The Power of an Energy Management system

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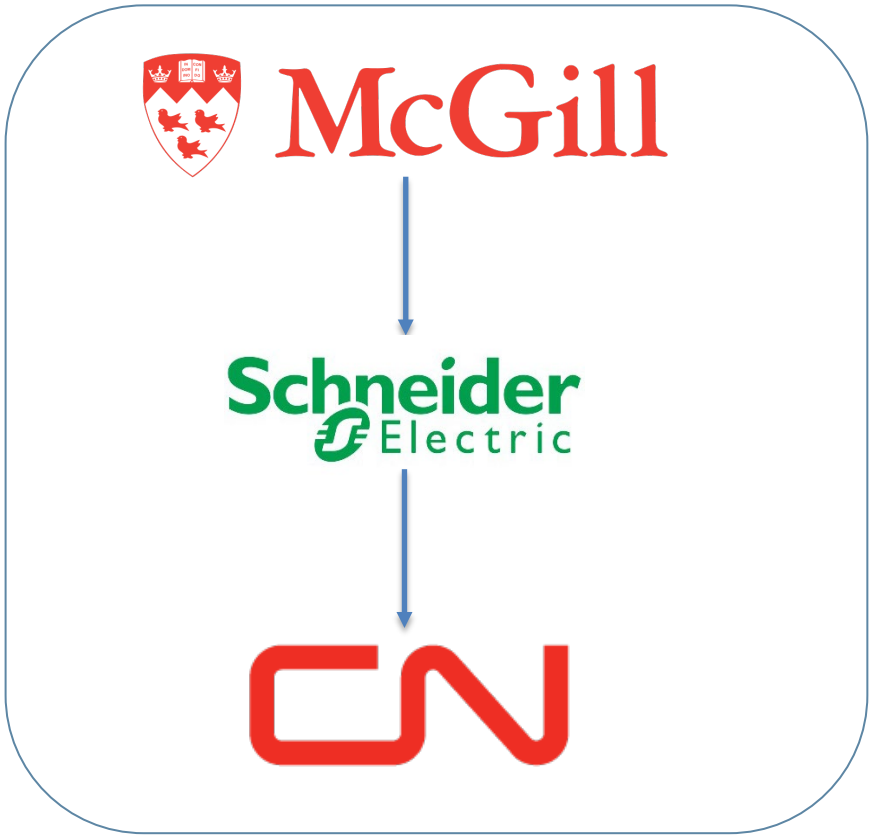
Asset Management Manager- CN

