Northwest **Power** and **Conservation** Council

July 5, 2017

MEMORANDUM

TO: **Council Members**

FROM: **Jennifer Light**

SUBJECT: **Guidance to RTF on Treatment of Fuel Choice Update**

BACKGROUND:

Presenter: Jennifer Light, Charlie Grist, and Ben Kujala

Summary: This is to provide the Power Committee an opportunity to discuss this topic further in advance of the full Council discussion. Please refer to the memo in the Council packet for more information.

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Guidance for the RTF on Treatment of Fuel Choice

Jennifer Light, Charlie Grist, and Ben Kujala

July 11, 2017

Background

Why are we here?

- The RTF is seeking a decision making framework for how to estimate savings for measures where consumers and builders have a choice in fuel (ex: space or water heating).

Why does this matter?

- If some portion of new electric units replace existing gas units, the grid sees added load
- RTF aims to develop reliable electric savings estimates, and therefore is seeking a way to properly account for this potential impact on electric savings

Reminder on How the RTF Estimates Savings

Lost Opportunity Measures

1. Something has died and needs to be replaced (examples: lighting, appliances, water heaters, etc.)
2. New load is being added to the system (example: new construction)

Because someone is required to purchase something new, savings are determined by taking the difference in energy use between the average unit on the market and the efficient option

Applying this to Fuel-Choice Measures

Example: Heat pump water heater

Installation of a new heat pump water heater replacing an electric water heater in existing homes.

Meaning, we can check that:

- ❑ A heat pump water heater is installed
- ❑ It went into an existing home
- ❑ It replaced an electric water heater

We can look at the current purchases of electric water heaters only to develop a baseline from which to estimate savings

Applying this to Fuel Choice Measures

Example: Heat pump water heater

Purchase of a new heat pump water heater.

Meaning, we can check that:

- ❑ A heat pump water heater is purchased

Without any other information, we don't have an easy way to know if this purchase:

- Went to an existing home or new construction
- Was purchased by a consumer that previously had a gas water heater
- Was purchased by a builder that might have otherwise installed a gas water heater

Summary of Stakeholder Feedback

Entity	Recommendation
RTF PAC	**Start with an assumption of 0% other fuels in the baseline and monitor market** *Rationale: markets are complex, there are many drivers of fuel choice and efficiency programs are not the primary one*
Avista	**Restrict measures to only electric to electric OR start with an assumption of 2-6% gas-to-electric** *Rationale: Know that 0% is wrong, as there is evidence of a push from gas-to-electric. Acknowledge this with an assumption of gas-to-electric in the analysis*
NW Natural	**(1) Require program controls and (2) Account for impact of incentives in analysis**
NWGA	**Postpone adoption until analysis can be done to inform an assumption OR use 5% gas-to-electric assumption**

Staff Analysis for Quantitative Estimate

Method	Pros	Cons
Economic analysis of consumer cost absent incentives	Predicts what a rational consumer would do just based on economics, without any incentives	Does not account for non-price effects, such as consumer fuel preference, CO_2 emissions, technology fit to application
Historical trend analysis	Accounts for non-price effects	Includes effects from previous incentives (gas and electric efficiency programs, manufacturers, Federal or state), does not account for emerging technologies Load forecast doesn't have sufficient detail on existing vs new construction
Seventh Plan load forecast	Blends the above two by predicting economic behavior while accounting for non-price effects	
Threshold analysis on incentives	Attempts to account for role that significant incentives can play. How big would a program incentive have to be to switch a rational economic choice?	RTF does not know what efficiency program incentives will be in advance of its analysis, nor have insight on other market incentives. Does not account for other non-price effects.

Staff Recommendation

- Proceed to estimate savings for such measures
  - Strong interest & value in RTF estimate of savings for such measures
- Starting assumption of 0% other fuels in the baseline
  - Consistent with Council's focus on a market-oriented approach
  - Efficiency programs are not the primary driver of fuel choice
  - No clear approach to develop an estimate with greater certainty
  - Small percentages (ex: 5%) of gas-to-electric are in the noise of the analysis and asymmetric
- Monitor this assumption for significant, clear indications of other fuel to electric conversions
  - Would require significant, clear, regional shift to be picked up in the noise of analysis
- Treat conversion to electricity as zero savings – not negative savings
  - This is not conservation as defined by the Act

Proposed Decision Making Framework for Measure Baselines with Fuel Choice

When the RTF analyzes a measure for which consumers have a fuel choice the RTF should assume efficiency programs have no impact on decision makers with respect to fuel choice and assume as a starting point that none of the electric-source units are conversions from other fuels. However, recognizing that fuel choice is a complex decision influenced by many factors and that the impact of efficiency programs on consumer fuel choice is not currently well understood, the RTF should develop a research strategy to monitor changes in fuel share relative to the Council's regular fuel-choice studies. Any electric market share clearly identified as fuel conversions from other fuels to electricity should be taken into account in the market baseline assumption and zero savings should be assigned to that share.

