

ENERGY EFFICIENCY: A BRIEF HISTORY OF AND OPPORTUNITIES FOR THE WESTERN DRY KILN ASSOCIATION

Mark Kendall
Oregon Department of Energy
Salem, Oregon

Overview

- History of energy use
- International energy policy
- Climate change
- Energy use in Oregon
- Efficiency as an energy resource
- Local services, resources and incentives

Mission

The mission of the Oregon Department of Energy is to protect Oregon's environment by saving energy, developing clean energy resources and cleaning up nuclear waste.

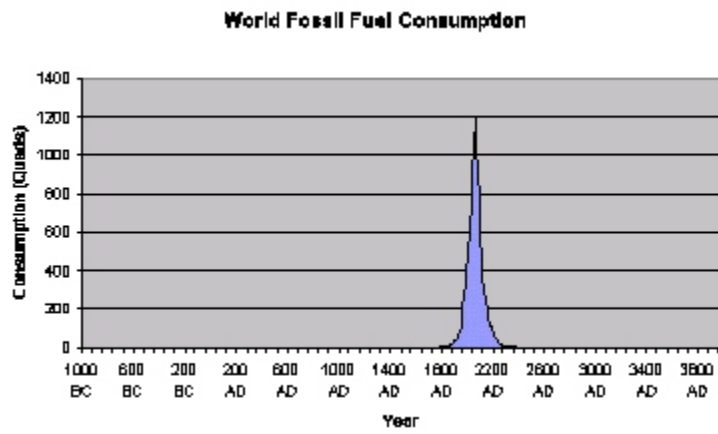
Goals and Benchmarks

- ◆ Conservation and renewable resources meet a significant portion of Oregon's incremental energy needs.
- ◆ Carbon dioxide emissions from burning fossil fuels are reduced 1 percent per year.
- ◆ The state and counties within 50 miles of an operating commercial nuclear power plant are prepared for nuclear safety emergencies.
- ◆ Key cleanup milestones at the Hanford Nuclear Reservation are achieved.

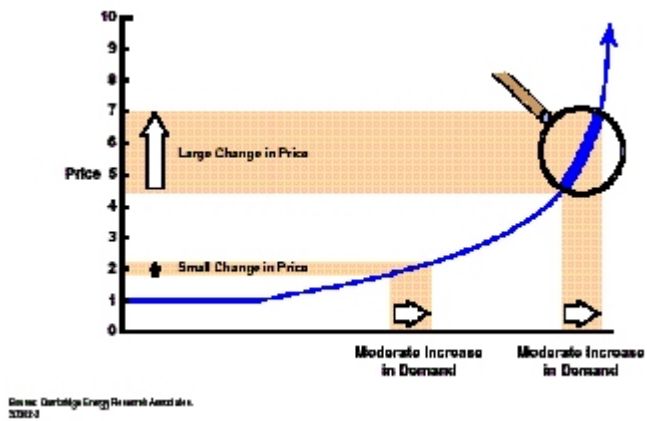
Energy Use History

- 50,000 B.C. fire (or earlier)
- 20,000 B.C. fire to forge and heat water
- 3500 B.C. wind harnessed to sail
- 85 B.C. water wheel for mechanical energy
- 1550 coal use (1658 first engine)
- 1850 petroleum (1860 gasoline)
- 1700 industrialization (Europe)
- 1908 mass production (Ford)
- 1940's production efficiency (Demming)
- 1970's scarcity and environmental awareness

