

<u>Renewable Natural Resources Foundation:</u> Congress on Assessing America's

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Transmission and America's New Energy Economy

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Outline

- **Overview: U.S. Electricity Sector Past, Present and Future**
- The Proper Context of Transmission in Future Electricity Scenarios
- Renewable Energy Background
- The U.S. Grid and the Integration of Renewable Energy
- Challenges for New Transmission
- Federal Initiatives to Address Challenges
- Focus DOE Transmission Planning for Renewable/Low-Carbon Resources



1. Overview: U.S. Electricity Sector Past, Present and Future



U.S. Electricity Sector

Where We've <u>Been</u> . . .







Where Are We Going?

Key Drivers of Future U.S. Electricity Sector

- increasing electricity demand
- resource diversification
- new, revitalized energy economy
- national security and energy independence
- climate change



Obama Administration Energy Policy

"So we have a choice to make. We can remain one of the world's leading importers of foreign oil, or we can make the investments that would allow us to become the world's leading exporter of renewable energy. We can let climate change continue to go unchecked, or we can help stop it. We can let the jobs of tomorrow be created abroad, or we can create those jobs right here in America and lay the foundation for lasting prosperity."

PRESIDENT OBAMA, MARCH 19, 2009



Advancing Presidential Priorities

Energy efficiency and renewable energy activities help the Nation meet its economic, energy security, and environmental challenges concurrently.

Energy Security

- Deploy the cheapest, cleanest, fastest energy source – energy efficiency
- One million plug-in hybrid cars on the road by 2015
- Develop the next generation of sustainable biofuels and infrastructure
- Increase fuel economy standards



Economic

- Create green jobs through Recovery Act energy projects
- Double renewable energy generation by 2012
- Weatherize one million homes annually

Environmental

- Implement an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80 percent by 2050
- Make the US a leader on climate change
- Establish a national low carbon fuel standard

State Renewable Portfolio Standards





In addition to State RPS:

- national RPS legislation
- national transmission legislation
- national climate change legislation
- state and federal initiatives:
 - energy efficiency
 - demand side management
 - smart grid
 - demand response
 - distributed generation



2. The Proper Context of Transmission in Future Electricity Scenarios



Hypothetical Electricity Sector Generation Portfolio of the Future





Proper Context for Renewable Energy and Transmission

- Ensure that new transmission is the result (not the starting point) of careful analysis of all options – especially the demand side technologies including efficiency and distributed generation.
- Transmission focus is on the <u>utility-scale</u> (non-distributed) renewable energy slice of the future generation pie



Comprehensive Resource Planning and GhG Emissions

- 2,340 MMT 2006 Baseline GhG Emissions US
- Wind-only example:





3. Renewable Energy Background

How Much Renewable Energy and Transmission?

- EIA 2007 and 2009 forecasts:
 - 60,000 MW of new renewable energy capacity by 2030
- NERC 2008 Long-Term Reliability Assessment: 15,000 miles of new transmission in Eastern Interconnection (wind)
- Western Governors Association: 7,500 miles of new transmission in Western Interconnection by 2015 (CDEAC 2006)

Generation and Transmission = <u>environmental, wildlife and landscape impacts</u>



Wind, Solar and Geothermal Overview

U.S. Electric Nameplate Capacity (2008): 1,109 GW







Wind – On and Offshore







U.S. Geothermal Resources



BLM Geothermal Programmatic EIS (2008):

- 5,540 MW by 2015
- 6,670 MW by 2025

Geothermal Potential (USGS):

- Discovered 9,000 MW
- Undiscovered 33,000 MW
- Enhanced (EGS) 517,000 MW





4. The U.S. Grid and the Integration of Renewable Energy



Q. Can the existing grid accommodate renewable energy additions for future scenarios?

A. No.

Three major issues:

grid isn't where it needs to be
 "location-constrained" renewable energy

- 2. existing transfer capacity: "congestion"
- ensuring reliability –
 naturally variable resources v. baseload



1. Existing Electric Transmission Lines and Location-Constrained Renewables



Source: IEEE

Proposed Major Transmission Projects in WECC

- Sea Breeze Projects
- TransCanada Projects
- Gateway & Other NTTG Projects
- Columbia Grid Projects
- TransWest Express
- **LS Power & Great Basin Projects**
- WY-CO Intertie Project
 - High Plains Express
 - Sun-ZIA
 - Canada/PacNW-NoCalif
- --- Central CA Clean Energy (C3ET)
- Green Path North
- Devers-Palo Verde 2
- Navajo Transmission Project

Source: WECC

... and linking renewables to load



2. DOE 2006 Congestion Study





5. Challenges for New Transmission

- planning -> today's focus
- siting
- cost allocation
- integration/reliability for variable resources
- market forces
 - chicken and egg dilemma
 - bilateral markets
 - state build-out v. regional expansion



