



# Alaska Department of Transportation & Public Facilities

## STRATEGIC ENERGY MANAGEMENT WORKSHOP

DIVISION OF FACILITIES SERVICES, ENERGY PROGRAM

March 2018



# PRESENTERS

**Eric Hershey, P.E., PMP**

Dept. of Transportation & Public Facilities

Lead Project Manager, Energy Office

[Eric.Hershey@alaska.gov](mailto:Eric.Hershey@alaska.gov)

(907) 269-5572



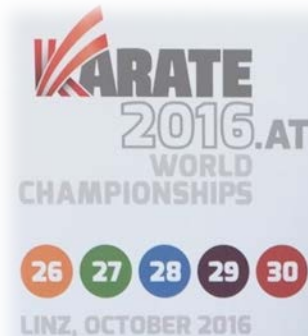
**Christopher Hodgin, P.E., CEM, CDSM**

Dept. of Transportation & Public Facilities

Program Manager, Energy Office

[Christopher.Hodgin@alaska.gov](mailto:Christopher.Hodgin@alaska.gov)

(907) 269-7484





# OVERVIEW

- DOT&PF Energy Program Overview
- The Project Puzzle
  - Scope Development
  - Life Cycle Cost Analysis
- Northern Region Case Study
- Reflection



# DOT&PF ENERGY PROGRAM

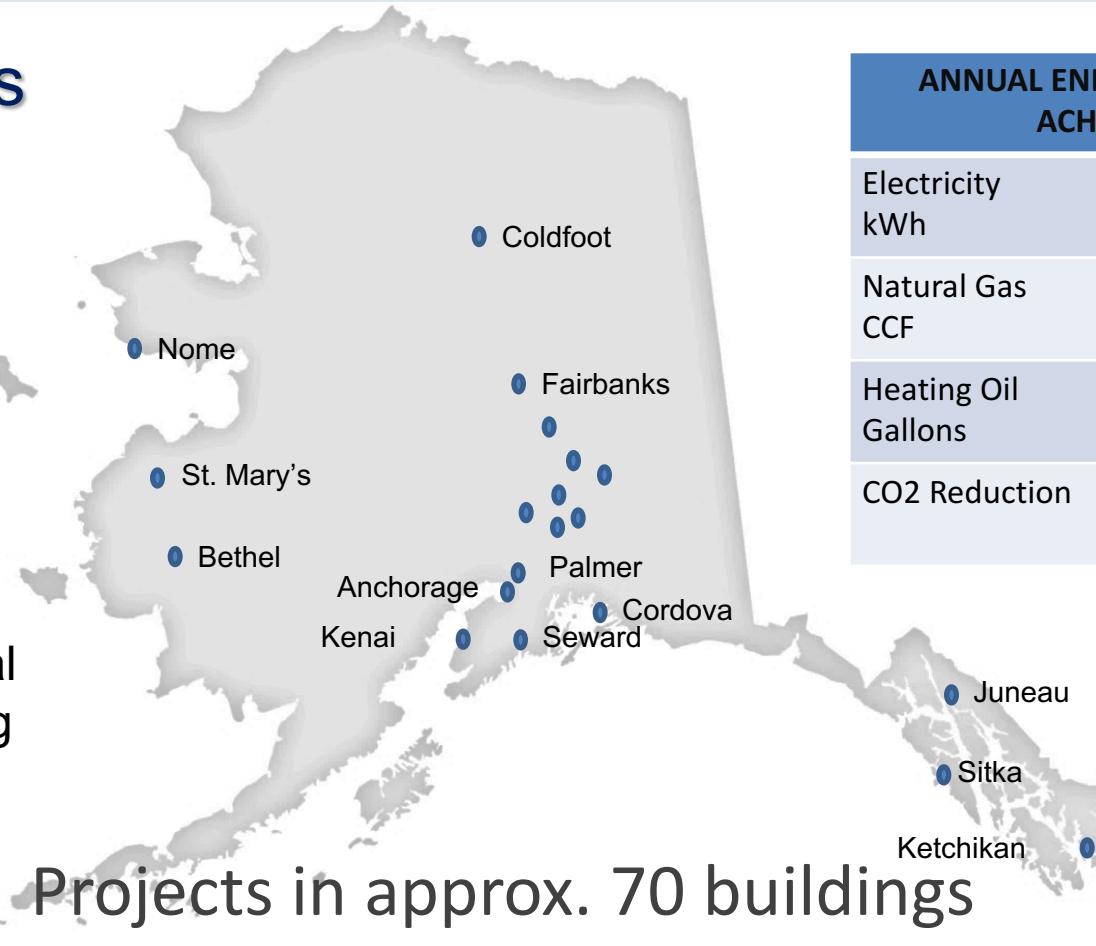
- Provide comprehensive energy efficiency project development, management and implementation services for State and public agencies.
- Manage and execute *Energy Savings Performance Projects* to serve our State Agencies.
- Collaborate with AHFC and other state energy partners to improve statewide energy efficiency.



