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## How Energy Audits can drive Operations and Maintenance as well as System Performance Improvements?

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# WHAT ARE YOUR CHALLENGES?

## Maintenance Issues

- Leaking valves
- Unreliable devices
- Lack of control feedback
- Poor or inconsistent air flow

## General

- No time
- Don't know where to start

## Building Operations

- Comfort complaints
- Air quality
- Drafts

## Building Control

- BAS doesn't make sense
- BAS is missing trending, data required to effectively monitor the building

# What can Energy Audits do for you?

- Address maintenance and operational issues
- Prioritize buildings or projects so you know where to start
- Give you a great summary of building upgrades – solving maintenance issues, replacing old equipment, energy and environmental conservation opportunities
- Optimize the BAS so it's easier to use and more intuitive
- Provide funding so you can upgrade your building for less

What types of energy audits are available  
and which one is best for your site?

# TYPES OF STUDIES

- **ASHRAE Level 1**
  - High level - gives you an idea about opportunities in your building
- **ASHRAE Level 2 (Recommissioning, Mechanical, Building Envelope)**
  - More detailed – will give you detailed inventory, more accurate cost and savings estimates
- **ASHRAE Level 3**
  - Most detailed – pre-design to ensure feasibility, most accurate cost and savings estimates
- **Water Audit**
  - Looks at water consumption and ways to reduce it
- **Lighting Audit**
  - Looks at lighting energy consumption and ways to reduce it

# Incentive Programs for Energy Studies

# FORTIS BC CUSTOM PERFORMANCE PROGRAM

- Fortis studies are looking for natural gas savings (1200 GJ minimum)
- Old natural gas equipment (boilers, DHW, gas fired MUA)
- Can look at all types of projects as long as they save natural gas
- If your building is too small to meet the minimum gas savings, you can bundle buildings together

**Fortis BC Custom Performance Program**

<https://betterbuildingsbc.ca/incentives/fortisbc-custom-performance-program/>

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# FORTIS BC INCENTIVES

## Energy Study

- Fortis will pay 50% of the energy study up front and then other 50% after implementation (up to \$50,000)

## Implementation

- Prescriptive Program
  - For upgrades that will save natural gas ex) condensing boilers, DHW and RTUs
- Custom Program
  - Typical implementation incentives range from \$20-\$40/GJ of gas savings
- Implementation incentives an additional 50% up to March 31, 2021

## Fortis Implementation Rebates:

<https://www.fortisbc.com/rebates-and-energy-savings/rebates-and-offers/rebates-business?l=c1eb935c-b839-402c-b8dc-f579aea42d2c>



# Example Fortis Study

## Scenario

- University building in Vancouver with classes, labs, offices
- 200,000 ft<sup>2</sup>
- Heating was provided mainly by gas fired boilers
- Significant negative pressure issues creating drafts and comfort complaints
- 8,400 GJ annual gas consumption
- 2,000 MWh annual electricity consumption

## Results

- Installed VFDs on RFs to address building pressure
- Implemented various controls measures improve comfort and save energy
- \$950,000 Capital Cost
- 250 annual GHG savings
- 490,000 annual kWh savings
- 5,000 GJ annual gas savings

# BC HYDRO COP ROUND 3

- Joint offering with BC Hydro and Fortis BC
- Looking for electricity and natural gas savings
- Eligibility:
  - Can't have participated in COp program in the past
  - Must have >50,000 sq.ft (Can bundle buildings together)
  - Need to have a BC Hydro Key Account Manager (KAM) and BC Hydro funded energy manager
  - Must have 1 year of billing history and no renovations planned for next 12 months

## BC Hydro COp Round 3

<https://www.bchydro.com/powersmart/business/programs/continuous-optimization.html>

# BC HYDRO COP INCENTIVES

## **Energy Study**

- BC Hydro will cover \$0.15/sq.ft for energy study costs (investigation, handoff)
- Building owner must spend \$0.25/sq.ft to implement any measures with payback of  $\leq 2$  years

