Alaska Housing FINANCE CORPORATION

Strategic Energy Management




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AASB – Maintenance
Oct. 18, 2017

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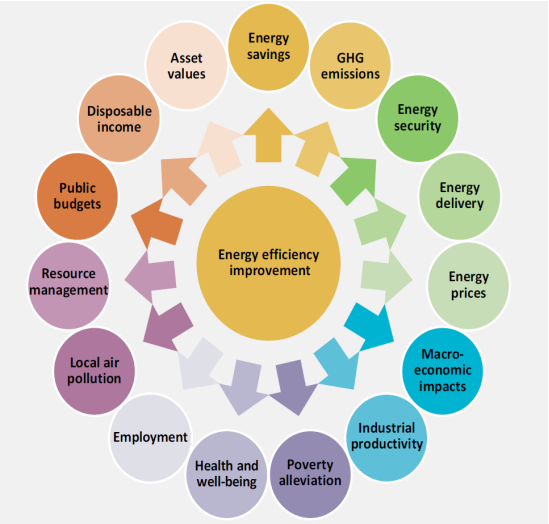
Energy efficiency is a smart investment

Multiple benefits of energy efficiency



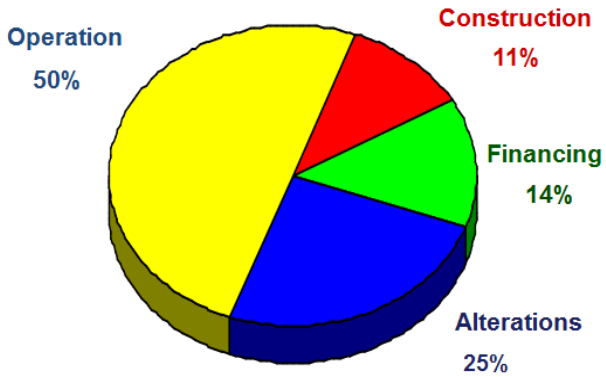
iea.org

3

Affordability

The Big Picture: Lifecycle Costing

A buildings' costs over 40 years



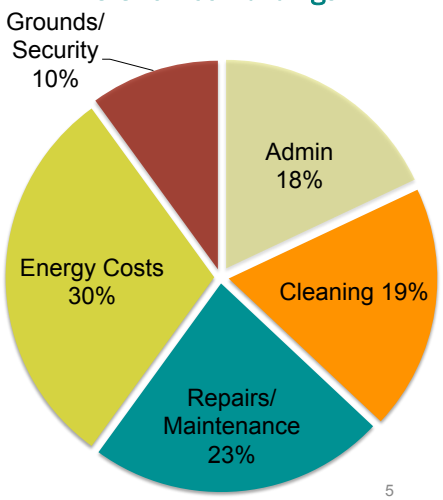
4

ENERGY EFFICIENCY

Reduced Operating Costs

- Energy costs are typically the largest portion of a building's operating budget
- EPA estimates that a comprehensive energy management strategy can reduce energy use by 30%

Typical Operating Costs for U.S. Office Buildings



5

Source: BOMA Experience Exchange Report

Background

American Recovery & Reinvestment Act funds

- Benchmarking
- Energy Audits
- White Paper

Alaska Energy Efficiency Revolving Loan Fund

- Outreach
- Technical Assistance

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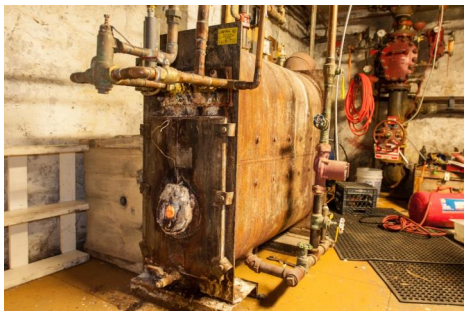
Department of Energy funds

- Strategic Energy Management Practices Guide

6

Energy Efficiency Potential

- Public buildings - 5,000 in AK
- Average age - 33 yrs.
- Annual energy expenditure - $640 million
- AK has some of the highest energy costs in the US



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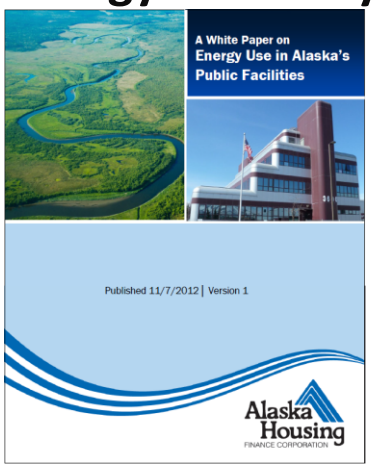
Energy Efficiency Works

