Energy Management Strategies for MURB & Commercial Buildings

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Utilizing an ASHRAE LEVEL 2 Energy Audit

- An Energy Audits executive summary will give you the financials to understand the benefits and approximate costs of the project you are interested in implementing
- You will be able to rank projects based on payback, savings, cost or a hybrid of both

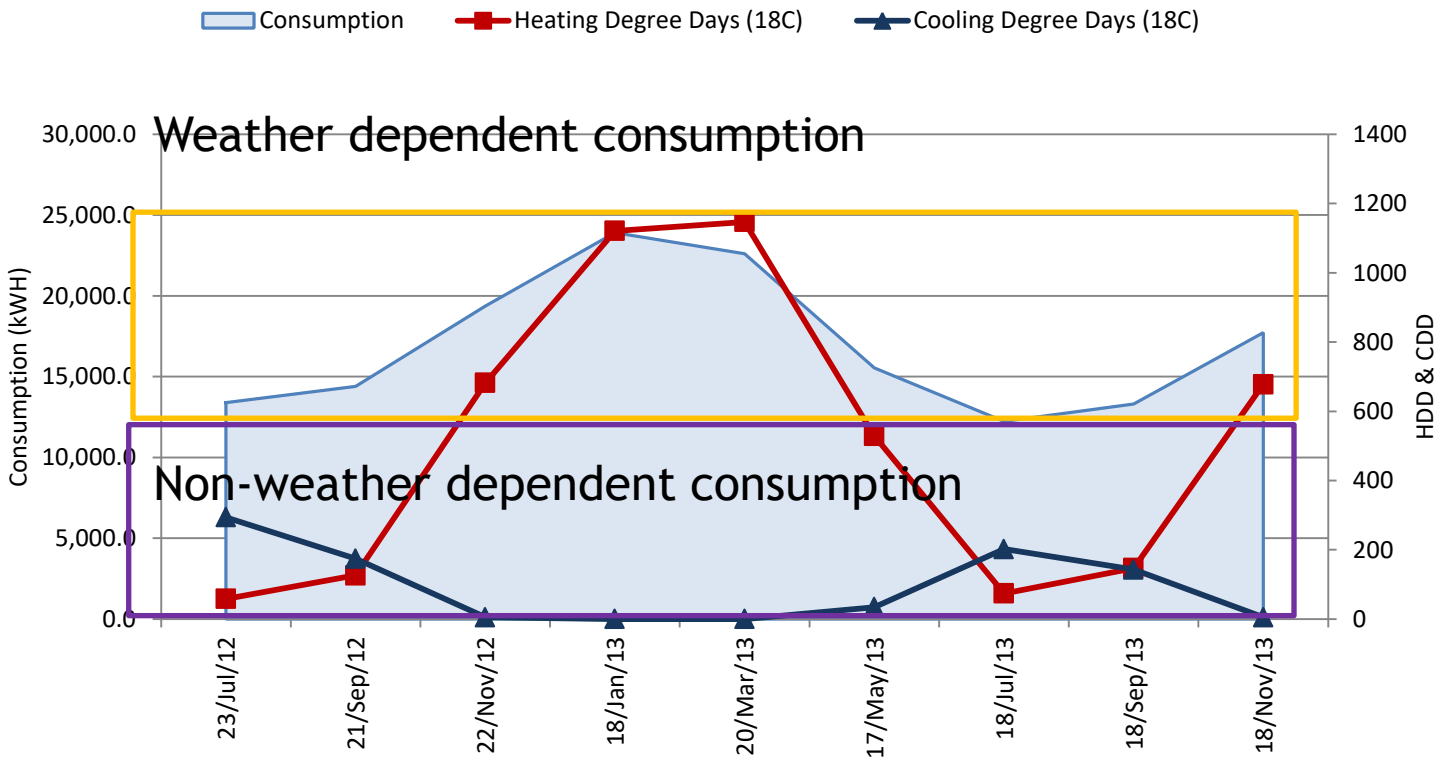
Project	Electrical Savings* ($/Year)	Electrical Savings (kWh/Year)	Electrical Savings (kW)	Gas Savings (m^3/Year)	Gas Savings* ($/Year)	Potential Savings (%/$)	Estimated Cost ($)	Estimated Grant Incentive* ($)	Estimated Cost w/Grant ($)	Estimated Payback (YRS)
4.2.7 Occupancy Thermostats	$18,430	153,580	N/A	N/A	N/A	10.00%	$50,000	$15,380	$34,620	1.87
4.2.8 PTAC Replacement	$12,141.00	121,008	N/A	N/A	N/A	N/A	$148,704.00	$920.82	$139,419.00	11.48
4.2.9 BAS	$5,000.55	41,671.22	N/A	57,457.80	$27,990.87	10% gas 5% electricity	$50,000.00	$5,000.55	$44,999.45	1.61
4.2.11 Mechanical room heater set back	$567.00	4,725.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Immediate
4.2.13RTU upgrade 4.5 ton (8.2EER)	$604.03	5,033.57	3.5	N/A	N/A	45.31%	6,750	$2,240	$4,510.00	7.47
4.2.14 LTC DHW boiler replacement	N/A	N/A	N/A	18,552.34	$7,408.93	17%	$81,360	$1,852.23	$79,507.77	10.73
4.2.14 LTC Hydronic boiler replacement	N/A	N/A	N/A	9,740.31	$3,896.12	6%	$84,420.00	$974.03	$83,445.97	21.41
4.2.14 Replacement of glycol boiler	N/A	N/A	N/A	3,235.22	$1,294.00	14%	$30,780.00	$323.52	$30,456.48	23.53
4.2.15 Heat recovery for MAUs	$23,106.01	192,550.11	N/A	108,126.22	$43,250.49	(e) 5% (g) 14.7%	1,100,000.00	TBD	1,100,000.00	16.33
5.1.1 Exhaust fan timer 15 HP	$3,528.88	29,407.32	N/A	N/A	N/A	15%	600.00	N/A	600.00	1.27
5.1.1 Exhaust fan timer 2 HP	$2,352.59	19,604.88	N/A	N/A	N/A	15%	3,000.00	N/A	3,000.00	0.17
5.1.2 MAU 15 HP VFD	$7,057.76	58,814.64	N/A	N/A	N/A	30%	$5,000.00	$1,610.00	$3,390.00	0.48
5.1.2 MAU 7.5 HP VFD	$7,057.76	58,814.64	N/A	N/A	N/A	30%	$7,200.00	$1,600.00	$5,600.00	0.79
5.1.2 MAU 5 HP VFD	1,176.30	9,802.44	N/A	N/A	N/A	30%	$1,300.00	$265.00	$1,035.00	0.88
5.1.3 Elevator upgrade 30HP	$11,049.31	92,077.59	N/A	N/A	N/A	TBD				
6.1 High efficiency bathroom faucets (Approx. - 500)	N/A	N/A	N/A	7,381.76	$23,215.76	77.11%	$79,946.00	N/A	$79,946.00	3.44
6.2 Converting kitchen faucets (Approx. - 210)	N/A	N/A	N/A	2,467.4	$7,761.01	31.33%	$33,600	N/A	$33,600	4.32
6.4 High efficiency toilets	N/A	N/A	N/A	383.25	$1,205.48	53.85%	$1,080.00	N/A	$1,080.00	0.90
6.5 Water cooled condenser upgrade (x3)	$-4,541.18	-37,843.20	-7.20	2,522.88	$8,577.79	100.00% (w)	$18,000.00	N/A	$18,000.00	4.45
6.6 Low flow shower heads	N/A	N/A	N/A	862.31	$2,712.34	50%	$1,200.00	N/A	$1,200.00	0.44
7.1 Lighting Upgrades	$21,528.00	215,276.10	42.6	N/A	N/A	32.41%	$102,367.81	$17,041.60	$85,326.21	3.96
7.2 Occupancy Sensors	$3,595.10	35,845.92	4.76	N/A	N/A	54.47%	$17,080.00	$1,905.60	$15,174.40	4.22

