

# Best practices in Existing Building Commissioning

# Existing Building Commissioning



## What is EBCx?

- ✓ A systematic process for investigating, analyzing, and documenting system and building performance
- ✓ Identification and implementation of Commissioning Corrective Actions (CCAs) and Commissioning Conservation Measures (CCMs)
- ✓ A scalable solution tailored to address Customer needs

## Key Deliverables / Actions

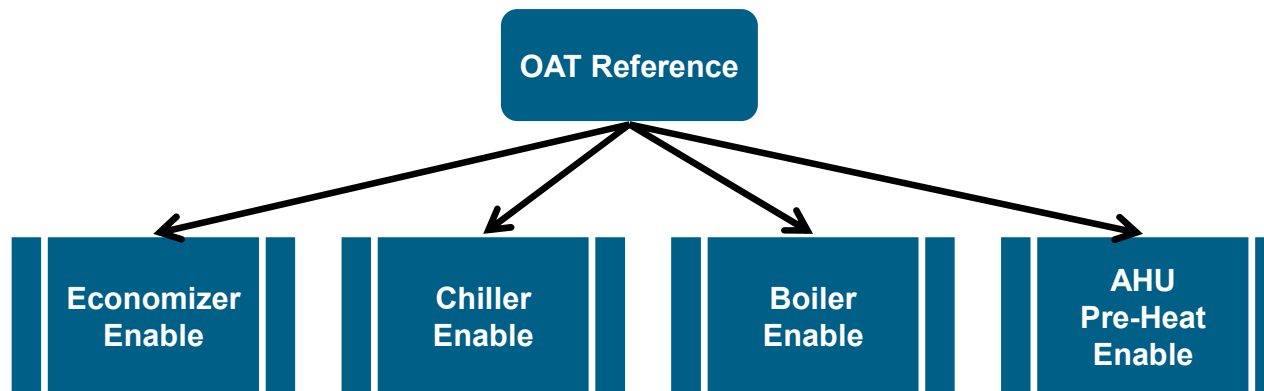
- ✓ Develop *Current Facility Requirements (CFR)* and optimize systems to meet these requirements
- ✓ Verification of performance and accuracy for the system components that actually matter
- ✓ Expedited remediation of discovered deficiencies or issues

# Existing Building Commissioning

## Why Does Commissioning Matter?

### Sensors: Critical Points of Failure

- ❑ This outside air sensor, located in an alcove is the reference for (14) of the (23) air handling units in the building.
- ❑ This sensors was found to **6 degrees off** from the calibrate reference reading.





# Existing Building Commissioning

## What we found in the field?

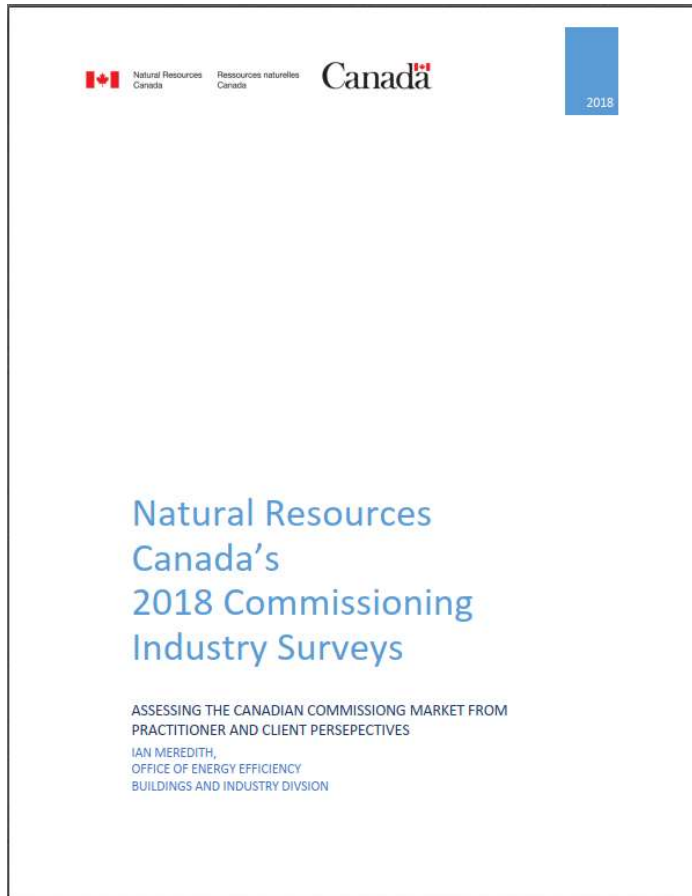
- These are (often) ASHRAE Level I or Level II Audits in disguise, where all the focus is on energy efficiency and optimization.
- The focus is primarily centered around delivering the Commissioning Report as the outcome.
- Commissioning Agents typically cannot work fully independently and must rely on the Controls provider to collect data and/or understand the system.
- Those completing the work sometimes have an engineering background but no practical experience in operating/maintaining mechanical or control systems.