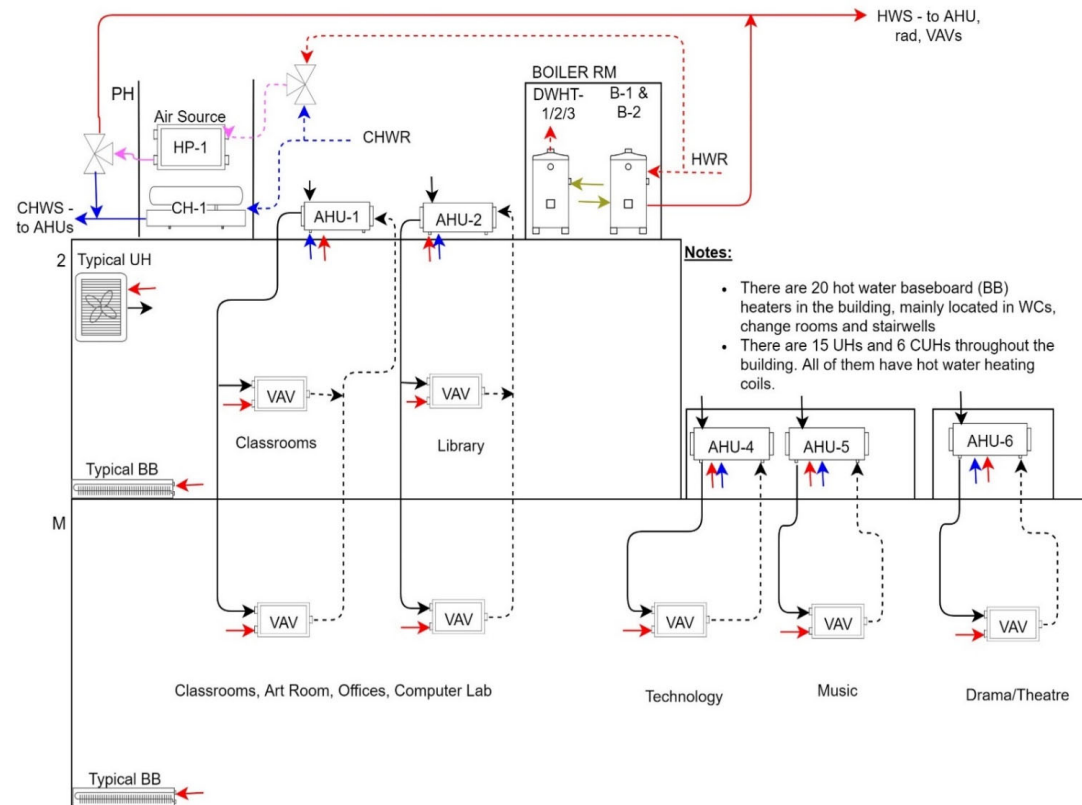
# Example COp Study

## Building

- Secondary School located in Vancouver
- 130,000 ft<sup>2</sup>
- Heating provided by gas boilers and heat pumps
- 3,500 GJ annual gas consumption
- 3,000 kWh annual electricity consumption

## Existing Issues

- Comfort Complaints
- Issues with control
- Building negatively pressurized



# Results

	Investigation						Implementation						
Title	kWh Saved	kW Saved	GJ Saved	\$ Savings	Total Cost	Payback	Project Status	kWh Saved	kW Saved	GJ Saved	\$ Savings	Actual Cost	Payback
Notched Belts	1,500	15	0	290	1,200	4.1	Cancelled	0	0	0	0	0	
Chiller Optimization	10,400	59	0	1,500	4,400	2.9	Cop - Completed	20,700	59	0	2,100	4,483	2.1
Scheduling & Optimal Start RCx	14,400	0	60	1,500	4,200	2.8	Cop - Completed	21,400	0	100	2,200	3,800	1.7
Occupancy Scheduling	16,000	0	90	1,800	10,000	5.6	Cancelled					2,100	
Corridor Lighting Schedules	5,300	0	0	340	900	2.6	Cancelled	0	0	0	0	600	
SAT Reset RCx	9,400	0	90	1,400	2,400	1.7	Cop - Completed	7,700	0	110	1,400	2,200	1.6
SAP Reset	13,200	78	10	1,900	7,500	3.9	Cop - Completed	13,300	71	10	1,900	6,600	3.5
Demand Controlled Ventilation	30,900	0	270	4,200	14,000	3.3	Cop - Completed	32,000	0	270	4,300	11,454	2.7
Heating Pump Shutdown	7,400	6	0	550	450	0.8	Cop - Completed	7,400	6	0	550	750	1.4
HWST Reset	0	0	130	1,000	3,000	3.0	Cop - Completed	0	0	110	930	3,000	3.2
	108,500	158	650	14,480	\$48,050	3.3		102,500	136	600	\$13,380	\$34,987	2.6

# SOCIAL HOUSING RETROFIT SUPPORT PROGRAM (SHRSP)

## Eligibility:

- Must be a registered charity that provides assistance to low-income people OR
  - A local government
  - A housing society registered under the Societies Act
  - A housing co-operative registered under the Cooperative Association Act
  - A governing body of Indigenous bands
- Minimum of nine residential units
- Must be a commercial customer of Fortis BC and/BC Hydro or municipal utility

