

How Can Western Transmission  
Expansion Planning  
Evaluate Maximum Renewable Energy  
Penetration?

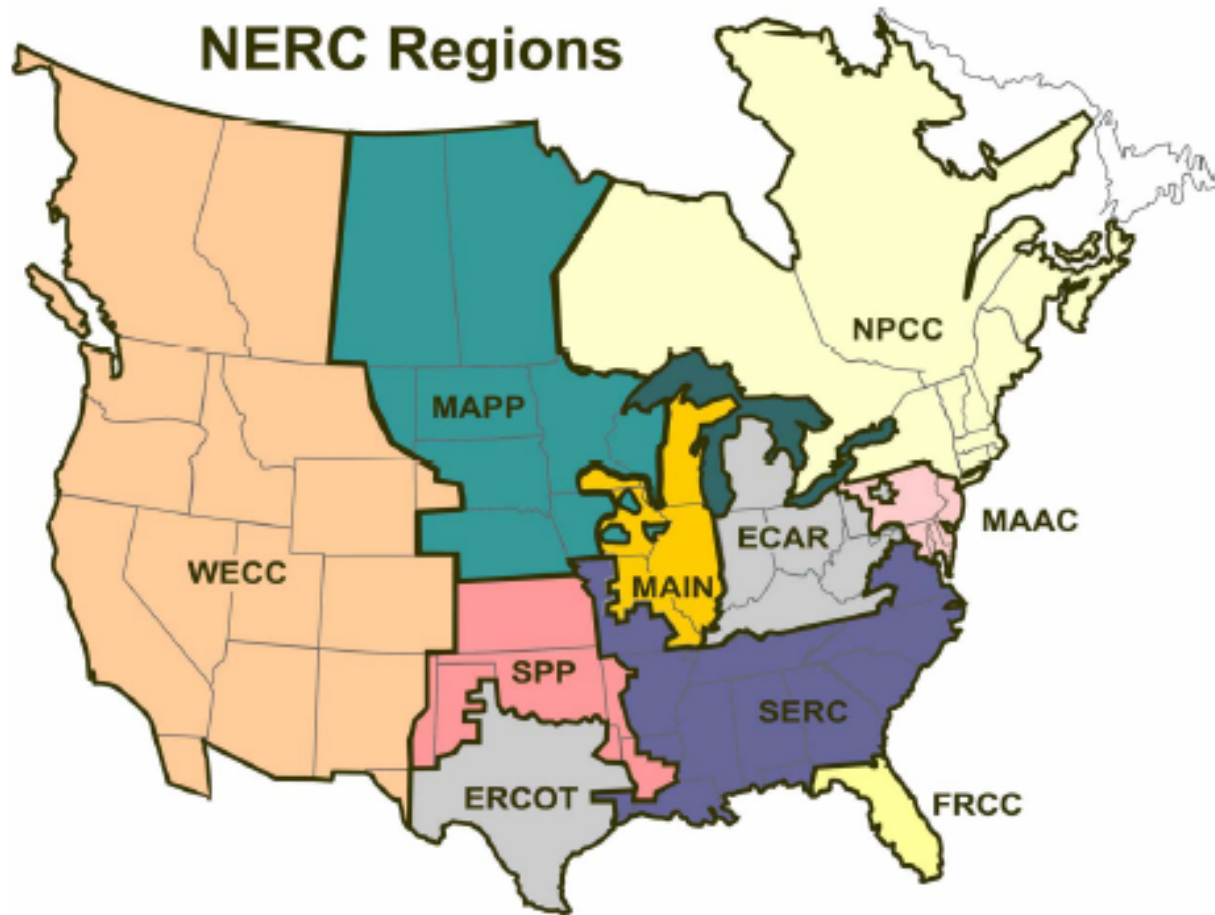


WECC Perspective

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September 27, 2007

# Western Electricity Coordinating Council (WECC)

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# Transmission Expansion Planning Policy Committee (TEPPC) Objectives

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- ❑ Database for regional transmission expansion planning.
- ❑ Policy direction and management of the planning process.
- ❑ Guide analyses and modeling for transmission expansion planning.
- ❑ Conduct studies that focus on plans with west-wide implications

# Transmission Expansion Planning Policy Committee (TEPPC) Objectives

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- ❑ High-level assessment of congestion and congestion costs.
- ❑ Complement planning responsibilities of WECC members.
- ❑ Does not include:
  - Detailed project-specific studies
  - Advocating specific projects
  - Identifying potential “winners” and “losers”
  - Cost allocation

# Prior Studies

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- ❑ Conceptual Plans for Electricity Transmission in the West – WGA, August 2001
- ❑ Framework for Expansion of Western Interconnection Transmission System - SSG-WI, October 2003
- ❑ Rocky Mountain Area Transmission Study (RMATS) – September 2004.