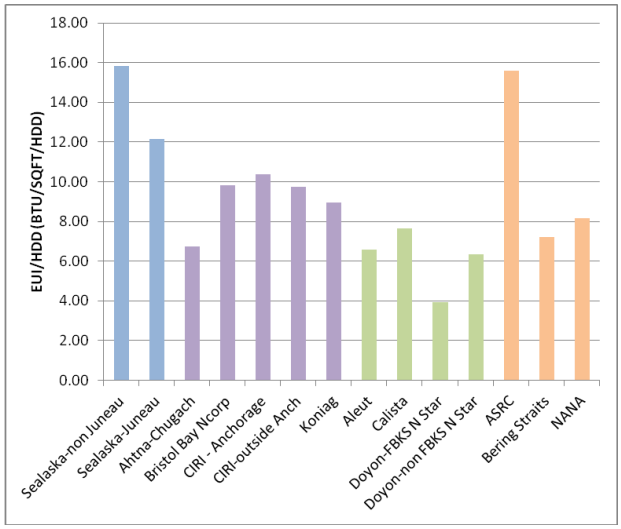


The take away:

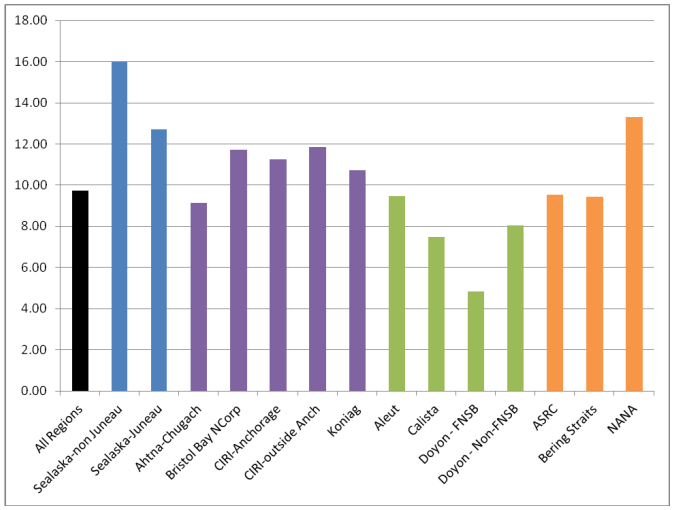
- Assuming average savings of 20%, potential **annual savings of $125 million** in our public facilities
- EE can help reduce costs and focus limited public dollars on core activities

8

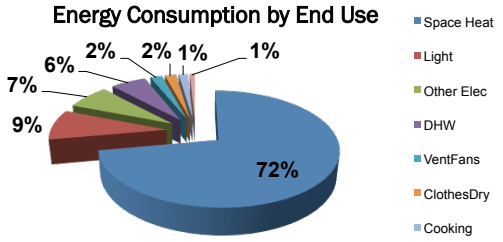
Average EUI by region

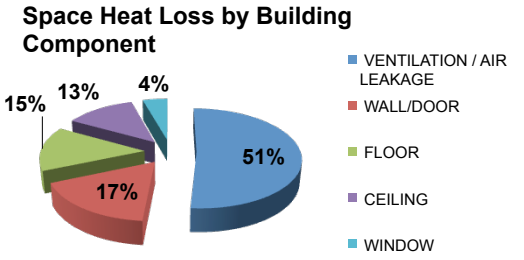


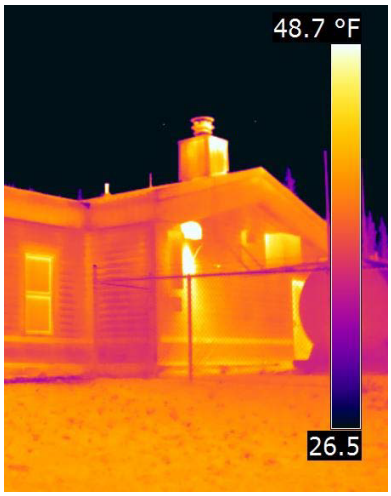
Average School EUI by region



Where does the energy go?







11

Fruit on the ground

- Turn it off:
  - School Refrigerators in summer
  - Vending machines when building not occupied – cheap timers work well
  - Boilers, HVAC, lights, fans, pumps when building is unoccupied
  - Computers and office equipment when not occupied

Low Hanging Fruit

- Track energy use
- Re-program controls to actual operations
- Occupancy sensors
- Tune up existing equipment – boilers, HVAC, controls, etc.

