



A New Data Resource for a Changing Energy Landscape

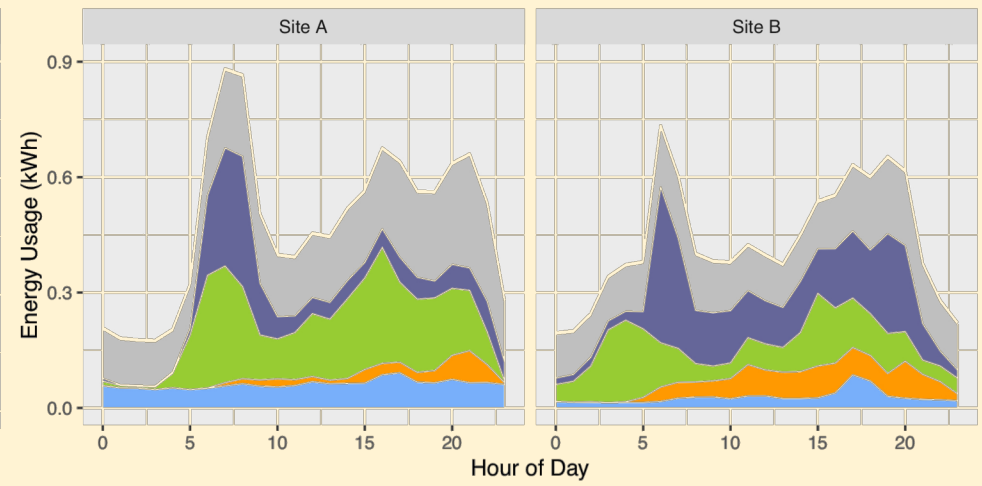
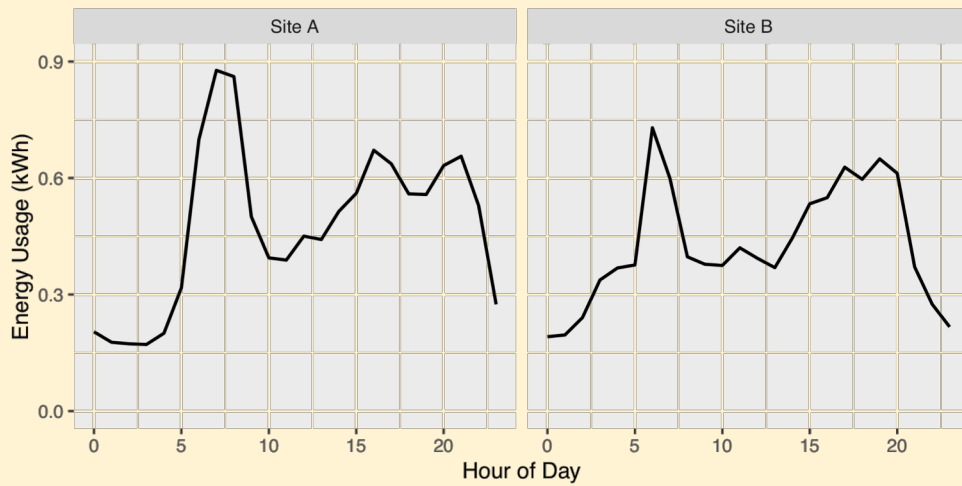
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Kevin Price,
Evergreen Economics



Why am I here today?



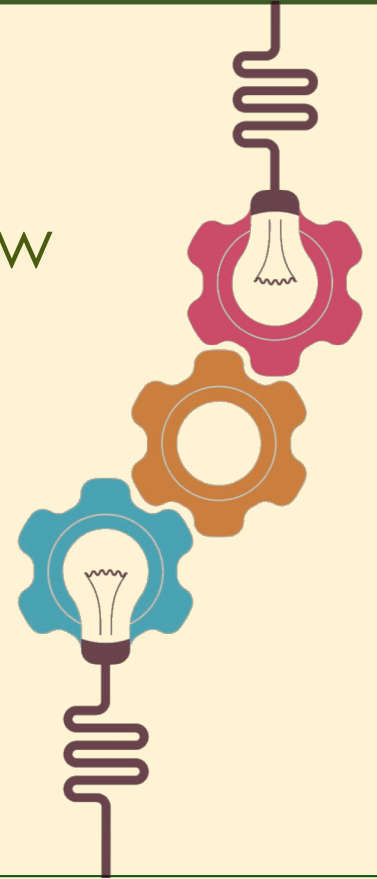
End Use Other Water Heater HVAC Cloth. Wash/Dryer Kitchen App