Utilizing an ASHRAE LEVEL 2 Energy Audit

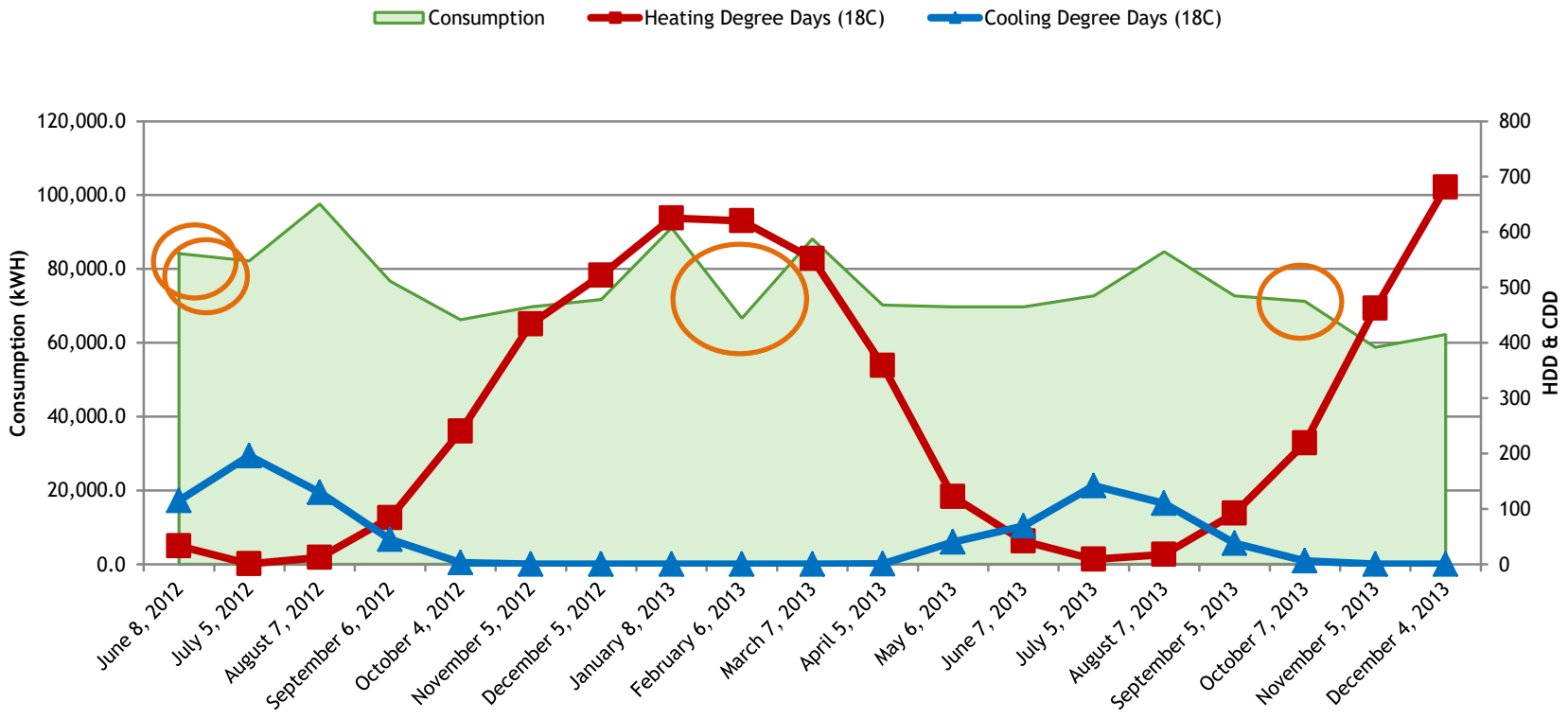
- Understanding all elements of the project financially