13

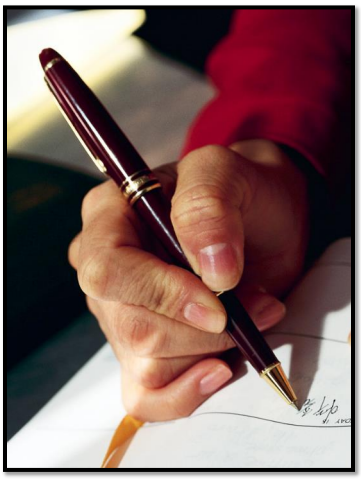
Overhead Fruit

- Build efficiency into planned maintenance
  - Pump, motor or ballast replacement
- Consolidate modular design to reduce energy load to underutilized areas
- Retro-commissioning
- Educate operators on specific systems – snowmelt, DDC, Lighting controllers, etc.
- Demand controlled ventilation
- Lighting retrofits

14

Recommendations: Policy

1. **Develop an energy policy**
   - Set goals



15

Recommendations: Policy

1. **Develop an energy policy**
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2. **Establish an Energy Conservation Coordinator/Manager**

16

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17

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4. **Provide Operator Training**

18

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2. **Establish an Energy Conservation Coordinator/Manager**
3. **Develop an energy management plan**
   - Establish a level of accountability
4. **Provide Operator Training**
5. **Prioritize efficiency retrofits**

19

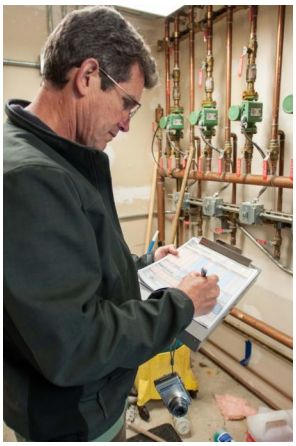
Impact of Energy Policy

Photo credit McCool Carlson Green
mcgalaska.com

- Energy efficiency goals & design standards signal owner intent
- 70% annual savings - Machetanz School

20

Impact of Energy Management



The Bottom Line:
It pays to know how much energy you use, and where and when you use it.

21

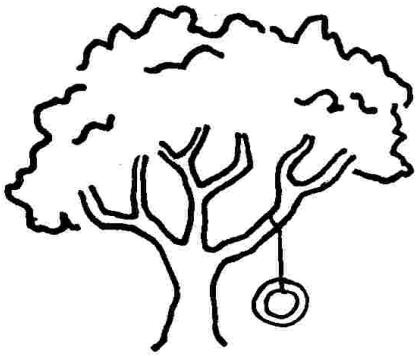
Energy Management, cont.

- Avoid this…

22

Energy Management, cont.

- ❑ Goals, Communication & Accountability



WHAT I REALLY WANTED !!

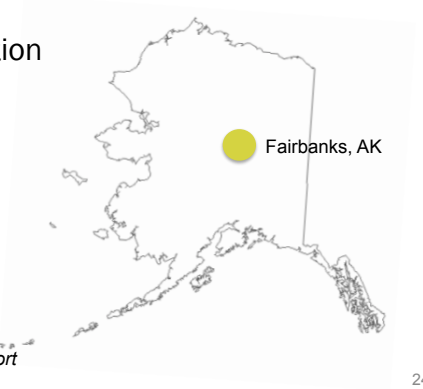
23

RESEARCH

New Buildings Institute

sensitivity analysis, 2011

- analyzes how design, operation and tenant behaviors affect energy use
- 28 building characteristics
- 16 U.S. cities



Source: 2011 New Buildings Institute Sensitivity Report

24

Impact of Operator Training

25

Tracking Energy Use and Costs

"You can't manage what you don't measure"

26

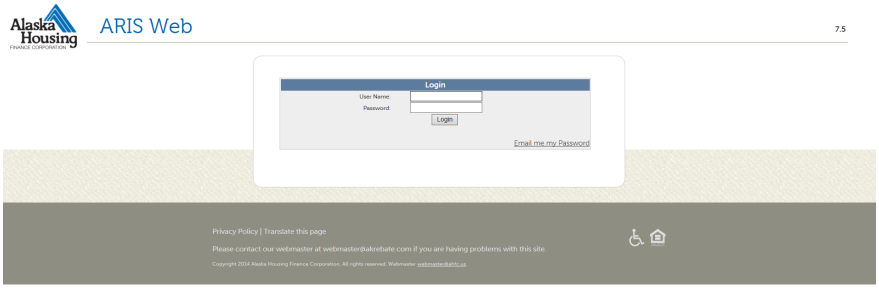
Tracking Energy Use and Costs

- How to track:
  - Energy bills: separate electric and fuel oil/gas
  - Normalize by square footage and climate
  - Sensors
- Compare, look for anomalies
- Tracking software:
  - ARIS: Allows you to compare with buildings in Alaska
- Similar to EnergyStar Portfolio Manager

27

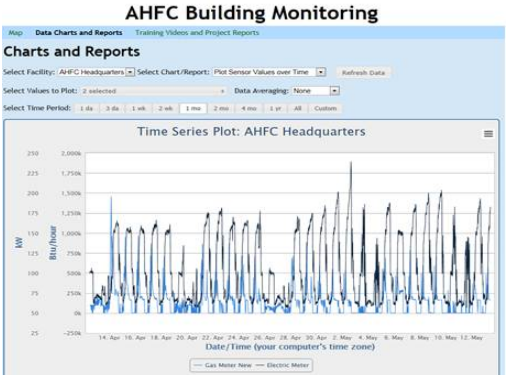
Recommendations: Investigation Practices