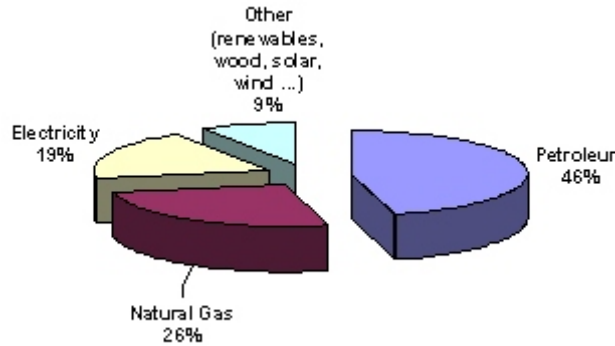
Energy Use History



Natural Gas Energy Cost



Oregon Energy Use by Fuel



- Natural gas - 219 trillion but/yr
- Electricity - 30,290 million kWh/yr
- Petroleum - 3.0 billion gallons/yr
- Other (wood, landfill gas, wind, solar)

Energy Efficiency

Increased profits as incentives:

		Energy Cost Percentage					
		1 %	2 %	3 %	4 %	5 %	6 %
Company Profit Margin	Profit Margin Increase						
1%	35%	69%	104%	139%	173%	208%	
2%	17%	34%	51%	69%	86%	103%	
5%	7%	13%	20%	27%	33%	40%	
10%	3%	6%	9%	13%	16%	19%	
20%	1%	3%	4%	6%	7%	8%	
25%	1%	2%	3%	4%	5%	6%	

Energy Efficiency - Wood Products

1. Typical building/plant systems
 - a. Heating, ventilating, air conditioning
 - b. Lighting
 - c. Air compression
 - d. Boilers
2. Bag House Upgrades
3. Motor systems
4. Process ventilation system efficiency
5. Kiln upgrades

Energy Efficiency - Boilers

Forty-five percent of all the fuel burned by U.S. manufacturers is to raise steam. Steam boiler inefficiency is through losses, boiler blowdown, exhaust stack gas loss, condensate and systems vent loss.

Blowdown losses

- Return blowdown condensate
- Optimize blowdown for minimum operation
- Preheat treated makeup water with waste heat

Condensate and system losses

- Replace failed traps and return all condensate
- Install proper type and size traps for condition
- Insulate headers and primary piping
- Evaluate sidearm for other system benefits

Stack efficiency

- Adjust combustion biannually (summer/winter)
- Clean boiler tubes
- Install oxygen trim combustion controls
- Install improved fuel dispersion or atomizing burners
- Install exhaust flue economizers
- Use waste heat to preheat combustion air
- Install variable speed controls on ID fans
- Replace jack shaft excess air dampers with servos
- Install fuel and air mixture controls with servos
-

Energy Efficiency - Thermal Distribution

- Insulate all steam, hot or chilled water pipe
- Insulate flanges and valves
- Locate and identify operation of all steam traps
- Repair or replace and properly choose steam traps
- Locate condensate tanks and recover to boiler
- Identify return temperature control operations
- Determine load schedules and optimize capacity
- Ensure steam mains are drained, and air vented
- Evaluate systems for pressure drops and resize
- Verify brackets for pipe expansion and contraction

Energy Efficiency - Kilns

Conventional

- Digital controls with zonal sensors
- Insulation - reduced loads
- Variable speed fans
- Heat recovery - tandem pre-heat

Super-Heated Steam

- Over pressure sensing vent controls
- Reduce fresh air ventilation

Condensation

- Dehumidification or heat pump kilns
- Condensation drying - chilling through absorption

Vacuum kilns

- Listen to the other presenters!!

Combined Heat and Power

Benefits

- Improved power reliability
- Reduced peak load
- Avoids transmission and distribution cost
- Reduces line losses
- Overall system efficiency increase
- Reduced environmental emissions possible
- On-site power quality control

Concerns

- More cost effective CHP may have higher emissions
- Often CHP is below regulatory levels
- Emissions often located in urban air/water sheds
- Local fuel distribution constraints increased
- Thermal and electrical loads are not commensurate
- Lowest cost systems can increase Nox or particulates
- Time consuming permitting process
- Utility interconnection cost and policy

Wood Product Applications

- High thermal demand
- High electricity demands
- High coincidence of thermal and electric demand
- Long operating hours
- Access to waste gas or low cost biomass fuels
- Peak power costs are high
- High reliability and/or power quality are required
- Remote, isolated or niche sites - oil boilers...