Project	Electrical Savings* ($/Year)	Electrical Savings (kWh/Year)	Electrical Savings (kW)	Gas Savings* (m^3/Year)	Gas Savings ($/Year)	Potential Savings (%/$)	Estimated Cost ($)	Estimated Grant Incentive ($)	Estimated Cost w/Grant ($)	Estimated Payback (YRS)
4.2.1 BAS	$1,787.48	14,895.63	N/A	6,220.60	$2,488.24	15% (e) 20% (g)	$27,000.00	$2,111.62	$24,888.38	5.82

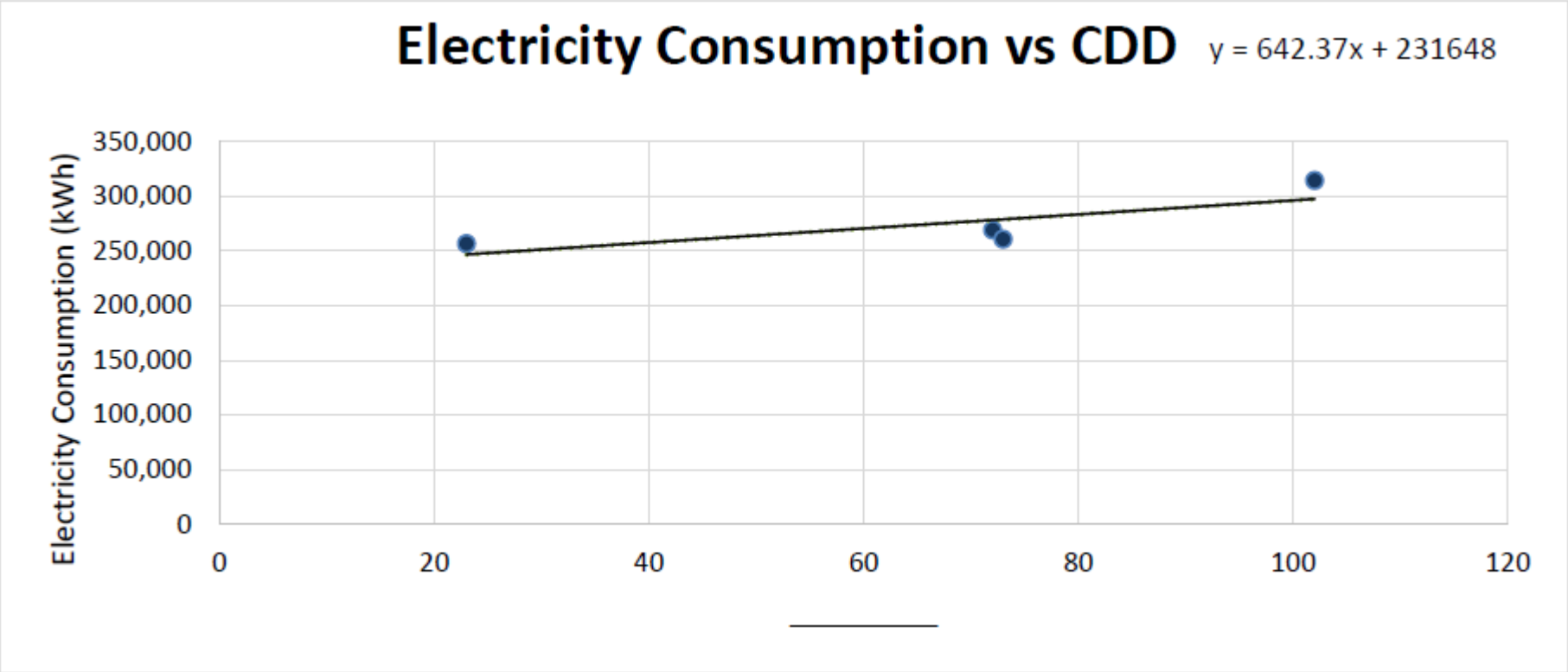
Energy Audit – Analyzing Utility Consumption Data



Energy Audit – Analyzing Utility Consumption Data



Energy Audit – Analyzing Utility Consumption Data – Regression Analysis



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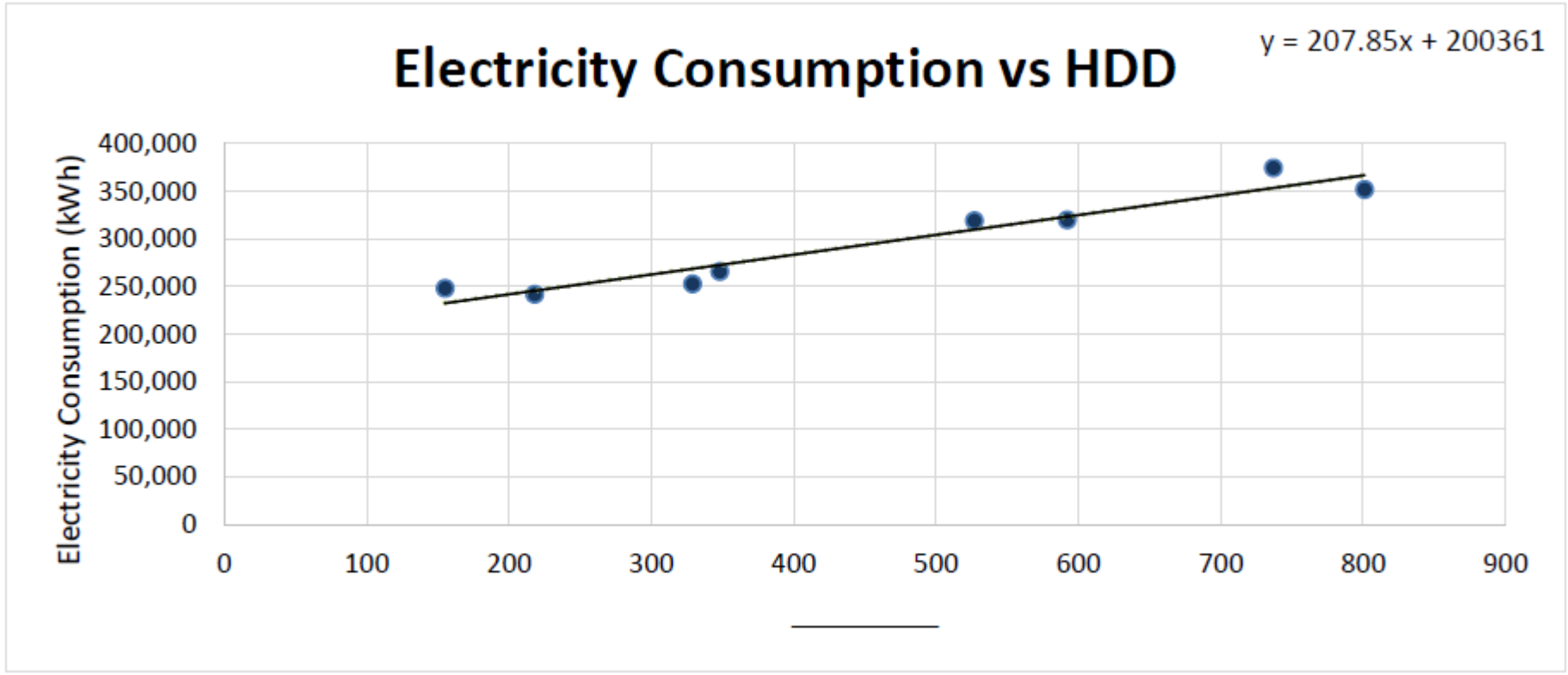