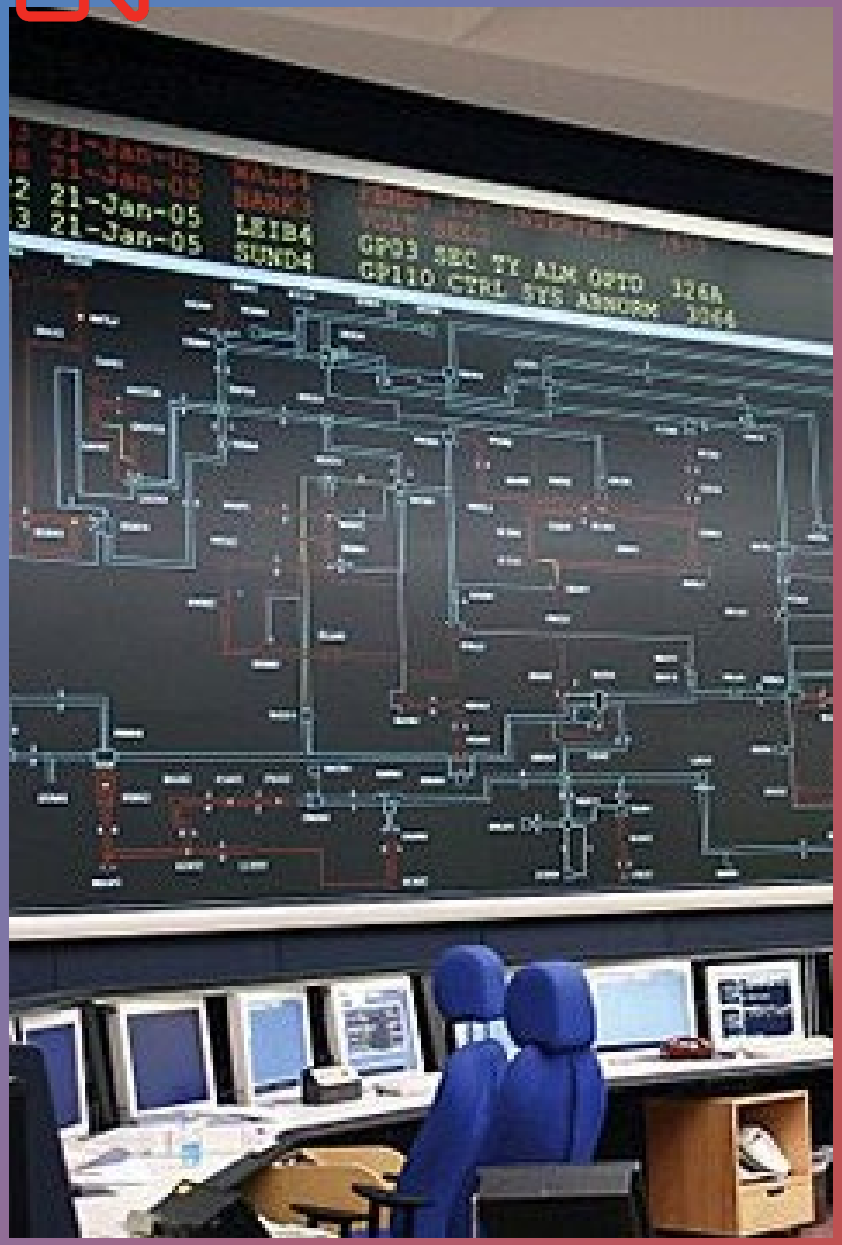
About Me



Mcgill University B.Eng Electrical Engineering 2014

Schneider Electric Advanced Technical Support. 2014-2017

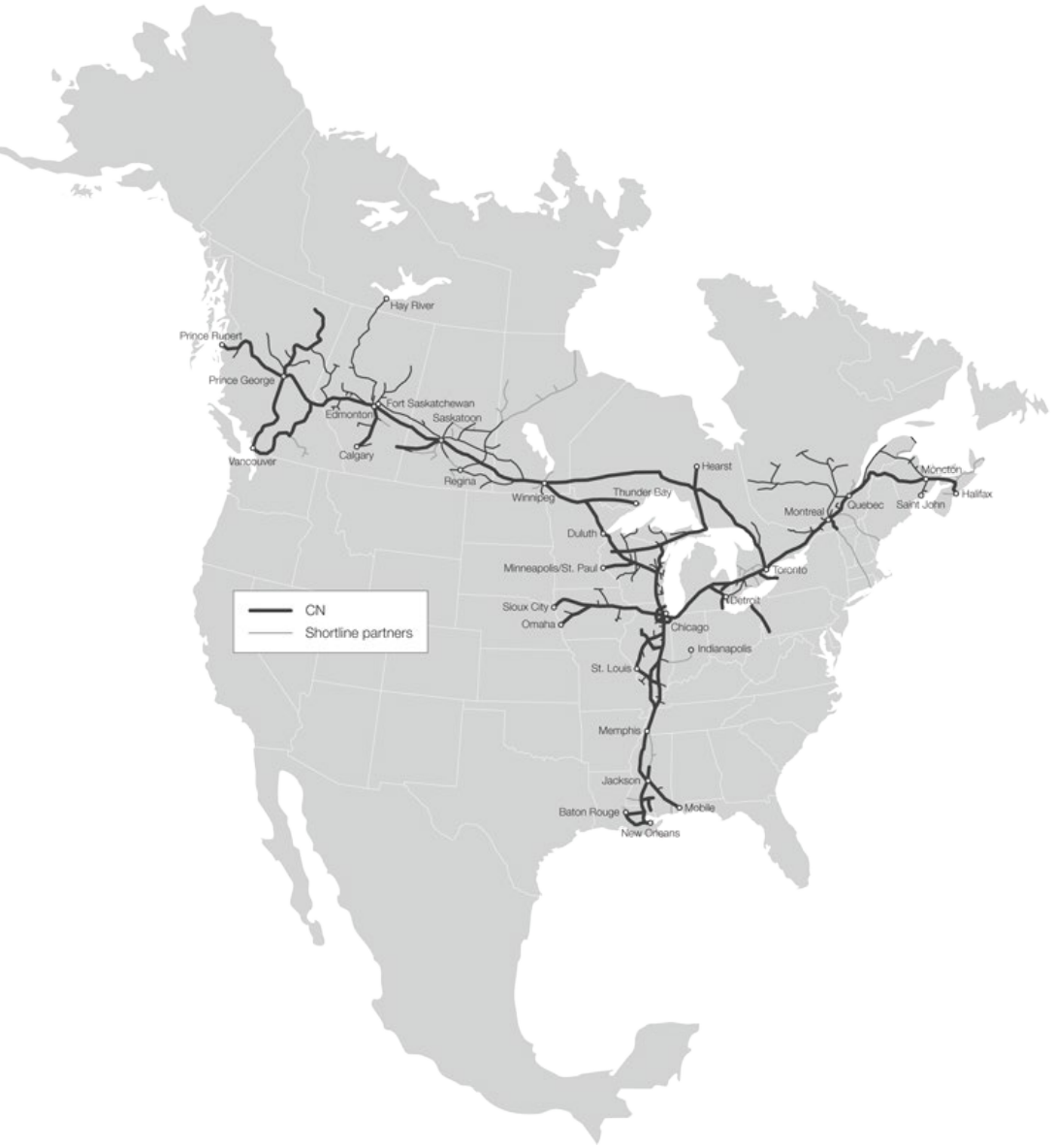
- Joined CN Energy Management team 2017
- Leading CN Facilities Asset Management efforts since 2021



Agenda

- Benefits of real-time data to field staff
- Integration of EMIS data with enterprise BI tools
- Non-Energy benefits of EMIS systems
- Lessons learned from large developments

CN at a Glance



- the largest rail network in Canada and the only transcontinental network in North America.
- 19,600 route-miles of track in North America with three coasts Access
- transporting approximately C$250 billion worth of goods annually:
  - Intermodal
  - Petroleum and chemicals
  - Grain and Fertilisers
  - Forest Products
  - Metals and Minerals
  - Automotive
  - Coal
  - And others

CN Energy in Numbers

- 25 Major Yard Monitored across North America
- Monitored Yearly Electrical Energy: 100 GWh (~ 9300 homes or YVR)
- Facilities: 2600 buildings and shops across CN network. Various equipment including: Compressors, switch heaters, Communications.
- Monitored Peak demand : 30 MW

