Event Frames for More Effective Decision Making – a Nuclear FWIV Application

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PALO VERDE

PI Admins
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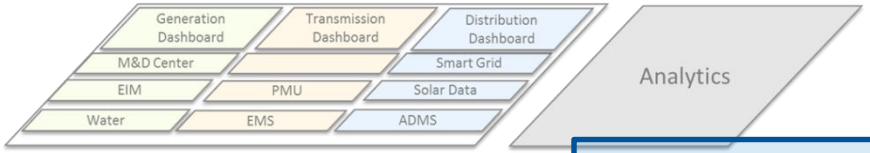
PI at APS: Program Vision

One version of the truth

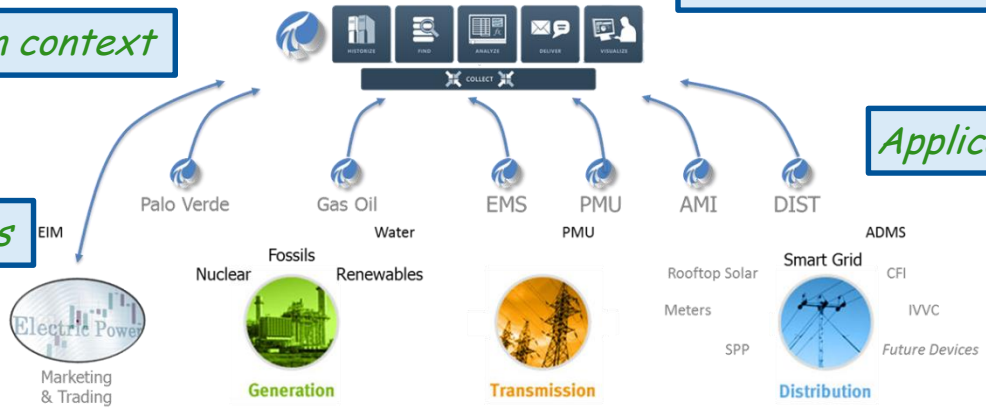
Direct access to data

Improved situational awareness



Foundation for Enterprise Analytics

