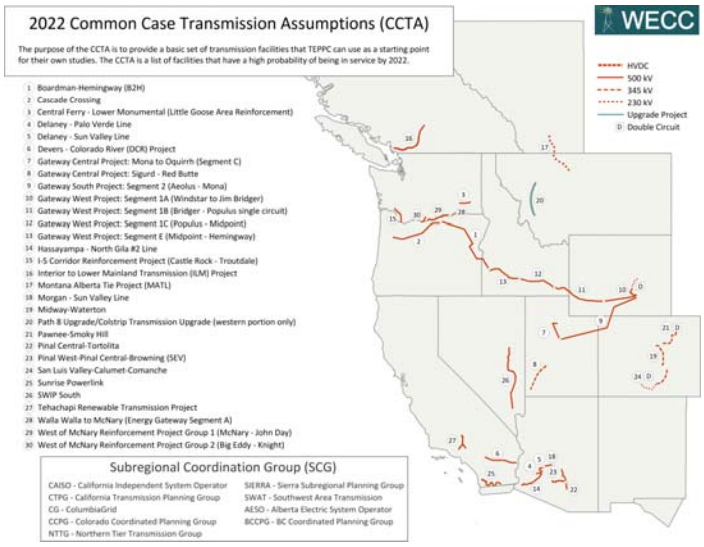
Transmission Assumptions are Key Input and Drive Results



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Key 10-Year Plan Observations

The expected future grid appears to be adequate to meet load and RPS requirements

Major transmission additions could be needed under futures with substantially greater renewable generation - particularly if development occurs in areas remote from load centers.

High and low gas prices, high and low hydro conditions, high loads produced varied impacts on projected transmission usage but did not indicate a strong requirement for major transmission additions.

High EE and DG increased transmission flows out of the Northwest as low-cost generation is freed up for export to more distant high-cost areas such as California.

Transmission that is assumed built

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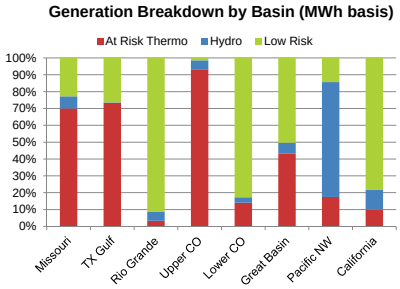
Other 10-Year Studies

Drought Study

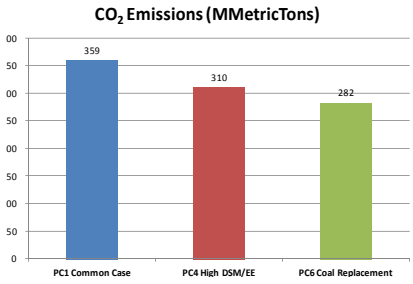
Goal: Examine the impacts of higher temperatures, changes to the timing and quantity of precipitation and runoff



Result: Lack of hydro resources and *not* the high loads or restricted thermal operation may be the Western Interconnection's biggest concern.

Coal Replacement Study

Goal: Maximize the delivery of renewable energy and minimize the construction of new transmission, while also trying to achieve a targeted reduction in carbon emissions



Result: Suggests that EE/DSM/DG may present an efficient path to CO_2 reduction (compared to retiring coal-burning resources)

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WECC 20-Year Long-Term Planning Tool (LTPT)

"…investment-optimizing model that was developed to identify transmission expansion additions needed in the 20-year planning horizon"

"The LTPT, as with any proof-of-concept tool, is not without limitations and areas for improvement."