A Typical Large Yard

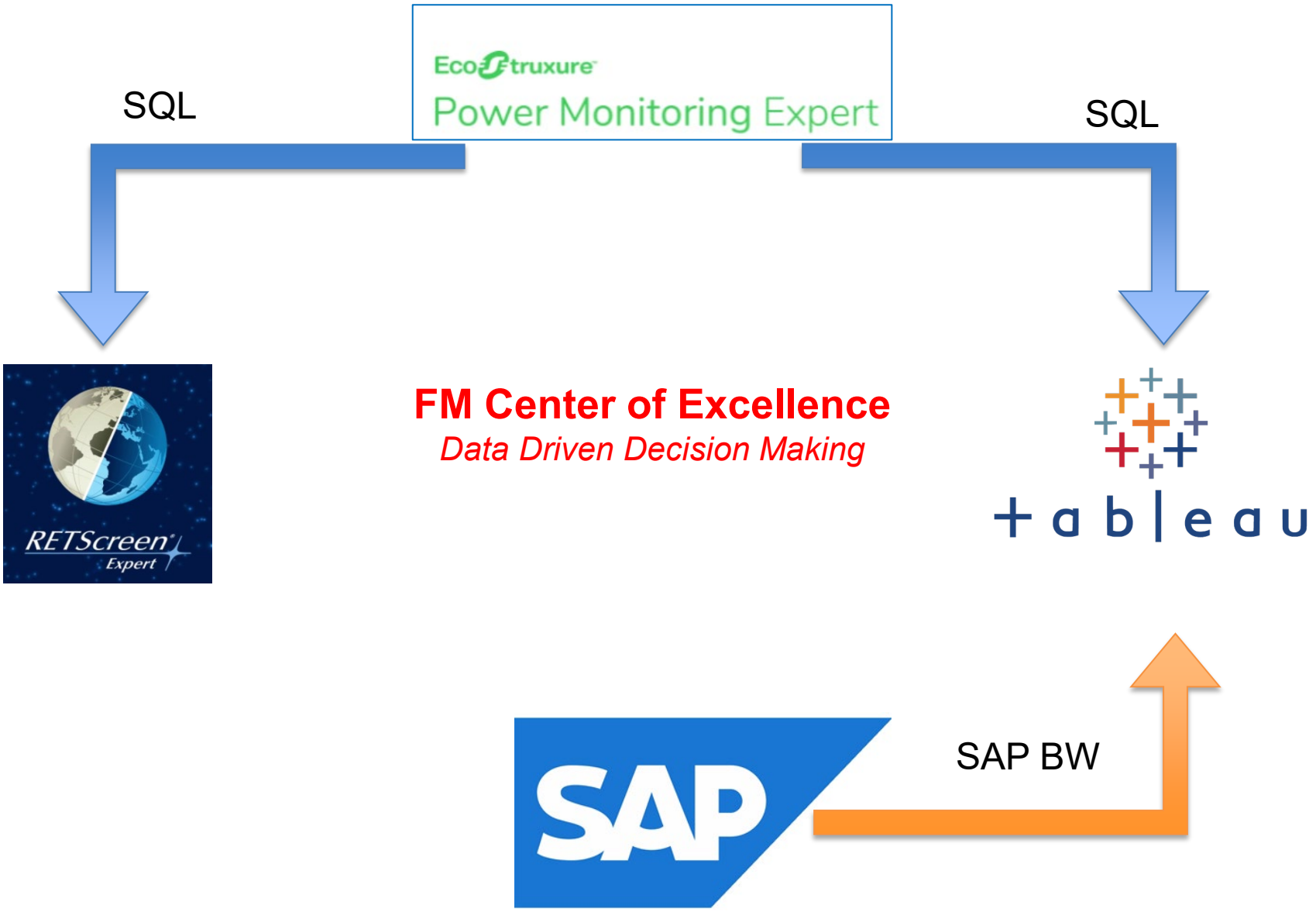
Monitoring Infrastructure

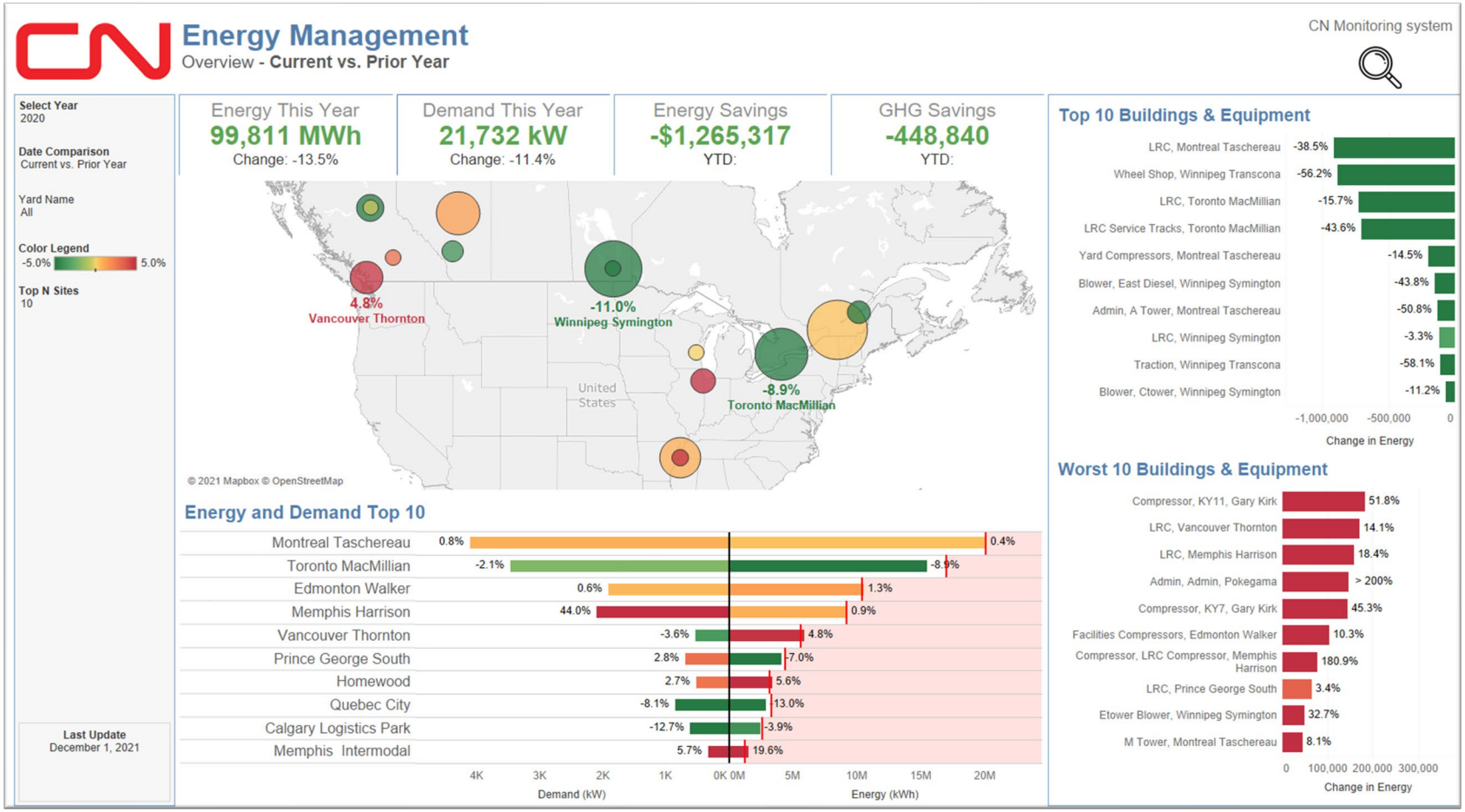
Monitoring Infrastructure- Field Devices

1- Developed a Monitoring standard to streamline installations on existing infrastructure as well as new installations

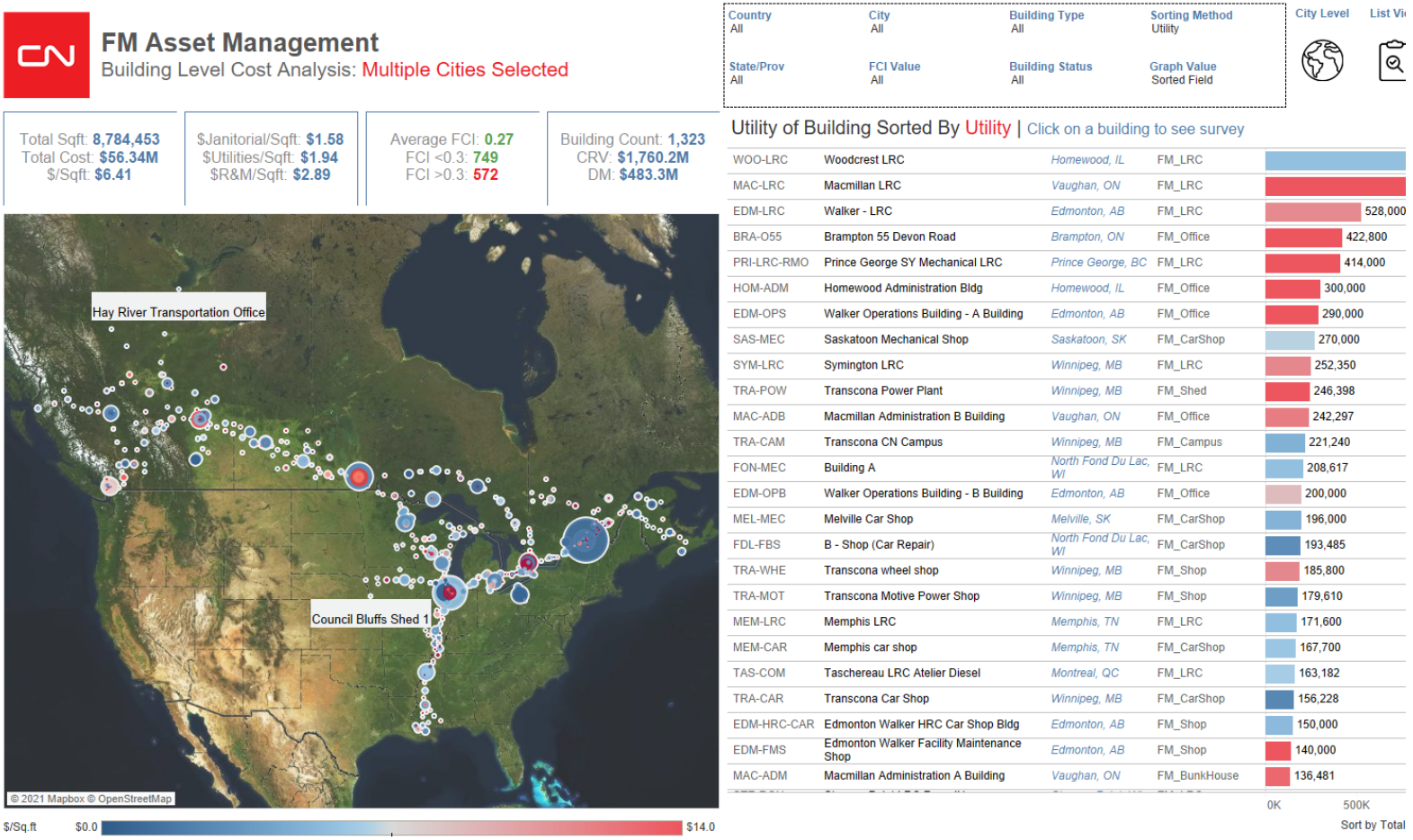
2- The focus is on critical assets that can help the team from both the maintenance and energy management aspect .