## What should be done

- ✓ Verify Critical Sensors
- ✓ Run System Analysis Tools
- ✓ Functionally Test Actuators
- ✓ Document Current Facility Operating Requirements
- ✓ Document as much as required to sustain operational improvements
- ✓ Minor Repair/Replacement
- ✓ As-Built Sequence of Operations

# EBCx Market Opportunity

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# EBCx Barriers, Challenges and Foreseen Changes

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## 3.1.4 Barriers, Challenges and Foreseen Changes in the Cx industry

Cx practitioners were also asked about their perceptions on current barriers to the uptake of commissioning services; the results of that question will be presented in Section 3.3. The survey closed with a pair of open-ended questions on the current challenges and foreseen changes to the commissioning industry.

Please describe any changes you foresee in the Cx industry over the next 5 years.

Please describe any challenges or hindrances to the Cx industry over the next 5 years.

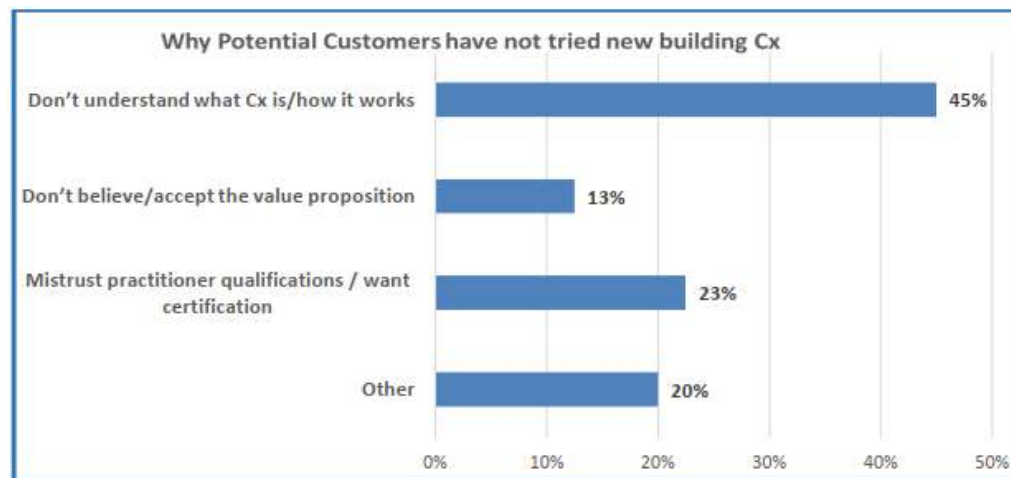
Thirty-five participants responded to these questions, but many of the answers provided tended to overlap between the two. The following highlights represent a distillation of the most common themes that emerged from the responses to these two questions:

- Existing building commissioning (EBCx) remains a relatively “untapped” market area with great potential – a significant opportunity exists for greater market uptake of EBCx;
- There is a sense that potential customers are seeking greater assurance of quality and consistency of Cx services, which could be aided through the introduction of a Cx practitioner certification or accreditation in Canada. Noting that the American market features a few competing certifications, the Canadian solution would ideally be to have just one, mutually-accepted certification.
- Further related to the issue of quality and consistency:
  - the profession should resist a trend towards “paper commissioning” (i.e., an over-emphasis on voluminous paperwork, at the expense of hands-on Cx work) and
  - there is a collective need to ensure and promote high-quality Cx over low-budget “commodity” Cx;
- Digitization of Cx processes and verification techniques (e.g., data analytics) will grow and gain importance for Cx practitioners;
- There is a growing need to address succession planning as senior Cx providers retire and to foster the next generation of Cx professionals;
- Related to the above, recruitment, training, professional development and opportunities to provide experience for entrants to the Cx profession are all crucial needs to be addressed.

- ✓ EBCx – “untapped” market
- ✓ Resist trend towards “paper commissioning”
- ✓ Data driven approach / Digitalization of commissioning projects

Source: “Natural Resources Canada’s 2018 Commissioning Industry Surveys”. 2018.  
Natural Resources Canada

