Heating Fuel Consumption Measurement

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Introduction: Alana Vilagi

- B.S. Mechanical Engineering, 2015
- M.S. Mechanical Engineering, 2019
- Data Processing
- Career Interests
  - Energy Auditing
  - STEM Outreach K-12

My History With ACEP

Introduction: Baxter Bond

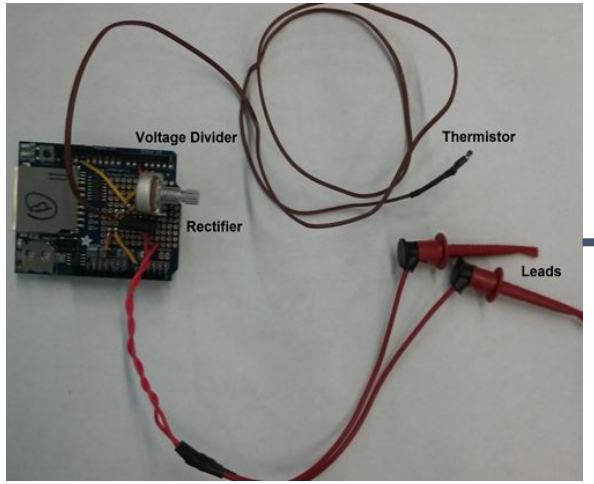
- B.S. Mechanical Engineering, 2018
- B.A. Yup’ik, 2017
- Hardware and Firmware
- Career Interests:
  - Renewable energy integration
  - Embedded systems
  - Computational linguistics

Background: The Need for Data

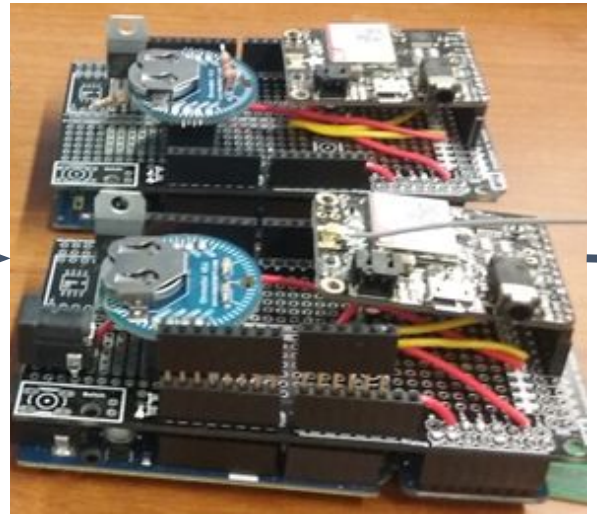
- Heating Fuel in Alaska
  - Significant portion of income
  - Complicated logistics to deliver
  - Price Instability
- Understand Home Heating Patterns
  - Energy Efficiency and Weatherization Programs
  - Renewables and Dispatchable Loads
  - Consumer Behavior

EnergyWire: Friday, February 19, 2016 Oscarville. Photo by Margaret Kriz Hobson

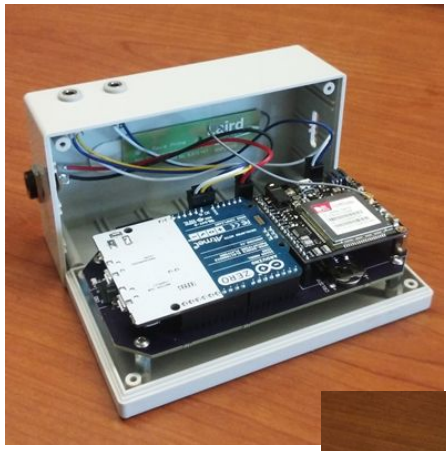
Designing PuMA (Pump Monitoring Apparatus)



Pre-2014



2014-2016



2016-present

First Deployment Review: Tanana

- 12 Meters Installed
- Determine trends in fuel use and cumulative consumption
- Present information to homeowners and work on strategies to reduce fuel use
- Develop predictive tools for future fuel usage patterns