# Transmission Expansion Planning

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- Computer models to simulate how electric system will behave in the future
- TEPPC simulates the hourly changes in load, dispatch of generation, transmission constraints over a future year
  - Whole Western Interconnection
  - Planning for reliability uses different models
- Identify new transmission to fix problems
  - Consider economics and environment

# Looking Ten Years Out

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- What are the resources?
  - What is “Maximum Renewable Energy Penetration”?
  - Challenges of trying to serve load with intermittent resources
- What are the loads?
  - Energy efficiency
  - Demand response
- Energy storage facilities?
  - Hydro, pumped storage and distributed storage

# Distributed Storage – Vehicle-to-Grid

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# Emerging Technologies

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- ❑ Emerging technologies will enable more renewable resources
- ❑ We can build a transmission system to accommodate emerging green technologies
- ❑ Key questions: when, where, and how much?
- ❑ Chicken and egg problem
- ❑ Lots of uncertainty

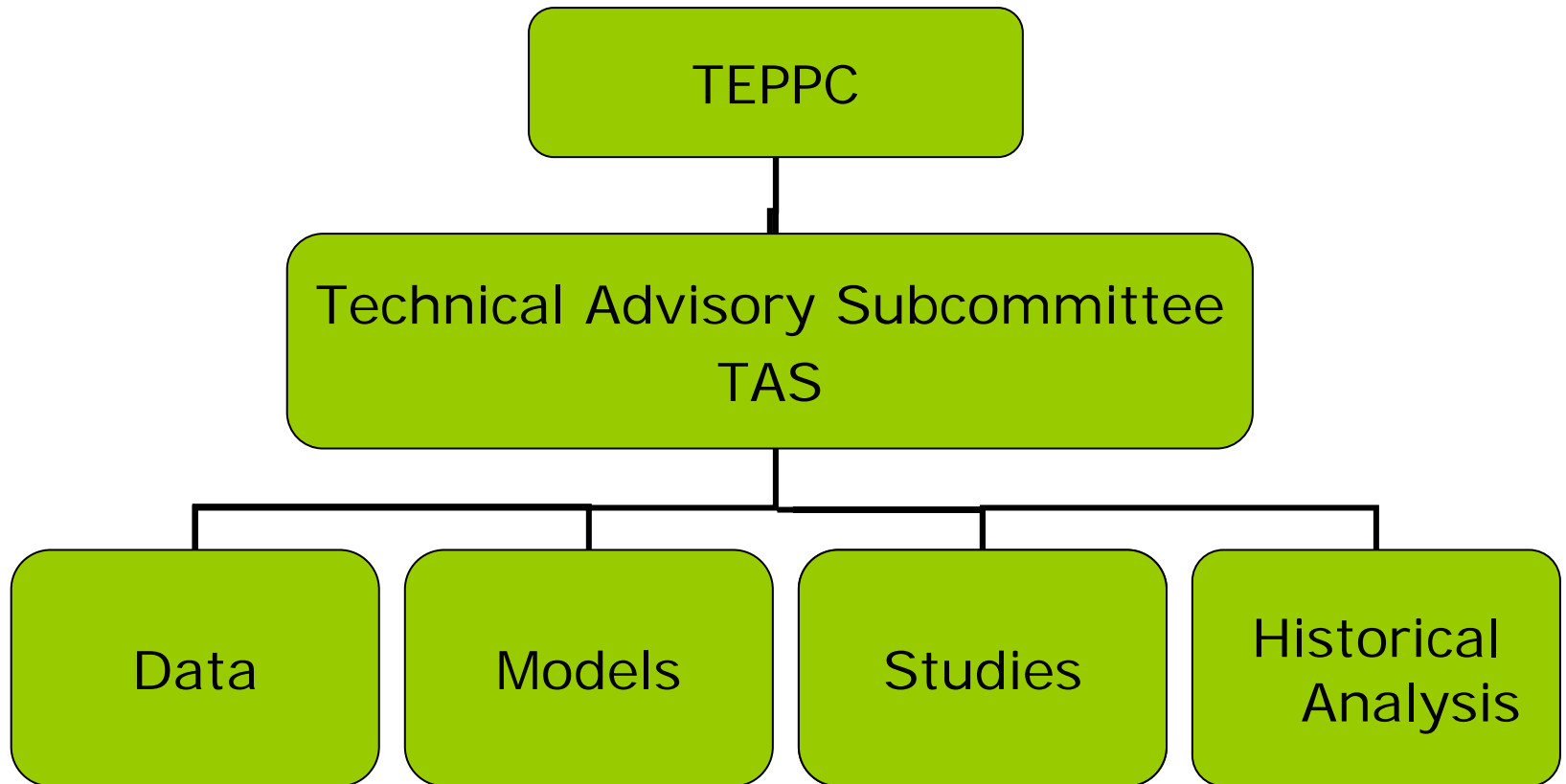