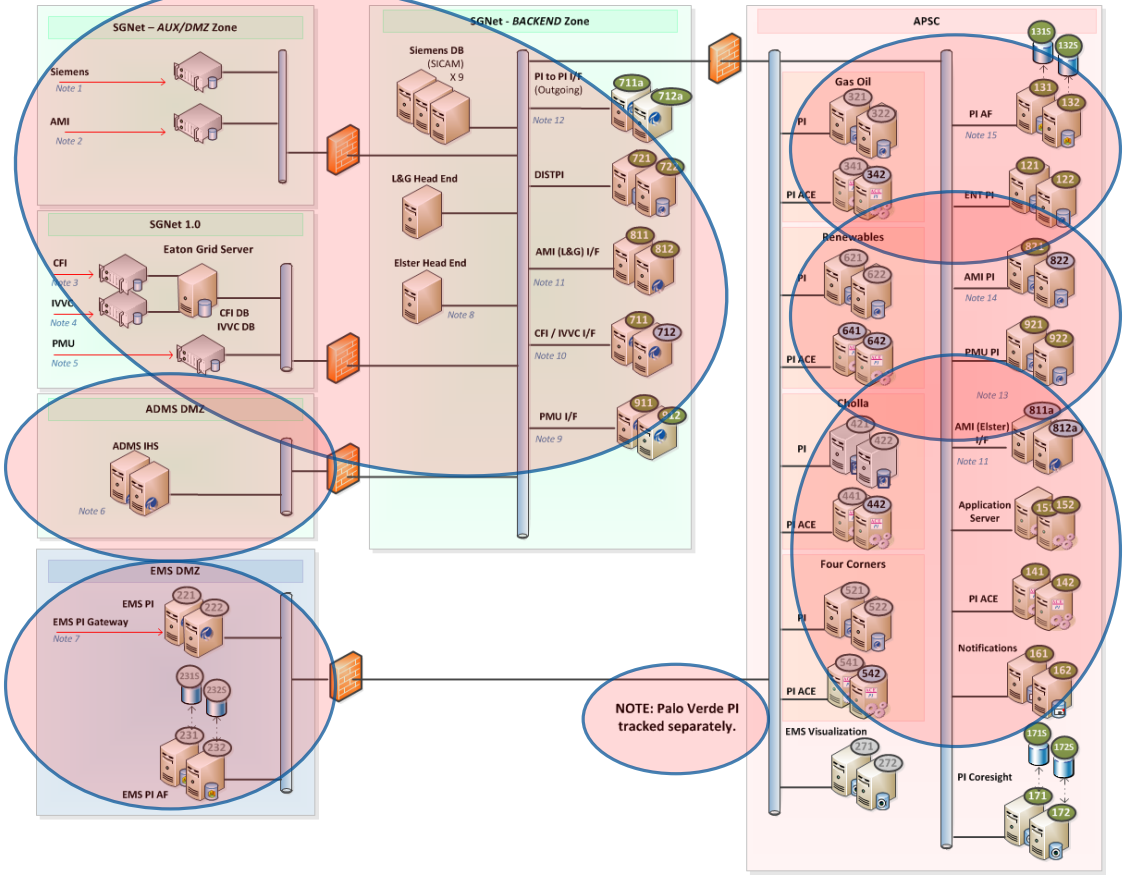
Data in context



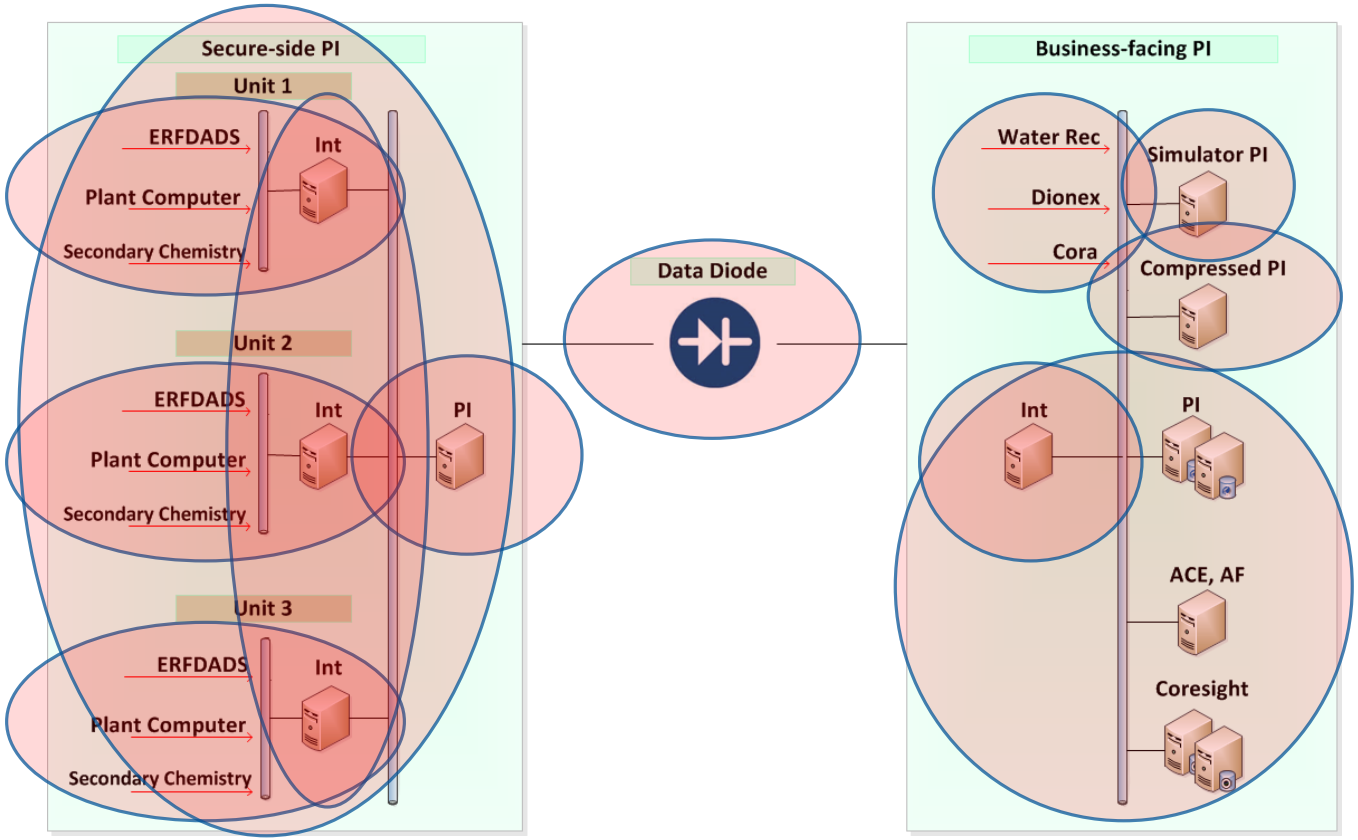
Applications monitor conditions

Additional insights

PI at APS: Architecture



PI at Palo Verde



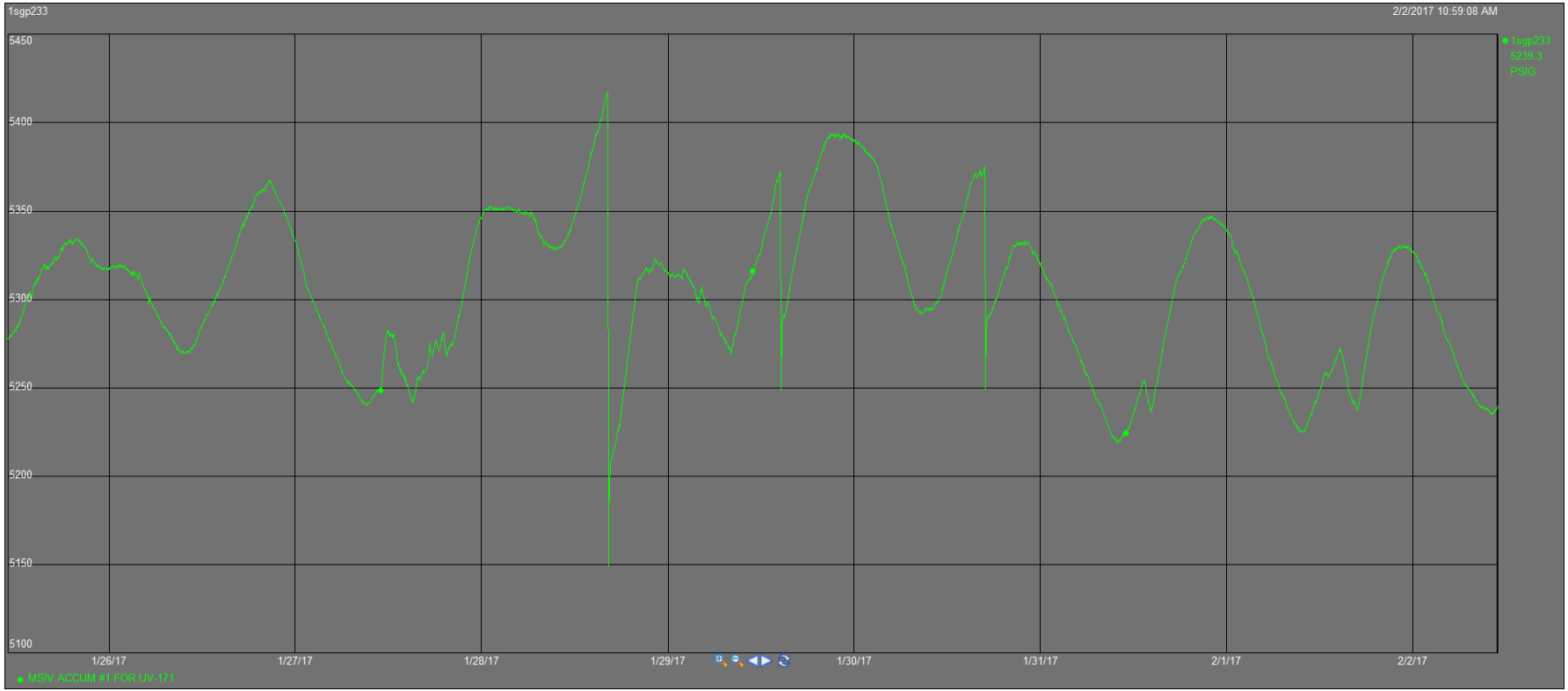
Enterprise Agreement

- In place October 2014
- Benefits
  - Software licensing
    - Takes licensing cost out of the equation when adding servers.