6. Federal Initiatives to Meet Transmission Challenges



Major Transmission Legislation

- Common purposes: Incentivize more transmission by reforms to *planning*, *siting*, *and cost-allocation*
- **Purpose of each bill varies (accessing renewables** and low carbon resources, reliability, reduce congestion, smart grid, backbone creation)
- Most allow, or encourage, or require interconnection-wide planning of some sort
- Some have FERC backstop siting with variations
 - **Deference to states varies**



Some FERC Activities

- Bills in Congress would expand FERC authority (planning, siting, cost-allocation)
- Order 890 Transmission Planning
 2009 Technical Workshops
- Approved two "anchor-tenant" financing concepts for *merchant* transmission lines
- FERC study on reliability impact of wind and solar underway (using LBNL)



Dept. of Interior

- Section 368 or "west-wide" energy corridors on public lands for oil, gas, hydrogen and electricity (with DOE and others)
- Wind, Geothermal and ongoing Solar Programmatic Environmental Impact Statements and Land Use Plan Amendments
- 2009 Renewable Energy and Transmission Secretarial Order
- Fast-track solar, wind and transmission projects
- New Renewable Energy Coordination Office



DOE Recovery Act Transmission Funding

- \$6.0 billion for loan guarantees for renewable technologies & transmission technologies (July 29 notice: \$2B for renewables & transmission; \$750M for commercial transmission)
- \$3.4 billion investments in Smart Grid; \$620 million in 32 Smart Grid projects storage, meters and distribution monitoring devices
- \$6.5 billion in increased Bonneville and new Western
 Power Administration borrowing authority
 Western's transmission investments must facilitate renewable energy
- \$80 million for facilitating the development of regional transmission plans



7. DOE Transmission Planning for Renewable/Low-Carbon Resources



DOE Recovery Act: Transmission Planning

- \$80 million for facilitating the development of regional transmission plans
 - \$20 million for national labs analysis and NERC

Overarching Policy Goal:

Support Development of Clean, Renewable, Low-Carbon Generation

- to satisfy new demand and replace carbon-heavy electricity sector generation
- displace petroleum-based fuels in the transportation sector



From Transmission Planning to "Plans"

Interconnection-Wide <u>Plans</u> must reliably "achieve and balance" the following five objectives:

a. consider all available <u>technologies</u> for electricity generation, energy storage, transmission, end-use efficiency, DSM

b. satisfy all current state and federal <u>clean energy</u> <u>requirements</u> for RE, EE and GhG reductions

c. <u>minimize</u> long-term <u>costs</u> of producing and delivering electricity

d. <u>minimize</u> overall long-term <u>impacts</u> on "electricity supply activities" on the <u>environment</u>

e. provide for <u>efficient grid</u> development (e.g., oversizing concept)



Key to Success: Meaningful and Early-on Participation of Diverse Stakeholders Interconnection-Wide Transmission Analysis and Planning (Topic A)

- transparent, collaborative and open *<u>focus on consensus</u>
- multi-constituency steering group, involved in:
 - i. scenario development
 - ii. developing modeling
 - iii. developing key assumptions
 - iv. "other essential activities"
 - ensure funding for relevant non-profit NGOs to participate
 - -- travel costs and "other expenditures"



Key to Success:

Coordinated Participation of States

7. Participation of States (Topic B)

*Goal: States participate in regional transmission planning in a consistent and coordinated manner

i. Develop coordinated inputs for Topic A planning and process for reaching <u>consensus</u>

ii. Analyze economic and environmental implications of alternative scenarios and associated transmission requirements



Participation of States (cont.)

- 7. Participation of States (<u>Topic B</u>) Western Interconnection:
 - iii. Finish Western Renewable Energy Zone Initiative
 - *regional procurement and overcoming jurisdictional, permitting, construction and coordinated purchasing barriers
 - iv. Address reliable integration of RE
 - v. Uniform of mapping of crucial wildlife habitats and corridors

*better and more uniform information on wildlife corridors and crucial habitats to improve decisions



WGA-DOE Western Renewable Energy Zones "Hub" Map



Source: Western Renewable Energy Zones _ Phase 1 Report, www.westgov.org

DOE Transmission Planning: Other Keys to Success

- Robust Future Scenario Development
 - "broad and diverse" range of future scenarios
- High quality data (available to public)
- Focus on variable generation integration
- Ensure public understands transmission "needs"
 - this will lessen conflict, lead to greater acceptance of cost-allocation and siting decisions
- Focus on Technology Advancements
 - particularly those that could have major effects on future transmission requirements – e.g., offshore wind, ocean energy, batteries for plug-in electric vehicles, energy storage, etc.





DOE Transmission Planning Summary

- Robust Future Scenario Development
 - Energy Efficiency, DSM, Demand Response, Smart Grid
- Diverse and well-represented stakeholder participation
 - early-on = buy-in, ... and buy-in = built
- Identifying "No Regrets" or "Least-Common Denominator" Transmission
 - focusing on transmission common to all plans is a good hedge against uncertainty and risk
- Environmental concerns addressed at high-level in planning process
 - Screening for lands, wildlife and other values
 - Upgrading existing grid assets
 - Opportunities for new transmission in <u>existing</u> corridors (remember reliability concerns)



Thank You!

Questions?

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