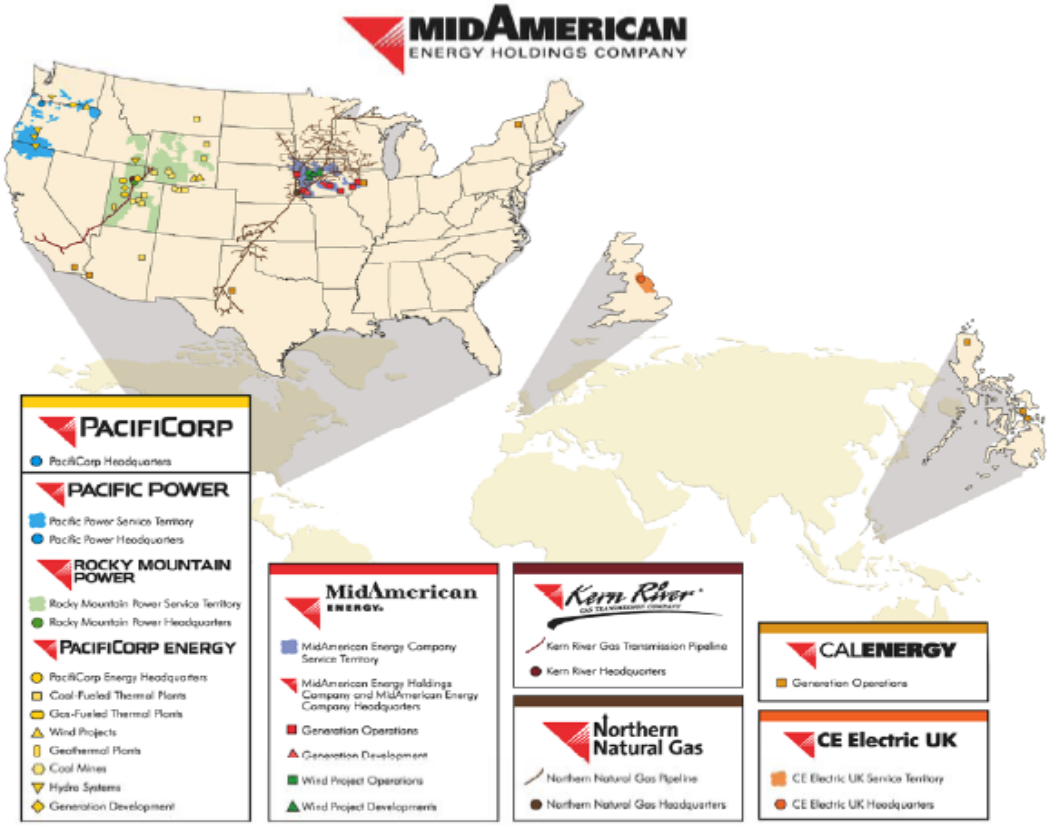
Northwest Wind Energy and Wildlife Workshop
Transmission Planning Overview