# What WECC Is Doing

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- Bring together experts from all industry segments to work on the questions.
  - Transmission Developers
  - Resource Developers
  - Load Serving Entities
  - State Regulatory Commissions
  - Environmental Organizations
  - Subregional Planning Groups

# TEPPC Organization

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# TEPPC Study Program

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- Consider the plausible range of When, Where and How Much
  - 10 years out
  - Various resource types, energy efficiency and demand response
- Develop a plan to study a range of future scenarios
  - Working with SPGs and transmission providers.
- Collect data and information
  - Research of state agencies
  - Conceptual plans of project sponsors

# TEPPC Study Program (cont.)

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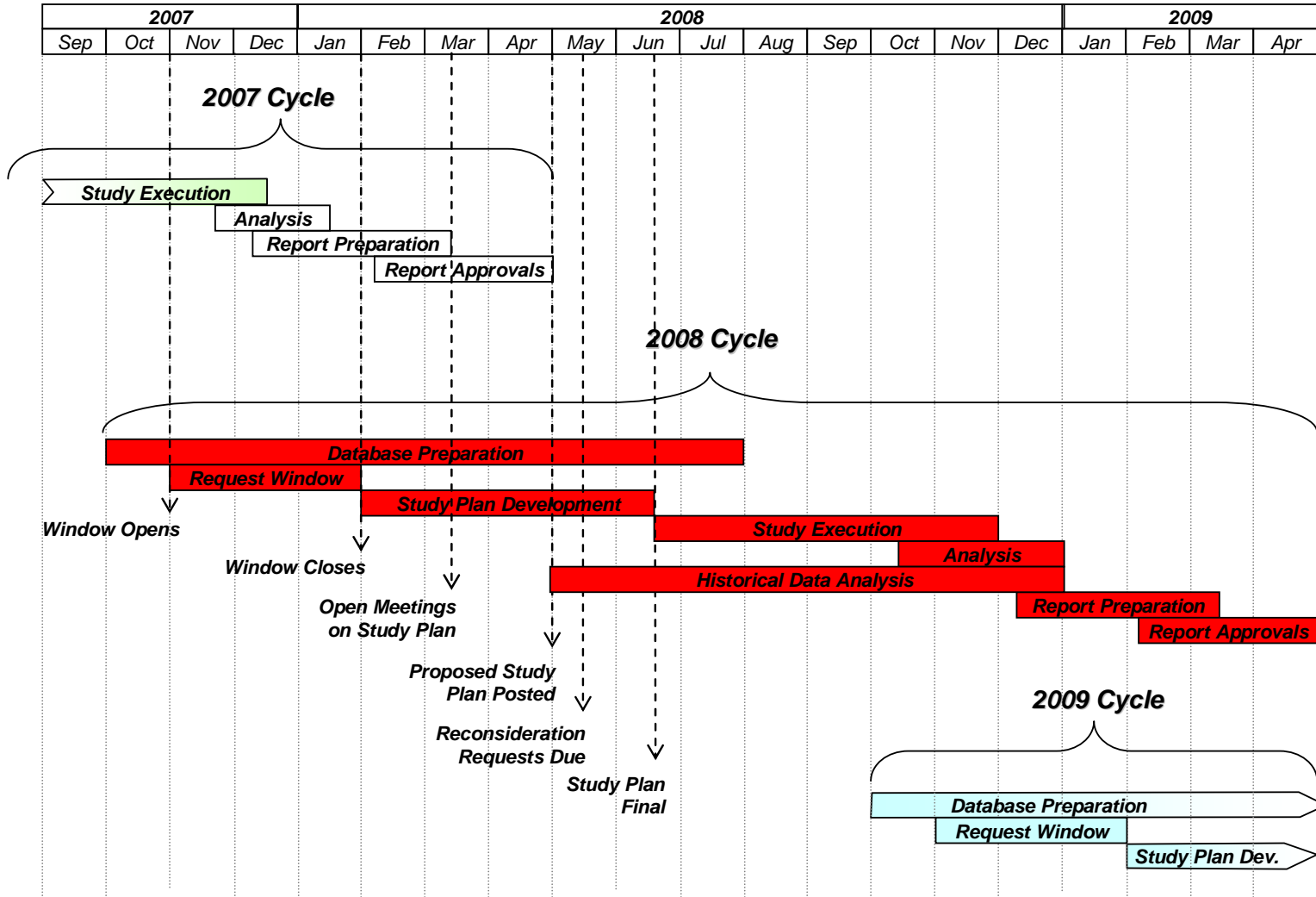
- Conduct workshops and webinars
- Compile a database to run the computer models
  - Available to all industry participants
- Analyze historical congestion
  - Support DOE efforts to identify critical energy corridors.
- Run the models to simulate the scenarios
  - Identify potential needs and opportunities for transmission and resources.