# DOT&PF ENERGY PROGRAM

Annual savings  
greater than  
**\$3.3M**

> \$35M in projects  
through state, federal  
and financed funding



Projects in approx. 70 buildings

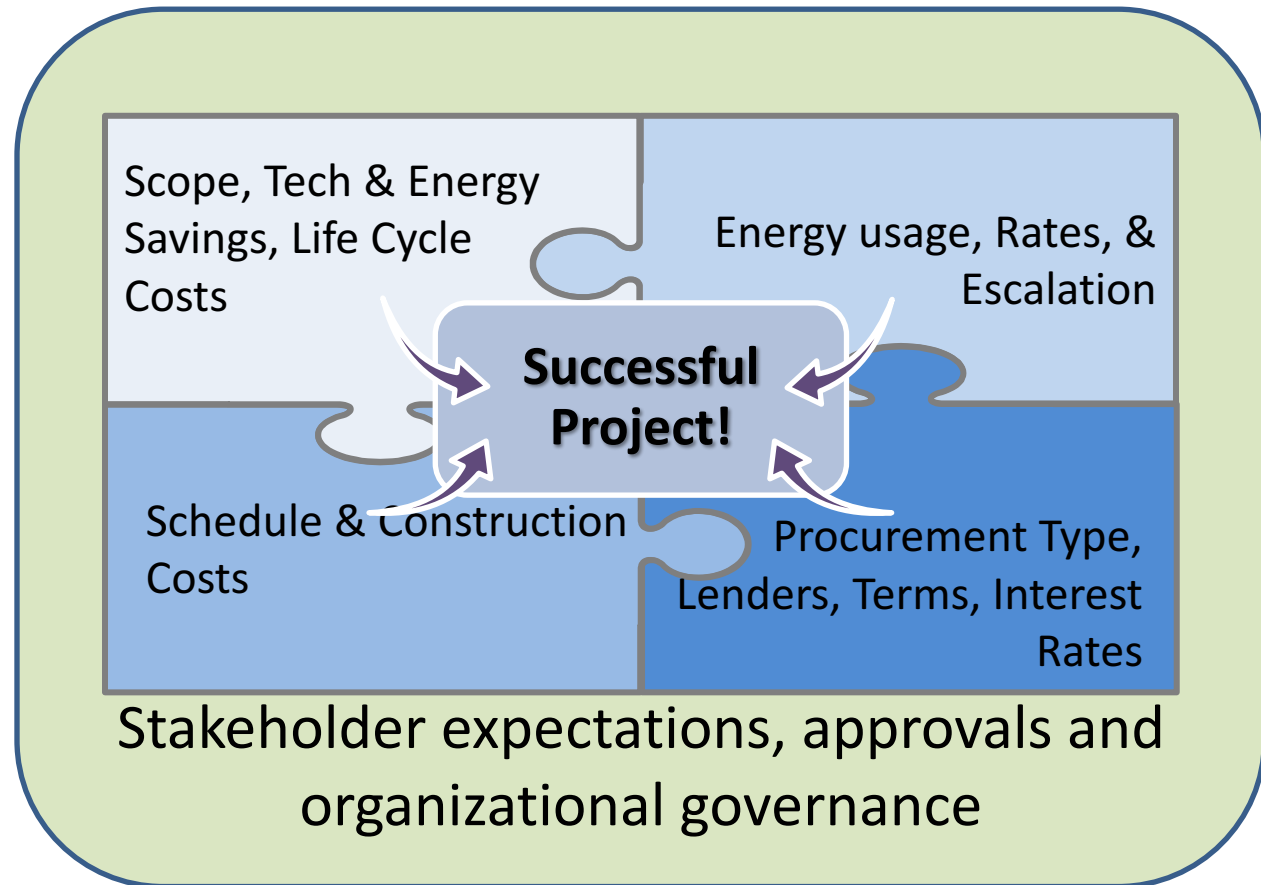
ANNUAL ENERGY SAVINGS ACHIEVED	
Electricity kWh	> 8,115,000
Natural Gas CCF	> 162,000
Heating Oil Gallons	> 261,000
CO2 Reduction	>10,000 Tons