- **Benchmark buildings and track energy costs**
  - Compare Energy use to comparable buildings



Recommendations: Investigation Practices

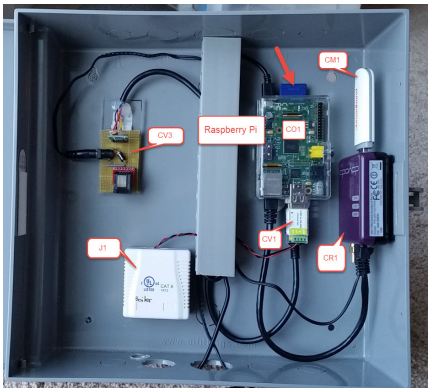
- **Benchmark buildings and track energy costs**
  - Compare Energy use to comparable buildings
  - Building Monitoring



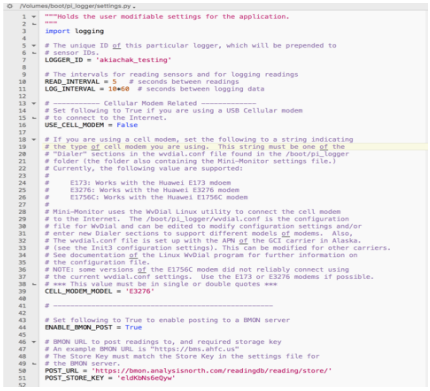
29

What Is BMON

Hardware



Software



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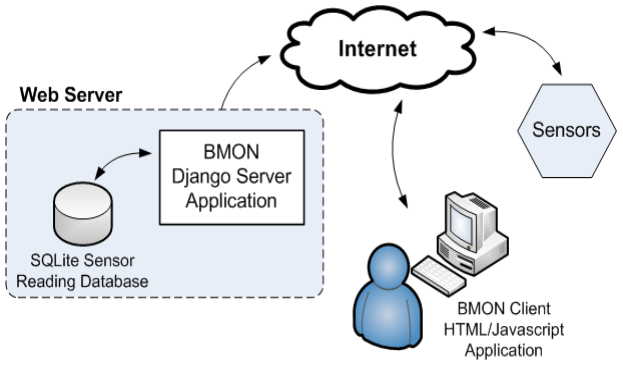
BMON Architecture



AHFC System Architecture

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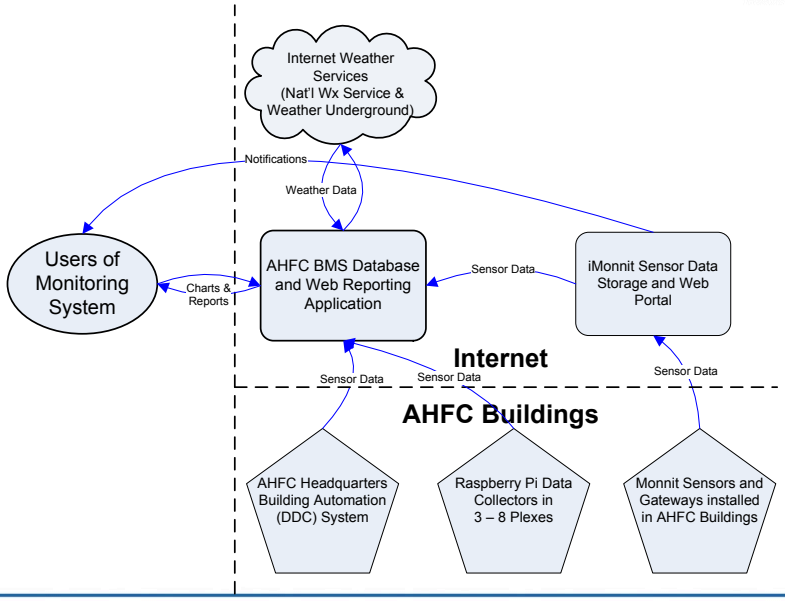


Advantages over other systems

- Non-proprietary
- Open source
- Much less expensive
- Can be modified by user to adapt to local situations
- Can be seen by multiple users