ADDITIONAL SLIDES

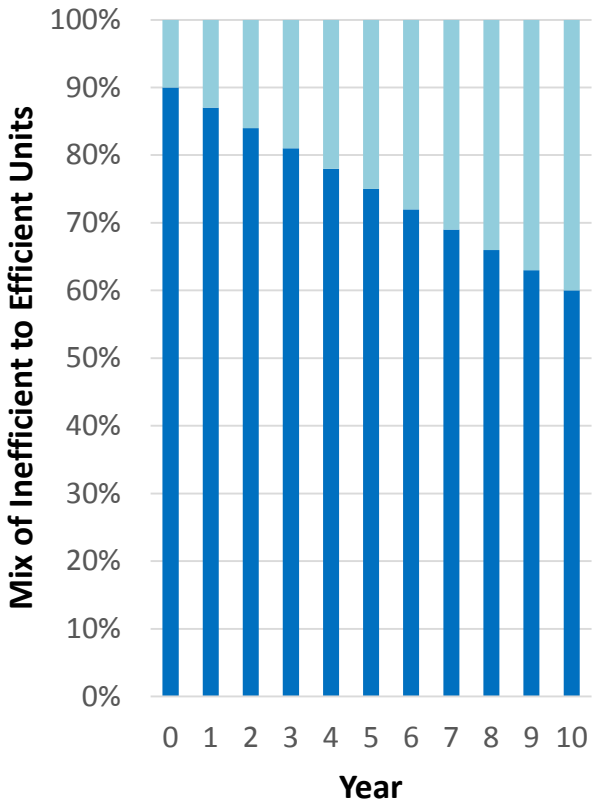
Reminder on How the RTF Estimates Savings

Lost Opportunity Measures

Demand forecast assumes some improvements in consumption over time.

Example:

- 90% of the existing stock is inefficient
- Sales data show that the current market mix is 60% inefficient and 40% efficient
- Every year 10 units burn out and must be replaced; the forecast assumes these are replaced at today's market mix of 60/40
- This results in efficiency improvements in the frozen efficiency demand forecast over time

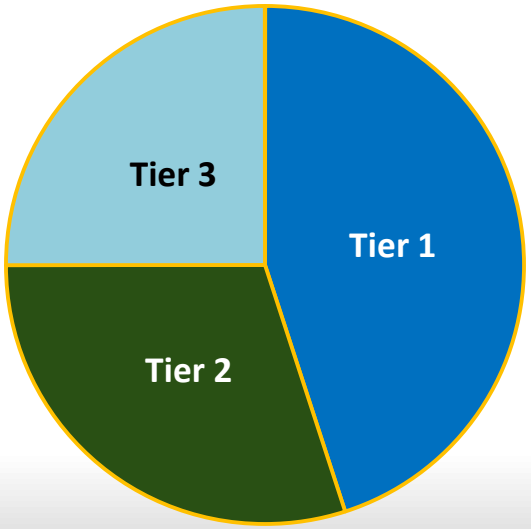


Reminder on How the RTF Estimates Savings

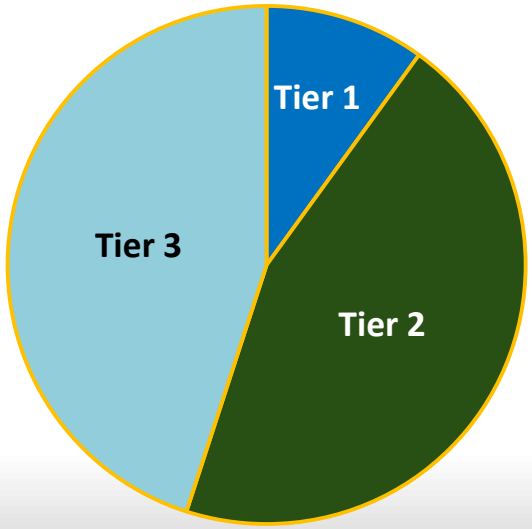
Lost Opportunity Measures

Savings occur when there is an improvement in efficiency of the market mix of units being purchased

Market Mix in Year 1



Market Mix in Year 10



Reminder on How the RTF Estimates Savings

Lost Opportunity Measures

- John's lamp burned out and he needs to replace it
- He goes to the store and buys a new efficient LED bulb
- Savings are estimated by looking at the difference in efficiency between the lamp that John bought and the average efficiency of all the lamps bought by Johns and Janes in the region

Reminder on How the RTF Estimates Savings

Lost Opportunity Measures

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The challenge comes, when the market options include a mix of gas and electric equipment…

Heat Pump Water Heater Example

Installation of a new heat pump water heater replacing an electric water heater in existing homes.

Residential Hot Water Market

85%

+ gas water heater 45% ➡ 78% inefficient, 22% efficient

+ electric water heater 55% ➡ 98% electric resistance, 2% heat pump

15%

+ gas water heater 90% ➡ 72% inefficient, 28% efficient

+ electric water heater 10% ➡ 95% electric resistance, 5% heat pump

Approximate numbers

Heat Pump Water Heater Example

Installation of a new heat pump water heater replacing an electric water heater in existing homes.