# TEPPC Study Program (cont.)

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- Identify and test conceptual plans to serve the potential needs.
  - Assess effectiveness at relieving congestion.
  - Compare potential benefits to the costs.
    - Tested plans may include sponsored projects
    - TEPPC study is not a determination of need.
- Improve of simulation tools
- Produce a report
- Post information on the projects that TEPPC and SPGs have identified

# Synchronized Study Timeline



# TEPPC Study Program (cont.)

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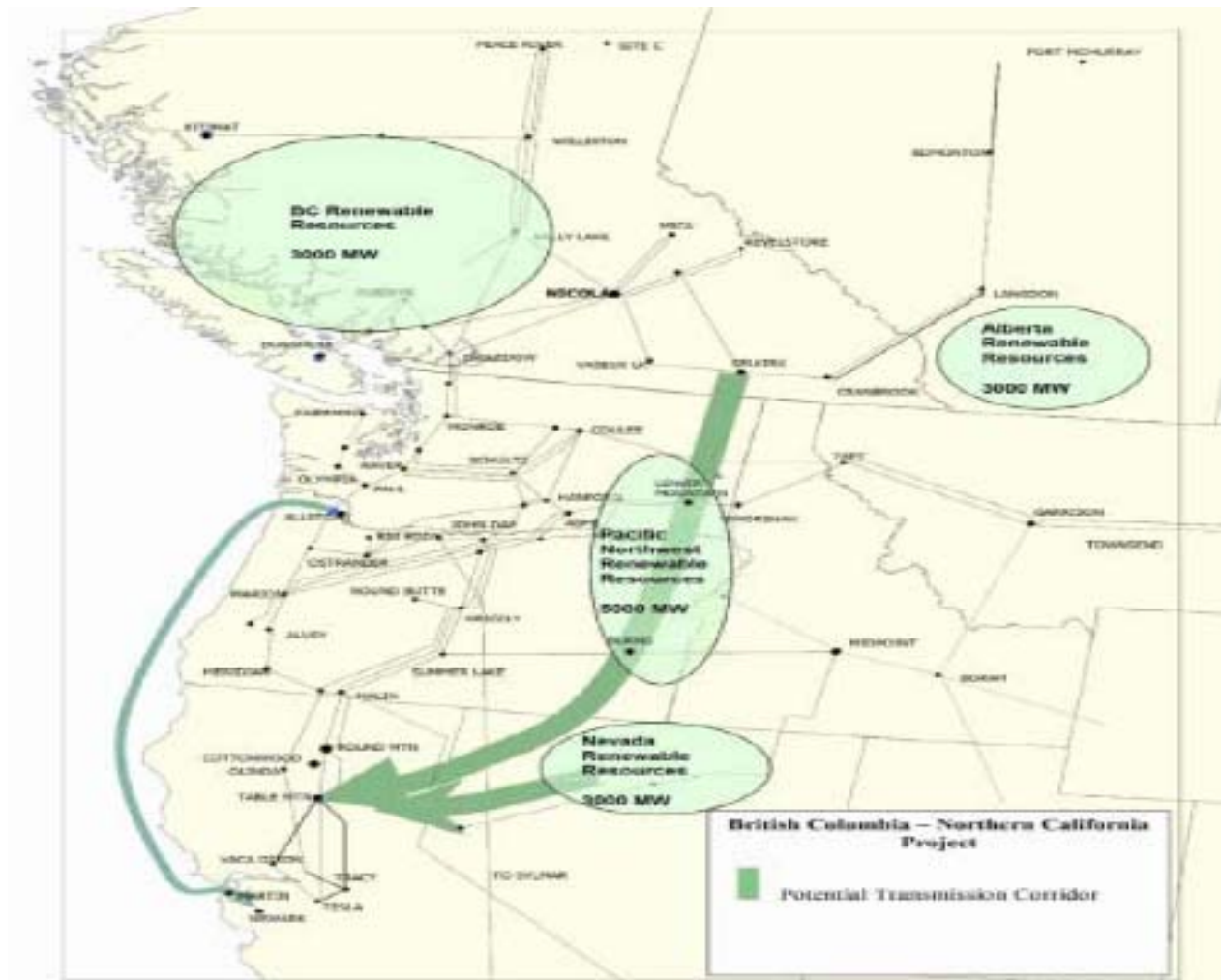
- TEPPC effort helps promote transmission and renewables
- Provides needed basic research
  - When, Where and How Much
  - Transmission requirements and costs
- Clears up uncertainties that make investors cautious