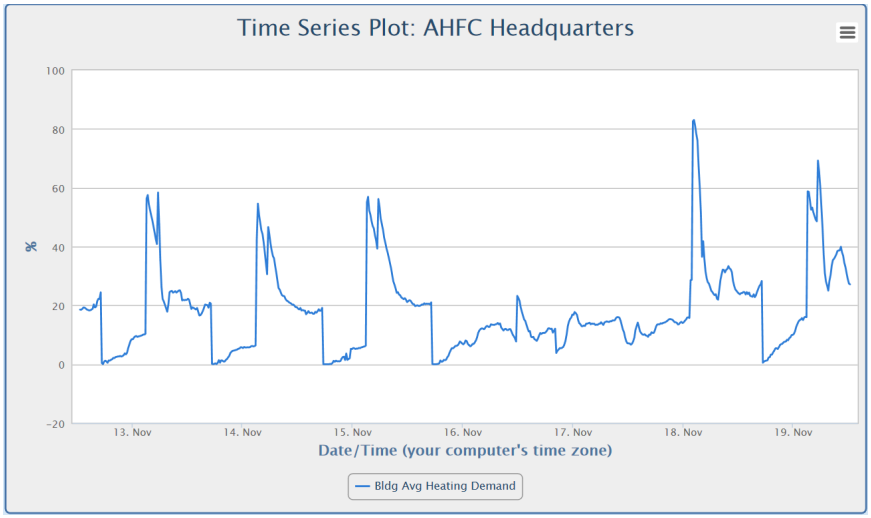
33

Features

- Real time performance data on building operations
- Analysis of energy use during occupied and unoccupied periods
- System design input (flow rates, BTU demand).
- Troubleshooting of systems
- Push notifications for system failures

34

Features-Performance Data



35

Features

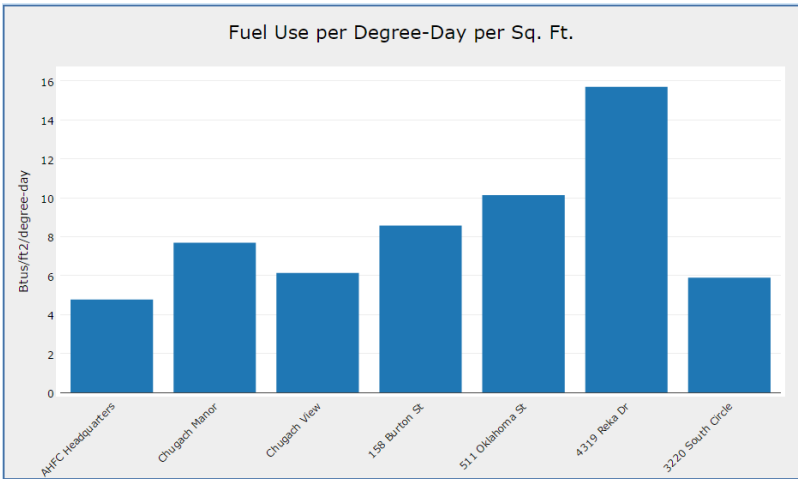
Design Benefits –

- Track actual flow rates
- Track actual BTU demand
- System sizing based on actual data *not estimates*

Electric Meter
(Chugach Manor)

36

Uses Data Analysis



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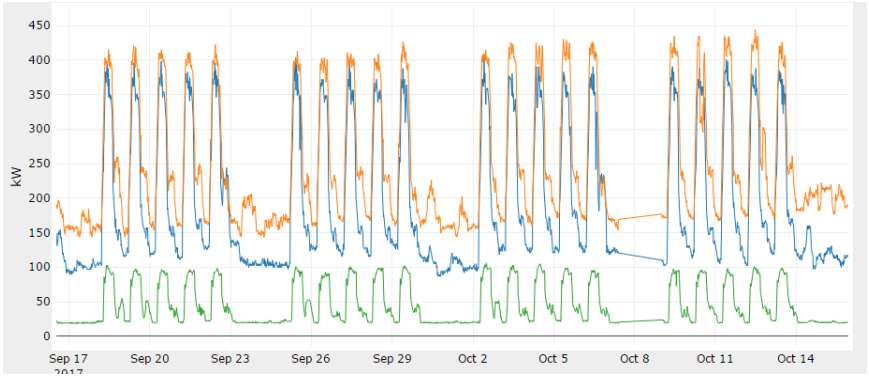

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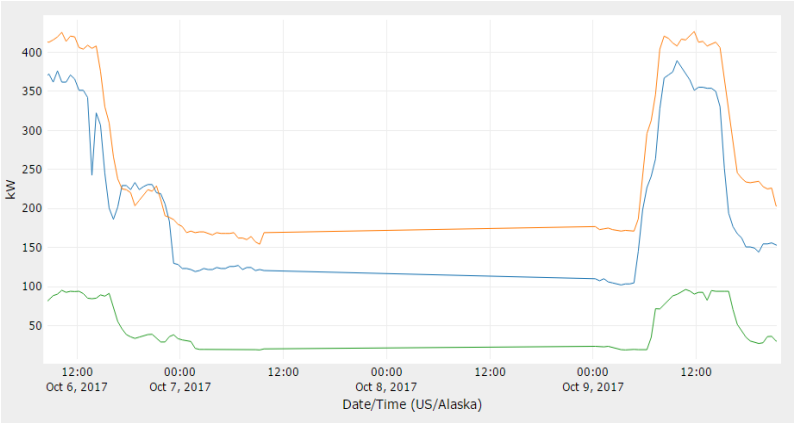