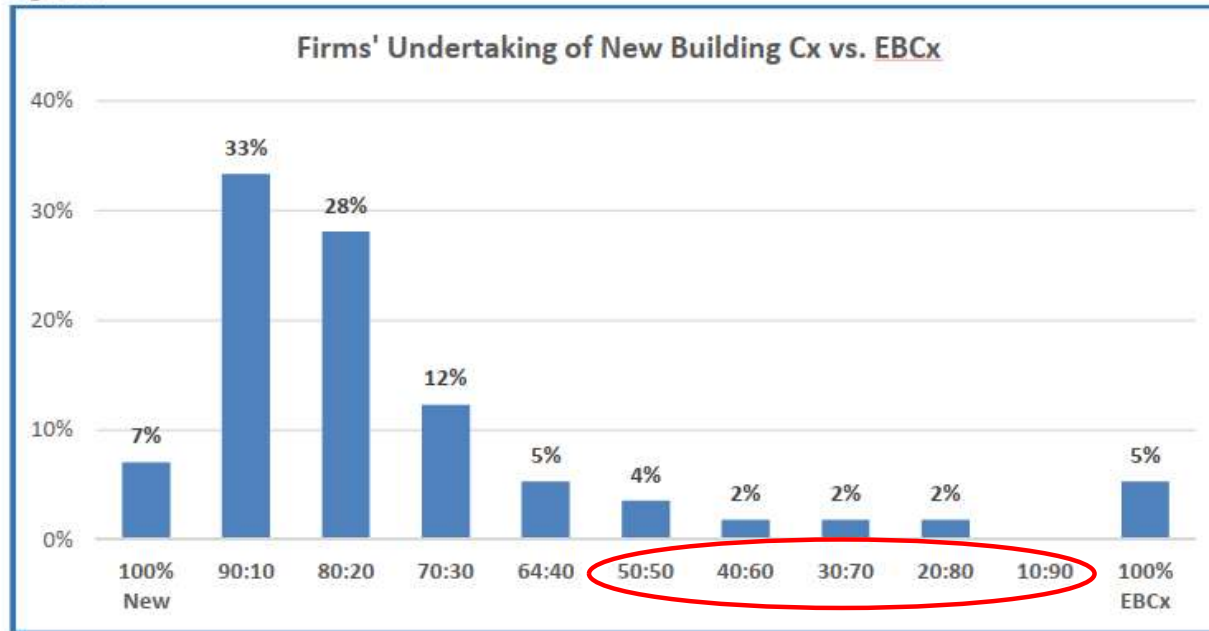
# Barriers to EBCx



Source: "Natural Resources Canada's 2018 Commissioning Industry Surveys". 2018. Natural Resources Canada

# EBCx Market Opportunity

Figure 4



Source: "Natural Resources Canada's 2018 Commissioning Industry Surveys". 2018.  
Natural Resources Canada



# EBCx Market Opportunity

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**Using BAS Data Trending for Diagnostics.** According to respondents, facilities personnel are not using building automation system (BAS) data trending consistently as a tool. About 13 percent of respondents stated that facilities personnel on their projects regularly use trend logging or BAS dashboards to diagnose building issues. The remaining 87 percent indicated “Sometimes,” “Rarely,” or – for 12 percent – “Never.” An opportunity exists for commissioning providers to either conduct, or train facilities personnel to conduct, improved diagnostics for identifying and optimizing building performance, with or without advanced monitoring systems. Facilities personnel often do use the BAS to review alarms and to review instantaneous values, but diagnostics can be more robust and predictive than that.

*Source: “Natural Resources Canada’s 2018 Commissioning Industry Surveys”. 2018. Natural Resources Canada*

## Look for partnership

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*“It is amazing what you can accomplish if you do not care who gets the credit.” – Harry Truman*





## Key Take-aways

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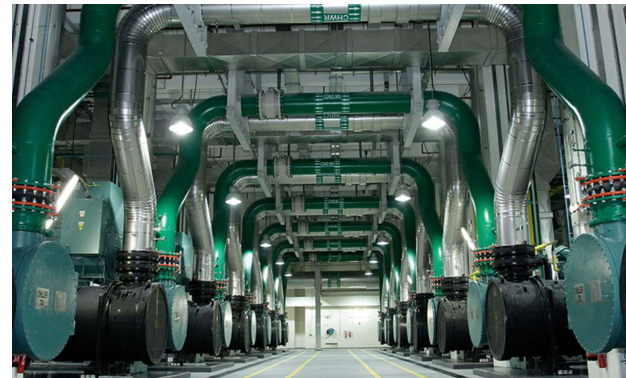
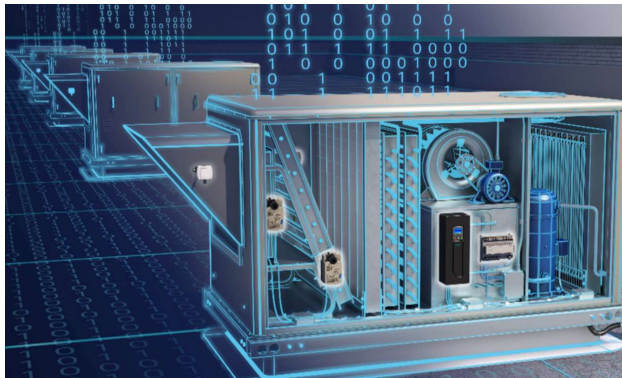
- Stir away from “paper commissioning”. Document only key findings and changes only necessary to sustain operation of systems
- Go after systems that will generate biggest impact from EBCx if budget is limited.
- Rely on automation data. Work with your BAS services provider.
- Don't just look at trends for set time period: slice and dice that data
- Review PPCL and analyse sequences of operation
- Allocated budget for key-strokes type of measures implementation