    - Easily take advantage of the full suite of PI System technologies
    - Unlimited points
  - Enterprise Program Manager, Center of Excellence, FSEs
  - Training, event vouchers
  - Workshops
- PAYOFF: EA accelerates solutions that impact business

Background

- FWIV – Feedwater Isolation Valve
  - Required to isolate a steam generator in the event of a tube rupture or steam line break

Nitrogen Fluctuations

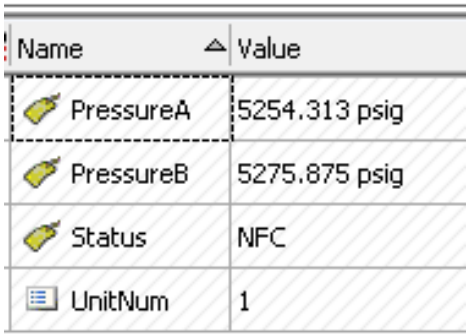


Insulation

- Multiple data points were needed
  - Which valve is the biggest offender
  - How can we validate the design
  - Is it economically justified

Event Frame Setup

- Establish trigger and event duration
- Backfill historical data
- Fidelity Check
- Tweak the data
- Repeat



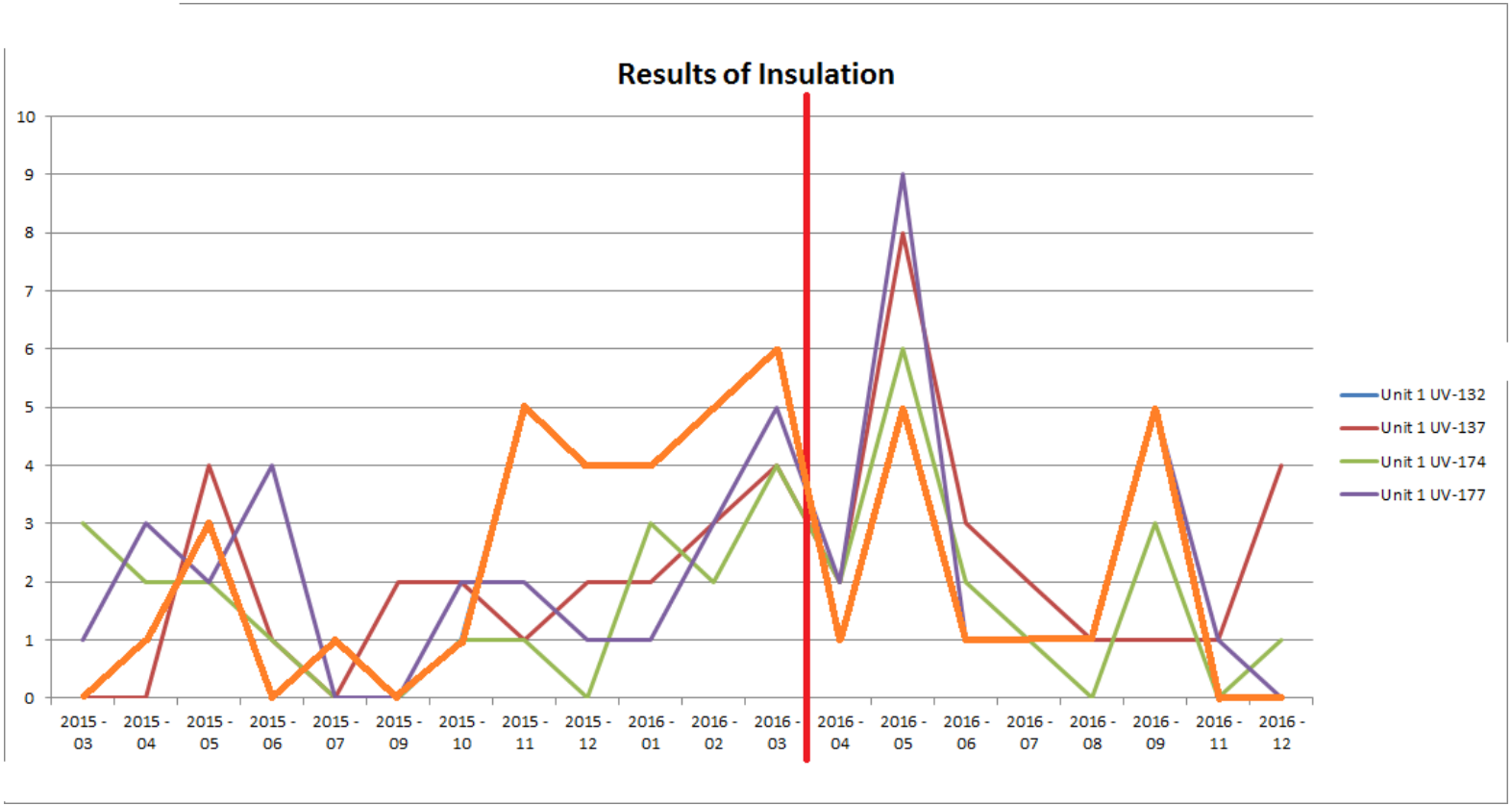
Name	Value
PressureA	5254.313 psig
PressureB	5275.875 psig
Status	NFC
UnitNum	1