Tom Tjoelker
Manager
Main Grid Planning, PacifiCorp

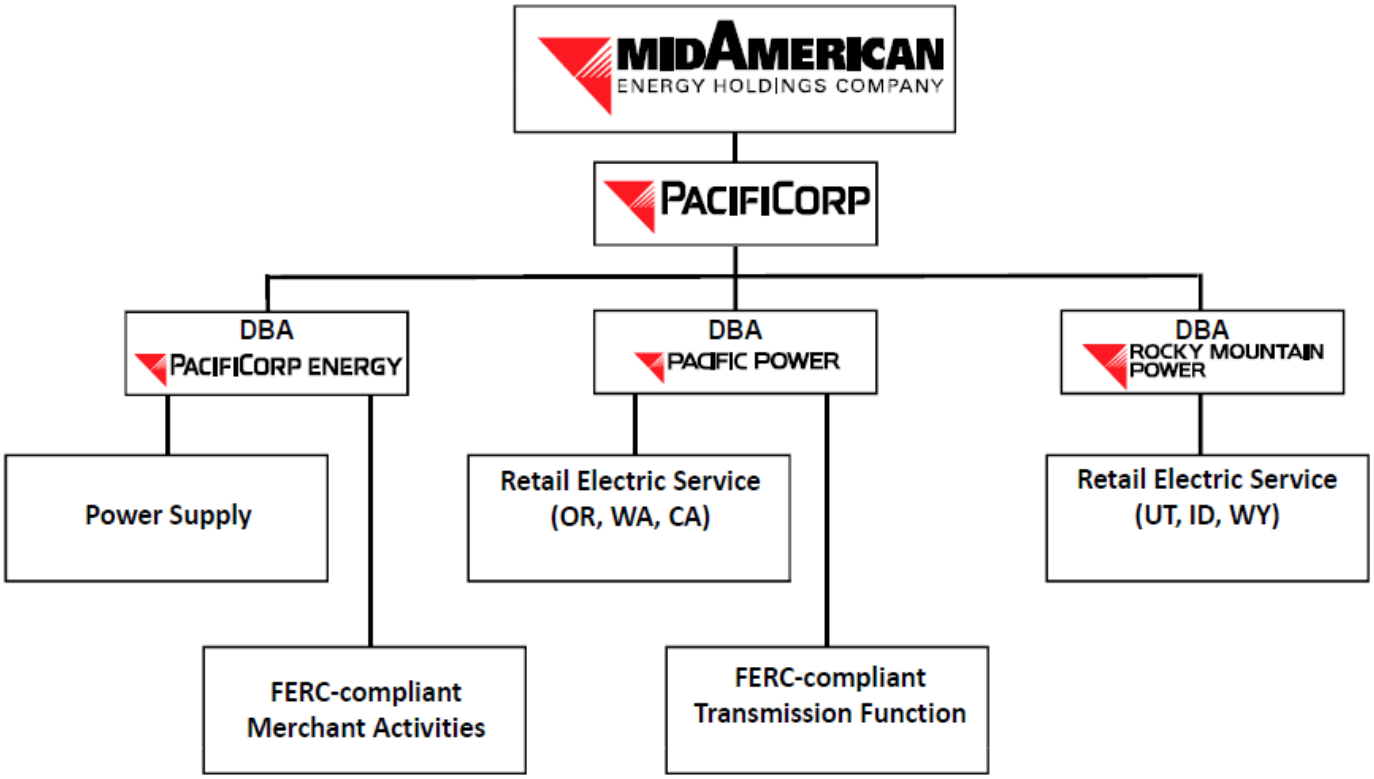
PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

MidAmerican Energy Holdings Company



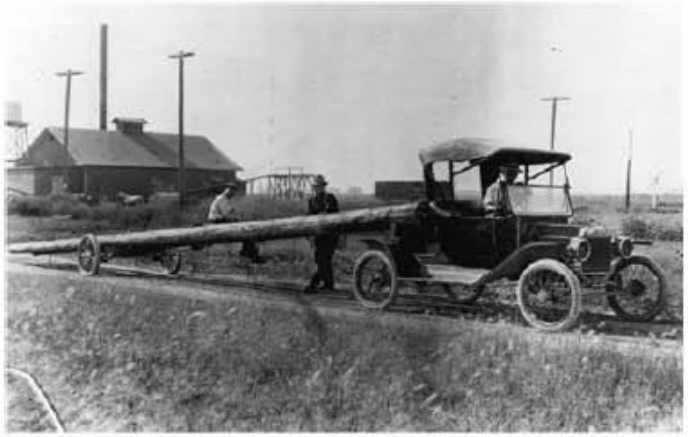
PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Organization Overview