## Social Housing Retrofit Support Program (SHRSP)

<https://betterbuildingsbc.ca/incentives/social-housing-retrofit-support-program/>

# SHRSP INCENTIVES

## **Energy Study**

- Up to \$5,000 for energy study costs

## **Implementation**

- Up to \$7,000 for implementation support (PM, design, installation etc.)
- Rebates for specific upgrades
  - High efficiency boilers, RTUs, DHW heaters
  - Window upgrades, insulation
  - LED lighting
  - Control upgrades

# CLEAN BC

- Fuel Switching/Electrification
- Eligibility
  - Have a BC Hydro Key Account Manager
  - The must be in the BC Hydro service territory
- 2 program options:
  - Custom Program: Minimum 1,200 tCO<sub>2</sub>e lifetime GHG savings available
  - Custom Lite Program: More than 500 and less than 1,200 tCO<sub>2</sub>e lifetime GHG savings available

## Clean BC

- Custom Program: <https://betterbuildingsbc.ca/incentives/cleanbc-custom-program/>
- Custom Lite Program: <https://betterbuildingsbc.ca/incentives/cleanbc-custom-lite-program/>



# CLEAN BC INCENTIVES

## **Energy Study**

- Up to 50% of energy study cost

## **Implementation**

- \$40/tCO<sub>2</sub>e lifetime GHG savings
- \$60/tCO<sub>2</sub>e lifetime GHG savings for heat pump RTUs
- Custom Program: Up to \$200,000 per customer
- Custom Lite Program: Up to \$48,000 per project (\$72,000 for heat pump RTUs)

# Example Clean BC Study

## Scenario

- Office building in Vancouver
- 500,000 sq.ft
- 6000 MWh annual electricity consumption
- 6000 GJ steam consumption
- Year round heating and cooling demand

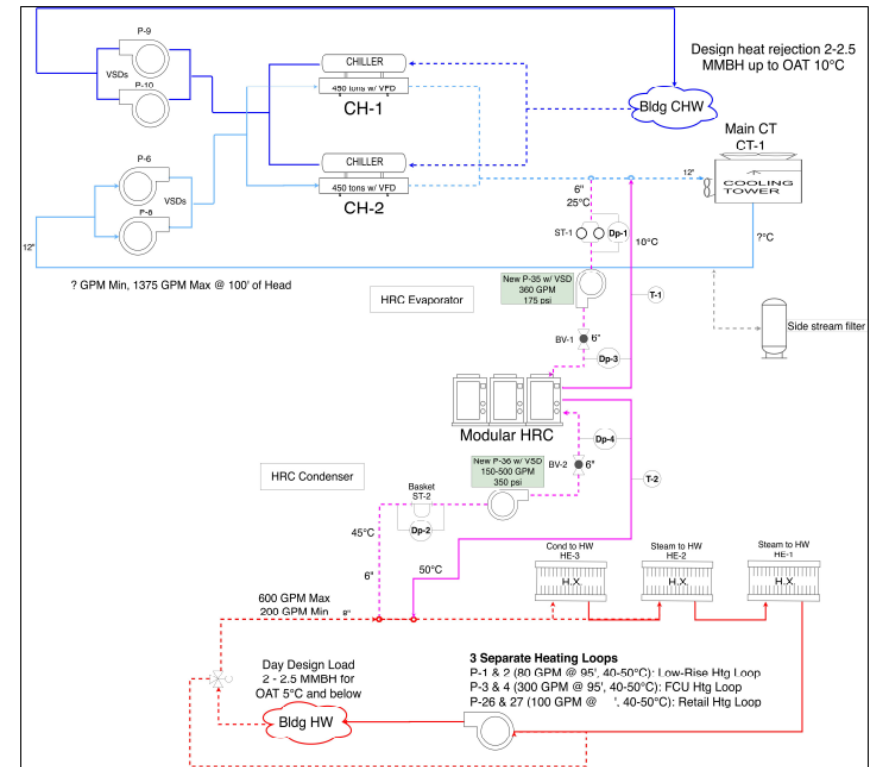
## Study

- Install a HRC to utilize waste heat to offset steam consumption



# Results

- Reduction in steam consumption for space heating, and domestic water consumption from reduced use of the cooling tower.
- First clean BC project implemented
- Projected to save 250 tons of GHGs and 5,500 GJs of natural gas annually
- Payback of less than 7 years with CleanBC incentives