Biomass for Wood Products

Potential sources:

- Hogged fuel from on-site
- Hogged fuel available on the market
- Hogged fuel sorted from chips
- Forest thinning projects
- Stewardship contracts on federal lands
- Urban wood waste collection

Energy Efficiency

Oregon Business Energy Tax Credits

- Business tax credit of up to 35% of cost
- Credit claimed over five years (10%, 10%, 5%, 5%, 5%)
- Projects under \$20,000, credit claimed in one year
- Eligible projects: energy conservation, recycling, renewables, transportation fuels
- "Pass-through" allows a third party to claim tax credit
- Projects have saved or generated energy worth \$100 million per year

Oregon Small-Scale Energy Loan Program

- Loan officers and technical staff available
- Loan fees usually less than 0.5%

- Fixed rates between 5 and 6.5%
- Fixed terms of five, ten, or fifteen years common
- Loans up to \$100,000 take 2-3 weeks to approve
- Loans over \$100,000 require committee approval

Energy Trust of Oregon, Inc.

Incentives for electric and natural gas energy savings

Available for consumers in following service areas

- PacificCorp
- Portland General Electric, and
- NW Natural

Rebates, custom incentives based on calculated savings

Opportunities covered

- Proper operations and maintenance
- Building efficiency
- New building efficiency
- Production efficiency

Production efficiency; energy experts will provide:

- Custom technical analysis
- Identify and quantify energy savings potential
- Help with Oregon Business Energy Tax Credits
- Engineering inspection
- Commissioning services for complex systems

Production efficiency; the following equipment may be eligible for incentives:

- Energy efficient pumps
- Compressed air
- Fans
- Material transport
- Refrigeration
- Controls and similar industrial processes
- Motors

To get started:

- E-mail a Project Manager
 - production.efficiency@energytrust.org
- Call on the phone
 - 1-866-ENTRUST (1-866-ENTRUST)
- Check the web site
 - <http://www.energytrust.org>

Northwest Organizations Providing Incentives

- Investor owned utilities
- Public utilities
 - Cooperatives
 - Municipals
 - Utility districts
- State agencies
 - Federal government grants
 - Regional efficiency organizations
 - Public foundations
 - http://www.eere.energy.gov/sro/financial_opps.html

Organizations Supporting Efficiency

- NW Energy Education Institute
- NW Energy Efficiency Council
- U.S. Department of Energy
- NW Energy Efficiency Alliance
- Oregon Climate Trust
- Energy trust of Oregon
- U.S. Department of Environmental Quality
- Bonneville Power Administration
- Bonneville Environmental Foundation
- Oregon Department of Environmental Quality
- Business Associations
- Community Action Programs
- Associate Oregon Industries
- Citizens Utility Board
- OSPIRG
- Oregon Manufacturing Extension
- University Research and Technical Services
- Electric and Natural Gas Utilities
- Union of concerned Scientists
- Natural Step Network
- Physicians for Social Responsibility

Some Other Kiln Efficiency Resources

Northern hardwood initiative

http://www.cfquesnel.com/nhi/content/section5/5_5.htm

U.S. Forest Products Laboratory

<http://www.uwex.edu/ces/ag/sus/wood/pdfindex/wman10.pdf>

USDA Forest Service

<http://www.fpl.fs.fed.us/documnts/fplrn/fplrn228.pdf>

University of Missouri Extension Service

<http://muextension.missouri.edu/explore/agguides/forestry/g05507.htm>

- ◆ Oregon has been able to improve energy efficiency and limit CO₂ emissions without harming the economy.
- ◆ Education, standards, technical assistance and incentives are key.
- ◆ Conservation and renewable resources are the state's preferred resources.
- ◆ A robust and competitive marketplace will select the best resources.

[Http://www.energy.state.or.us](http://www.energy.state.or.us)