Monitoring Infrastructure- Software Layers

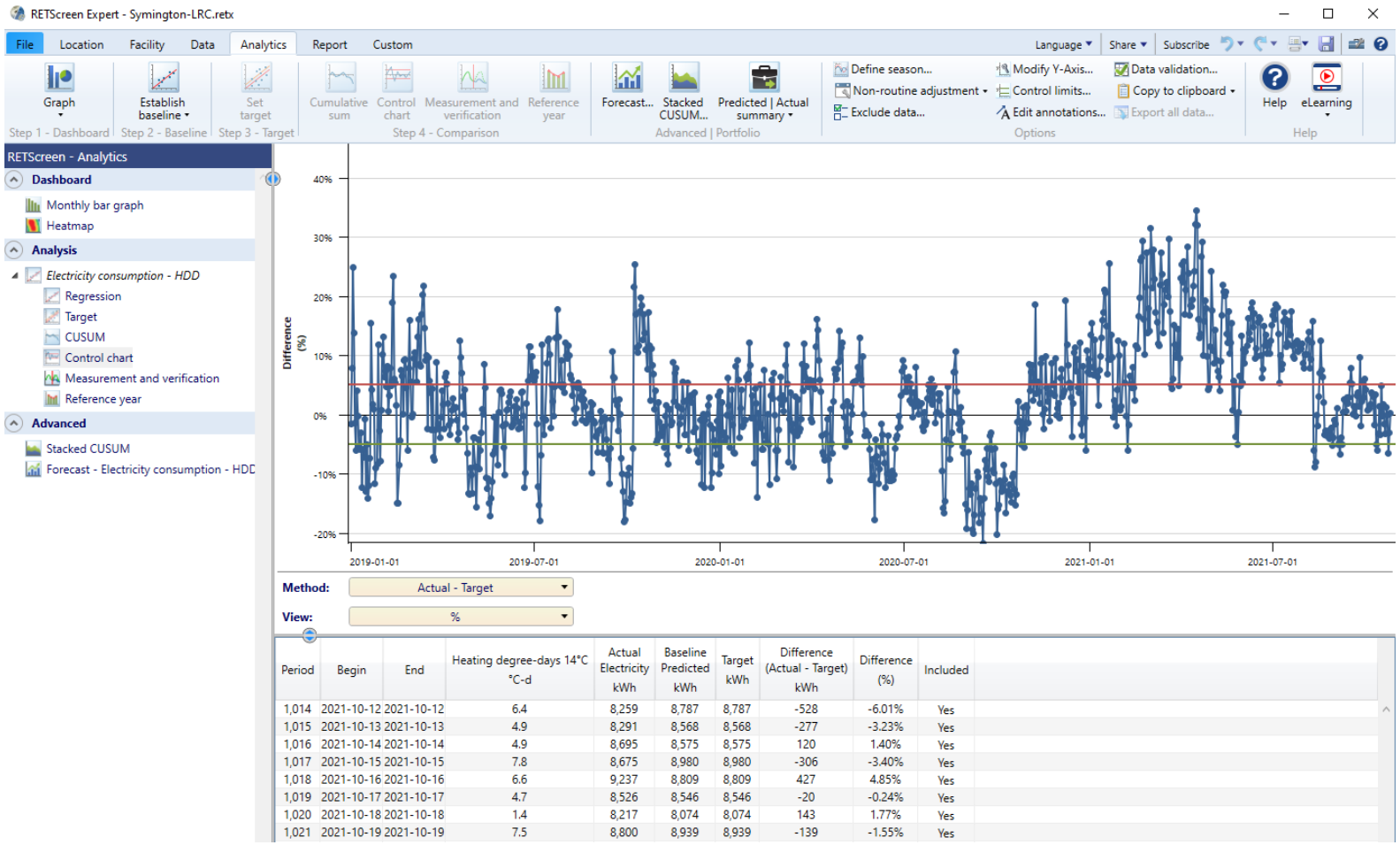




Integration- Tableau based Energy dashboards



Integration- Energy +Asset Management



Period	Begin	End	Heating degree-days 14°C °C-d	Actual Electricity kWh	Baseline Predicted kWh	Target kWh	Difference (Actual - Target) kWh	Difference (%)	Included
1,014	2021-10-12	2021-10-12	6.4	8,259	8,787	8,787	-528	-6.01%	Yes
1,015	2021-10-13	2021-10-13	4.9	8,291	8,568	8,568	-277	-3.23%	Yes
1,016	2021-10-14	2021-10-14	4.9	8,695	8,575	8,575	120	1.40%	Yes
1,017	2021-10-15	2021-10-15	7.8	8,675	8,980	8,980	-306	-3.40%	Yes
1,018	2021-10-16	2021-10-16	6.6	9,237	8,809	8,809	427	4.85%	Yes
1,019	2021-10-17	2021-10-17	4.7	8,526	8,546	8,546	-20	-0.24%	Yes
1,020	2021-10-18	2021-10-18	1.4	8,217	8,074	8,074	143	1.77%	Yes
1,021	2021-10-19	2021-10-19	7.5	8,800	8,939	8,939	-139	-1.55%	Yes

Integration- RETSCREEN

Example System:
Compressed Air

Compressor Monitoring

Why is it important to monitor?

- Compressors consume between 15-30% of our electrical energy.
- Compressors are used to charge train cars and operate equipment and the system functionality is crucial for CN operations.
- Pressure must be maintained at a certain level.
- Avoid Excessive Airflow from the compressors.
- Verify compressor system work sequence