# THE PROJECT PUZZLE

## Many pieces:

- *Energy retrofit scope, savings & technology*
- *Energy Prices, history and fluctuation*
- *Construction costs, logistics and schedules*
- *Lending options, interest rates & terms.*
- *Client expectations & governing authority*





# SCOPE

## Prioritizing

- Aging or failing equipment
- High utility consumption or costs
- Benchmarking your building to determine your Annual Energy Use Index (EUI)



Alaska Housing  
ARIS Web

Commercial REAL Form

Facility Owner: [ ]  
 Building Name/Identifier: [ ]  
 Building Usage: [ ]  
 Facility is owned by: [ ]  
 Originally Created by: [ ]  
 Last Updated by: [ ]  
 JACSA Region: [ ]  
 City: [ ]  
 Apply Filter

Owner	Building Name	City	Building Usage	Owner Type
Department of Transportation	Arctic Building	ANCHORAGE	Office	Department of Transportation
Fairbanks International Airport	State of Alaska/University Ave 5 East Ramp/ACC#0610	FAIRBANKS	Other	Department of Transportation
Fairbanks International Airport	State of Alaska/ Airport Rd/ACC#4876	FAIRBANKS	Other	Department of Transportation
Fairbanks International Airport	State of Alaska/100 Brumbaugh Rd (VEIC)/ACC#0077	FAIRBANKS	Other	Department of Transportation
Fairbanks International Airport	State of Alaska/1626 University Ave S/ACC#0807	FAIRBANKS	Other	Department of Transportation

Building Information | Energy Usage

Months #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Month End Year	11/2009	10/2009	10/2009	11/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	12/2009	
Electric Consumption (kWh)	110262	118460	120060	111900	110200	120240	118440	120680	110640	109080	114420	108060	108240	108000	108000	108000	108000	108000	108000	108000	108000	108000	108000	108000	108000
Electric Cost (\$)	2794.41	2793.31	2814.81	2660.01	2602.91	2871.81	2764	2828.12	2747	2615.86	2664.43	2648.63	2621.61	2607.11	2616.46	2616.46	2616.46	2616.46	2616.46	2616.46	2616.46	2616.46	2616.46	2616.46	2616.46
Electric Demand (kW)	3008.88	3043.12	2993.78	3116.13	2994.03	3201	3201.1	3201	3023	3023.84	3118.13	3022.37	3073.4	3002.2	3002.03	3002.03	3002.03	3002.03	3002.03	3002.03	3002.03	3002.03	3002.03	3002.03	3002.03
Water and Sewer	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Water Use (Gallons) (CCF)	101.22	100.46	113.4	109.38	104.93	109.69	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73
Water Use Cost (\$)	101.22	100.46	113.4	109.38	104.93	109.69	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73
Water Use Demand (kW)	101.22	100.46	113.4	109.38	104.93	109.69	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73	107.73

Internet | Protected Mode Off



# SCOPE

## Assessing the Project

- Conversations with maintenance staff
- ASHRAE Level 1 walk-through:
  - Analyze energy bills
  - Conduct a brief on-site survey of the building
  - Identify and provide a savings and cost analysis of low-cost/no-cost measures
  - Provide a listing of potential capital improvements that merit further consideration
  - An initial judgment of potential costs and savings.