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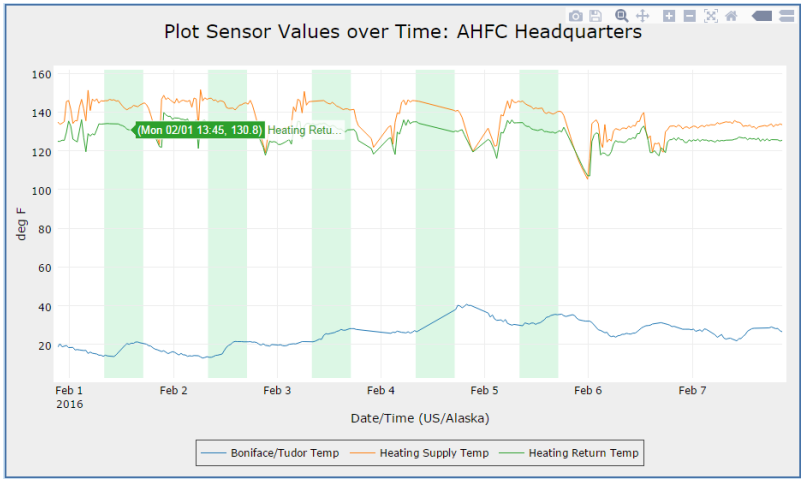

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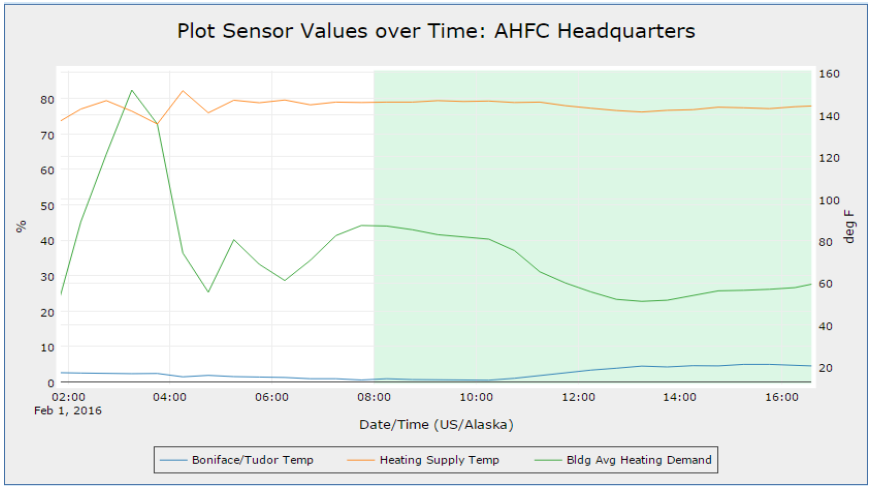
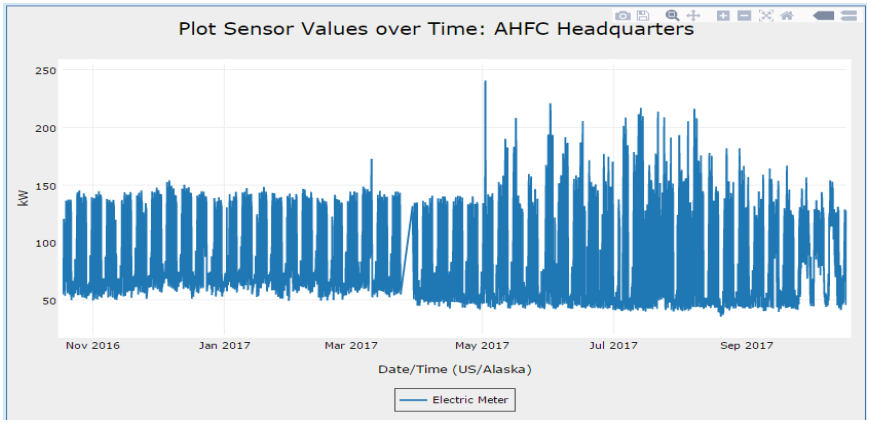