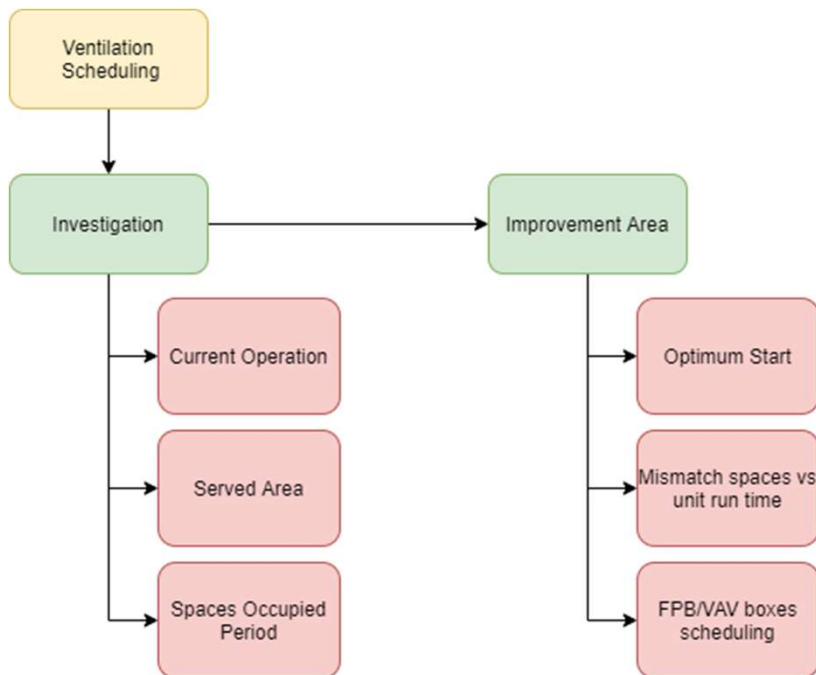
# EBCx – Where To Start

## ➤ Building Energy End Users

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# EBCx – Scheduling

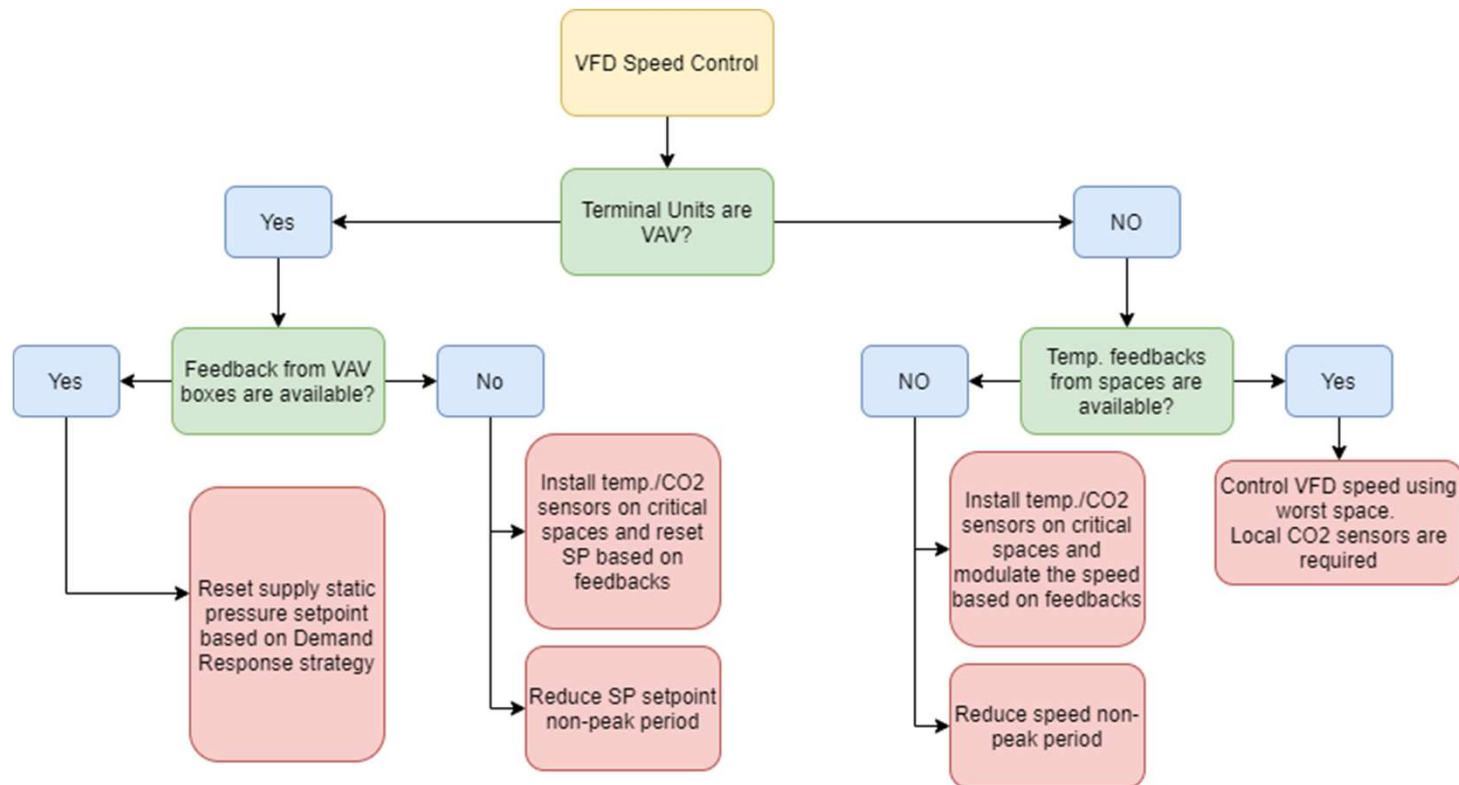


Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
0:00:00	100%	0%	25%	0%	0%	0%	0%
1:00:00	100%	0%	25%	0%	0%	0%	0%
2:00:00	100%	0%	50%	0%	0%	0%	0%
3:00:00	100%	25%	50%	20%	0%	0%	0%
4:00:00	100%	25%	50%	20%	0%	0%	0%
5:00:00	100%	100%	100%	100%	100%	0%	0%
6:00:00	100%	100%	100%	100%	100%	0%	0%
7:00:00	100%	100%	100%	100%	100%	0%	0%
8:00:00	100%	100%	100%	100%	100%	0%	0%
9:00:00	100%	100%	100%	100%	100%	0%	0%
10:00:00	100%	100%	100%	100%	100%	0%	0%
11:00:00	100%	100%	100%	100%	100%	0%	0%