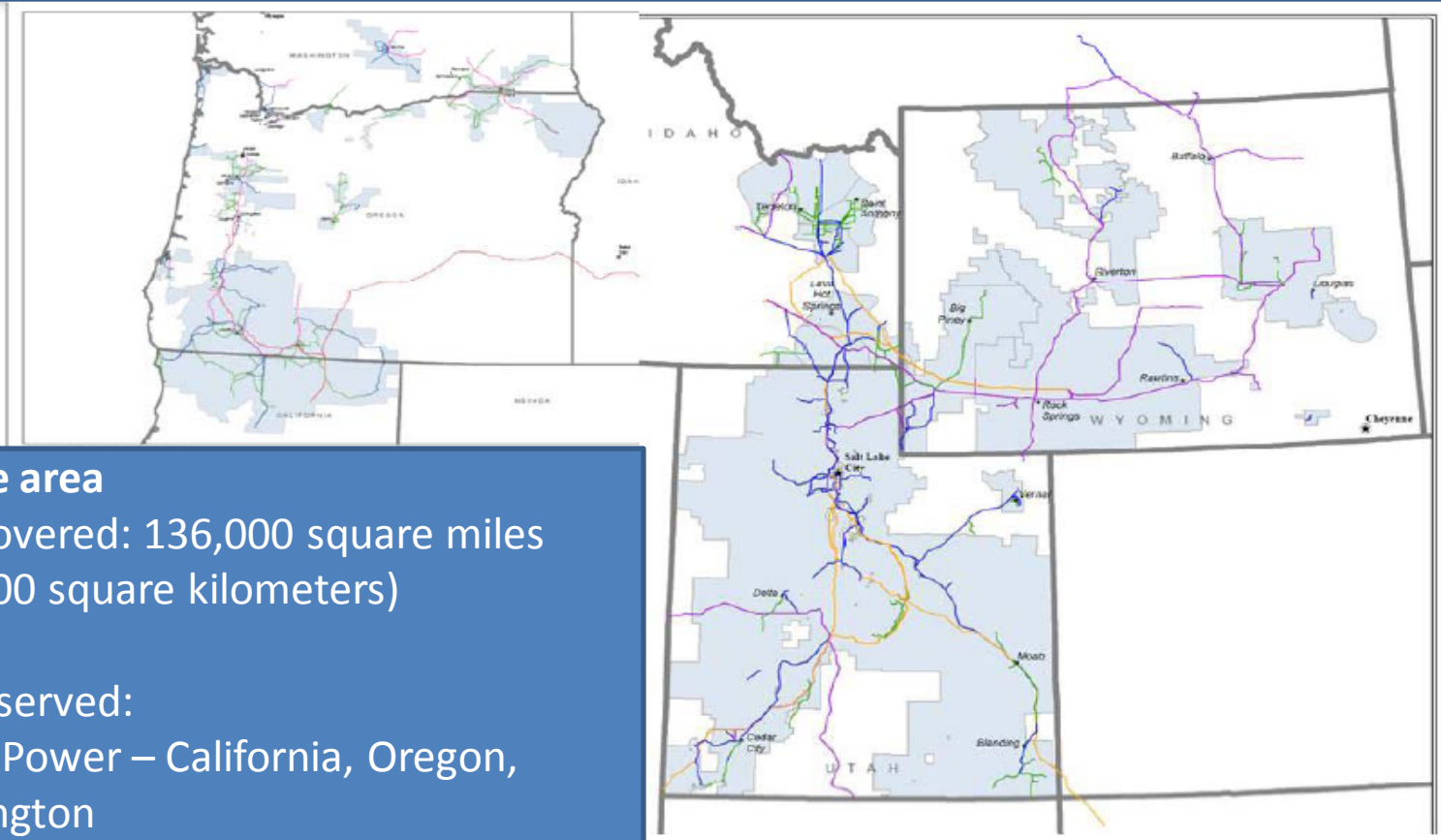
PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

100 Year Anniversary



PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Service Territory and System Overview