20-Year Studies

New WECC "Long-Term Planning Tool"

Dataset (2032)

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Capital cost assumptions

Water nexus

Environmental GIS

Tools

Resource Optimization + Transmission Analysis and Expansion =

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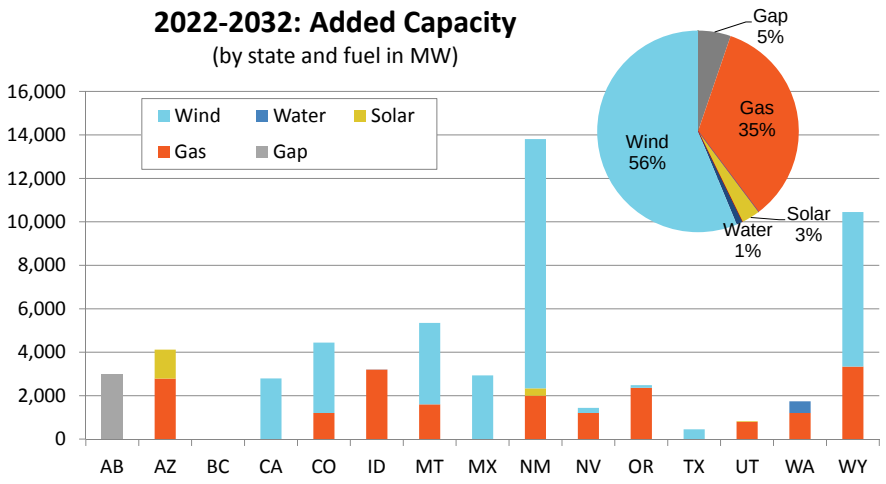
2032 Reference Case

Renewables Added for Energy (beyond policy)



Added 57,000 MW from 2022-2032

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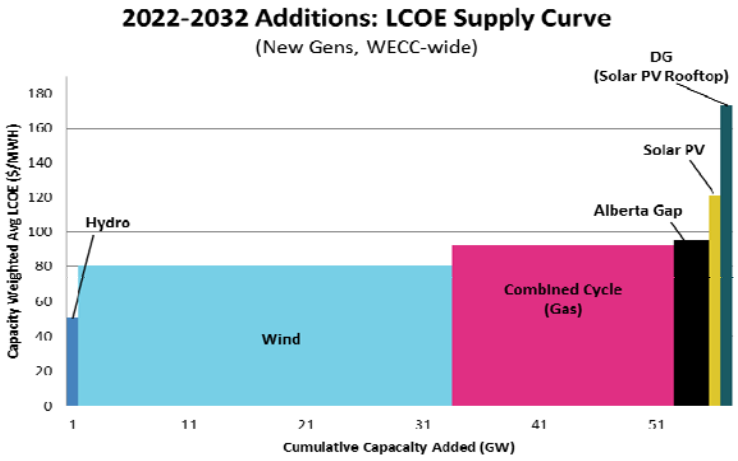
2032 Reference Case

Uncertainty Dominates (cont.)



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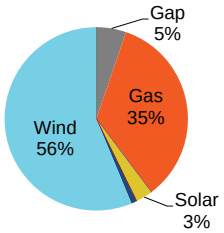
2032 Reference Case

Remote Resources = Transmission

Resources Added
2022-2032



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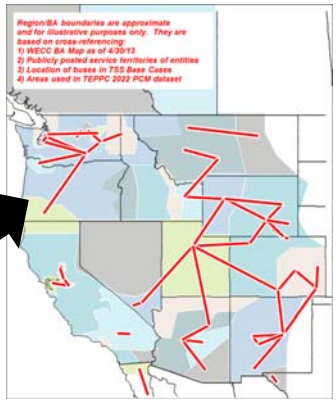
Transmission Added
2022-2032



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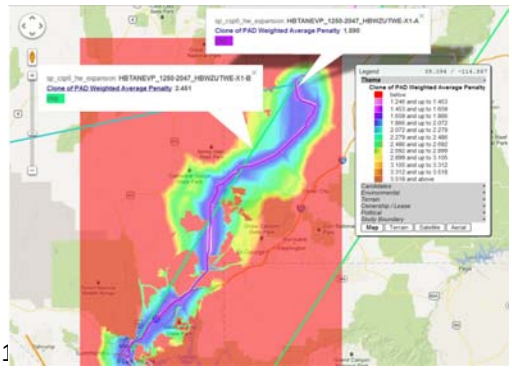
EDTF Work Summary