Presentation Overview

- Study Background
- Research Objectives and Project Overview
- Research Implementation
- Implications

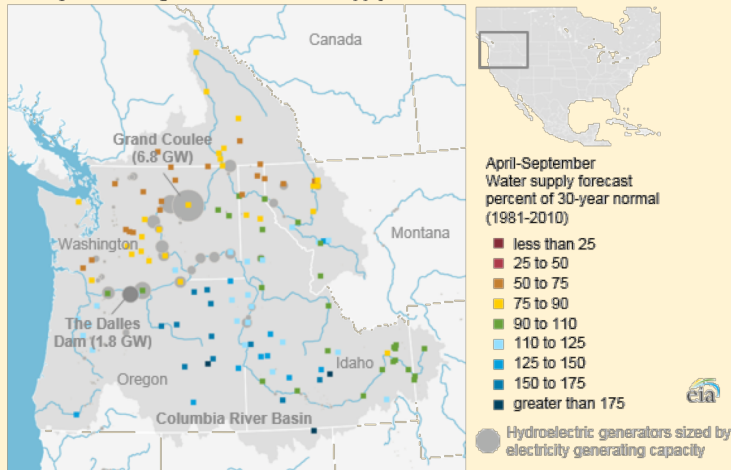




Study Background

NORTHWEST	NATIONAL
NUCLEAR	OTHER
WIND	WIND
NATURAL GAS	NUCLEAR
COAL	COAL
	NATURAL GAS
56%	7%
HYDROELECTRIC	HYDROELECTRIC

U.S. hydroelectric generators and water supply forecast in the Columbia River Basin



Source: U.S. Energy Information Administration, based on National Oceanic and Atmospheric Administration Northwest River Forecast Center

“with the **planned retirements of four Northwest coal plants** by July of 2022, the [Pacific Northwest’s power supply] system... will have to acquire nearly 1,400 megawatts of new capacity.”

Source: Northwest Power and Conservation Council’s Pacific Northwest Power Supply Adequacy Assessment for 2021

Source: <https://www.bpa.gov/Hydroflowshere/hydroimages/2018-08/2018-Energy-Sources-Fuel-Mix-Graphic.jpg>





Study Background

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Forecasted reductions:

- Coal plants
- Natural gas plants
- Hydro reliability

Due to economics, climate change, and GHG reduction goals

Needed to meet demand:

- Energy efficiency
- Demand response
- Renewables

And a better understanding of how they work together

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ELCAP

“The [Northwest Power and Conservation] Council relies on... the End-Use Load and Consumer Assessment Program (**ELCAP**) database.”



“...The **ELCAP** database... *is more than 30-years old*, and so its accuracy in representing modern load shapes is questionable.”





New Research Needs

Northwest End Use Load Research (EULR) Studies:

- Residential: Home Energy Metering Study (HEMS)
- Commercial: Commercial Energy Metering Study (CEMS)





HEMS Study Objectives

Collect comprehensive data to determine contributions of EE technologies

- Load shapes for EE technologies
- How EE reduces peak demand

Collect current data to reflect growth of new technologies and renewables

- Load forecasting & resource planning
- Integration of renewables





HEMS Study Overview

- **Residential Building Stock Assessment (2017)**
- **Home Energy Metering Study** initiated in 2018:
 - Remote panel monitoring of 400 homes
 - Certain key end uses prioritized
 - Interior and exterior temperature monitoring





