AABC Commissioning Group
AIA Provider Number 50111116

Owners and Engineer's Success with a Monitoring-Based Approach

Course Number: CXENERGY1828

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ETC group

delivering energy savings

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Course Description

The University of Utah implemented a laboratory controls upgrade at the Henry Eyring Chemistry Building inspired by the U.S. Department of Energy's Better Building Challenge.

This case study outlines how the monitoring system was set up and utilized throughout the process.

The owner's perspective focuses on the process of resolving issues to establish a safe laboratory environment and to gain energy savings.

Learning Objectives

At the end of the this course, participants will be able to:

1. Understand Monitoring-Based Commissioning, including benefits and challenges.
2. Understand typical operational issues and solutions in laboratories. The data tells the story!
3. Understand the value of Monitoring-Based Commissioning from an owner's perspective.
4. Learn about the software tools used, the challenges, and lessons learned during the construction phase, both from the commissioning practitioner and owner's perspective.

Definition

MBCx is a measurement-based paradigm that affords improved risk-management by identifying problems and opportunities that are missed with periodic commissioning or basic functional testing that do not incorporate energy measurement

Monitoring + Analytics + CxA = MBCx

Source: Mills, E., and P. Mathew. 2009. “Monitoring-Based Commissioning: Benchmarking Analysis of 24 UC/CSU/IOU Projects.” Lawrence Berkeley National Laboratory Report number 1972E.

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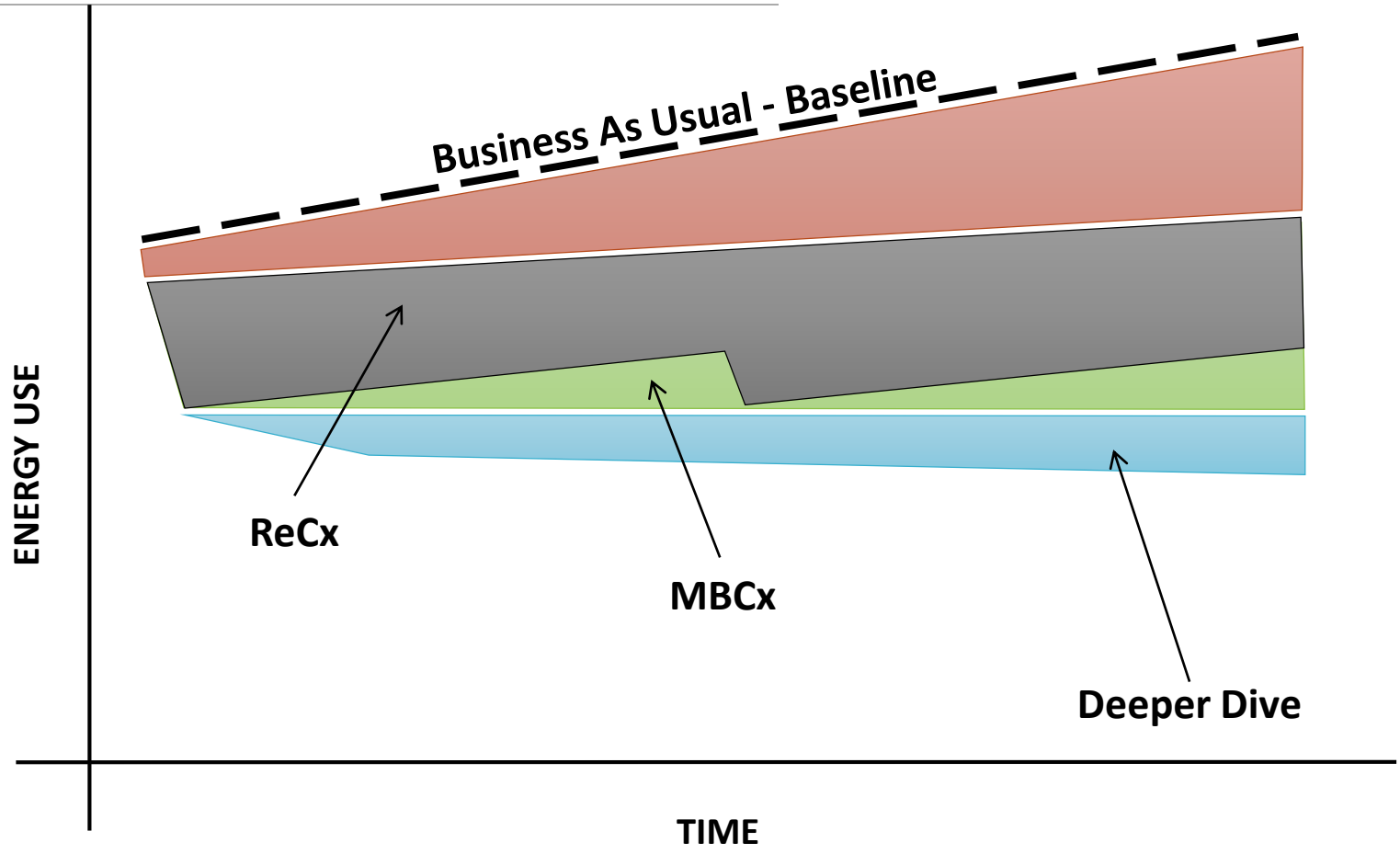
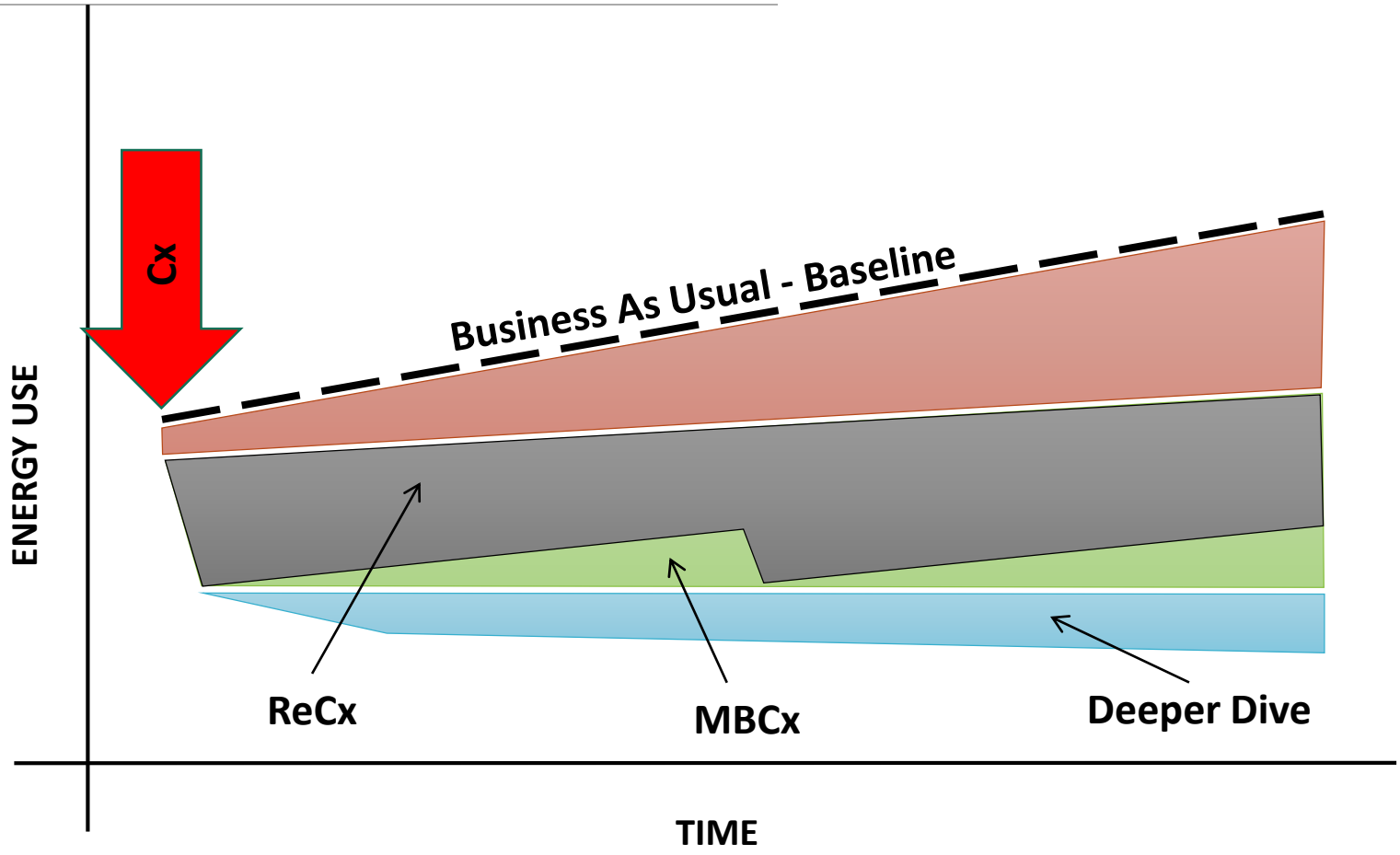
Why? Drift.

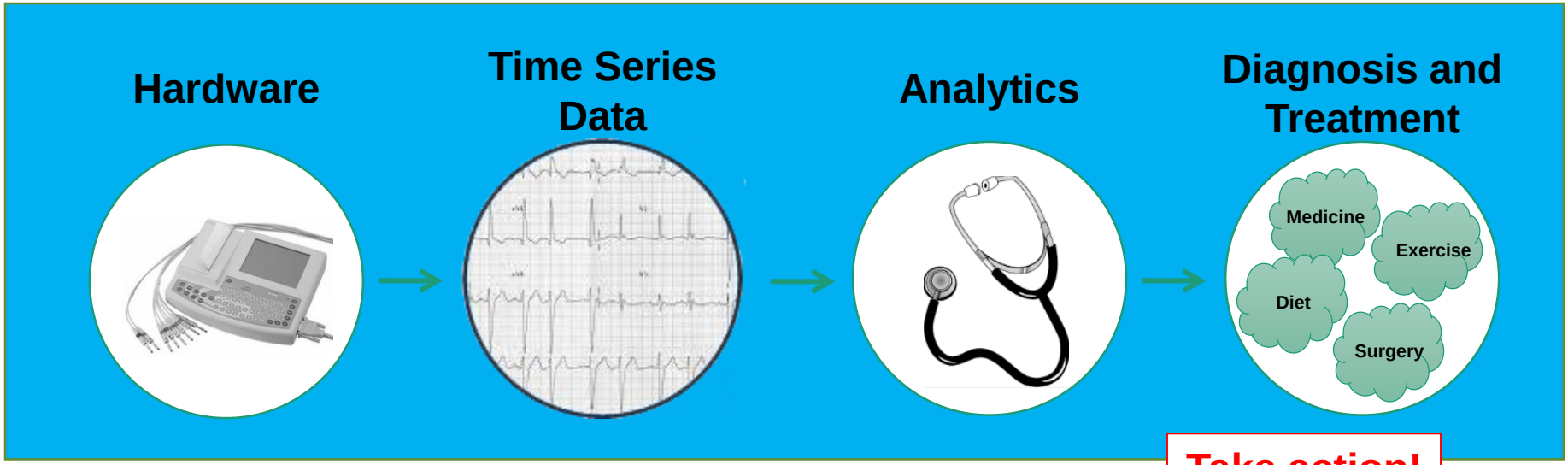

Business As Usual - Baseline
ENERGY USE
ReCx
MBCx
Deeper Dive
TIME

Drift


Cx
Business As Usual - Baseline
ENERGY USE
ReCx
MBCx
Deeper Dive
TIME

Monitoring & Analytics

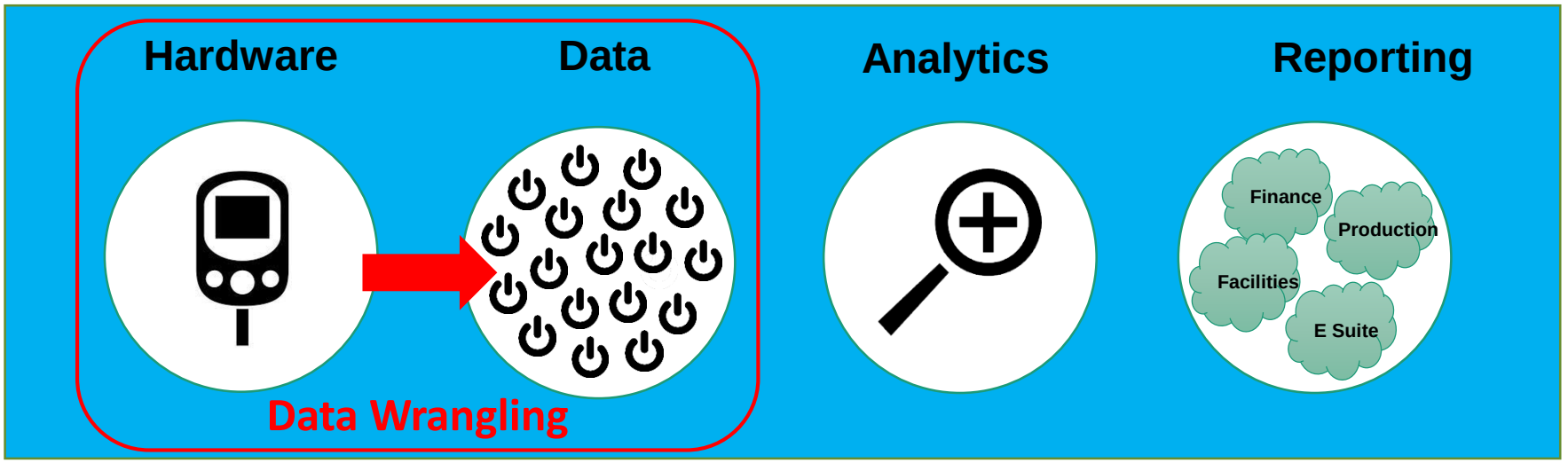
What is it? The EKG Example



Wouldn’t it be wonderful if you could do something similar with your building?

It is possible!

How?



Meters/Sensors
BAS
Production
Weather

Identify the data you need; high level to deep dive

Process and store data
Integrate other data sources
Identify operational issues

Dashboards
Reports
Notifications/Alerts
Actionable Info

Benefits

1. No sampling

   Field work is informed by M&A observation
   (e.g. traditional Cx looks at random sample. MBCx looks at an informed 10% of devices in the field)

2. 30 day observation: during occupancy variations, load variations
3. Ongoing Cx and Optimization during warranty period
4. Access to data valuable for GC and trades

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Challenges

1. Cost
    - More expensive than a typical Cx approach
2. Data wrangling
3. Root cause analysis
4. Communication

The Project – University of Utah Chemistry Building

Controls Upgrade: Constant Volume -> Variable Volume

267,000 square feet

Equipment

3 Dual Duct Air Handling Units
- 100% Outside Air
- Retrofit to Fan Wall

94 Student Labs

30 Fume Hoods

267 Office Mixing Boxes

Measured Energy Savings:
$381,000/year

Roles

Owner: Sarah Boll, University of Utah
Facility Director: Jim Mueller
Engineer: Burns & McDonnell
Lab System: TSI Controls
BAS: Honeywell, Wasatch Controls
Commissioning Agent: ETC Group
Analytics Platform: SkySpark

What's so great about using analytics during commissioning?

1. Data Visualization
2. Analytics – over time and across all devices
3. Savings Measurement

Data Visualization – Installation deemed complete …(?)

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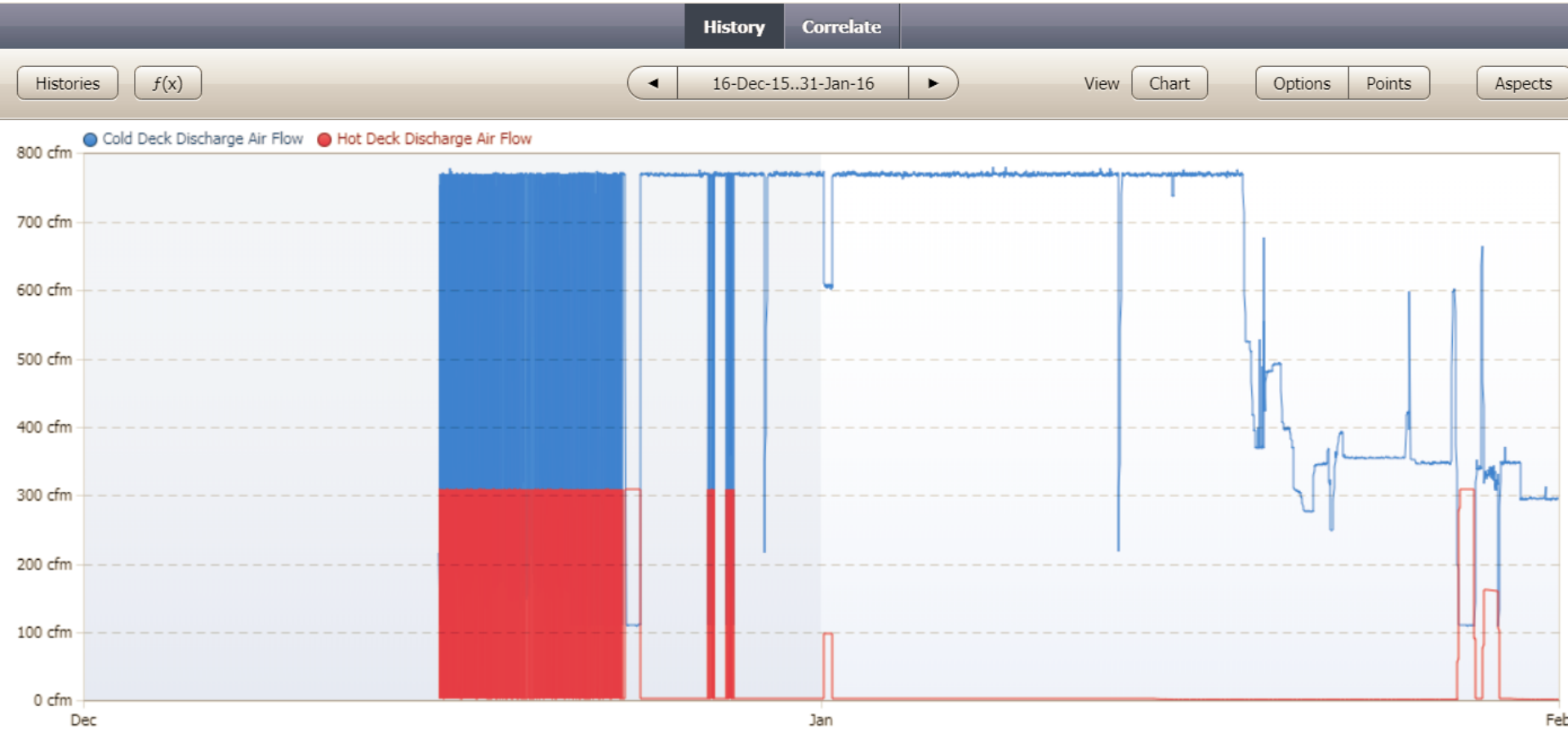
Data Visualization – Correction #1

Data Visualization – Correction #2

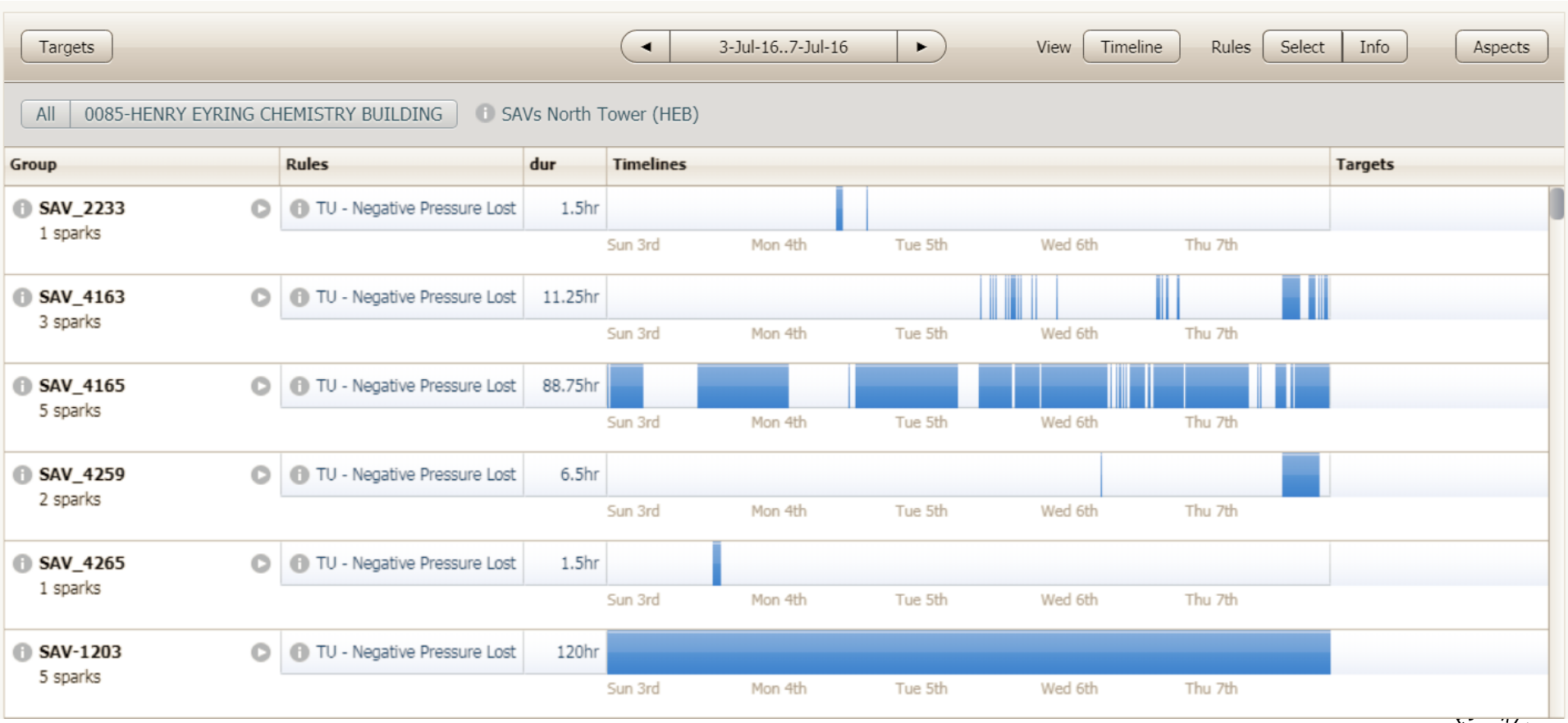
Data Visualization - Resolution



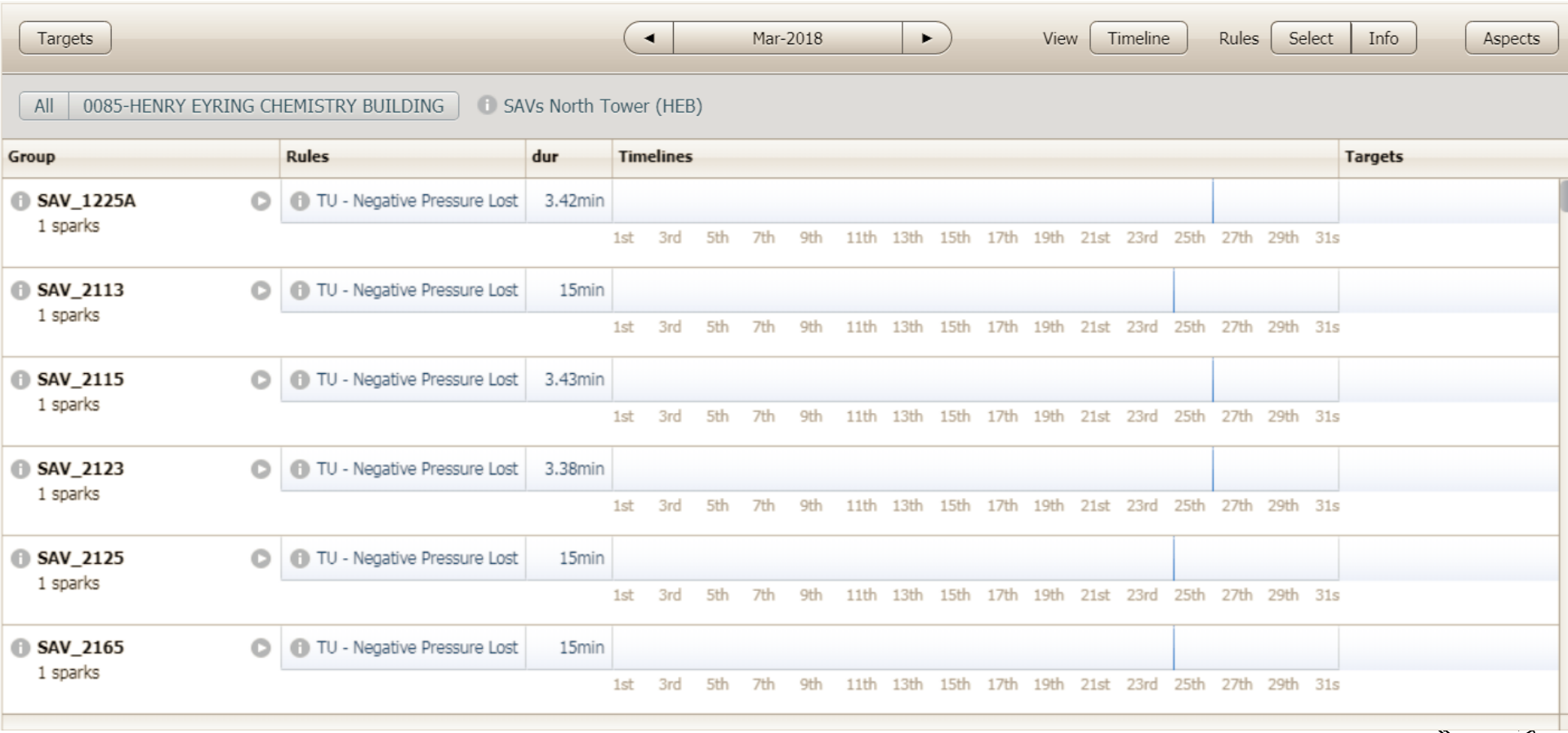
Data Visualization – Safe Conditions Verified

Data Visualization – Unsafe Conditions during Warranty Period

Analytics – 100% of Devices tested for Safety



Analytics – Two years later, Safety Monitored



Data Visualization – over time and across 100% of devices

Measured Energy Savings

Owner Perspective – Sarah Boll

Owner Benefits from MBCx – project specific

- 100% equipment check-out
- On-going trending finds additional issues
- Maximizes items corrected during warranty
- Holds contractors accountable
  - It is hard to argue with easy-to-understand data!

Owner Benefits from MBCx – ongoing

- Time savings for technicians
- Reduces building drift
  - USU Holland Commons
- Single monitoring platform
  - Across multiple Building Automation Systems and Energy Meters
- Gives Facility Managers visibility into their building performance

Owner Challenges with MBCx

- Convincing facilities - this is not a BAS!
- The information can *seem* over-whelming, but actually, it helps to prioritize issues!
- Cost of implementation
- Deciding which MBCx approach is appropriate for your agency / institution
  - Learn the skills in-house
  - Contract with a MBCx service provider
  - Both are good models – it all depends on the scenario

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Questions?

Thank you

This concludes The American Institute of Architects
Continuing Education Systems Course

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