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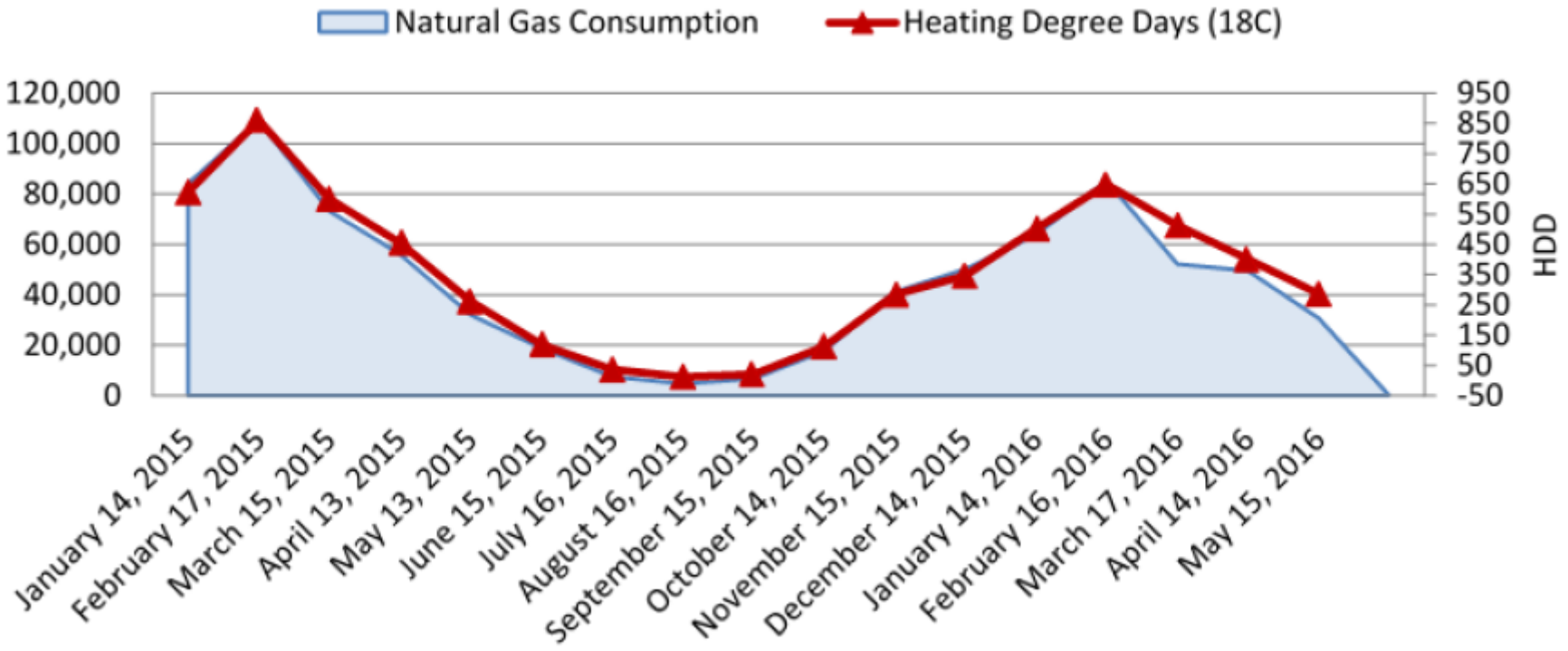