12:00:00	100%	100%	100%	100%	100%	0%	0%
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14:00:00	100%	100%	100%	100%	100%	0%	0%
15:00:00	100%	100%	100%	100%	100%	0%	0%
16:00:00	100%	100%	100%	100%	100%	0%	0%
17:00:00	100%	100%	100%	100%	100%	0%	0%
18:00:00	100%	100%	100%	100%	100%	0%	0%
19:00:00	100%	100%	100%	100%	100%	0%	0%
20:00:00	100%	100%	100%	100%	100%	0%	0%
21:00:00	0%	0%	0%	0%	0%	0%	0%
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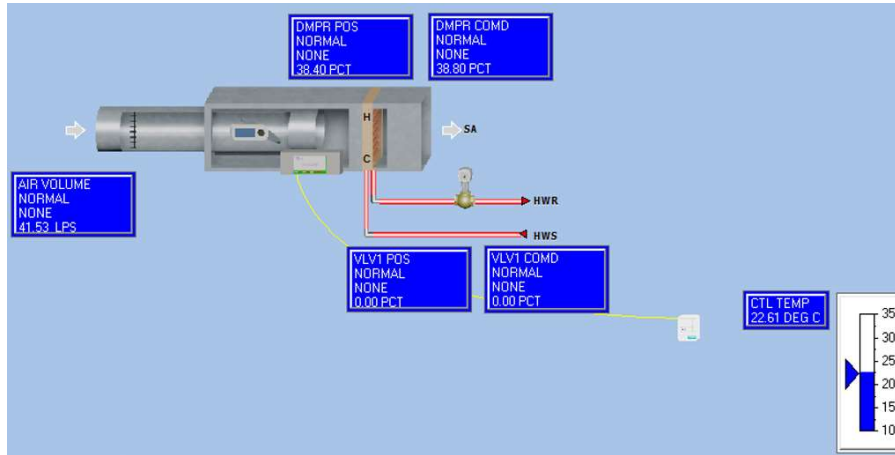
# EBCx – VFD Speed Control

## ➤ Optimize VFD Speed Control



# EBCx – VFD Speed Control

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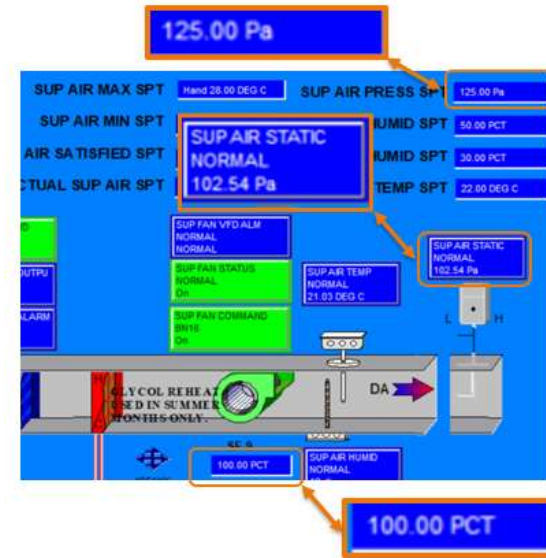