# LIFE CYCLE COST ANALYSIS

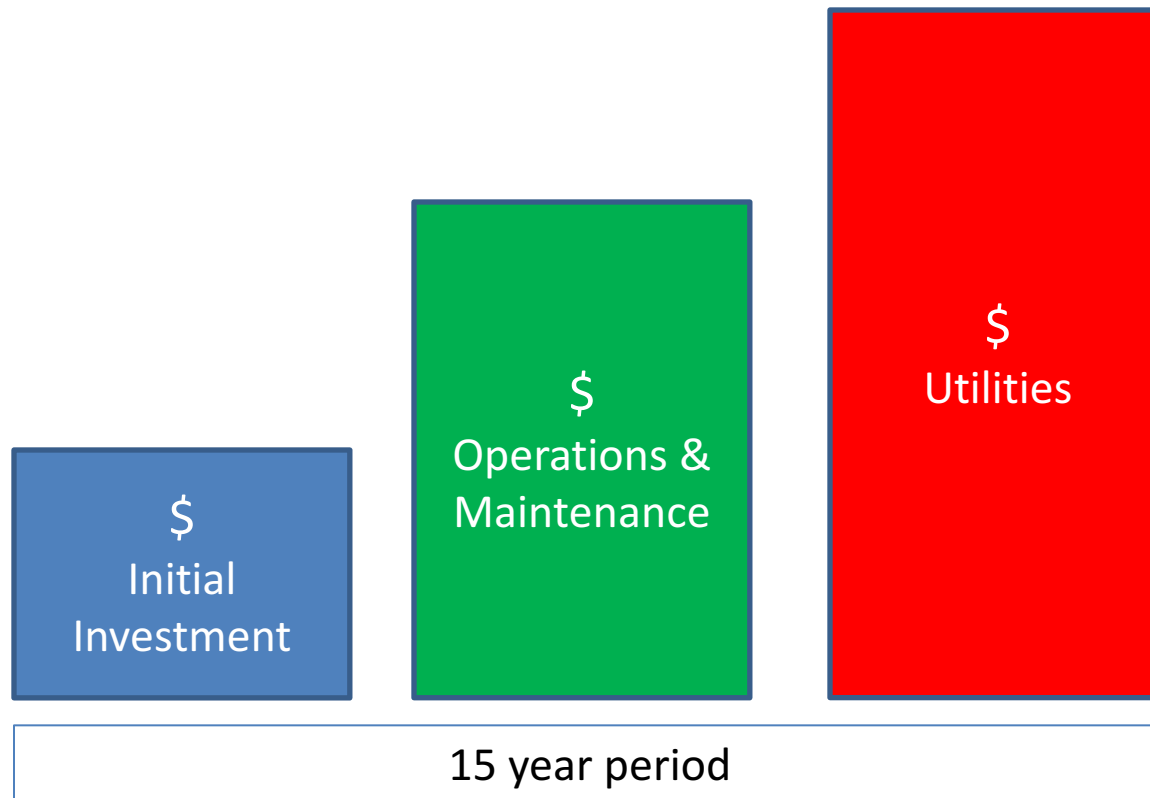
All Costs associated with installation, operation & maintenance, and replacement of equipment and systems through the lifetime of a project.

## Why Life Cycle Cost Analysis?

- Determine optimal energy efficiency levels
- Accept/ Reject project options
- Select or Design optimal systems
- Determine optimal combination of interdependent systems
- Prioritize independent projects to ensure return on investment



