Energy Efficiency: Lessons Learned from Three Decades of Northwest Experience

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Today’s Topics

• Who Are Those Guys?

• What’s “Their Plan”?

• Should Be We Following “Their Plan”?
Who Are Those Guys?

• **Northwest Power Planning and Conservation Act of 1980 (PL96-501)** authorized ID, OR, MT and WA to form an “interstate compact” (aka, the “Council”)

• Council develops a 20-year electricity load forecast and resource plan (“The Plan”) and updates it every 5 – years

• **Power Act:**
  – Requires that Council “Plans” identify the *least cost* mix of resources for development
  – Defined *Conservation (energy efficiency)* as the first priority “resource” and assigned it a 10% cost advantage over generating resources
  – Mandated public involvement in the Council’s planning process
Council’s Planning Process

• Longest running Integrated Resource Planning Process in US (and likely the world)
• Council has publish six regional plans since 1983
• All Plan’s have called for significant reliance on energy efficiency
• Council has no regulatory authority over utilities or state commissions*
• However, Council’s plans serve as a reference against which utility specific IRPs are reviewed

*Resource acquisitions by the Bonneville Power Administration (BPA), a federal power marketing agency, must be “consistent with the Plan”
Council Uses “Gump” IRP Model

*The Future’s Like A Box of Chocolates.*

*You Never Know What You’re Gonna Get.*
Council IRP Analysis => Test Lots of Chocolates

- Annual Load Growth
- Hydrosystem Output
- Resource Supply Curve
- Natural Gas Prices
- Wholesale Market Electricity Price
- Carbon Price
- Portfolio ABCD
- Resource Portfolio Model
- NPV System Cost (billion 2006$)
- NPV System Risk (2006$ billions)

Slide 6
Plans Along the Efficient Frontier Are The Lowest Cost Plans at Each Level of Risk

NPV System Cost (2006$Billions)

- Least Cost Plans
- Least Risk Plans

NPV System Risk (2006$Billions)

- $158.0
- $157.5
- $157.0
- $156.5
- $156.0
- $155.5
- $155.0

NPV System Cost (2006$Billions)
Power Planning Made Simple
Generic coal, gas and nuclear units are shown at typical project sizes - more units could be built at comparable cost.
Council’s Cost-Effectiveness Analysis:

Compares resources based on their *Total* costs and benefits
Council’s Cost-Effectiveness Analysis Compares the Benefits of Risk Reduction Against Their Costs
Council Considers Both Societal and Utility Perspectives

• Measures that are not cost-effective on TRC basis cost society more than the alternative
  – Society has limited resources, devoting more to saving energy than it cost to produce diverts money away from other societal needs (e.g., education, health care, etc.)

• Utility cost should not exceed utility system benefits even if TRC is higher
  – If the costs of efficiency savings are equal to avoided resource costs there is no utility system (i.e., customer) benefit
  – Measures with high customer non-energy benefits may need less utility incentive
What’s Their Plan?
6th Plan Meet’s 90% of Load Growth with Energy Efficiency
Result: Meeting These Goals Drops Carbon Emissions 15% Below 1990 Levels by 2020
But, The Times They Are A-Changin’

- Forecast of spot market prices for both gas and electricity are lower (*but don’t count on them being correct!*)
- Prolonged recession has reduced load growth, reducing perceived need for new resources
- State codes and federal standards are “bringin’ up the baseline”
Natural Gas Prices Are Indeed Down From Recent Highs

But Have Not Remained As Low As Some Had Forecast

US Average Monthly City Gate Natural Gas Price (Nominal$/MMBTU)

$14

$12

$10

$8

$6

$4

$2

$0

Wholesale Market Electricity Prices Have Also Moderated

Mid Columbia Wholesale Electricity Price (2006$/MWH)
Northwest Regional Electric Loads Have Remained Virtually Unchanged for Seven Years
Do These Changes Matter for Energy Efficiency Programs?

“I just write them. There’s no great message. Stop asking me to explain.”
Should We Be Following “Their Plan”? 
Lower Avoided Cost Shouldn’t Limit Cost-Effective Potential for Electric Measures

![Bar chart showing levelized cost of combined cycle combustion turbine](chart)

- **Levelized Cost (2006$/MWH)**
  - $2.00/MMBtu
  - $4.00/MMBtu
  - $6.00/MMBtu

- **Lifetime Natural Gas Price**
  - PNW Maximum CF (79%)
  - PNW Average CF (51%)
  - PNW Minimum CF (17%)
  - Historical Utility Cost of Efficiency
In the NW Over 36,000 GWH/yr of Achievable Potential* Exists at Cost Below <$40 MWH
(That’s Two-Thirds of Our Cost-Effective Potential)

*Lost-Opportunity Potential is Cumulative Amount Available Potential by 2030
Average Cost of Utility Acquired Savings Continues to Be Lower and Less Volatile Than Wholesale Market Electricity Prices

Wholesale Electricity Price (2006$/MWH)

- Levelized Cost of Utility Efficiency Acquisitions
- Monthly Average Wholesale Market Price @ Mid-C Trading Hub
No Load Growth for Seven Years - Efficiency Accomplishments Are A Partial Explanation

* Approximate impact only, since PNW Actual Loads are not weather adjusted.
Historically, the pace of utility efficiency development has been tied to short term market conditions. The result has been Mr. Toad’s Wild Ride.