Application Sub-point Display Report

Selection: UAB22061  
 Match subpoint: <all>

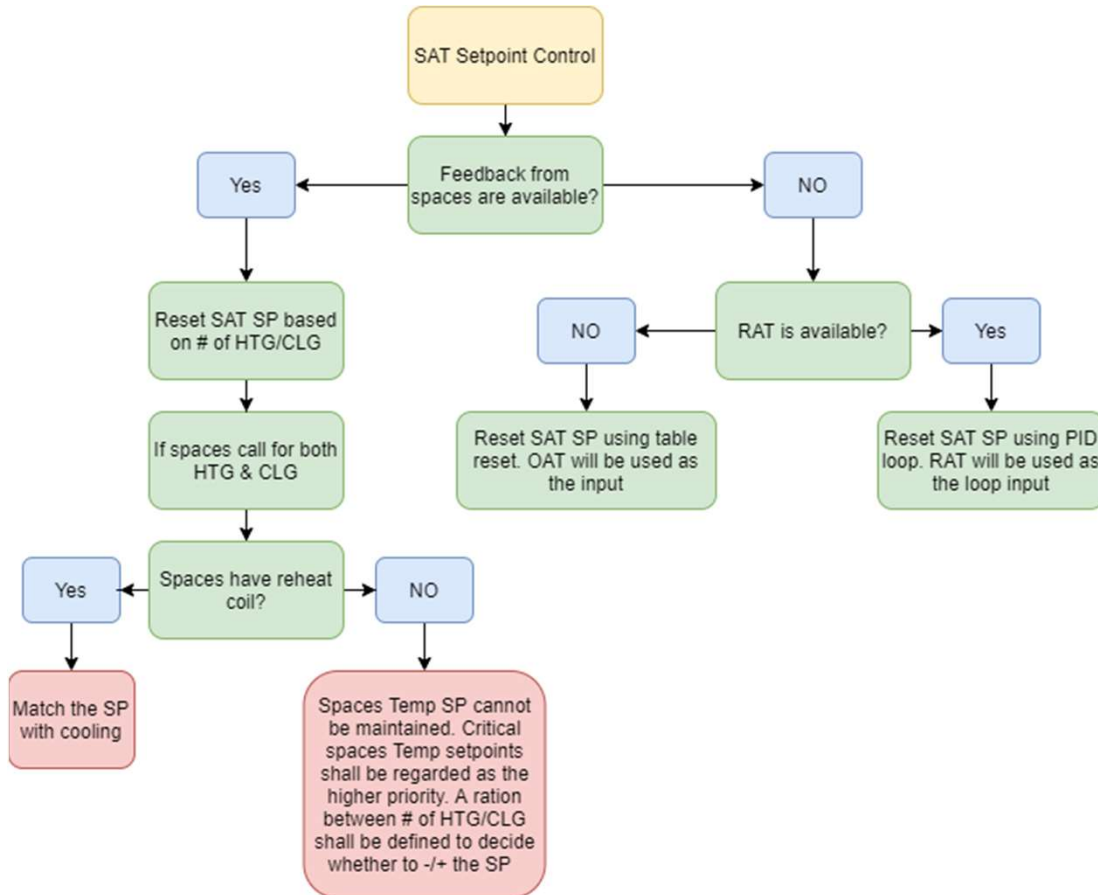
Match Application: <all>

Subpoint #	Name:Suffix	Description	Value	Status	Priori
TEC System Name:UAB22061					
Descriptor: COORD OFFICE					
1	UAB22061:ADDRESS		17	-N-	NONE
2	UAB22061:APPLICATION		2023.0	-N-	NONE
4	UAB22061:ROOM TEMP	COORD OFFICE	22.1889	DEG C	-N- NONE
5	UAB22061:HEAT_COOL		HEAT	-N-	NONE
6	UAB22061:DAY CLG STPT		23.4489	DEG C	-N- OPER
7	UAB22061:DAY HTG STPT		23.0289	DEG C	-N- OPER
8	UAB22061:NGI CLG STPT		27.9289	DEG C	-N- NONE
9	UAB22061:NGI HTG STPT		18.4089	DEG C	-N- NONE
11	UAB22061:RM STPT MIN		12.8089	DEG C	-N- NONE
12	UAB22061:RM STPT MAX		32.4089	DEG C	-N- NONE
13	UAB22061:RM STPT DIAL		24.5689	DEG C	-N- NONE



Zones Not Controlling to Flow Setpoint					
TEC	MODE	FLOW	FLOW STPT	Deviation	Notes
N.VAV.N05		205	2000	1795	DMPR: 100%
N.VAV.N118	COOL	254	1952	1698	
E.VAV.E134	COOL	1448	2985	1537	DMPR: 100%
W.VAV.W24	COOL	270	1800	1530	
W.VAV.W49	COOL	0	1500	1500	DMPR: 100%
W.CAV.W13	HEAT	3116	4500	1384	DMPR: 100%
E.VAV.E76	COOL	0	1300	1300	DMPR: 100%
C.CAV.C01	COOL	913	2200	1287	DMPR: 100%
E.VAV.E116	HEAT	0	1240	1240	DMPR: 100%
E.VAV.E15		1175	0	1175	DMPR: 0%