HEMS Study Details

- Sampling Strategies
- Recruitment Overview
- Metering Installation Overview





Sampling Strategies

Leverage Resources

- RBSA as sample frame
- Existing metering data used to inform needs

Compare Variance

- More/fewer points for certain end uses
- Treatment of geographic sub-strata

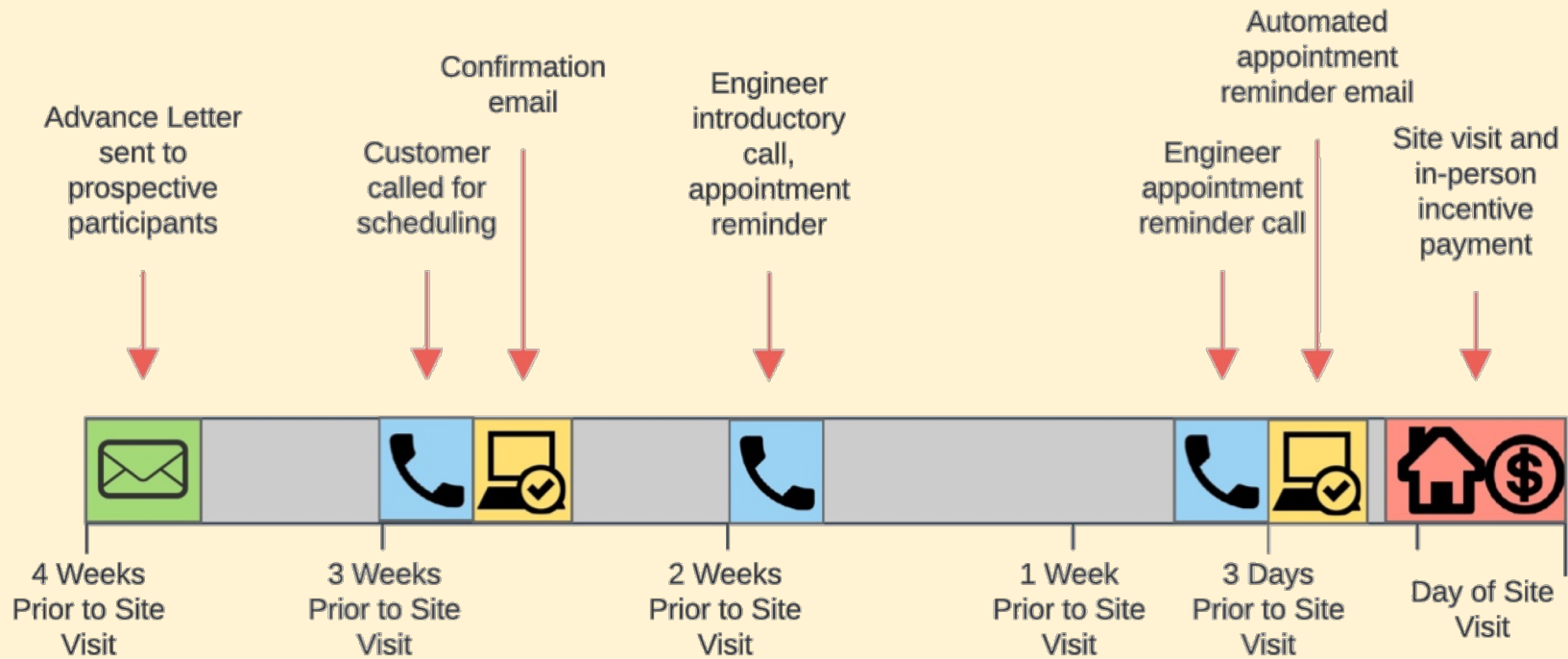
Ongoing Adjustments

- Variance analysis to update targets
- Adjust recruitment to meet targets





Recruitment Overview





Metering Installation Overview

Orientation discussion

Site assessment

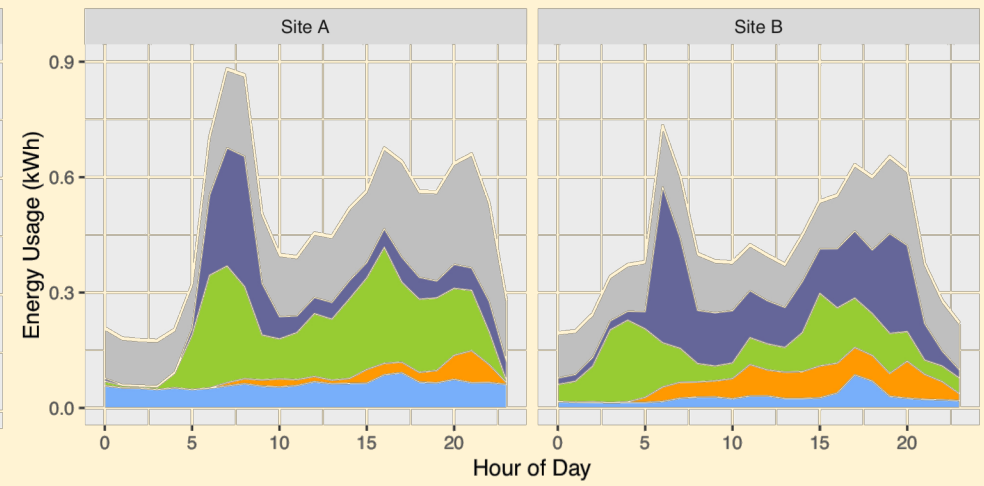
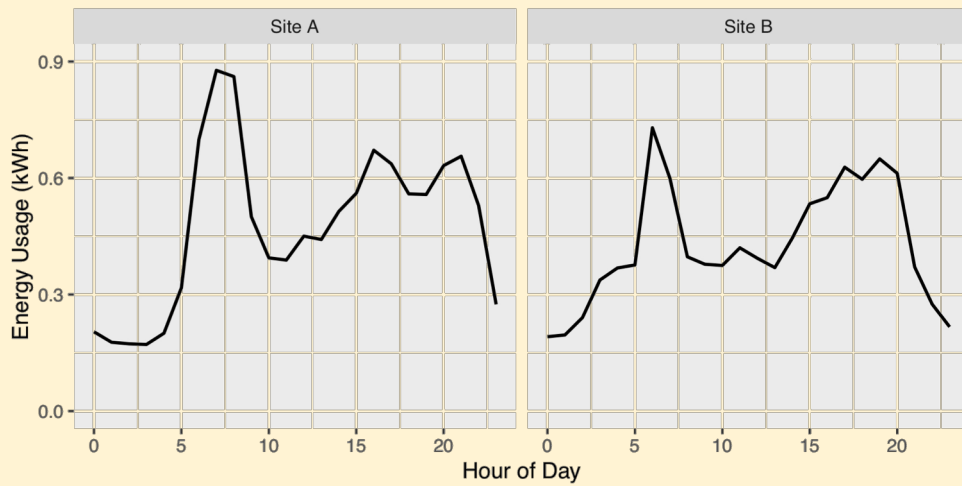
Equipment installation

Wrap-up / Incentive





Whole House vs Disaggregated



End Use Other Water Heater HVAC Cloth. Wash/Dryer Kitchen App

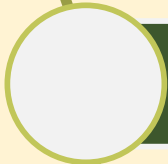




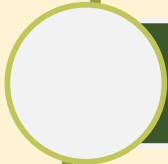
Northwest Implications



Collecting granular data for load forecasting and resource planning



Developing a better understanding of EE technologies in Northwest homes



Developing a better understanding of renewables integration in the Northwest



Informing assessments of the impact of EE, demand response, and renewables on the grid





Additional Implications

Applying study findings to regions with similar climates, housing stock?

Opportunity to inform load disaggregation technologies?

Research design applicable to other states, utilities?

Innumerable additional uses!





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