- Response to West Coast Energy Crisis
- Response to “Restructuring Discussions” and surplus
- Short Term Memory Loss?
- Response to PNW Recession
Valuing the additional EE at historic market prices would have saved the region $14.9 Billion!

Even if the energy crisis had not occurred, the market value of the additional EE would have saved the region $8.9 Billion!

The Council’s Resource Portfolio Analysis Found That There Was Significant Economic Benefit in Smoothing Mr. Toad’s Wild Ride!
So, Is Sustaining Efficiency In Today’s Environment . . .

Mission Impossible?
Questions?
6th Plan Calls for A Doubling of Annual Energy Efficiency Savings Over Next Decade

Embassy contractor has record of troubles

Afghanistan | Drunken parties bring attention to ArmorGroup, but U.S. officials knew of wider problems

By GINGER THOMPSON and MARK LANDLER
NEW YORK TIMES NEWS SERVICE
WASHINGTON—When a security guard at the U.S. Embassy in Kabul was bitten

With a goal of doubling the region’s energy saving in the next 20 years, Northwest businesses and homeowners are urged to find …

The power in CONSERVATION

Energy efficiency is cheapest source of energy

<table>
<thead>
<tr>
<th>New energy sources</th>
<th>Monthly investment cost on the average homeowner’s utility bill</th>
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<tbody>
<tr>
<td>Energy efficiency</td>
<td>$32</td>
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<tr>
<td>Natural gas plant w/o carbon charge</td>
<td>86</td>
</tr>
<tr>
<td>Advanced coal w/o carbon charge</td>
<td>66</td>
</tr>
<tr>
<td>Geothermal</td>
<td>69</td>
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<tr>
<td>Columbia Basin wind</td>
<td>89</td>
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The big white house near Ithaca College was screaming for an energy upgrade: almost 100 years old, scanty insulation, nearly triple the drafts of a modern home.

Last month, it got one—with the help of two energy audits. Federal
Conditions where it may make sense for the utility system to pay for measures that are not cost-effective to society

- If inclusion of the non-cost-effective measure will increase market acceptance and eventually lead to reduced costs and cost-effectiveness
- Where it would be more expensive to exclude a few non-cost effective applications of a measure that is generally cost-effective
- Where inclusion increases participation in a cost-effective program
- Where a package of measures cannot be changed frequently and the measure is expected to become cost-effective during the time between program changes, or
- Where the measure is a pilot or research project
Council’s Cost-Effectiveness Analysis: Ignores Equity Impacts

• Analysis is “agnostic” regarding the distribution of cost and benefits
  – Regulators do not judge the cost-effectiveness of new generating resources by gauging their cost impact on one segment of consumers compared to another
  
  – Equity is important, but it is not a measure of economic efficiency or risk
  
  – Decisions on which resources to acquire are independent of how the cost of resource acquisitions are distributed
Now to the “Score Card”
Regional Utility/SBC-Funded Savings Equaled Just Under 1.4% of Regional Electricity Sales in 2011 Almost Three Times the US Average.
Regional Utility/SBC Energy Efficiency Investments Per Person Are Slightly More Than Double the US Average
Regional Share of Retail Electric Revenue Invested in Energy Efficiency in More Than Double the US Average

![Bar chart showing share of retail electric revenue invested in energy efficiency from 2005 to 2011, with US average indicated as well. The chart shows an increasing trend in energy efficiency investment across the years.](chart.png)
Since 1978 Utility & BPA Programs, Energy Codes & Federal Efficiency Standards Have Almost Over **45,000** GWH/yr of Savings
So What’s 45,000 GWH/YR?

• It’s enough electricity to serve nearly the entire state of Oregon

• It saved the region’s consumers nearly $3.1 billion in 2011

• It lowered 2011 PNW carbon emissions by an estimated 19.8 million MTE.
Energy Efficiency is Now the Region’s Third-Largest Resource

- Hydropower: 46%
- Coal: 18%
- Energy Efficiency: 16%
- Natural Gas: 11%
- Nuclear: 4%
- Wind: 4%
- Geothermal: <1%
- Petroleum & Pet Coke: <1%
- Biomass: 1%
- Natural Gas: 11%
- Petroleum & Pet Coke: <1%

Based on Estimate of 2010 Actual Resource Dispatch/Contribution
Since 1980 Efficiency Has Met Over 50% of PNW Load Growth

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<thead>
<tr>
<th>Project</th>
<th>Annual Firm Energy Output (GWH/yr)</th>
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<tbody>
<tr>
<td>Rocky Reach</td>
<td>NEEA</td>
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<tr>
<td>The Dalles</td>
<td>State Codes</td>
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<tr>
<td>John Day</td>
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<td>Chief Joseph</td>
<td>Utility/SBC Programs</td>
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