Compressor Monitoring

Monitor Pressure

Detect Leakage and high airflow

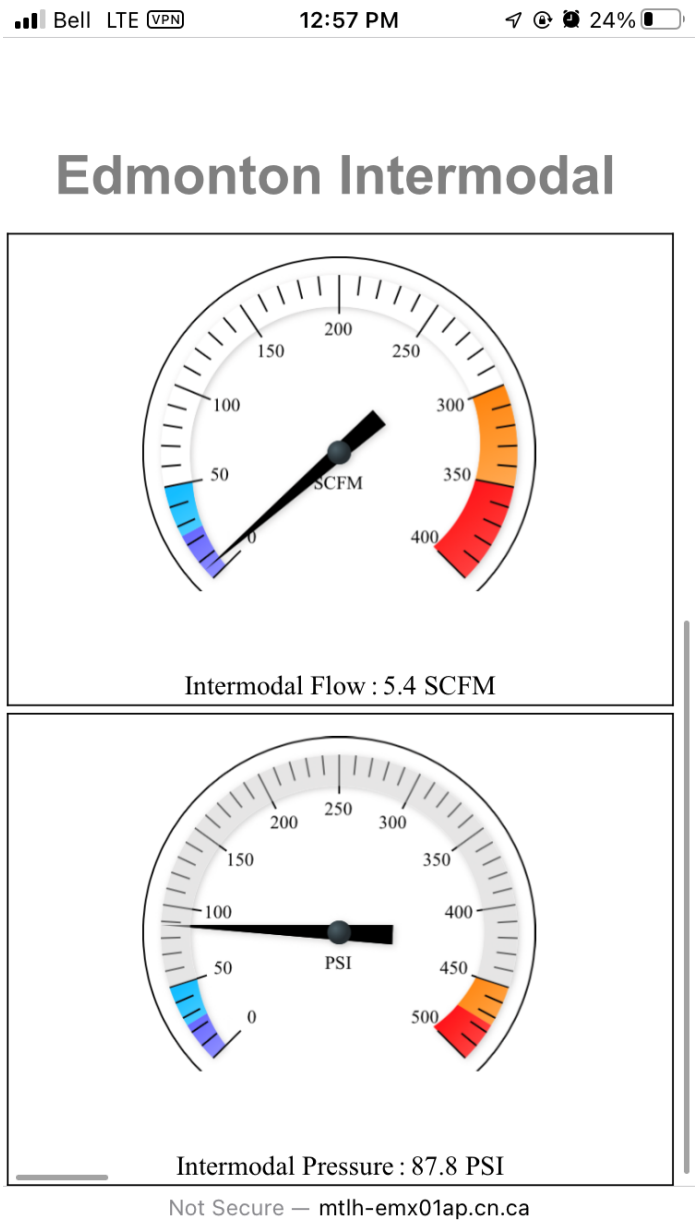
Vista Screens, Trends, Historical Gadgets

Demand Monitoring

Detect Abnormalities

Ease of accessibility

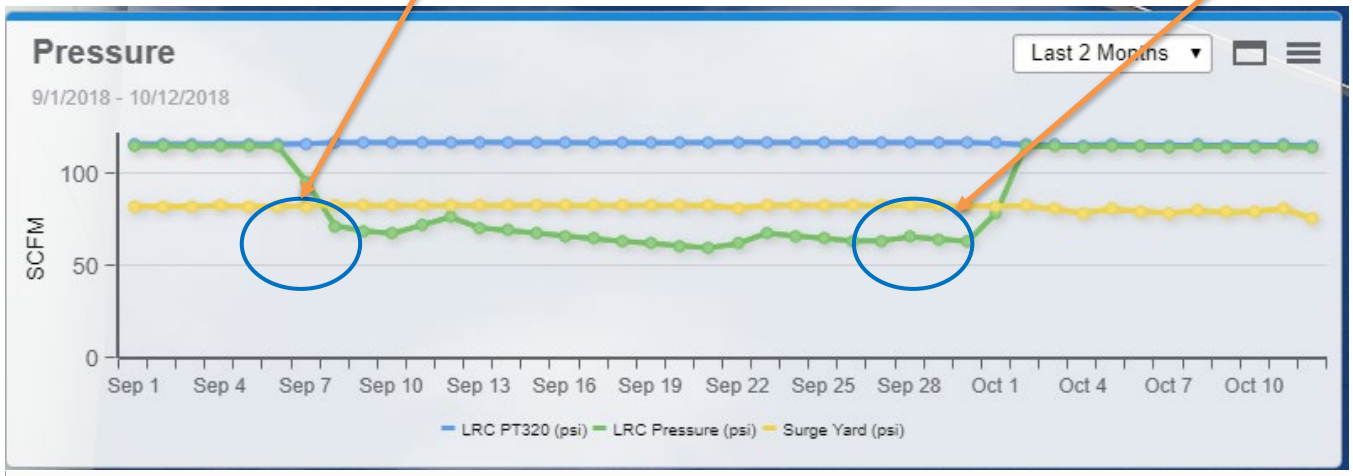
1- Union staff have mobile access to monitor Compressors

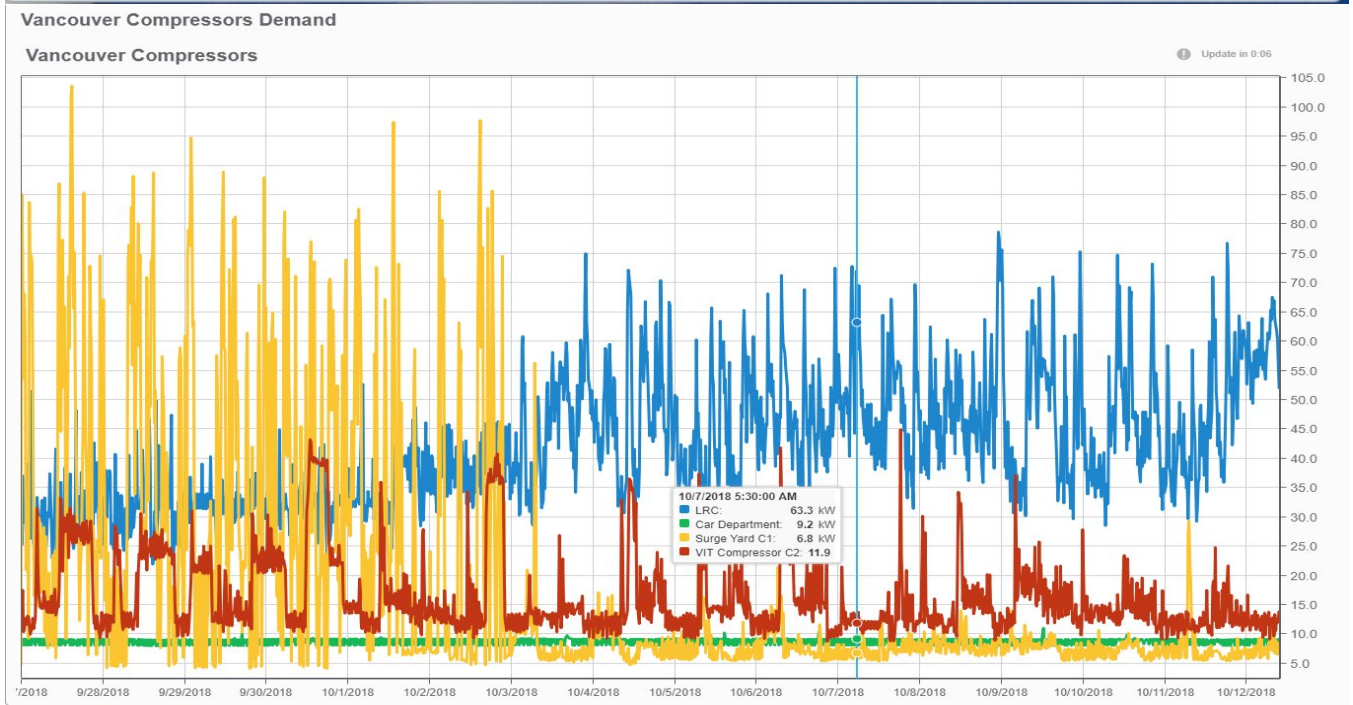


Compressor Incident- Vancouver

Sudden Unexplained pressure drop

Issue found and valve opened





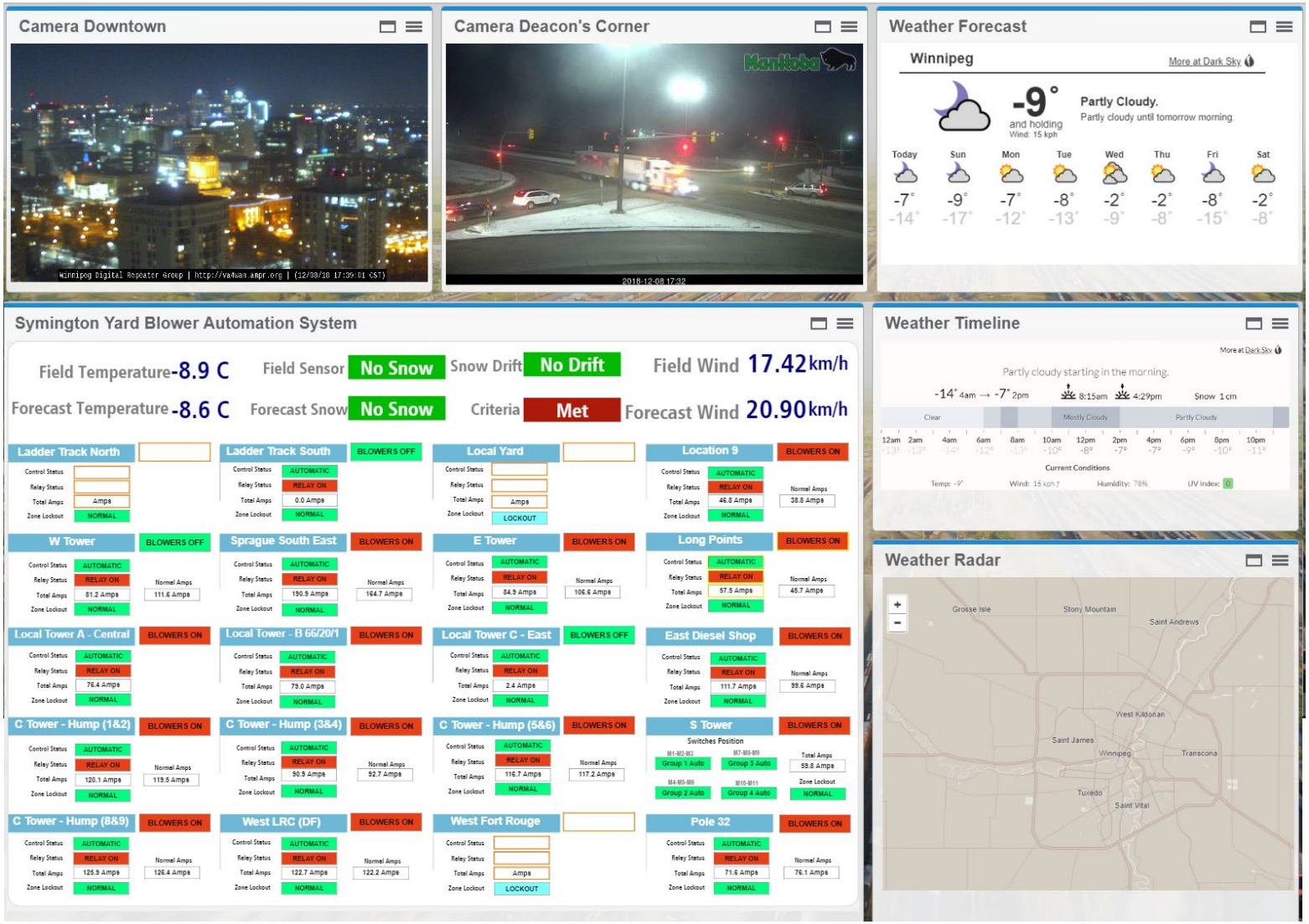
Example System:

Snow Blower System

Switch heater Monitoring

- Switch Heaters/Blowers are crucial for Track operations in winter season
- They account for up to 40% of our winter demand
- A good candidate for automation and control given their weather dependability.

Yard Equipment monitoring (NEBs)



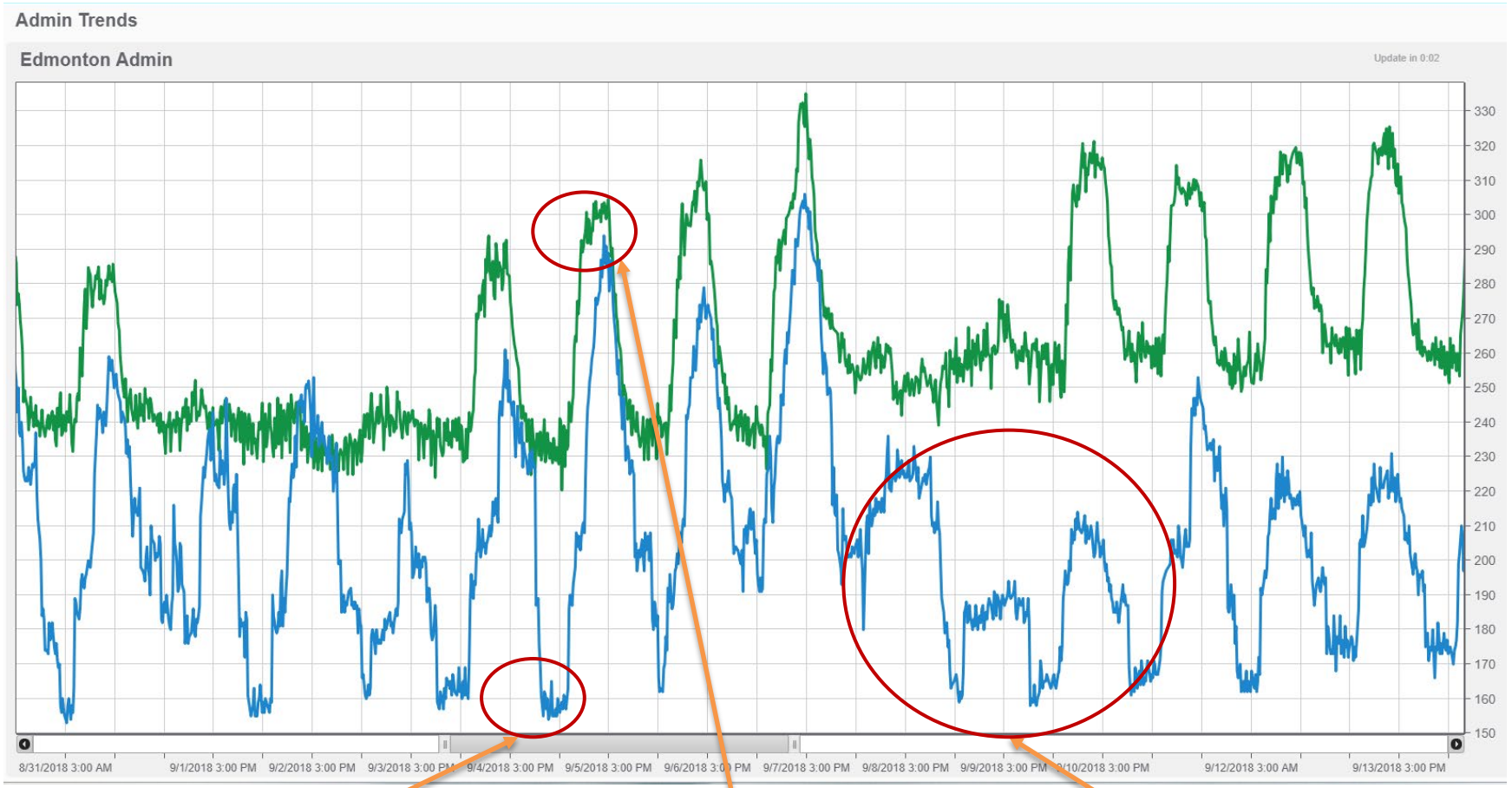
- Troubleshoot blower panels by looking at real-time current readings.

Buildings Monitoring

- Keep Track of Energy Usage and spot abnormalities in real time
- Track the short term demand and compare it to the long term demand.

Buildings Monitoring

- Spotting anomalies by comparing similar sized buildings within the same climate zone



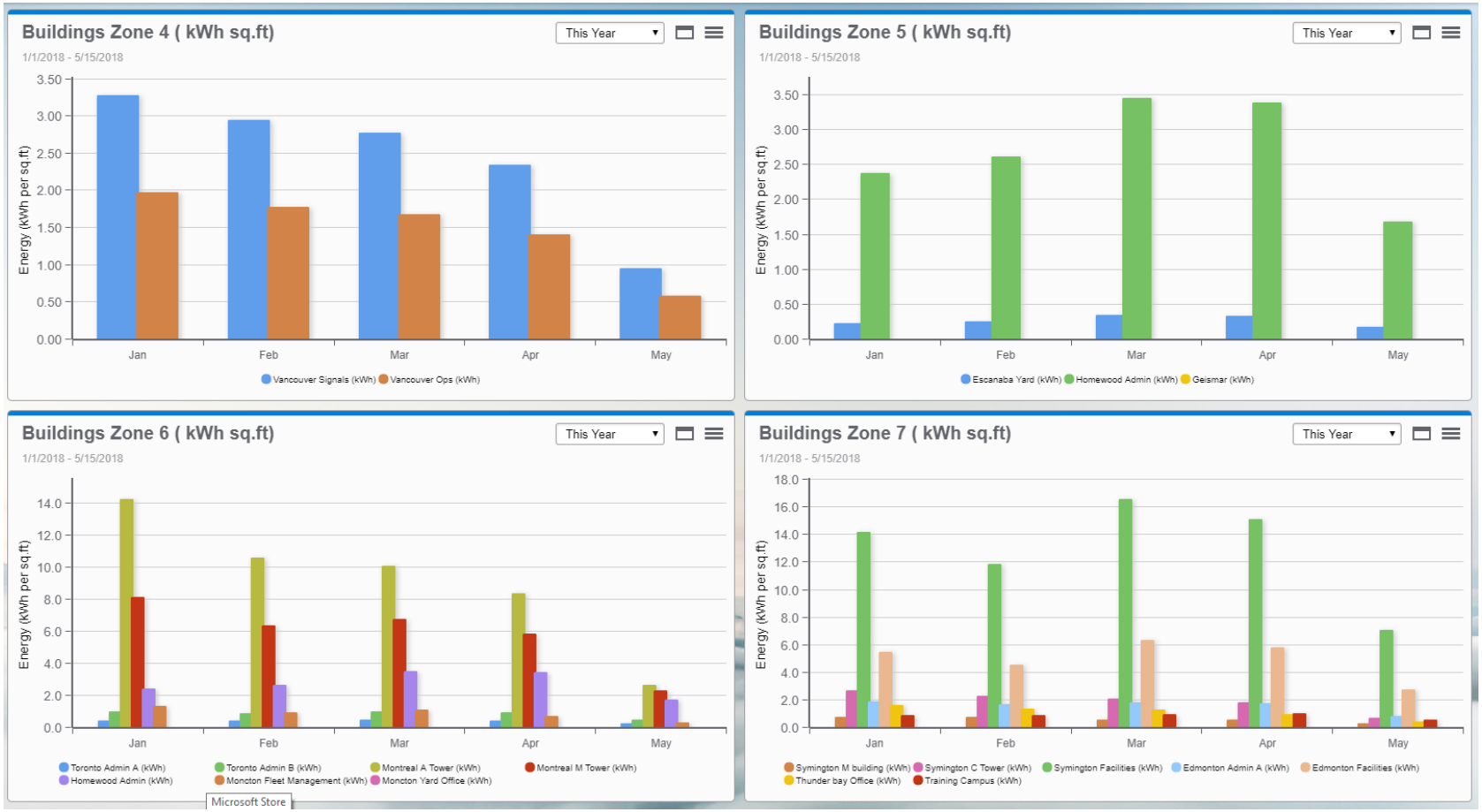
Better night setbacks

Comparable day loads

Weekend shift footprint is lower

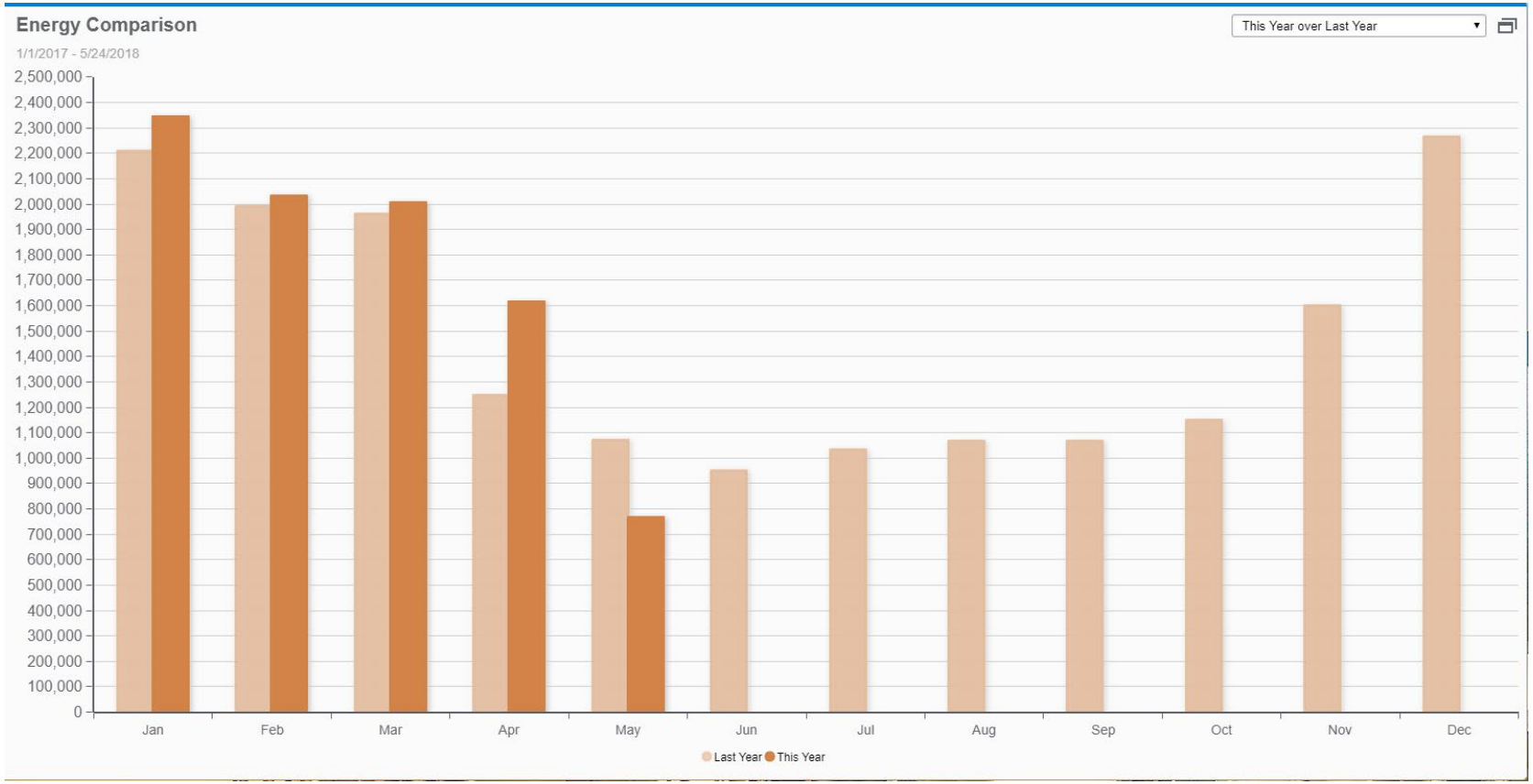
Benchmarking

1- Group Buildings based on ASHRAE climate zone
2- Easy to compare building performance and establish benchmarks



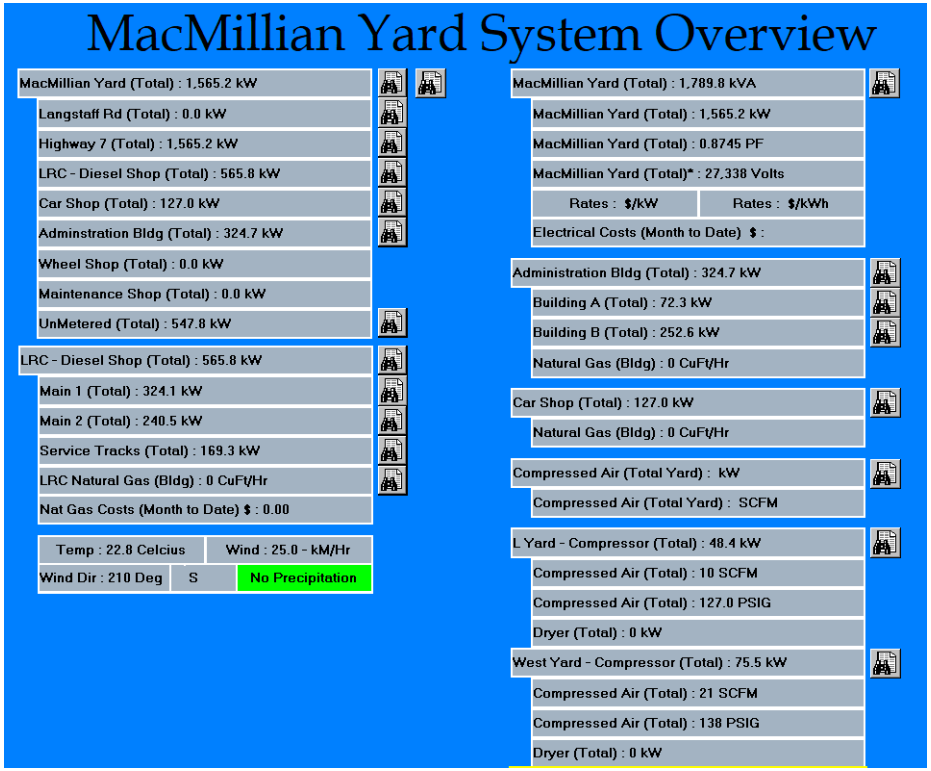
Why do we need an energy model?

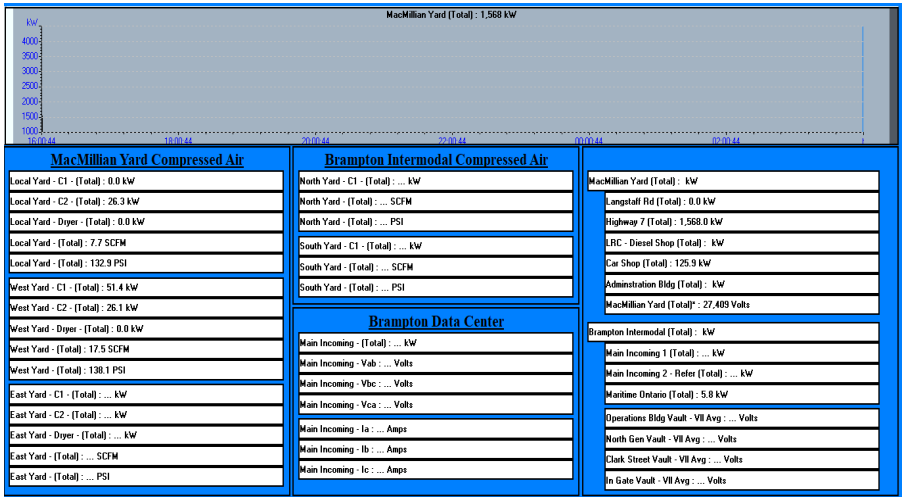
- Analyzing raw data can be tricky
- What drives energy usage in a facility?
- Comparisons can be misleading if the conditions are different (eg. colder winters).

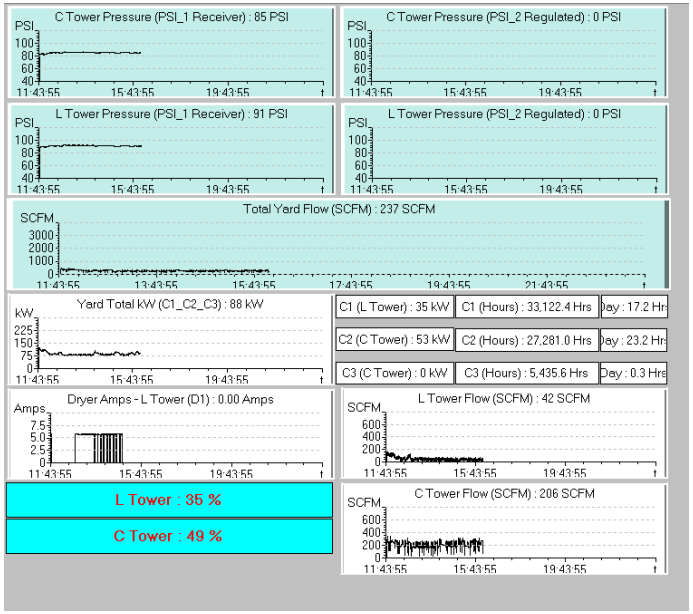


Evolution of EMS

How it started







The Full story- Easy to read

Sub Metering

Real-Time Trend

Vista Screen

Energy Modeling results

Historical Data


Thank you!