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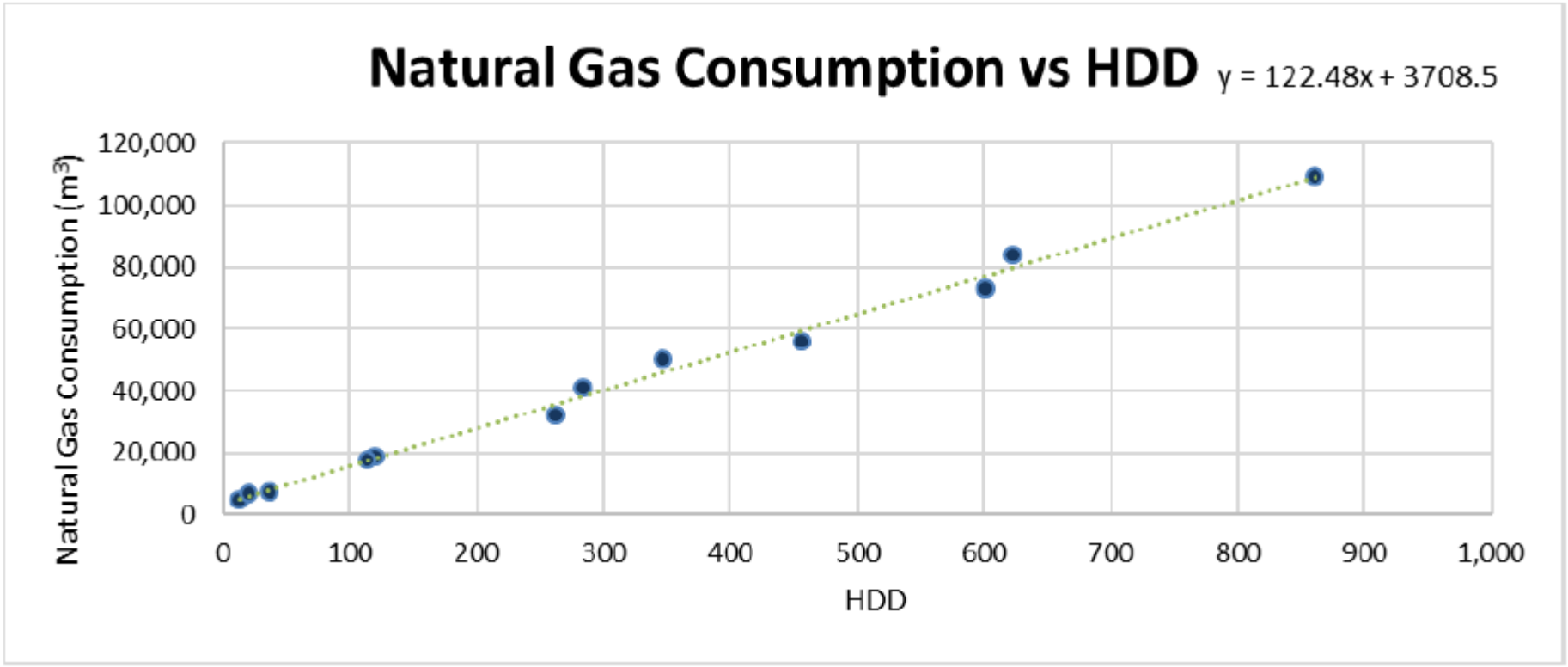

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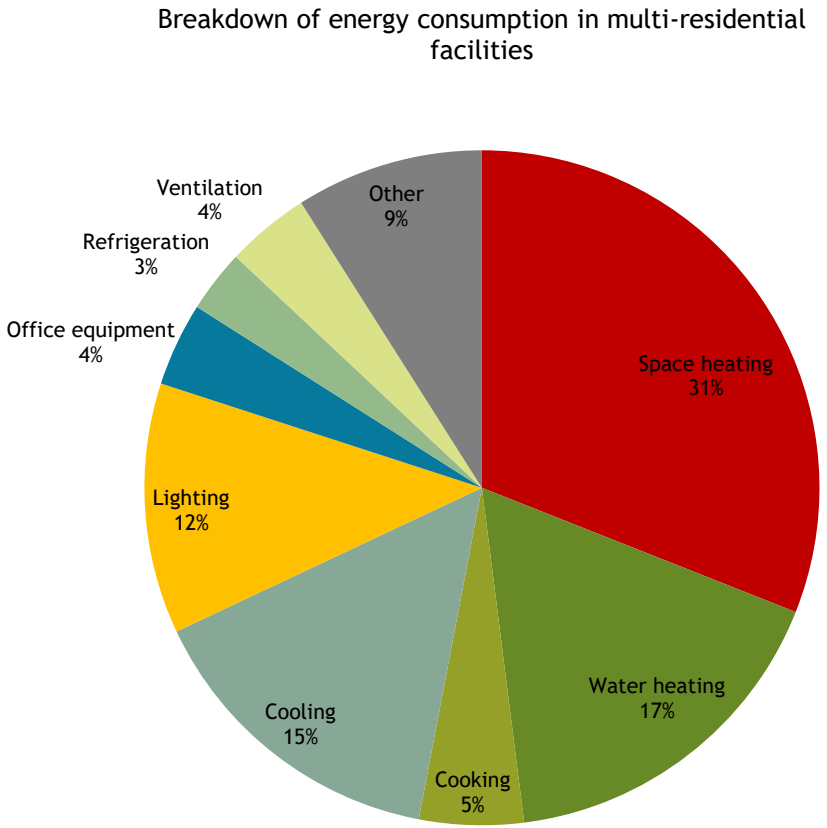


Figure 2.2b) Breakdown of energy consumption in multi-residential facilities

- What are the primary consumers of energy within your building ?
- What area's do you currently have control over via (Timers /Building Automation / Programmable Thermostats / Chiller Plant Controls
- What current energy initiatives or strategies are implemented within your facility