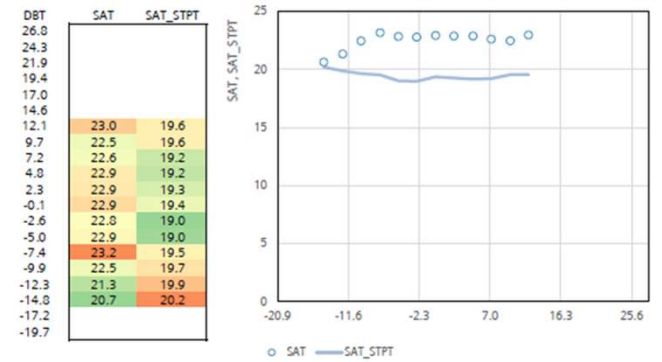
# EBCx – SAT Control



STPT ANALYSIS

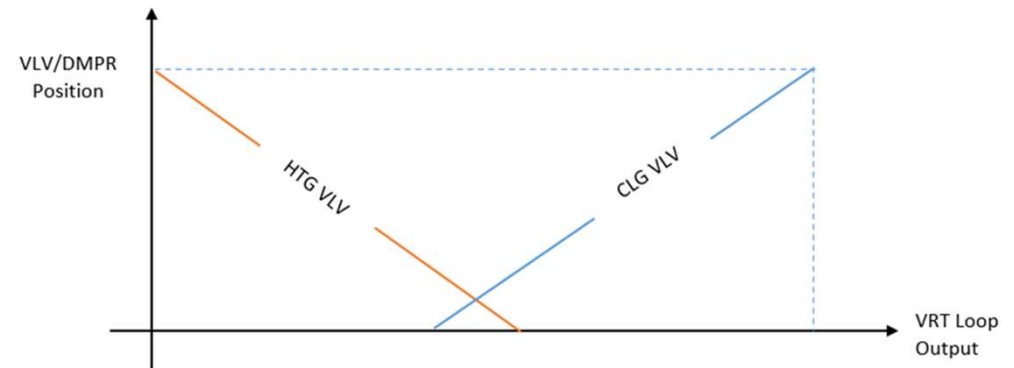
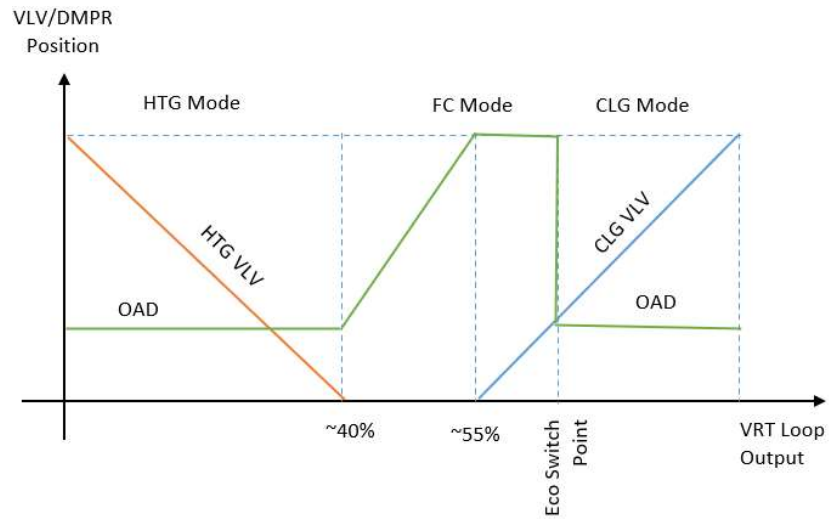
SAT