Environmental Data Task Force

Purpose - Develop recommendations on the type, quality, and sources of data on wild lands, wildlife, cultural resources and potential water resources that can be used in transmission planning processes

Environmental Data Layers



Environmental Risk Classification

Report: "Transmission Alternative Environmental Risk Comparison Methods"

Goal: Provide approach for evaluating environmental and cultural risks to transmission planning

Other 20-Year Cases

- WECC Scenarios
- High EE/DR/DG
- Low Carbon
- Solar PV – Technology Breakthrough
- Solar Thermal – Technology Breakthrough
- Geothermal – Technology Breakthrough
- Various sensitivities

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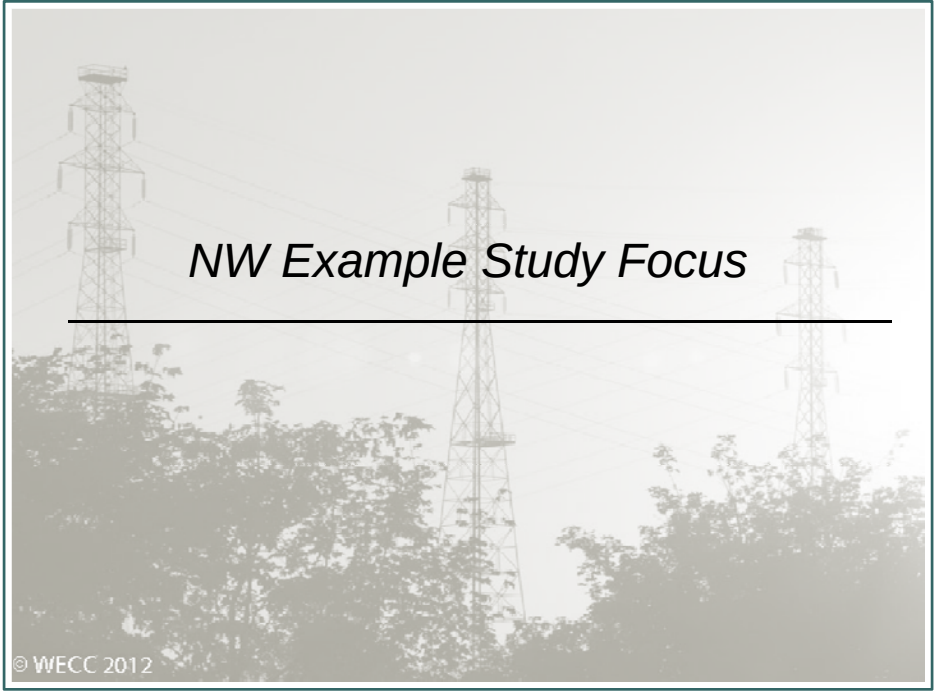
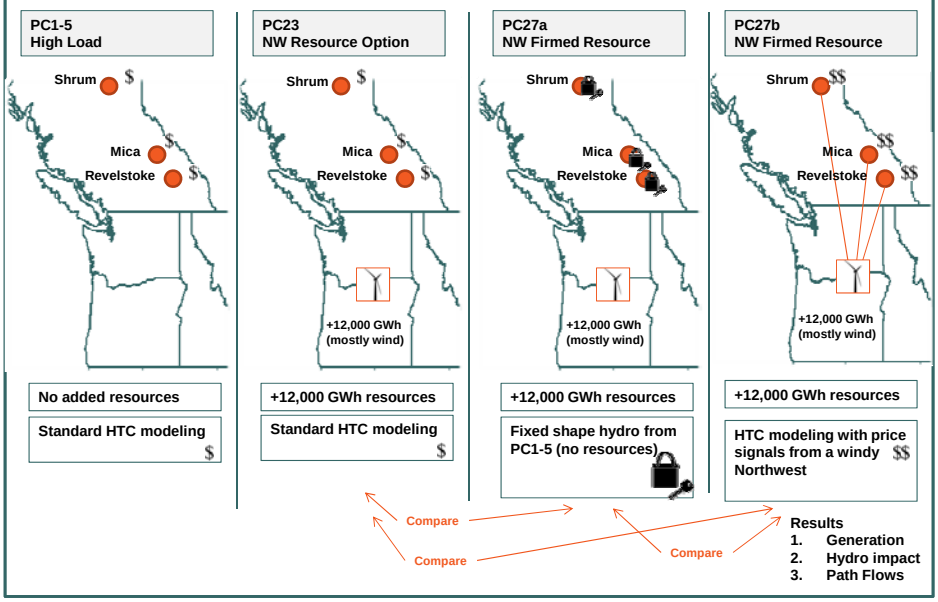