Creating Your 5 Year Energy Plan

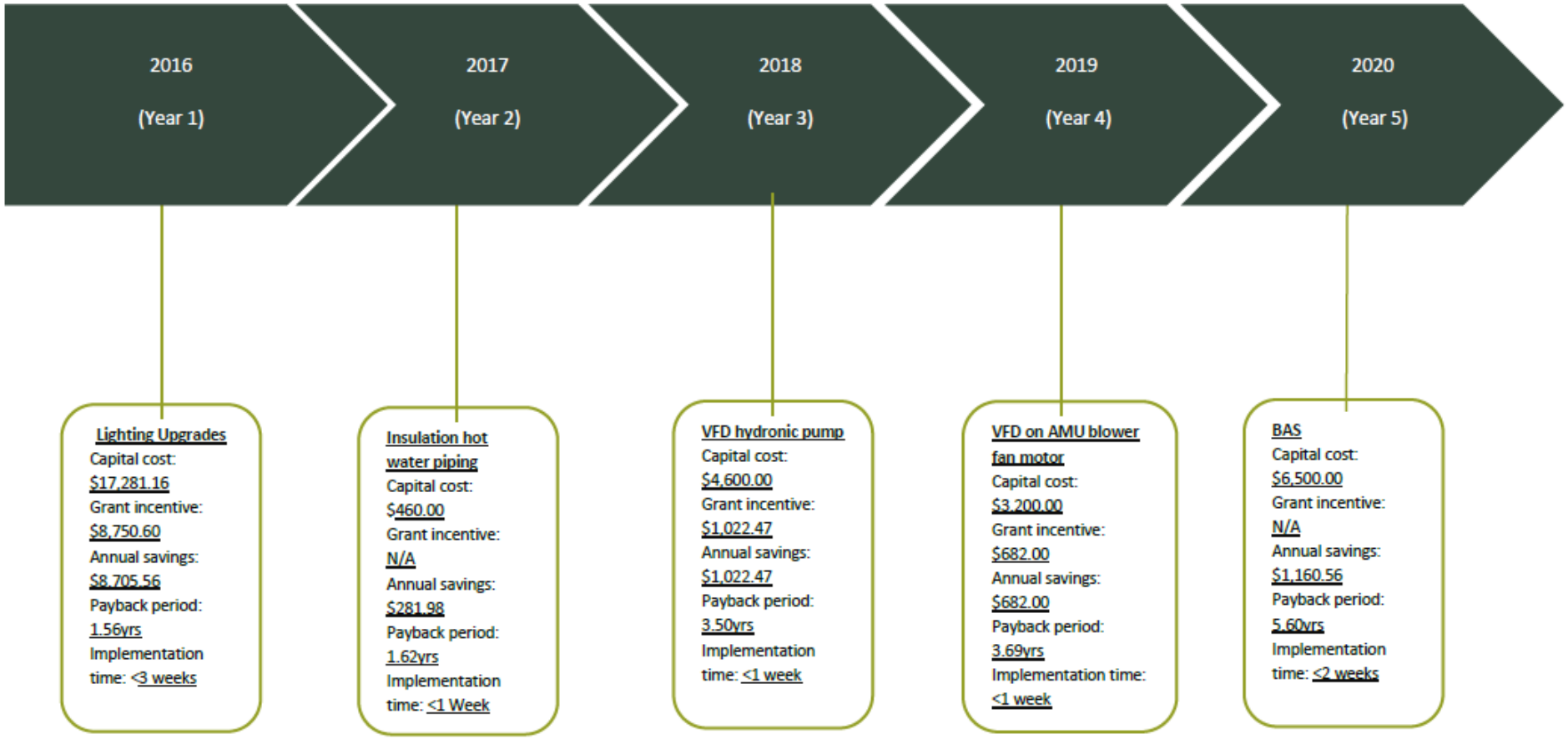
1. First select the energy projects that you would like to include in your 5 Year Energy Plan

Project	Electrical Savings ($/Year)	Electrical Savings (kWh/Year)	Electrical Savings (kW)	Gas Savings (m^3/YR)	Gas Savings ($/Year)	Potential Savings (%)	Estimated Cost ($)	Estimated Grant Incentive ($)	Estimated Cost w/Grant ($)	Estimated Payback (YRS)
Project 1. Lighting upgrades	$5,574.14	55,741.40	21.44	N/A	N/A	88.10%	$17,281.16	$8,575.60	$8,705.56	1.56
Project 2. Insulation of hot water piping	N/A	N/A	N/A	859.70	$281.98	90.90%	$460.00	N/A	$460.00	1.62
Project 3. VFD implementation on hydronic distribution pump	$1,022.47	10,222.47	N/A	N/A	N/A	48.80%	$4,600.00	$1,022.47	$3,577.75	3.50
Project 4. VFD implementation on AMU blower fan motor	$682.00	6,820.00	N/A	N/A	N/A	70.20%	$3,200.00	$682.00	$2,518.00	3.69
Project 5. Building automation system	$799.06	7,990.62	N/A	1,102.12	$361.50	8.20% (e) 5.60% (g)	$6,500.00	N/A	$6,500.00	5.60

Creating Your 5 Year Energy Plan

1. Plot your projects out in order of implementation and select real dates to solidify commitment

2.1 Plan for project implementation



Creating Your 5 Year Energy Plan

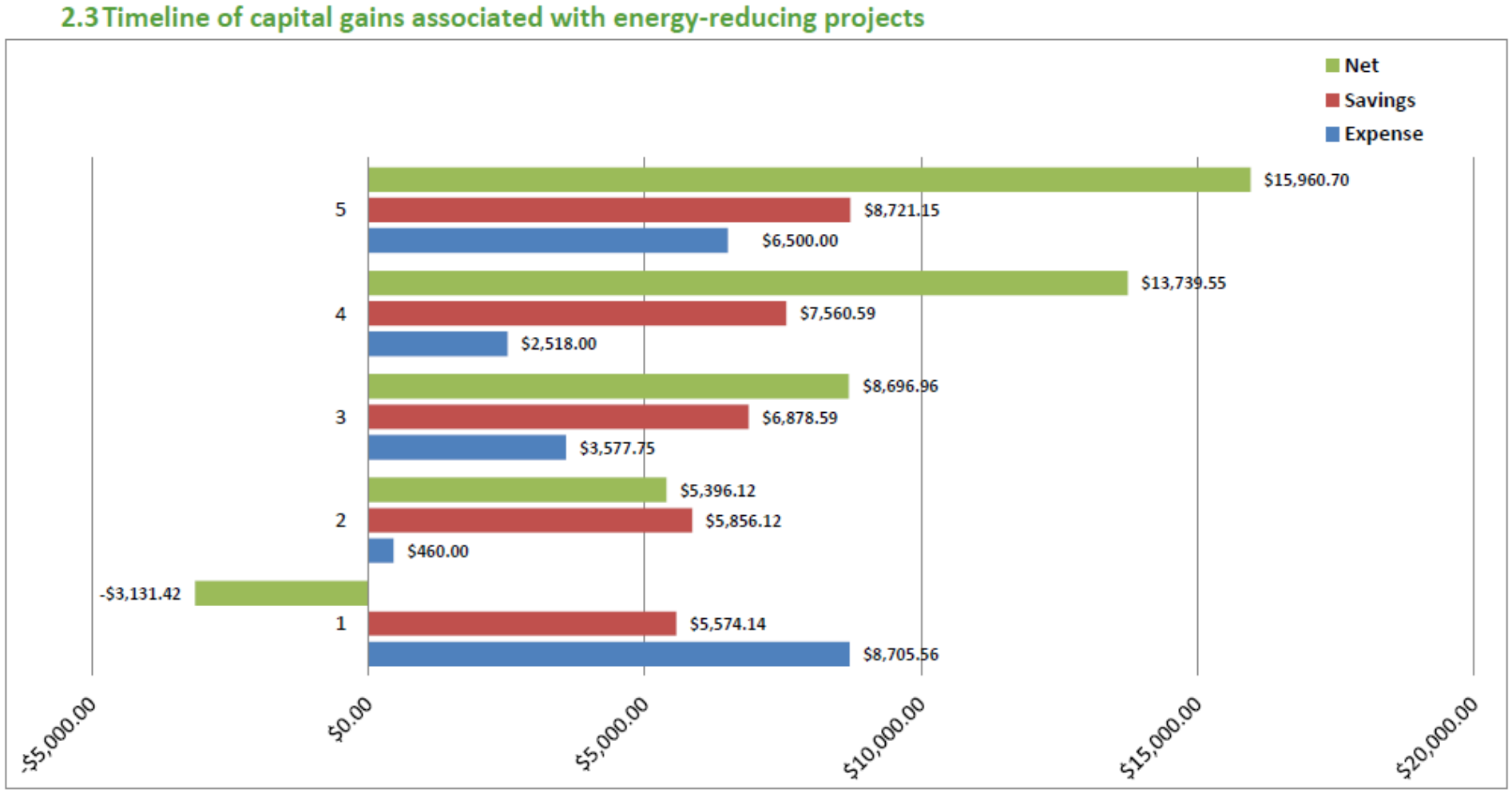
1. Financially Plotting your projects and cash flows