Process Variable: 1452TS  
Setpoint Variable: 514201

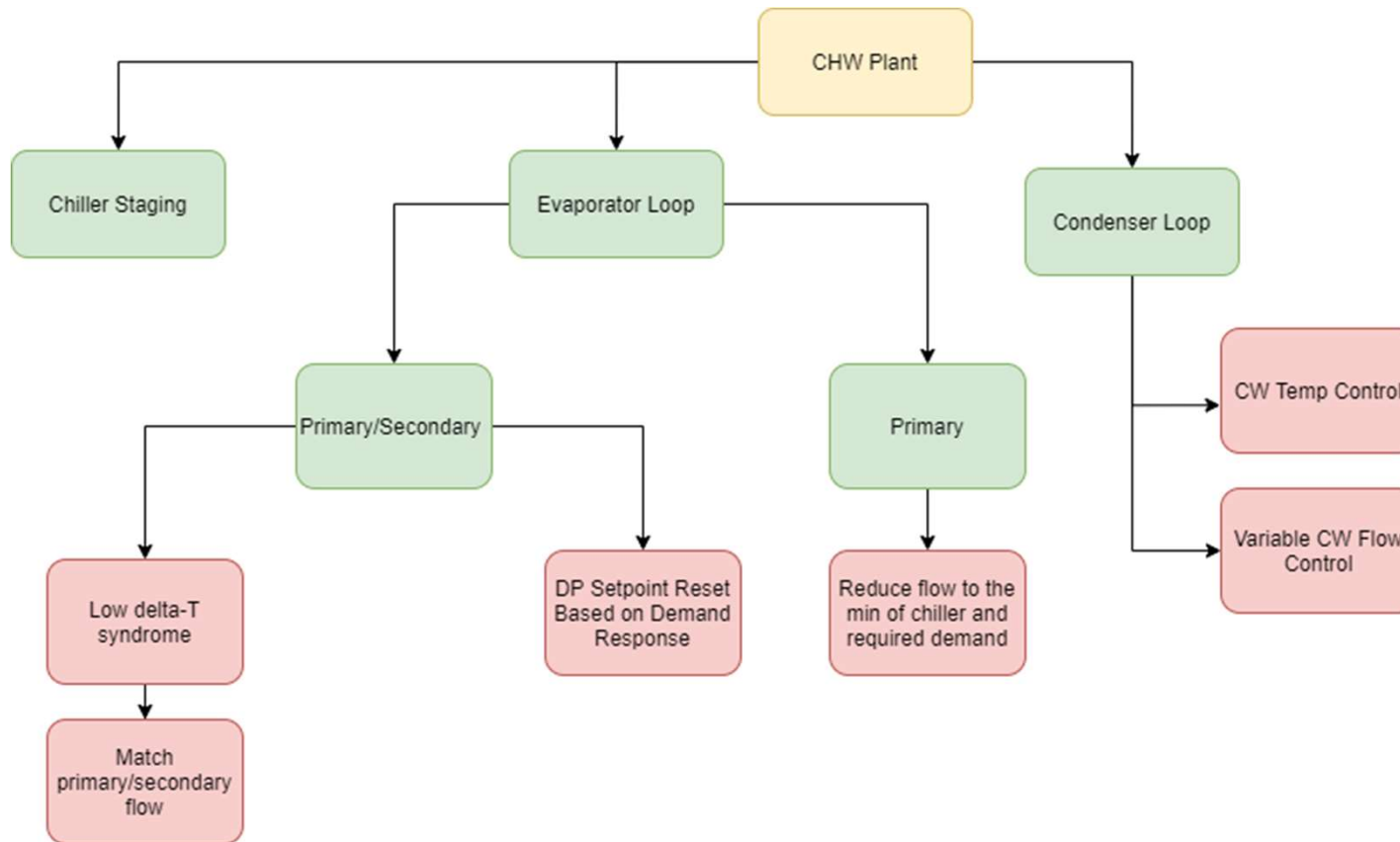


# EBCx – Economizer Control

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# EBCx – CHW Plant

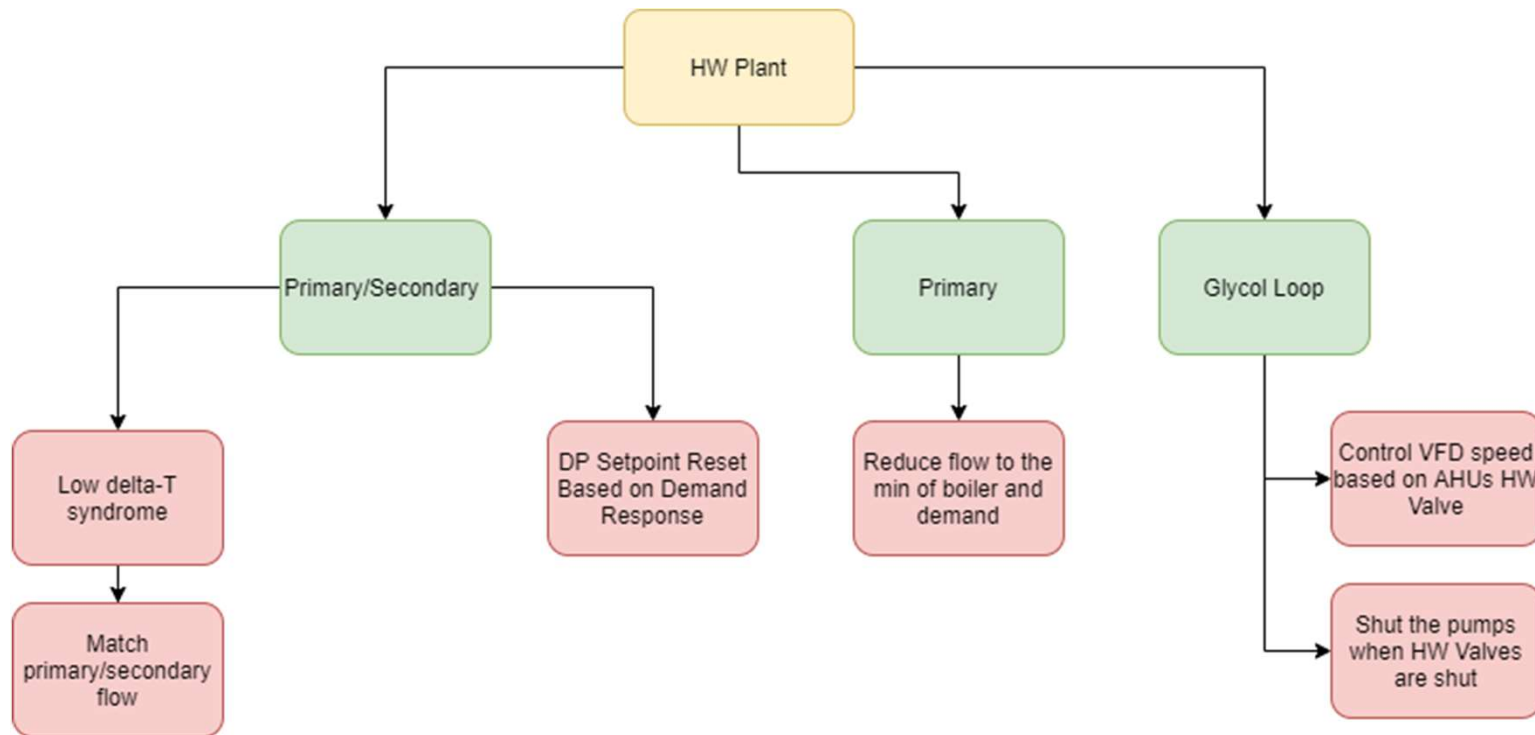




# EBCx – CHW Plant



# EBCx – Heating System



## Questions?

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For more information contact:

Farhang Vahabi, M.Eng., P.Eng.  
Senior Energy Engineer

[farhang.vahabi@siemens.com](mailto:farhang.vahabi@siemens.com)

Natalia Malafeeva, M.Eng., CEM, CMVP  
Energy Services Operations Manager

[natalia.malafeeva@siemens.com](mailto:natalia.malafeeva@siemens.com)