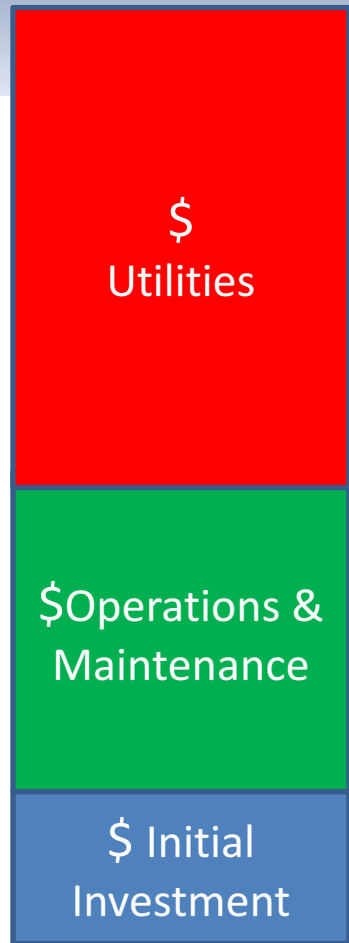
# LIFE CYCLE COST ANALYSIS





# LIFE CYCLE COST ANALYSIS





Equipment Option A



Equipment Option B

Savings

- Higher Initial Investment
- Lower Life Cycle Cost



# LIFE CYCLE COST ANALYSIS

## Other factors to consider:

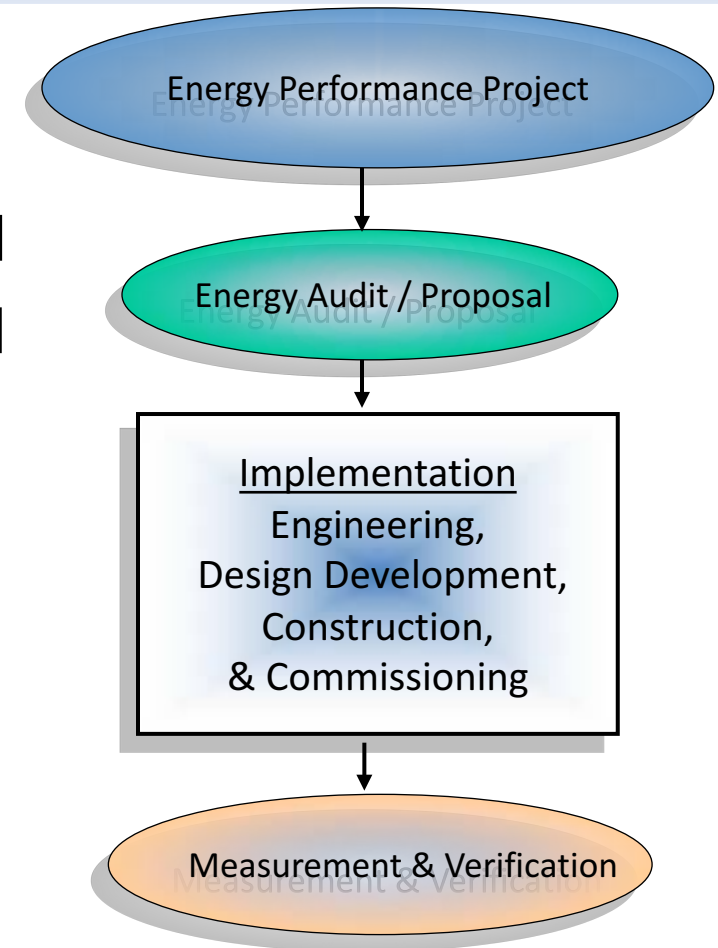
- Reliability
- Constructability
- Suitability
- Availability / Lead time
- Space constraints
- Maintenance considerations
- Parts availability





# ENERGY SAVINGS PERFORMANCE CONTRACTING

- Contractor is an Energy Services Company (ESCO)
- Multiple funding sources can be used
- Paid for from energy savings realized
- All parties cooperatively develop the scope of work
- Guaranteed Maximum Price
- ESCO assists with financing
- Guaranteed Energy Savings