Residential Hot Water Market

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- ❑ It replaced an electric water heater

Heat Pump Water Heater Example

Installation of a new heat pump water heater replacing an electric water heater in existing homes.

Residential Hot Water Market

+ gas water heater

+ electric water heater

Market average efficiency:
98% electric resistance water heaters
2% heat pump water heaters

+ gas water heater

+ electric water heater

Approximate numbers

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Approximate numbers

Heat Pump Water Heater Example

Purchase of a new heat pump water heater.

Residential Hot Water Market

+ gas water heater

+ electric water heater

+ gas water heater

+ electric water heater

Meaning, we can check that:

- A heat pump water purchased

But, we don't have any other information as to where the water heater went…

Heat Pump Water Heater Example

Purchase of a new heat pump water heater.

If we think new units can go anywhere in the market…

Residential Hot Water Market

+ gas water heater

+ electric water heater

+ gas water heater

+ electric water heater

Market average efficiency:
Accounts for the mix of gas and electric options, and their respective efficiency levels, across the mix of housing stock in the market.

Heat Pump Water Heater Example

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If we think new units can go anywhere in the market…

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+ gas water heater 90% ➡ 72% inefficient, 28% efficient

+ electric water heater 10% ➡ 95% electric resistance, 5% heat pump

Estimated savings: 280 kWh and 50 therms

Approximate numbers

Heat Pump Water Heater Example

Purchase of a new heat pump water heater.

If we think new units only end up in houses that would otherwise be electric…

Residential Hot Water Market

+ gas water heater

+ electric water heater

+ gas water heater

+ electric water heater

Market average efficiency:
Accounts for the different electric efficiency levels between the two housing types.

Heat Pump Water Heater Example

Purchase of a new heat pump water heater.

If we think new units only end up in houses that would otherwise be electric…

Residential Hot Water Market

85%

+ gas water heater

+ electric water heater → 98% electric resistance, 2% heat pump

15%

+ gas water heater

+ electric water heater → 95% electric resistance, 5% heat pump

Estimated savings: 1,250 kWh

Heat Pump Water Heater Example

Purchase of a new heat pump water heater.

Depending on how you define your market, the savings will vary significantly.

Residential Hot Water Market

+ gas water heater

+ electric water heater

+ gas water heater

+ electric water heater

Market Option	Savings
All products	280 kWh electric savings 50 therms gas savings
Only electric products	1,250 kWh electric savings

Fuel Switching Policy

The Council recognizes that there are applications in which it is more energy efficient to use natural gas directly than to generate electricity from natural gas and then use the electricity in the end-use application. The Council also recognizes that in many cases the direct use of natural gas can be more economically efficient. These potentially cost-effective reductions in electricity use, while not defined as conservation in the sense the Council uses the term, are nevertheless alternatives to be considered in planning for future electricity requirements.

The changing nature of energy markets, the substantial benefits that can accrue from healthy competition among natural gas, electricity and other fuels, and the desire to preserve individual energy source choices all support the Council taking a market-oriented approach to encouraging efficient fuel decisions in the region.

Fuel Switching Policy Context

- Last reaffirmed in March 2015
- Some form of market-oriented approach has been used since the First Power Plan in 1982
  - Current policy states 1) Changing nature of markets and 2) desire to preserve individual energy source choices "support the Council taking a market-oriented approach"
- The 7th Plan, Appendix N: Direct Use of Natural Gas has the latest iteration of the Council's study of consumers decisions and market trends

Fuel Switching Policy Implications

- Originally, the fuel switching policy was to prevent switching from electricity to natural gas end-uses as a form of conservation – i.e. **direct** and intentional measures designed to displace electricity with gas (or wood) and call it electric conservation
  - The natural gas companies also argued after the first power plan that energy efficiency payments would incentivize the use of more electricity
- Improvement in electric end-use technology and electric generation along with concerns about carbon dioxide emissions from natural gas end-uses have the potential to push markets and/or regulation toward broader electrification
- Efficiency program incentives on end-use technologies could tip the balance on decisions comparing natural gas to electric appliances – even when the incentives are intended to displace less efficient electric or gas appliances

Implementing the Council's Fuel Switching Policy at the RTF

What does it mean to take a "market-oriented approach to encouraging efficient fuel decisions in the region"?

Residential Hot Water Market

+ gas water heater

+ electric water heater

+ gas water heater

+ electric water heater

- If we include some level of gas in the baseline, therefore implying that at least some fraction of gas units change to electric, does that conflict with this policy?

Implementing the Council's Fuel Switching Policy at the RTF

What does it mean to take a "market-oriented approach to encouraging efficient fuel decisions in the region"?

Residential Hot Water Market

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+ electric water heater

- If we include some level of gas in the baseline, therefore implying that at least some fraction of gas units change to electric, does that conflict with this policy?
- If we focus only on electric units, will we get the savings right?