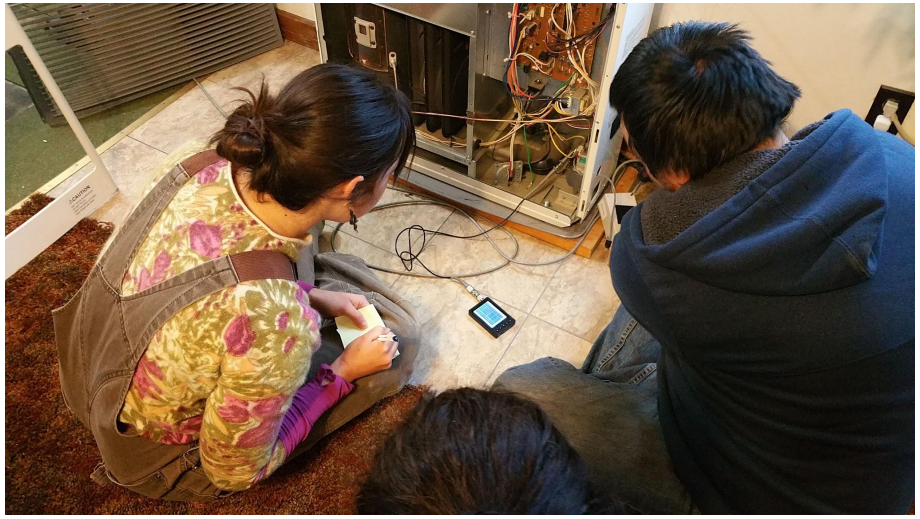
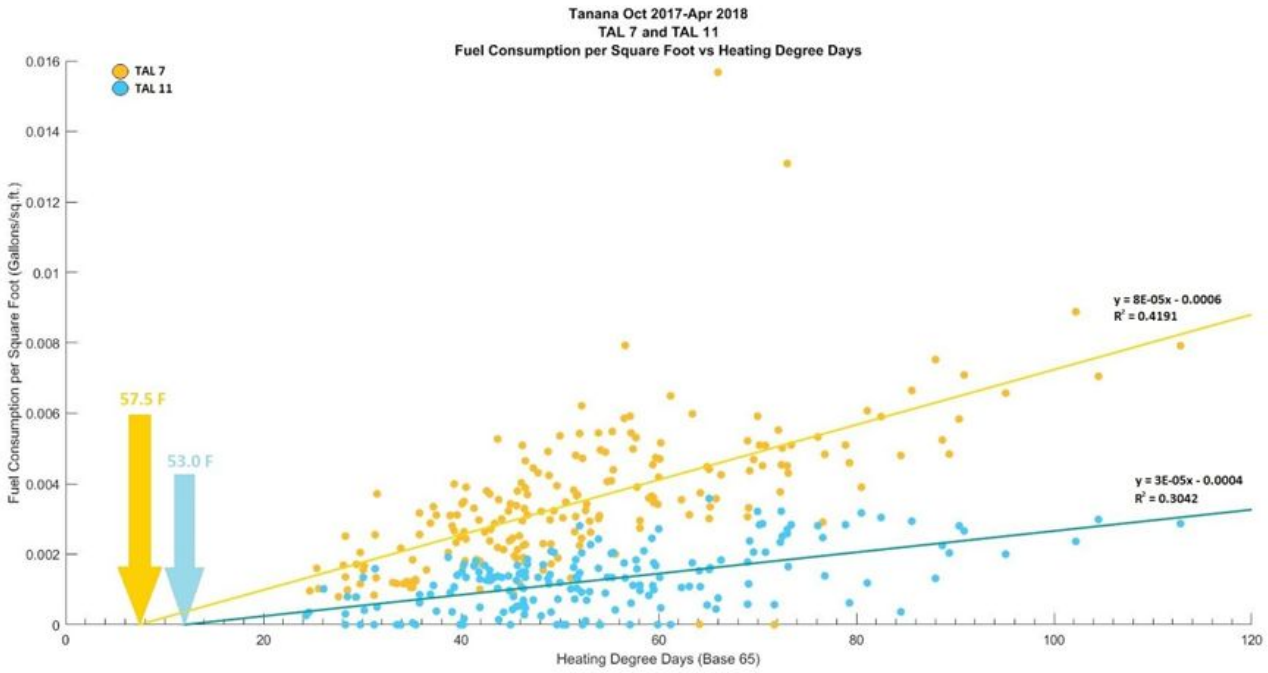
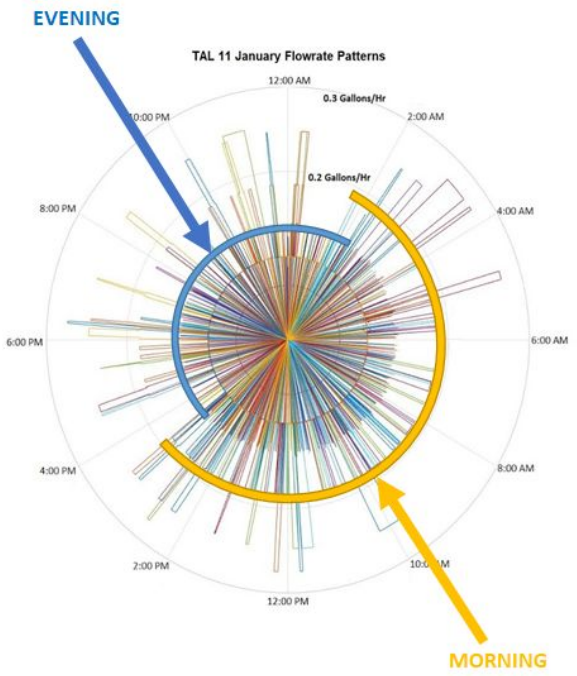