Name	Expression
StartTrigger	`Abs(('PressureA'- TagVal('PressureA','*-10s')))>11.5 and 'PressureA' > 4999 and 'PressureA' < 5501`

Fidelity Check

- Certain instances where the more events were created than actually existed.
  - A repressurization from 0 would count
  - A depressurization to 0 would count
- Backfills worked successfully, however the event frame would not capture new data
  - The trigger would only look at the last 10 seconds worth of data to see if an event was lasting for at least 45 seconds.

Results



Results (cont.)

- Previous 9 months
  - Chosen Valve: 26 adjustments
  - Sister Valve: 17 adjustments
- Following 9 months
  - Chosen Valve: 14 adjustments
  - Sister Valve: 22 adjustments

Results (cont.)

- Event frame creation: 9 Hours
  - Establishing the event frame
    - 6 hours
  - Fidelity check
    - 3 hours
- Estimated time to review data manually
  - 27 hours

Results (cont.)

- Operational Savings
  - Unit 1 FWIV adjustments from 3/2015 to 3/2016
    - 94 adjustments
  - Based on a 53% decrease model
    - Estimated 50 adjustments
- Cost of adjustment
  - 2 Auxiliary Operators, 1 Reactor Operator, and 1 Control Room Supervisor for approximately 15 minutes
- Reduction of risk

Summary

COMPANY and GOAL

Palo Verde Nuclear Generating Station wanted to alleviate the burden associated with maintaining our hydraulically operated valves

CHALLENGE

Temperature sensitive pressure swings cause undue burden to maintain OPERABILITY

- Very tight pressure band
- Exposed to environmental temperature fluctuations
- Must be adjusted locally.

SOLUTION

We can insulate accumulators, but with limited resources, is it worth it?

- Event Frames were developed to track the number of pressure adjustments to determine which valves were the worst offenders and to assess the effectiveness of insulating one test case.