NW Firmed Resource Cases

Comparing Four Cases



Summary

- Having some portion of BC hydro providing price responsiveness output based on NW market signals (near areas of high wind penetration) could result in West-wide production cost savings of $7 million per year
- These savings do not include any costs to compensate or incent BCH for changing operation of its hydroelectric projects.

Other interesting NW results: Impact of energy efficiency programs

Plan Recommendations

"Broad recommendations regarding future studies and how decision makers or others might use these study results as a point of departure going forward"

Plan Recommendations

Recommendation 1 – Include Uncertainty in Planning Studies
Modest changes in natural gas prices, CO_2 prices or penalties and technology costs may result in significantly different future optimal generation resource mixes, and thus, different transmission needs.

Recommendation 2 – Evaluate Options to Hedge against Future Uncertainty
Decision makers may want to investigate strategies that can protect against the inherent risk posed by the uncertainty associated with gas prices, CO_2 and other environmental costs or constraints, and technology advances.

Recommendation 3 – Assess Future Operational Flexibility
WECC recommends that planners and others attempt to develop more comprehensive, accurate and detailed assessments of flexibility needs and of operational and infrastructure investment approaches to providing flexibility.

Recommendation 4 – Evaluate Risks in Gas-Electric Interface
Additional analysis is needed to quantify the risks and vulnerabilities faced by the bulk power system.

Recommendation 5 – Further Quantify Uncertainty
TEPPC and other planners should attempt to further quantify or bound key uncertainties and provide that information to stakeholders for external use.

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Plan Recommendations (cont.)

Recommendation 6 – Attempt to Quantify Mitigation Costs
WECC recommends that TEPPC consider the use of analytical results from ongoing Environmental Data Task Force (EDTF) work related to mitigation costs.

Recommendation 7 – Identify Environmentally Least-Risk Corridors
TEPPC should consider using the LTPT to derive least-risk corridors between major load and generation hubs within the Western Interconnection, and provide the results of this analysis to stakeholders.

Recommendation 8 – Consider Improvements to Modeling, Data Quality and Data Sharing
TEPPC should undertake work to improve a number of technical modeling issues, including investigating improvements to the 20-year LTPT Modeling approach. TEPPC should also embrace the opportunity to improve data quality and sharing practices.

Recommendation 9 – Acknowledge Uncertainty around Assumed Transmission
To account for the possibility that one or more of "assumed built" transmission projects are not constructed, WECC recommends that TEPPC consider performing sensitivities by individually removing key projects from the 2022 Common Case.

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Recent happenings…

- 2015 Plan, 2014/2013 Study Program, 2024 Common Case
- Stochastic resource adequacy assessments
- Reliability studies via production cost model
- WECC and recent changes
  - o New CEO (Jim Robb)
  - o Bifurcation (pending, Peak & WECC)
  - o New BOD (pending FERC)

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Discussion and Questions

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