Watt About Energy in the Northwest

WSU Whatcom County Carbon Masters Course

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Turn of the Century

- Extraction economy
  - Timber
  - Wheat
  - Fish
  - Minerals

- Small dams
  - produce electricity in 1880’s

- Private and municipal providers
Commodity vs. Essential Service

- *Commodity* - open to price competition, take it or leave it VS.

- *Essential service* - regulated with obligation to serve

- Natural monopoly - elimination of duplication of poles and wires

- State regulation - 1907, Public Utility Districts and Co-ops 1930
1930’s Key to Electricity History

- Congress declared that:
  - Electricity is an essential service
  - Sell power at cost with an opportunity to earn a profit
  - Natural monopoly in exchange for an obligation to serve
  - State regulators must set just and reasonable rates

- Build out of the Columbia River System
Bonneville Power Administration

- BPA markets 45% of region’s electric power from 31 federal hydroprojects and one nuclear plant
- BPA power sales – about 80% from hydro
- Has 136 customers - public utilities, DSIs, other federal agencies, private utilities
- BPA owns and operates 75% of the NW’s high voltage electrical transmission system.
- The system includes more than 15,000 miles of transmission line and 285 substations.
Thermal Program

- Hydro power served all NW power needs into the 1970s
- Thermal generation seen as the future for meeting load
- Private and public utilities started fossil and nuclear construction
- BPA agreed to buy and market the output – then bill its customers
- This deal allowed WPPSS to go forward - largest public bond default in US history
Investor-Owned Utilities Serving WA

• Puget Sound Energy - Electric & Gas
• Avista Utilities - Electric & Gas
• PacifiCorp (Pacific Power) - Electric
• Cascade Natural Gas - Gas
• Northwest Natural - Gas
Consumer Owned Utilities

• Municipal - 10 cities
  – Department of city government - City Council is governing board
  – Tacoma is different - utility governing board

• Public Utility Districts - 28 PUDs
  – Electric, water, wastewater, and telecom
  – 23 PUDs provide electricity to 815,000 customers
  – Locally elected Commissioners
  – Mostly within County boundaries but not all
Consumer Owned cont.

• Cooperatives and Mutuals
  – 20 in the state
  – Serve 280,000 customers
  – Rates about the same as state average
    • But bills are higher
    • 8 customers per mile of line vs. 41 customers per mile of line as the state average
    • Costs to serve higher
2009 Washington State Electric Utility Fuel Mix
Electricity Sales to Washington Customers by Fuel Source

- Hydro: 64%
- Coal: 17%
- Natural Gas: 13%
- Nuclear: 4%
- Wind: 0.7%
- Biomass: 0.5%
- Waste: 0.3%
- Other: 0.2%

Reported to utility customers in 2009, Produced by Washington Department of Commerce
Home Heating Fuel Comparison

• Electricity
  • WA = 53%
  • US = 33%

• Natural Gas
  • WA = 33%
  • US = 51%

• Fuel Oil
  • WA = 6%
  • US = 9%
State Ranking 12. Electricity Residential Prices, January 2010
(cents/kWh)

Map Instructions: For statistical information for a given State, hover over the State. For full information about the State, click to zoom in and then click the when it appears. To zoom out, right-click and select “Zoom Out!”

Legend
(cents/kWh)
- > 14.20
- 10.40 - 14.20
- 8.81 - 10.39
- < 8.81
- NA

Electricity Residential Prices Data Source
Chart 3: Washington State: Monthly Electricity Prices by Sector 2004-08

Source: EIA Electric Power Monthly
State Ranking 11. Natural Gas Residential Prices, February 20XX (dollars/thousand cu ft)

Map Instructions: For statistical information for a given State, hover over the State. For full information about the State, click to zoom in and then click the 📊 when it appears. To zoom out, right-click and select "Zoom Out!"

Natural Gas Residential Prices Data Source

Legend (dollars/thousand cu ft)
- > 13.30
- 10.81 - 13.30
- 8.90 - 10.80
- < 8.90
- NA
Generating Resources

- Hydropower
  - Storage, Run of River
- Nuclear
- Fossil
  - Coal, Natural Gas
- Renewables
  - Wind, Solar, Geothermal, Biomass, Ocean
- Efficiency, CHP, Load Management
Lower Granite Dam
Fossil Fuels

- 9 coal plants - Serving the NW
  - WA, OR, MT, NV, WY
  - Considered a low cost fuel
  - Rail and mine mouth
  - Carbon constraints eminent
  - 48% of US electricity - 17% of WA

- 26 natural gas fired plants all over the region
  - Gas turbine technology advance
  - 2000-01 energy crisis spikes prices
  - 21% of US electricity - 13% of WA
Natural Gas

- Canada supplies most of WA and NW natural gas
- Northwest Pipeline Corp. supplies western WA and OR, Gas Transmission Northwest supplies the eastern part of both states
- Residential sector leads natural gas consumption - then industrial and electric power generation
- Roughly one-third of households use natural gas for home heating
Renewable Energy Technology

- **Wind** - fastest growing in US and NW
  - Bigger turbines, off-shore, slower wind speeds, small scale
  - Intermittent

- **Solar** - fastest growing worldwide
  - Photovoltaics, concentrating solar thermal, hot water, passive
  - Expensive but dropping in cost

- **Geothermal** - 24/7 resource
  - Hot water, hot rocks
  - Low and high temperature
Renewables Cont.

- **Biomass**
  - Combustion
  - Gasification
  - Liquid fuels

- **Ocean Energy**
  - Wave
  - Pressure
  - Tidal
  - Current
Energy Efficiency

Time magazine calls energy efficiency "Miracle Juice"

- Helps stabilize prices and lower energy bills
- Generates good, local jobs
- Boosts the bottom line for businesses and utilities
- Makes our built and natural environments healthier and more comfortable
- Frees up electric grid and pipeline capacity
Load Management

- Customer side of the meter
  - Direct load control
  - Price signal notification
  - Demand response - paid to shut down

- Time of Use & Block Rates
  - Peak prices
  - Inclining block rates - use more, pay more
  - Seasonal rates
Assumptions:

Efficiency Cost = Average Cost of All Conservation in Draft 6th Power Plan Under $100 MWh

Transmission cost & losses to point of LSE wholesale delivery

2020 service - no federal investment or production tax credits

Baseload operation (CC - 85%CF, Nuclear 87.5% CF, SCPC 85%)

Medium NG and coal price forecast (6th Plan draft)

6th Plan draft mean value CO2 cost (escalating, $8 in 2012 to $47 in 2029).
Sixth Plan Resource Portfolio*

*Expected Value Build Out. Actual build out schedule depends on future conditions