Energy Savings					Cost Savings			Simple Payback		GHG Savings (tons/yr)
Steam (GJ/yr)	Electricity (kWh/yr)	Demand (kW/yr)	Net		Steam (\$)	Electricity (\$)	Net (\$)	No Incentive (years)	With Incentive (years)	
			(kWh/yr)	(GJ/yr)						
4,110	(209,300)	(851)	932,367	3,357	\$58,362	(\$24,718)	\$33,644	< 12	< 7	388

## More Ways Energy Audits Can Help You

## Solving Problem Zones

### *Potential Solutions:*

- SAT reset
- Optimal start
- Verifying air flow to the zone
- Occupancy sensors
- Thermal comfort adjustments

Rooms	Temp	Setpoint
154 W	24.1 °C	23.0 °C
154 E	23.9 °C	21.5 °C
154-3	27.2 °C	21.2 °C
154-5	25.5 °C	21.2 °C
154-1	23.7 °C	21.5 °C

## Quantifying the costs of ongoing maintenance issues

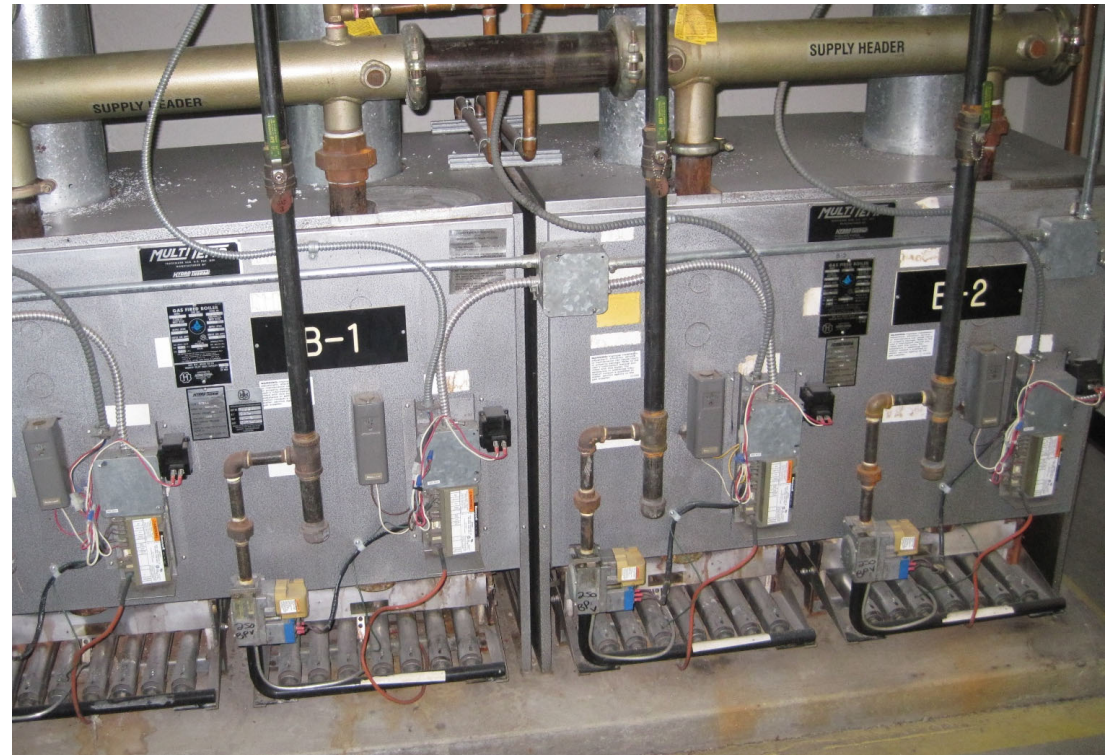
*Some examples:*

- Leaking valves
- Dirty filters
- Units operating outside of scheduled hours
- Cavitating pumps
- Unmet air delivery

# Leveraging Utility Funding

End of life equipment can take years to be replaced

Utility funding can help empower upgrades that wouldn't have been possible otherwise



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## Improving BAS Graphics and Trending

Many systems are not well configured, we can help recommend minor upgrades that can improve system schematics, educating and empowering operators to do more.

Improved trending can support issue identification resulting in improved comfort, better air quality, identification of maintenance issues and generally just a better understanding of how systems work.



## FDD and SAAS Products

Energy audits sometimes highlight a recurring issue that arises

Many clients are now using automated software tools to monitor the data of various systems.

The savings proposition for using tools like this can be evaluated in an audit, with recommendations to use these products included in the business case.

# THANK YOU!

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