# CASE STUDY

DOT&PF  
NORTHERN  
REGION  
ENERGY  
UPGRADES



DOT&PF Station  
St. Mary's, Alaska

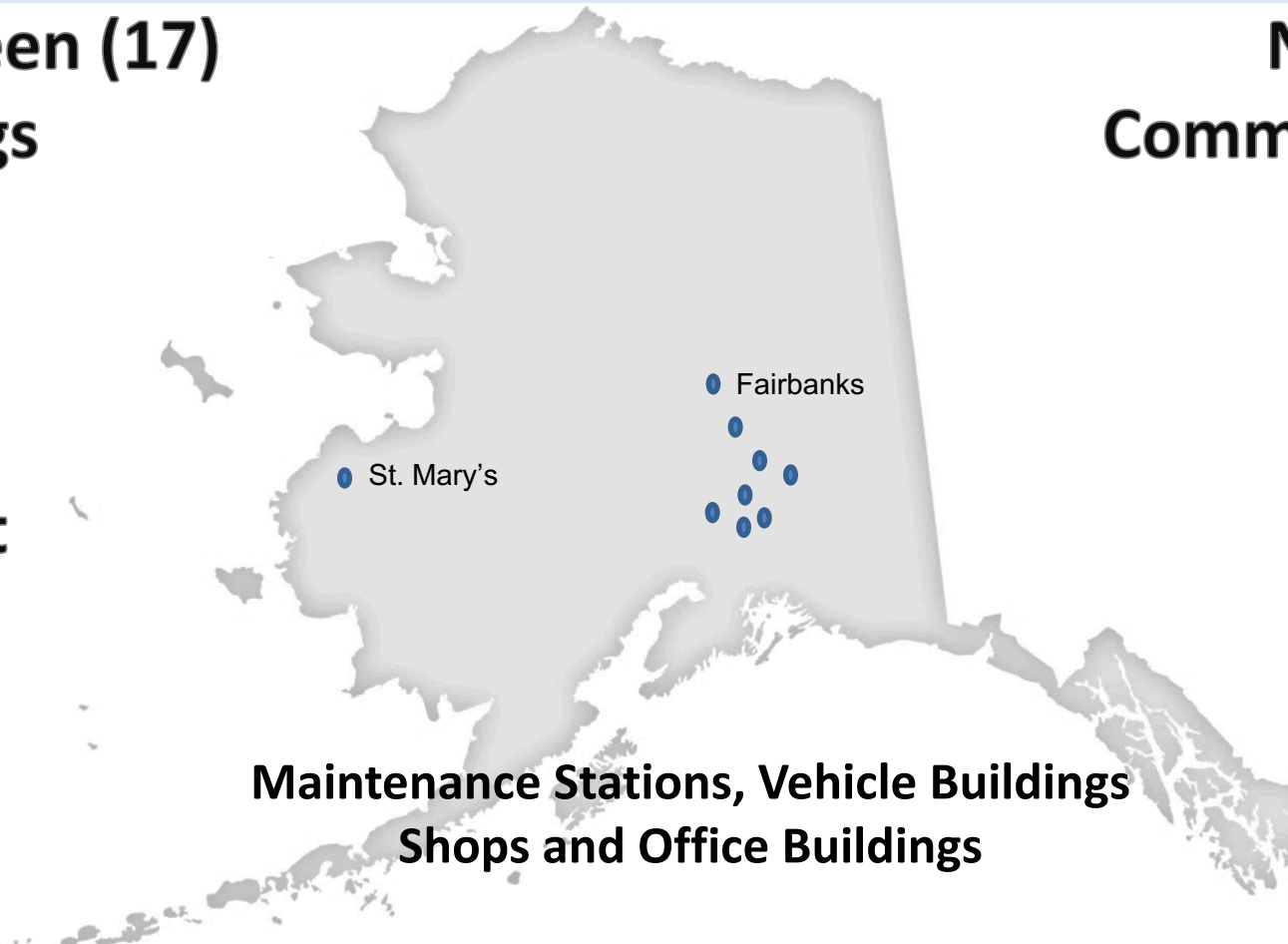


# PROJECT BOUNDARIES

**Seventeen (17)  
Buildings**

**Nine (9)  
Communities**

**\$3.5M  
Project**



- Chitina
- Ernestine
- Fairbanks
- Gulkana
- Nelchina
- Paxson
- Slana
- St. Mary's
- Tazlina





# PROJECT SYNOPSIS

- Accomplished through ***Energy Savings Performance Contracting*** partnership with ***Siemens***
- Investment Grade Energy Audit & Proposal
  - Determined annual energy spend: **\$916,000**
  - Determined potential annual savings from energy retrofits: **\$220,000 - \$290,000**
- Established maximum payback of 15 years
  - Creating framework for maximum project budget: **\$3M - \$4M**
- Financed Project – *Construction 2015 through 2016*



# INVESTMENT GRADE ENERGY AUDIT

- **Energy Efficiency Measures** developed through *Investment Grade Energy Audit & Proposal*
  - Retro-commissioning
  - Building Envelope and insulation
  - Building Controls Upgrades – simple and Direct Digital Control
  - New higher efficiency heating systems
  - Combined Heat and Power