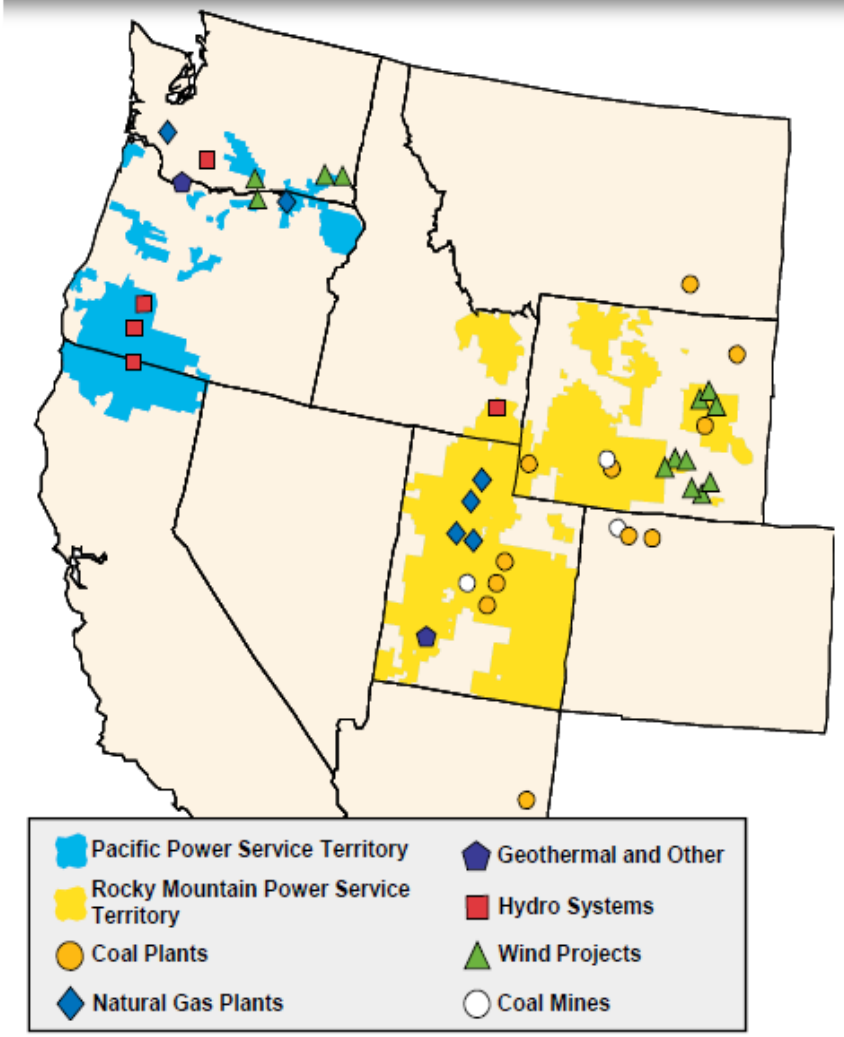
Service area
Area covered: 136,000 square miles (353,000 square kilometers)

States served:
Pacific Power – California, Oregon, Washington

Rocky Mountain Power – Idaho, Utah, Wyoming

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Service Territory and System Overview



Transmission/distribution lines
Transmission: 15,900 miles (25,580 kilometers)
Distribution: 62,000 miles (99,780 kilometers)
Substations: 900

Customers
Total: 1,719,000
Residential: 1,467,000
Commercial: 214,000
Industrial and irrigation: 34,000
Other: 4,000

Customers by state
Oregon: 555,070
Washington: 126,665
California: 45,148
Utah: 787,550
Wyoming: 133,770
Idaho: 70,281

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Service Territory and System Overview

Two Balancing Authority Areas

- **PACW:** Oregon, Washington, Northern California, Montana
- **PACE**: Utah, Southern Idaho and Wyoming

Import/Export Capability

- PACE > **8142/7457** MW
- PACW > **8545/7015** MW the two are interlinked through Idaho with inter area transfer capability of **1600 MW**

Transmission

- **16,000 miles** of transmission line
- **59,000 miles** of distribution line
- Midpoint-Summer Lake 500-kV line is longest, with approximately **400** miles

Installed Capacity

Energy mix

- Coal 60%
- Natural Gas 22%
- Hydro 11%
- Wind 7%

Wind Generation

Total Connected Wind: **1936 MW**

PACE

- Wyoming 1021 MW
- Idaho 64.5 MW
- Utah 18.9 MW

PACW

- Washington 521.6 MW
- Oregon 115 MW

- Other 194.5 MW

Service Territory and System Overview

- **PACE Balancing Authority Area**
  - Arizona Public Service
  - Sierra Pacific Power
  - Los Angeles Water & Power
  - Northwestern Energy (MPC)
  - WALC – Phoenix
  - Idaho Power
  - Nevada Power
  - WACM – Loveland