# WECC Planning Coordination Committee

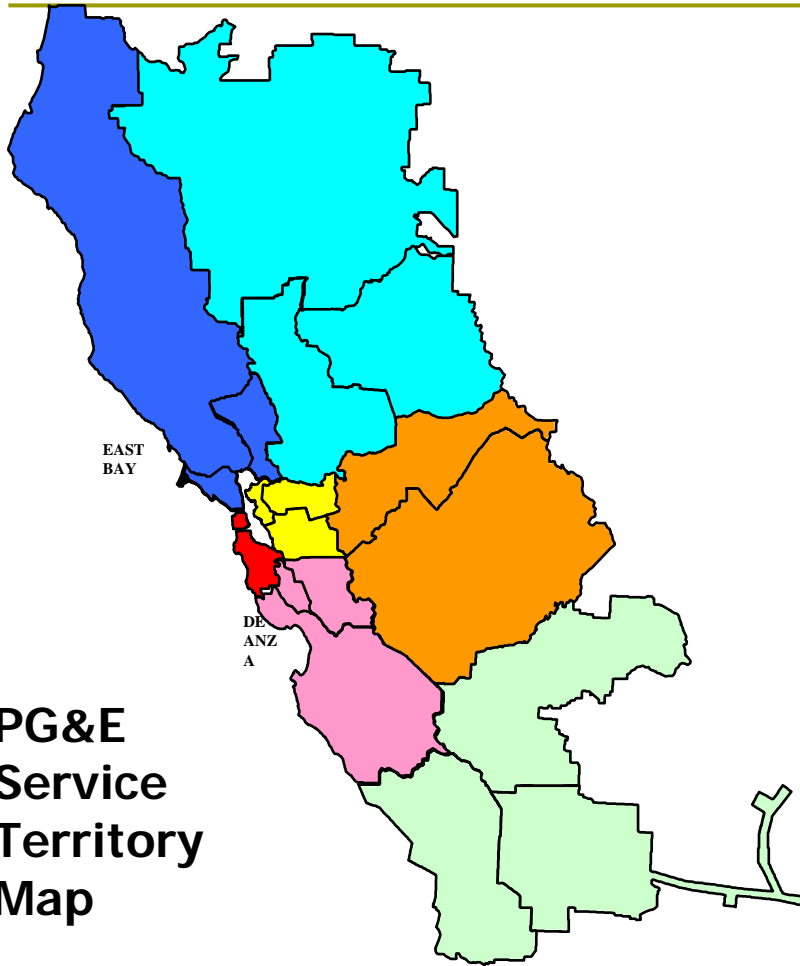
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- ❑ Studies how renewables would affect reliability.
- ❑ Develops models for new types of wind machines to use in outage simulations.
- ❑ Develops new standards, e.g. for low voltage ride-through capability.
- ❑ Oversees the Regional Planning Project Review Process.
  - Transmission project sponsors meet with interested stakeholders.
  - Discuss transmission needs (e.g., for renewable resources).
  - Consider revising project plan to better serve needs.

# Canada/Pacific Northwest to Northern California Transmission Project



[http://www.pge.com/biz/transmission\\_services/canada/](http://www.pge.com/biz/transmission_services/canada/)



- 70,000 Square Miles Service Territory
- 5 Million Electric Customers
- 4 Million Gas Customers
- 18,600 miles of Electric Transmission Lines
- 22,544 MW Peak Demand
- 6,331 MW-Owned Generation