Table 1. 2 Proposed EEM Summary

EEM #	FACILITY	EEM DESCRIPTION	ELECTRIC CONSUMPTION SAVINGS kWh	ELECTRIC DEMAND SAVINGS kW	ELECTRIC CONSUMPTION SAVINGS kWh	ELECTRIC DEMAND SAVINGS kW	FUEL OIL CONSUMPTION SAVINGS US Gallons	FUEL OIL CONSUMPTION SAVINGS \$	DOM SAVINGS \$	TOTAL ANNUAL SAVINGS \$	IMPLEMENTATION COST \$	SIMPLE PAYBACK YEARS	ROI %						
<b>ENTIRE</b>																			
1.01	All Facilities	Interior and Exterior Lighting Upgrade	326,354	\$	84,290	\$	11,781	\$	6,082	\$	17,232	\$	9,800	\$	88,126	\$	1,132,294	12.8	2%
5.01	Tadina Maintenance Building	Direct Digital Control Upgrade	76	\$	71	\$	-	3,100	\$	3,271	\$	1,400	\$	4,142	\$	108,305	22.8	4%	
5.02	All Facilities Except for Tadina	Programmable Thermostat Installation	-	\$	-	\$	-	6,100	\$	24,681	\$	-	\$	24,648	\$	52,240	3.3	30%	
6.01	Tadina Maintenance Building	Heating System Redesign and Replacement	636	\$	228	\$	-	1,720	\$	4,833	\$	6,000	\$	11,061	\$	390,139	15.3	7%	
6.02	China Shop, St. Mary's SEF, St. Mary's SEB	Replace Leaky Radiators with Automatic Heat Source	27,938	\$	12,401	128	\$	3,468	\$	11,052	\$	48,803	\$	11,186	\$	41,239	3.7	27%	
8.01	All Facilities	Weatherstripping	541	\$	81	\$	-	11,043	\$	36,014	\$	-	\$	36,495	\$	809,187	11.2	9%	
8.02	Nechma, Chaska, St. Mary's 3-Bay, Tadina	Door Seal Replacements	-	\$	-	\$	-	132	\$	384	\$	-	\$	384	\$	73,011	18.4	7%	
9.04	Guikema CHD, Farbanks Grader Warm Storage, St. Mary's SEF	Window Retention and Seal	-	\$	-	\$	-	202	\$	843	\$	-	\$	843	\$	21,189	25.1	4%	
9.06	Farbanks Warm Storage, St. Mary's SEF	Overhead Door Removal and Seal	-	\$	-	\$	-	182	\$	825	\$	-	\$	825	\$	26,846	31.4	3%	
9.07	St. Mary's SEF, 3-Bay & SEB	Increase Building Insulation	-	\$	-	\$	-	2,383	\$	11,907	\$	-	\$	11,907	\$	204,869	12.8	8%	
11.01	Gravelton, Guikema New, Farbanks 153, Farbanks Large Vehicle Warm Storage, Santa	Pipe Insulation	-	\$	-	\$	-	1,058	\$	3,164	\$	-	\$	3,164	\$	32,000	10.1	10%	
11.02	Nechma, Farbanks SEF, Farbanks Warm Storage	Exhaust Fan Trim Motor Service	389	\$	72	\$	-	271	\$	1,119	\$	-	\$	1,191	\$	3,213	2.2	27%	
11.03	Tadina Maintenance Building	Engine Room Weather Stripping	7,142	\$	1,845	\$	-	-	\$	1,845	\$	-	\$	1,845	\$	12,153	6.6	17%	
11.04	St. Mary's 3-Bay	New Fuel Oil Day Tank	-	\$	-	\$	-	-	\$	5,000	\$	-	\$	5,000	\$	90,000	18.5	6%	
11.05	Parson	Combined Heat & Power Generation	-	\$	-	\$	-	3,885	\$	11,539	\$	18,140	\$	30,679	\$	684,330	18.0	6%	
11.06	Farbanks SEF Building	HR Compressors	16,797	\$	1,112	\$	-	730	\$	2,206	\$	-	\$	3,118	\$	54,020	15.4	7%	
11.08	Farbanks SEF Building	New Desiccant/Dryer Fans	41,833	\$	2,710	\$	-	876	\$	2,260	\$	-	\$	1,980	\$	15,168	7.8	17%	
	Audit Cost															29,546			
	Commissioning /M&V Set Up															70,821			
	SO2 SOX Fee															1,000			
	Warranty															18,820			
																114,100			

## Annual Energy Savings:

Heating  
Electricity

> 23,300 Gal Fuel Oil  
> 357,000 kWh

> \$220,000



# FUNDING & FINANCING

- Solicited financing offers from acceptable lenders for lease purchase agreement:
  - Requested term 15 years
- Offers reviewed and negotiated by project members, Agency Leadership and Department of Law.
- Submitted project and financing details to OMB for *OMB & Department of Revenue* approval.