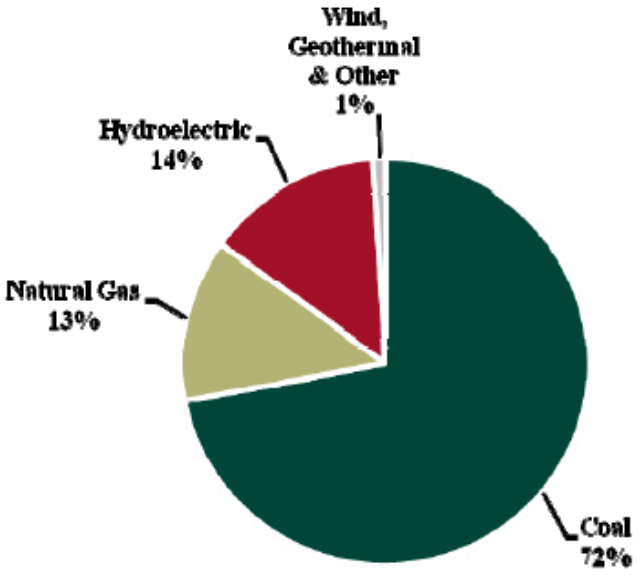
- **PACW Balancing Authority Area**
  - Bonneville Power (BPA)
  - Portland General (PGE)
  - AVISTA
  - Grant County PUD
  - Idaho Power
  - California ISO

- **PACE – 50+ Ties with other balancing authority areas**

- **PACW – 80+ Ties with other balancing authority areas**

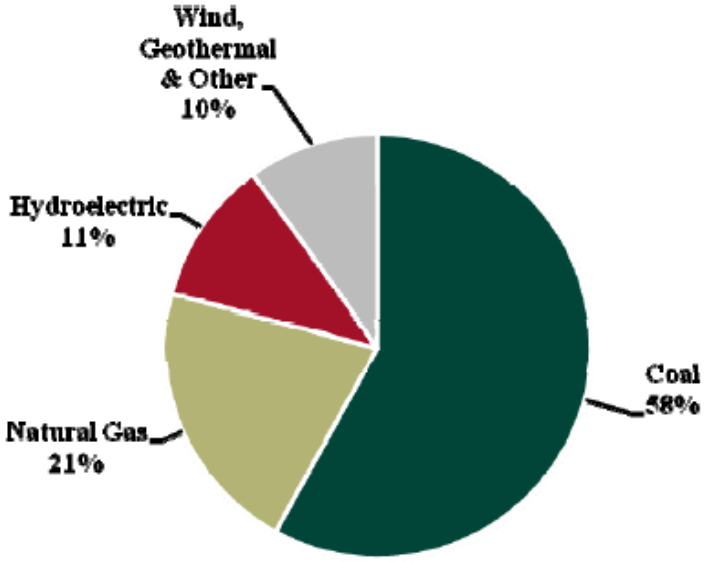
Generating Capacity by Fuel Type

March 31, 2006



8,470 MW (1)

December 31, 2009



10,594 MW (1)

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Electricity Basics

- Electricity is a form of energy that is mostly created by rotating machines known as Generators
- The energy sources commonly used to make the machines rotate are Thermal, (Coal, Natural Gas, Oil, Nuclear, Biomass, Geothermal) Hydro, or Wind.
- Solar and other energy types are less that 1/10 of 1% of total generation.

Electricity Basics

- Electricity flows from Generators to the Load
- Electricity must be consumed as it is being generated.
- If the generator and the load are remote from each other, Transmission Lines and Substations are used to connect the load to the generation.

Connecting Wind Generation to the Transmission System

- Transmission Planning is the determination of what needs to be done in order to reliably connect the generation to the load.
- What is needed is determined by the size of the generation, the location of the generation and the location of the load.
- Wind generation is generally remote from the load and because of this the transmission required for wind generation is often significant.

Transmission Expansion Planning

Sub Regional Transmission Planning Organizations

Western Electricity Coordinating Council

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Populus to Terminal

New structures on left (Ben Lomond to Terminal section)

Populus Substation

Populus substation (Downey Idaho) – Sized to integrate Populus Terminal, existing Bridger West lines (from Wyoming) and future Gateway West 500kV line (from Wyoming)

Questions