RESULTS

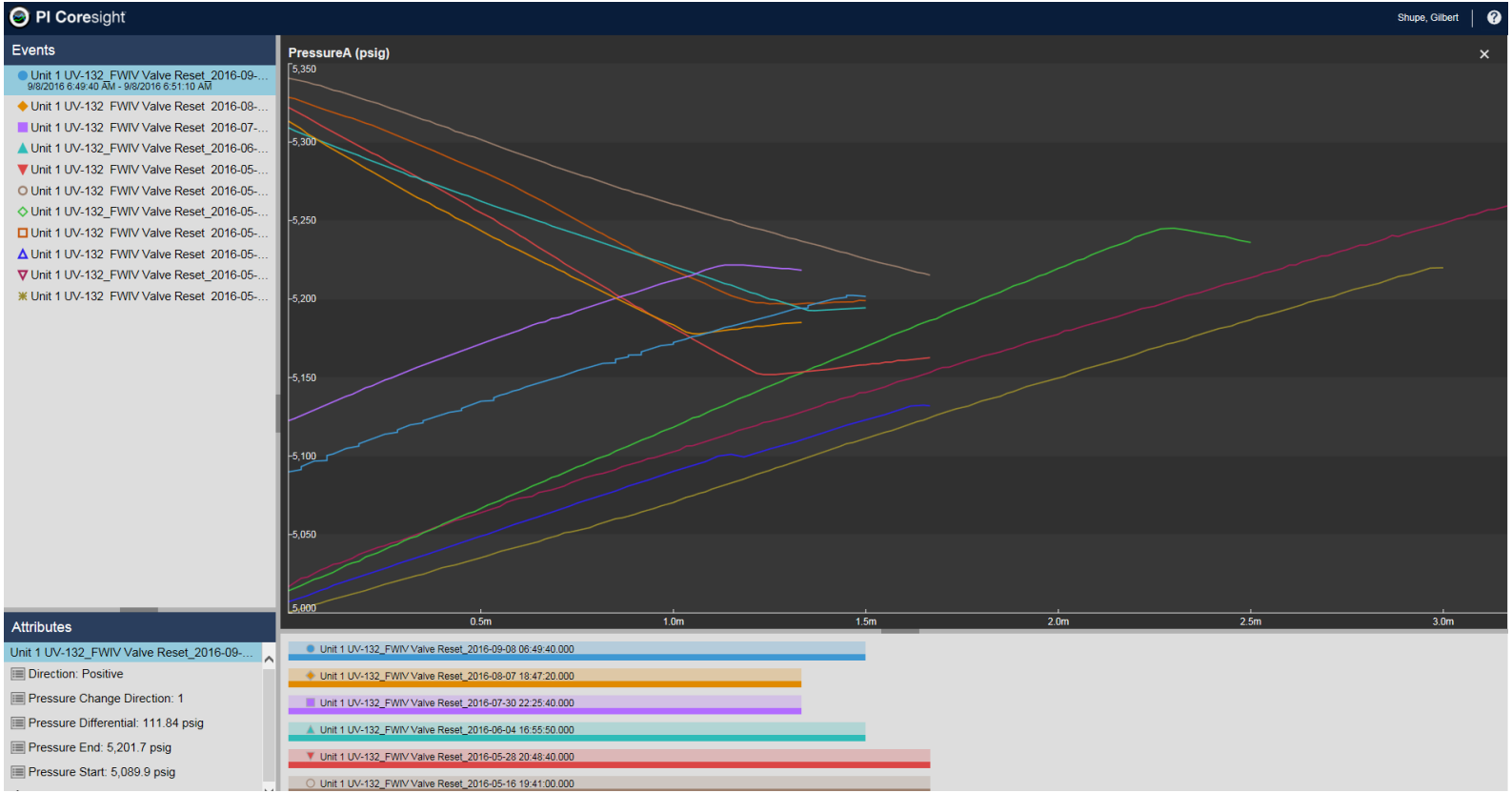
Insulation was much more effective than anticipated

- Pressure swings fell by approximately 40%
- Cost savings and risk aversion
- Alleviates the burden of adjustments dramatically

Going Forward

- The site will move forward with insulation
  - Currently revising our specification to allow for aerogel impregnated blankets
- The savings not only justified the use of resources to install the current blankets, but justified the use of resources to optimize the current design.

Going Forward (cont.)



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PALO VERDE

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado