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Beneficial Electrification: Considerations for EE

EESE Board, Concord, New Hampshire

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Introduction

The Regulatory Assistance Project is a global, non-profit, non-advocacy team of veteran regulators advising current regulators on energy sector issues. (***www.raponline.org***)

David Farnsworth **Jessica Shipley**

WASHINGTON STATE
ENERGY OFFICE

Analysis of Consumer and Marginal Costs for Electric and Natural Gas Space and Water Heat in Single Family Residences in Puget Sound Power and Light Company Service Territory

Prepared Pursuant to inter-agency agreement between Public Counsel Section of the Office of the Attorney General of Washington State and Washington State Energy Office

Prepared by:
Richard Byers
Washington State Energy Office
809 Legion Way SE
Olympia, WA 98504

September, 1989

DIRECT USE OF NATURAL GAS FOR RESIDENTIAL SPACE AND WATER HEAT

COMPARED TO

GAS-FIRED ELECTRIC GENERATION FOR HYDRO-FIRMING

THERMODYNAMIC, ECONOMIC, AND

ENVIRONMENTAL IMPACTS

PREPARED FOR

ASSOCIATION OF NORTHWEST GAS UTILITIES

Portland, Oregon

Jim Lazar
Consulting Economist
Olympia, Washington

Fuel Choice – 1989

- Wind and solar were not viable economic resources
- Best heat pumps had a coefficient of about 2
- Heat pump water heaters were not commonly available
- Best natural gas generating plants had about 42% conversion efficiency

Fuel Choice Today

- Wind and solar are coming in at two and three cents per kWh
- Modern heat pumps and heat pump water heaters have COPs of 3 or better in mild climates, and improving results in cold climates
- New gas generation is as much as 62% efficient, converting gas to electricity when wind not blowing and sun not shining
- Modern technology enables load control

What Makes for ***Beneficial*** Electrification (BE)?

Three explicit criteria: Achieve at Least One Without Adversely Impacting the Others

1. Saves Customers Money Long-Term; New Services

2. Reduces Environmental Impacts

3. Enables Better Grid Management

An Easy Example:
Oil vs. Heat Pump Water Heater

BOCK 58800 32E OIL FIRED WATER HEATER,
GALLON / 104000 BTU - TANK ONLY

Our Price Per Unit: $1,054.83

Rheem Prestige Hybrid Electric Water Heater

$1,389.00

Consumer Economics

Oil Water Heater

Capital: $1,054

150 gallons oil/year
$3.00/gallon
$450/year

10 Years: $5,554

Heat Pump WH

Capital: $1,389

1,500 kWh/year
$.12/kWh average
$180/year

10 Years: $3,189

Oil vs. Heat Pump Water Heater:

- Consumer Economics: 40% Advantage
- Emissions: 40% Advantage
- Grid Flexibility: Heat pump can be controlled into key hours

By switching to an electric end-use technology, we can use less primary energy.

This is unambiguously a form of energy efficiency.

Straightforward Examples of BE

- Oil and Propane Water Heater Replacement
- Electric Vehicles with Smart Charging

Photo credits: EPA Energy Star / Cassandra Profita/OPB/EarthFix

Promising Opportunities for BE

- New build super-efficient residences
- Oil and propane space heat
- Warm climate residential

Challenging Areas for Electrification Today

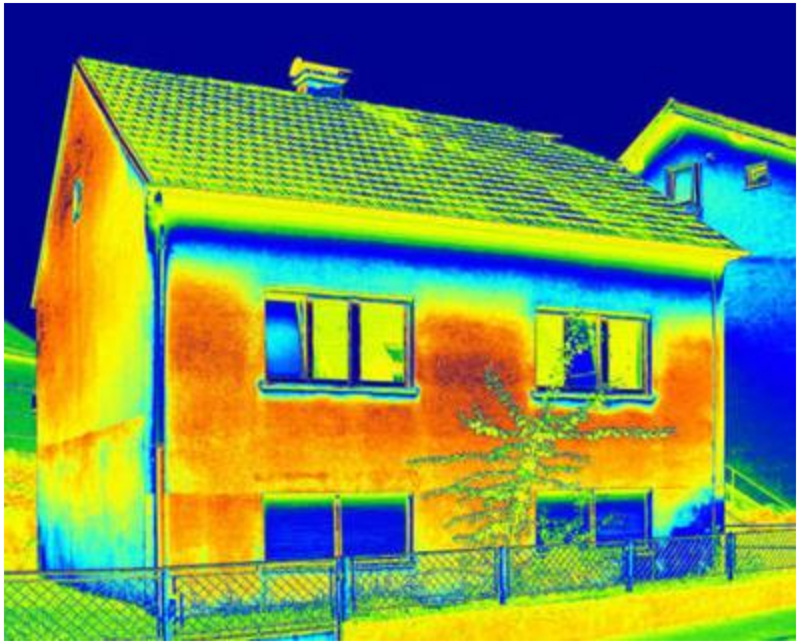
- Existing gas space and water heat
- Cold climate space heat

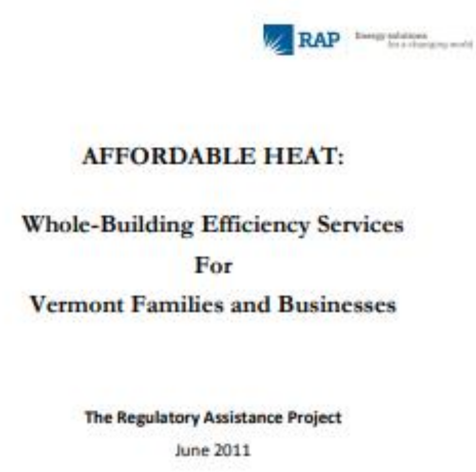
Strategies to Achieve BE Benefits

Energy Efficiency Policy

- Identify and address language in EE standards that would unnecessarily limit BE opportunities
  - Consider an overall-energy-use target?
- Revisit any prohibition on fuel switching. If it is beneficial then it should not be prohibited.

One Key: Building Envelope Efficiency





RAP

AFFORDABLE HEAT:

Whole-Building Efficiency Services
For
Vermont Families and Businesses

The Regulatory Assistance Project
June 2011

New England: Cold Climate & High Cost Electricity

- Cold climate air source HPs can provide most, but generally not all, space heating needs

- Where buildings can be better sealed and insulated, HPs will be more effective

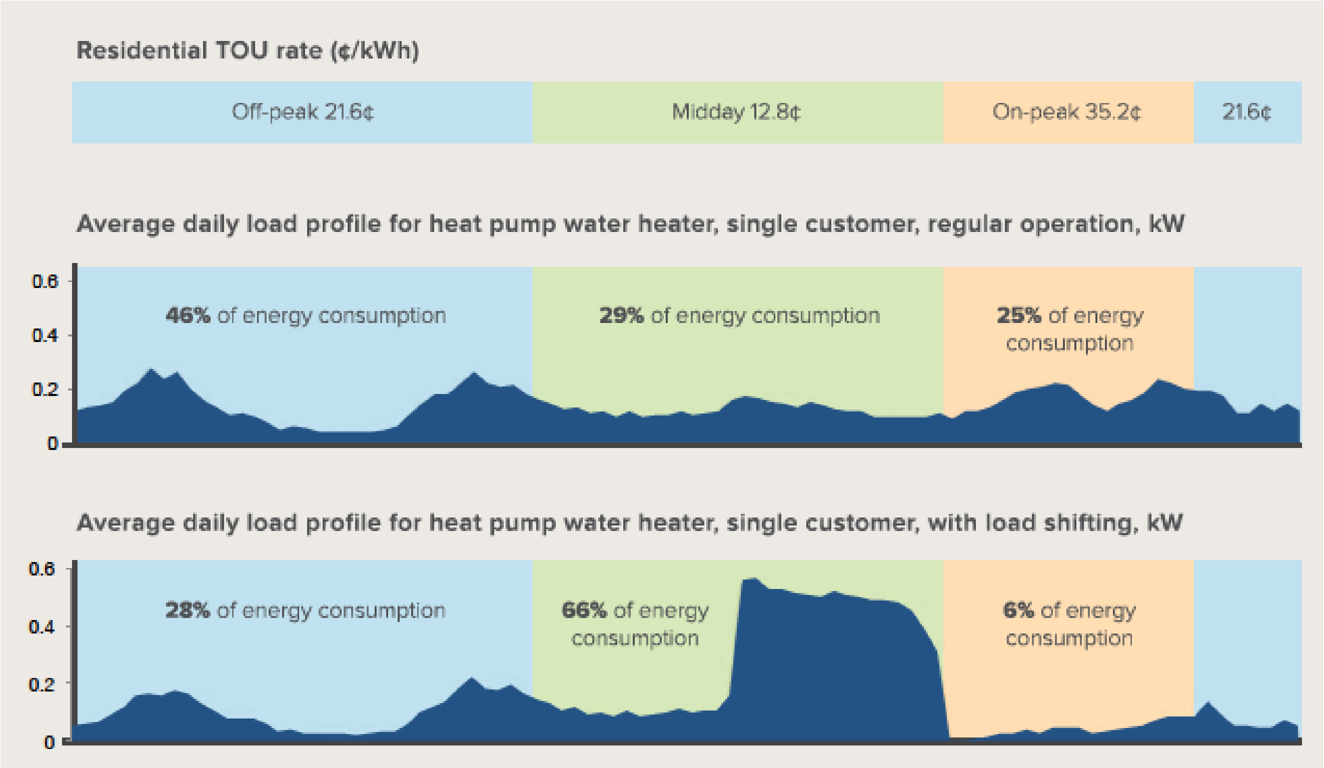
Building and Appliance Standards

- New construction: More efficient buildings help clear the way for increased BE
  - Consider code to make buildings *all electric ready*
  - Minimum: ensure codes do not contain barriers to BE
- Appliances: Level the EE playing field
  - Compare overall energy saved by switching to a heat pump or HP water heater
  - Consider code to make appliances ‘controllable’ remotely or by grid operator

Rate Design

Time-varying rates help align consumer and system costs.

Water heater load shifting in Hawaii



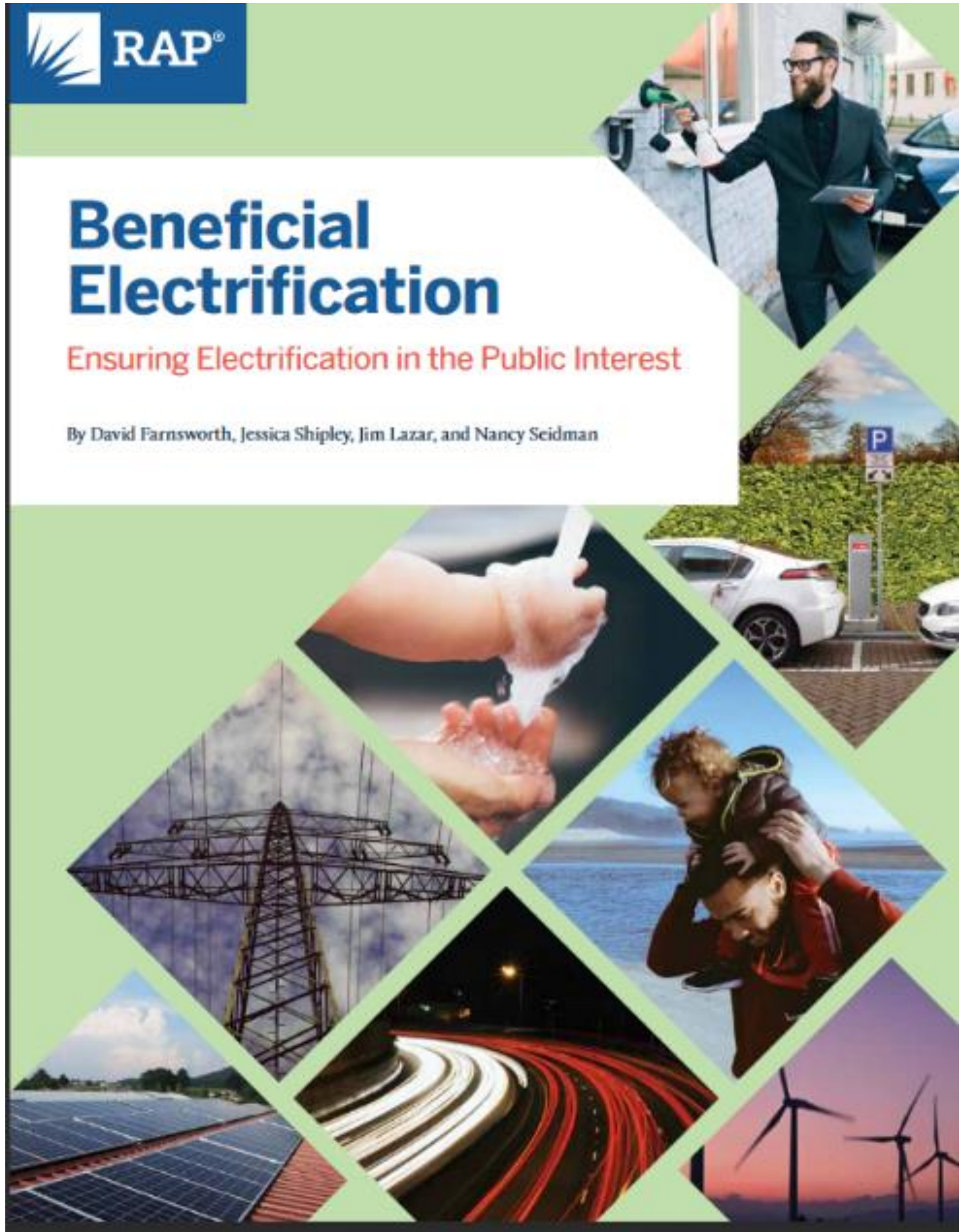
Source: RMI 2018

Incentive Programs

- Revisit overarching goals – is fuel switching prohibited? Are fuels treated separately?
  - Consider an emissions or primary energy savings approach
- Consider early replacement programs
- Take a holistic approach to reviewing programs
  - What incentives exist for replacing fossil-fueled appliances?

Thoughts on Next Steps for Regulators and Policymakers

- Develop goals
- Identify barriers
- Evaluate what existing policies are accomplishing
- Use open processes to analyze alternatives
- Anticipate need for policy action
  - Rate design
  - EERS
  - Incentive programs
  - Standards and codes


RAP®
Beneficial Electrification
Ensuring Electrification in the Public Interest
By David Farnsworth, Jessica Shipley, Jim Lazar, and Nancy Seidman
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About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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