Photo Credit: Jennifer Schmidt

Understanding Home Heating Patterns

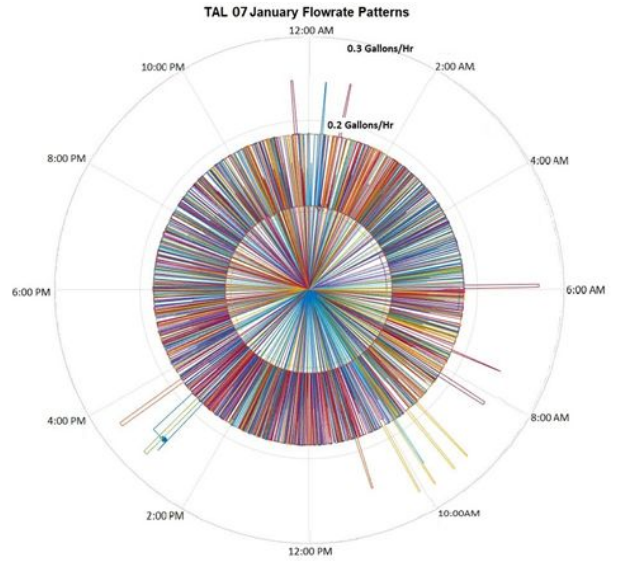


Home A



33 Gallons

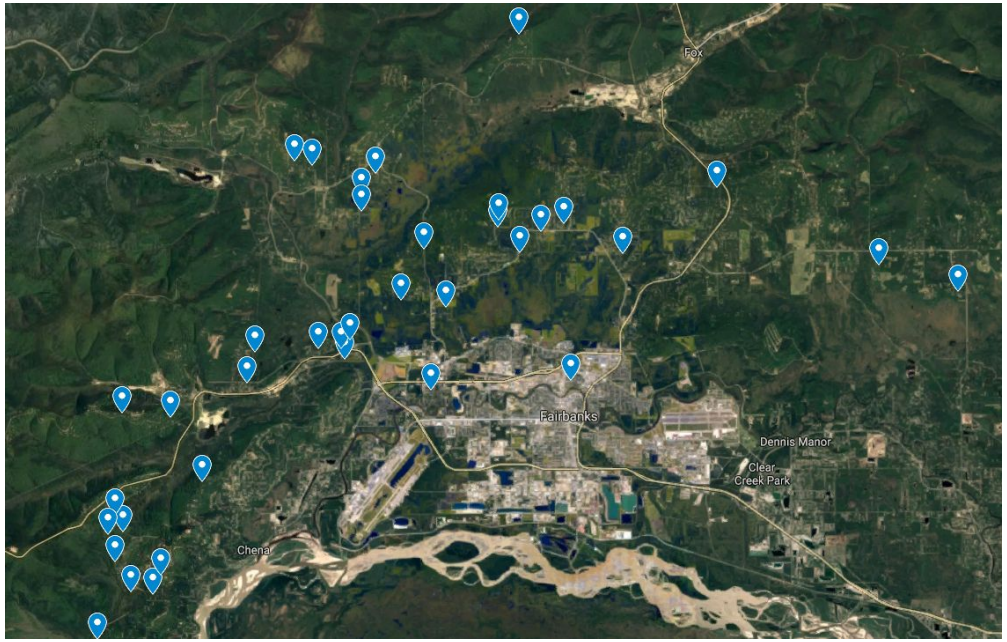
Home B



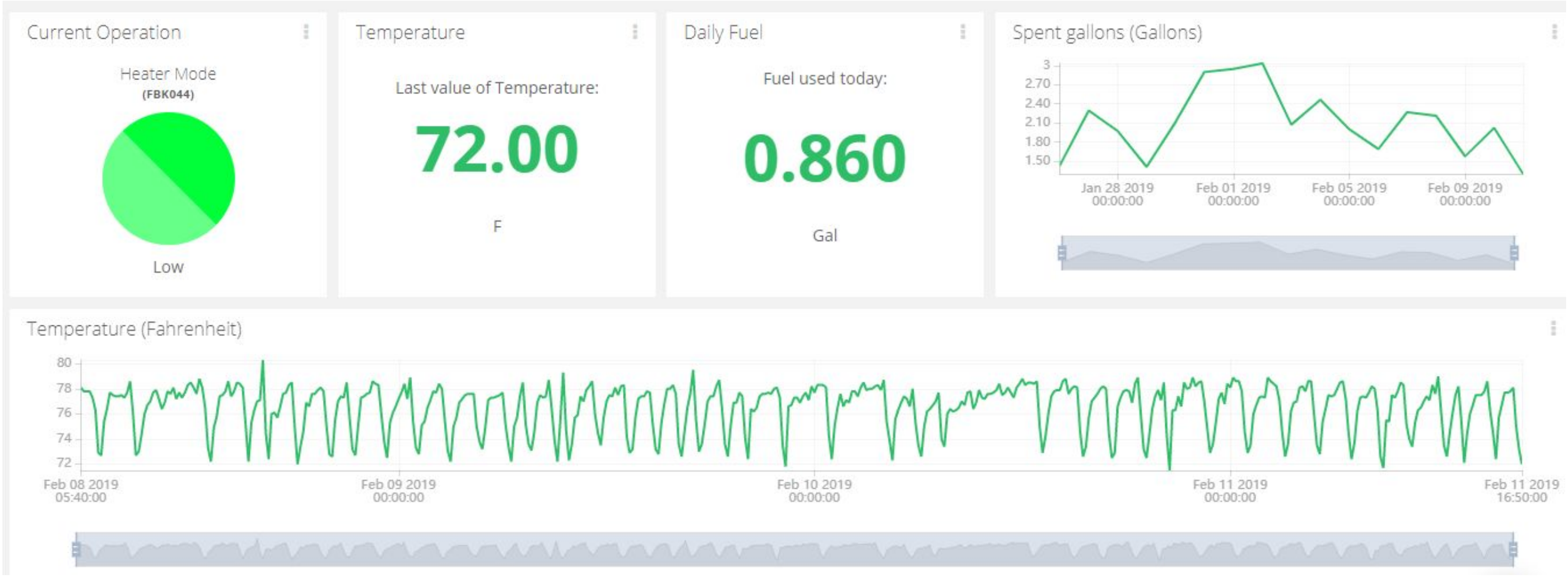
63 Gallons

Current Developments

- Fairbanks: ~50 meters deployed
  - All meters are in households where the vented heater is the only source of heat
- Meters are linked to the cloud, so users can see current fuel data with a dashboard
- Continuing deployment with Tanana



Example Dashboard



AISES National Conference

Received awards for Distinguished Chapter of the Year and Professional and Chapter Development

Partners in PuMA Development

- Cold Climate Housing Research Center (CCHRC)
- College of Engineering and Mines (CEM)
- Jennifer Schmidt with the Institute of Social & Economic Research (ISER)
- Alan Mitchell of Analysis North
- Jeffrey Rothman with Chaparral Physics

What We've Learned

- Designing an appliance that will be used in residential homes
  - Researcher vs. Homeowner
- Communication across different device components and cloud services
- Need for evaluating heating contributions from secondary sources such as wood stoves

Becoming Better Engineers

- Analytical Thinking
- System Design
- Experimentation
- Understanding the Economic and Social Context
- Communication and Teamwork

Questions?

How PuMA Works