2.2 Timeline of annual expenditure and savings for energy-reducing projects

Figure 2.2a) Timeline of annual expenditure and savings over a span of 10 years

Creating Your 5 Year Energy Plan

1. Financially Plotting your projects and cash flows

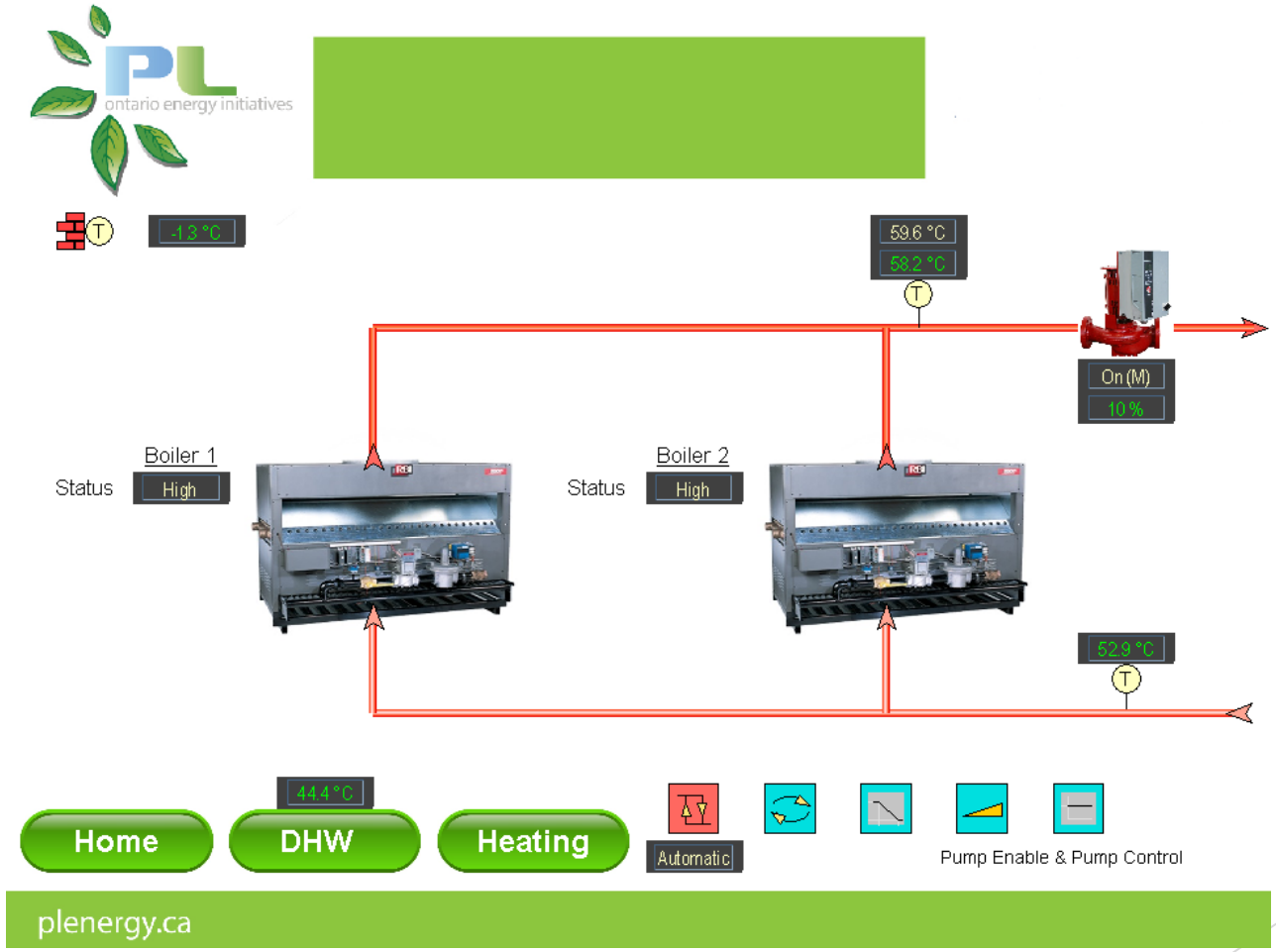


Utilizing Building Automation for Energy Savings

System	BAS Controls
Cooling Tower	Automatic control over desired loop temperature based on measured OAT and space temperatures. Automatic lock out based on OAT and time of day. Automatic set back based on time of day
MAU	Automatic control over desired supply air temperature based on measured OAT time of day. Automatic control over unit operations based on time of day and OAT
Boilers	Automatic control over desired loop temperature based on measured OAT and space temperatures. Automatic lock out based on OAT and time of day. Automatic set back based on time of day
Loop Pumps	Automatic control over lead –lag configuration. Supervisory control