Peak Demand Management

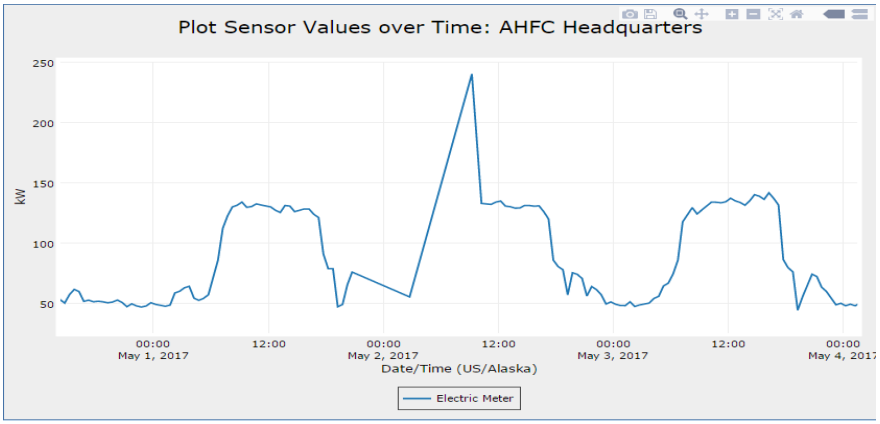


Peak Demand Management Case Study

- 2 afternoons per summer setting ratchet
- No viable co-generation options
- Decided to load shed with a lighting retrofit
- Save 43 Watts per lamp
- 518 lamps in the building saves 27 kW

43

Peak Demand Management



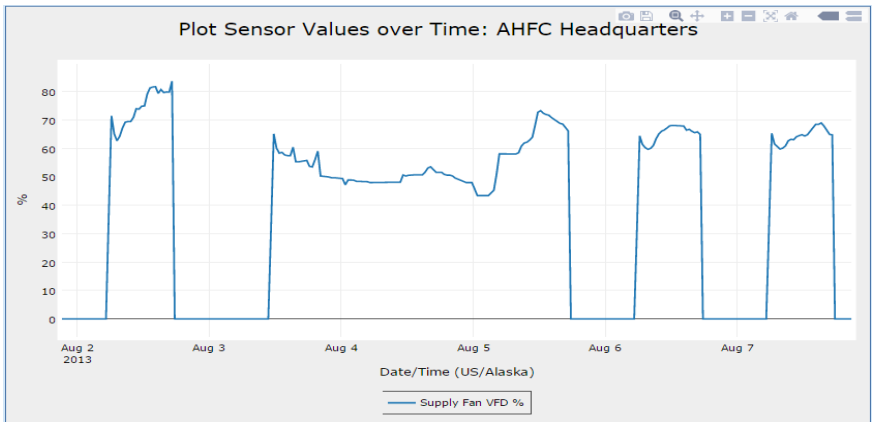
44

Peak Demand Management Case Study

- Volumetric savings of $9,180.02
- Demand savings of $6,785.84 (27kW)
- Estimated yearly savings of $15,965.86
- Hard project costs $13,500
- Simple Pay Back 10 months
- Savings to Investment Ratio 6.8 to 1

45

Automation System Case Study



46

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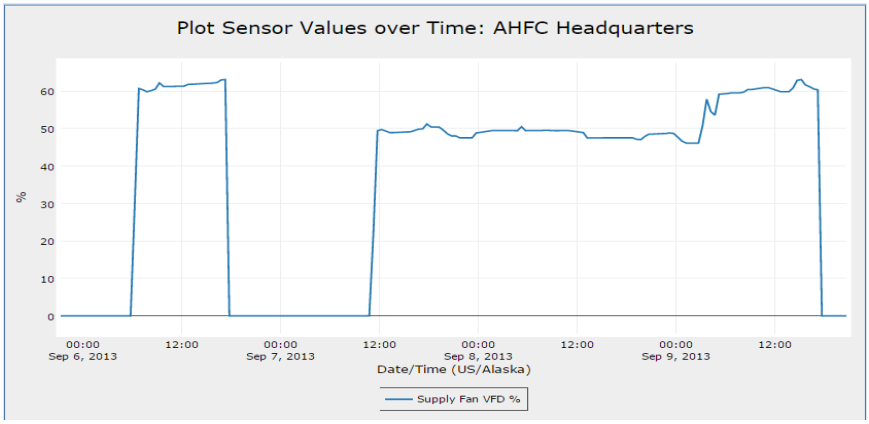

47

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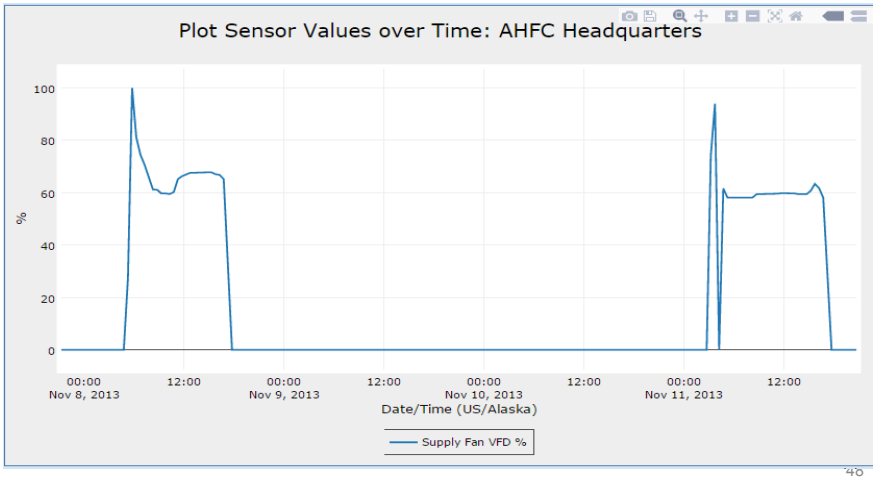