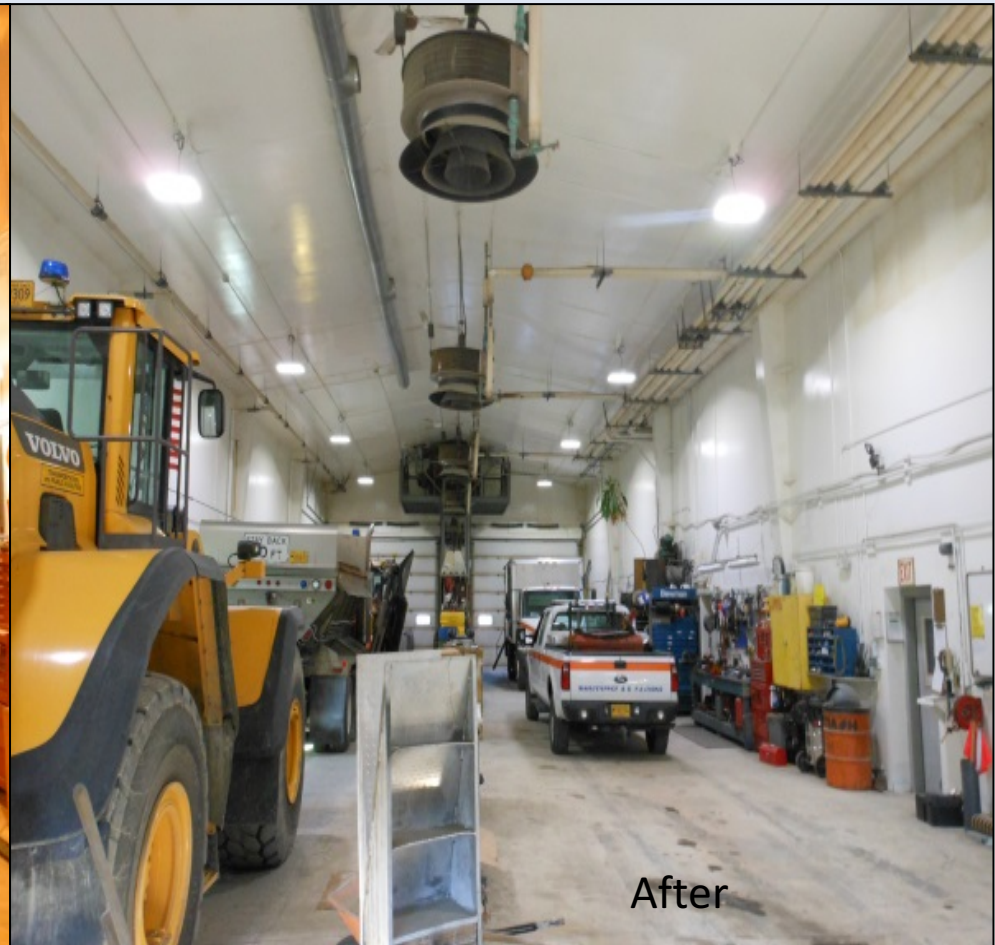




# IMPLEMENTATION



Before



After



# IMPLEMENTATION

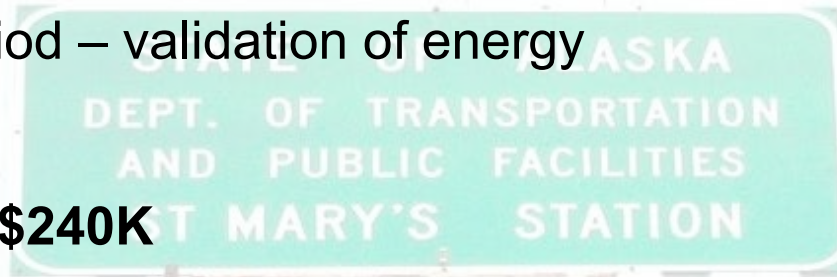




# MEASUREMENT & VERIFICATION

- **Measurement & Verification (M&V)**

- 3 Years period – validation of energy savings
- Year 1 > **\$240K**
- Siemens will visit sites again for two years



	Electric Energy Savings (kWh/yr)	Electric Demand Savings (kW/yr)	#2 Fuel Oil Savings (Gall/yr)
Energy Savings			
Guaranteed	351,806	1,163	23,380
Year-1	357,001	1,171	25,225

Annual Period	Measured & Verified Savings (\$)	Stipulated Savings (\$)	Total Realized Energy Savings (\$)	Operational Savings (\$)	Total Realized Savings (\$)	Guaranteed Savings (\$)	Excess/ Shortfall in Savings (\$)
Construction				\$0	\$123,054	\$72,330	\$50,724
1	\$167,900	\$31,186	\$199,086	\$41,708	\$240,794	\$229,248	\$11,546



# THE FUTURE

*More projects in progress now and in development*

***Continuing forward – Essential for:***  
**LEADERSHIP, VISION and WILL**

- To share that
  - Financial, Operating and Environmental Benefits
  - *Doing Nothing.... is not an option.*
  - Delays cost money and degrade an agencies abilities







# REFLECTION





# THANK YOU FOR THIS OPPORTUNITY

Eric Hershey, P.E., PMP

Dept. of Transportation & Public Facilities

Lead Project Manager, Energy Office

[Eric.Hershey@alaska.gov](mailto:Eric.Hershey@alaska.gov)

(907) 269-5572

Christopher Hodgin, P.E., C.E.M.

Dept. of Transportation & Public Facilities

Program Manager, Energy Office

[Christopher.Hodgin@alaska.gov](mailto:Christopher.Hodgin@alaska.gov)

(907) 269-7484

***For Further  
Information***