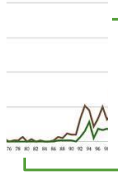
Utilizing Building Automation for Energy Savings

Utilizing Building Automation for Energy Savings



HVAC RTU REPLACEMENTS

- This project included the replacement of (4) 20 Ton Rooftop HVAC units.
- Based on the upgrades to efficiency of the new units that were installed there was a considerable amount of peak demand savings and a very impressive grant incentive that **covered 25% of the total project cost.**



Project Cost: $92,750.00

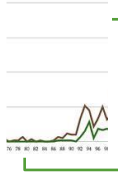
Demand Savings: 30 kW

Energy Savings: 20,100 kWh

Grant Incentive: $24,000.00

HVAC RTU REPLACEMENTS

- This mall project included the replacement of (6) 5 Ton units, (1) 7.5 Ton unit and (2) 20 Ton Rooftop HVAC units.
- In consolidation with the facility energy savings, the efficiency upgrades amounted to an energy savings of 18,000 kWh and demand savings of 40kW.
- The grant incentive of $31,000 was able to drastically lower total project cost.



Project Cost: $111,100.00

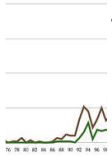
Demand Savings: 40 kW

Energy Savings: 18,000 kWh

Grant Incentive: $31,000.00

HVAC RTU REPLACEMENTS

- The project was completed on a commercial plaza with (7) 3 Ton HVAC units, (2) 4 Ton units and (4) 5 Ton rooftop HVAC units that require retrofit.
- With the upgrade to a more energy efficient model from the outdated inefficient RTUs, the client was able to save more during peak demand savings as well as yearly energy savings.
- The client was rewarded with a grant incentive of over $10,000.00.



Project Cost:
$60,900.00

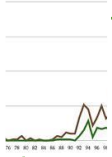
Demand Savings:
13 kW

Energy Savings:
6,000 kWh

Grant Incentive:
$10,160.00

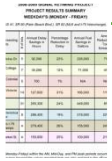
HVAC RTU REPLACEMENTS

- A 6 Ton rooftop unit was replaced, along with (4) 5 Ton units, (2) 7.5 Ton units and (2) 20 Ton Rooftop HVAC units.
- This saved our client an additional 10,393 kWh and an added grant incentive nearing $20,000.00.



Project Cost:
$62,000.00

Demand Savings:
23 kW

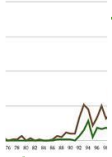


Energy Savings:
10,393 kWh

Grant Incentive:
$20,000.00

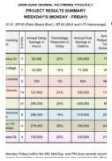
HVAC RTU REPLACEMENTS

- Sony Ericson Head office enlisted PL Consulting to replace numerous HVAC on the facility.
- This project replaced (1) 6 Ton unit, (2) 20 Ton units and (5) 25 Ton Rooftop HVAC units.
- Utilizing the high energy savings and the peak demand saving, the upgrades to efficient units was granted 25% of the total project cost.



Project Cost:
$157,900.00

Demand Savings:
50 kW

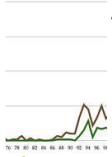


Energy Savings:
33,000 kWh

Grant Incentive:
$40,000.00

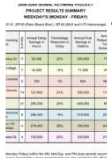
CHILLER REPLACEMENTS

- This project consisted of the replacement of a buildings 260 Ton chiller system to a high efficiency unit.
- The project ended up having 74kW of energy savings and yielded a grant incentive of $43,824.00.



Project Cost:
$180,000.00

Demand Savings:
75 kW



Energy Savings:
209,000 kWh

Grant Incentive:
$44,000.00

CHILLER REPLACEMENTS

- A chiller is required for this multi residential facility; thus the replacement of the old inefficient model was necessary.
- This project lead to an energy saving of 20,000 kWh and a demand savings of 17.
- The project received a grant incentive of $13,056.00.

Project Cost:
$200,000.00

Demand Savings:
17 kW

Energy Savings:
20,000 kWh

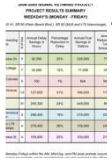
Grant Incentive:
$13,056.00

LIGHTING RETRO-FIT PROJECT

- This project consisted of the replacement of old T12 lamps with T8 Lamps as well as the replacement of incandescent lights with LED counterparts.
- The incentive for this project paid 43% of the total cost of the project. The total incentive was $13,737.00

Project Cost:
$25,252.50

Demand Savings:
24 kW



Energy Savings:
105,000 kWh

Grant Incentive:
$13,737.00

PL Consulting and saveONenergy

- Government Incentives
  - The OPA (Ontario Power Authority) will pay up to 50% of project costs.
    - PL Consulting works with our clients on maximizing potential rebates
  - To apply is an intricate process that includes many parameters, regulations and documentation of the project.
    - PL Consulting works closely with the OPA to provide our clients the highest incentive
    - The process includes, but are not limited to filling, documentation and site visits, Specifications, Turnkey project management for energy projects

Utilizing Financial Tools & Programs to Implement Energy Projects:

- **UTILIZING ENERGY INCENTIVE PROGRAMS:** As could be seen in the previous slides of case studies. Each participant had utilized the energy saving programs to drastically reduce there capital cost of the project and reduced the payback periods.
- **FINANCING GREEN PROJECTS:** Even when capital is not available there are many banks as well as government assisted financial lending tools that can finance the projects which will slightly reduce your payback period but allow for a project to come to fruition when internal capital funds were not available. This is also a great way for management to raise the value of there asset while at the same time reducing there bottom line

Q & A

Hope you Enjoyed This Presentation !

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