48

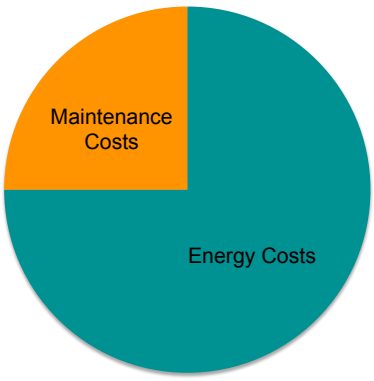
Alaska Energy Efficiency Revolving Loan Program (AEERLP)

- Open to public facilities including;
- School, City and Borough buildings
- State Agency and University of Alaska buildings
- Loans can be repaid by energy savings

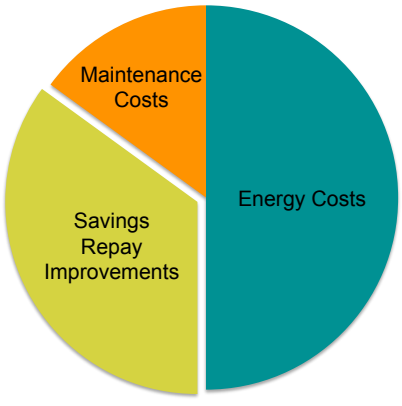
49

Finances

Before Improvements



After Improvements



50

Source: Energy Services Coalition

Impact of Priorities – Cost of Delay

Cash Flow Calculator

INPUTS & OUTPUTS

Pre-Retrofit Annual Energy Expenditure	$460,000	Cost for Improvements	$ 563,000	Loan Term (yrs.)	6
Post-Retrofit Annual Energy Expenditure	$317,000	Design/Engineering	$ 84,450	Interest Rate	2.500%
Post Retrofit Annual Energy Cost Savings	$143,000	Project Management	$ 16,890	Number of Payments per year	12
Post Retrofit Annual Energy Savings %	31%	Contingency	$ 56,300	Down Payment	$ -
Energy Cost Annual Escalation Rate	2.0%	Project Costs - Down Payment	$ 720,640	Discount Rate	8.0%
Assumed Project Life	15				

51

Impact of Priorities – Cost of Delay

INVESTMENT ANALYSIS		
Project Cost	$ 720,640	*Includes applicable incentives or down payment of $0*
Internal Rate of Return (IRR)	21%	*Assumes 2.0% annual utility cost increase*
Simple Payback	5.04	*Only applicable if using internal funds*
Cost of Delay (6 Months)	$ 84,081	*Lost incremental cash flow from waiting to implement project*
Life Cycle Savings	$ 1,739,051	*Assumes loan and immediate action, with 15 year equipment life*
Annual Savings		
With loan payment	$ 22,789	*Represents average energy cost savings - loan payments*
No loan payment	$ 168,161	*Represents increased cash flow from energy cost savings, in scenarios where no loan is taken, or where loan is paid off*

52

RESOURCES

1. Introduction and History to Green Building
2. Understanding Building Energy Use
3. The Economics of Energy Efficiency
4. Policy and Codes that Support Efficiency
5. High Performance Envelope Design
6. Climate Responsive Design in Cold Climates
7. Energy Modeling as a Design Tool
8. Building for Efficiency: The Role of Contractors & Trades
9. Energy Efficient Retrofits of Existing Buildings
10. Commissioning and Retro-commissioning

53

"You *either* pay for energy **waste**...

or for energy ***improvements***."

Coffman Engineers

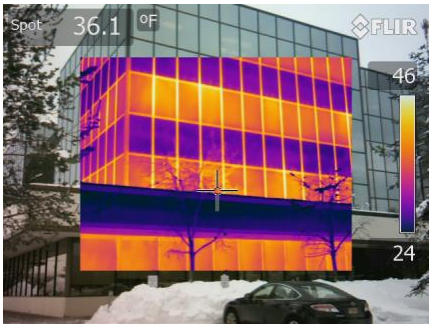
Thank You

Alaska Housing Finance Corporation
https://www.ahfc.us/efficiency/

Energy Efficiency Technical Assistance Center

eetac@ahfc.us

1-877-257-3228



55