AVEVA PI WORLD

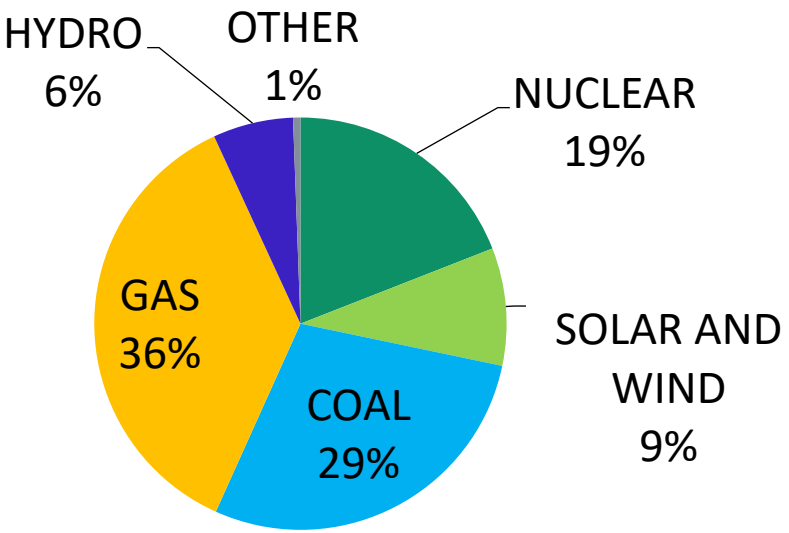
Continuous Online Monitoring at Duke Energy Nuclear

Presented By: Wayne Lee

Duke Energy

- 56,500 Megawatts Capacity
- 7.8 million customers

POWER GENERATION PORTFOLIO



Thousands of machines deployed!

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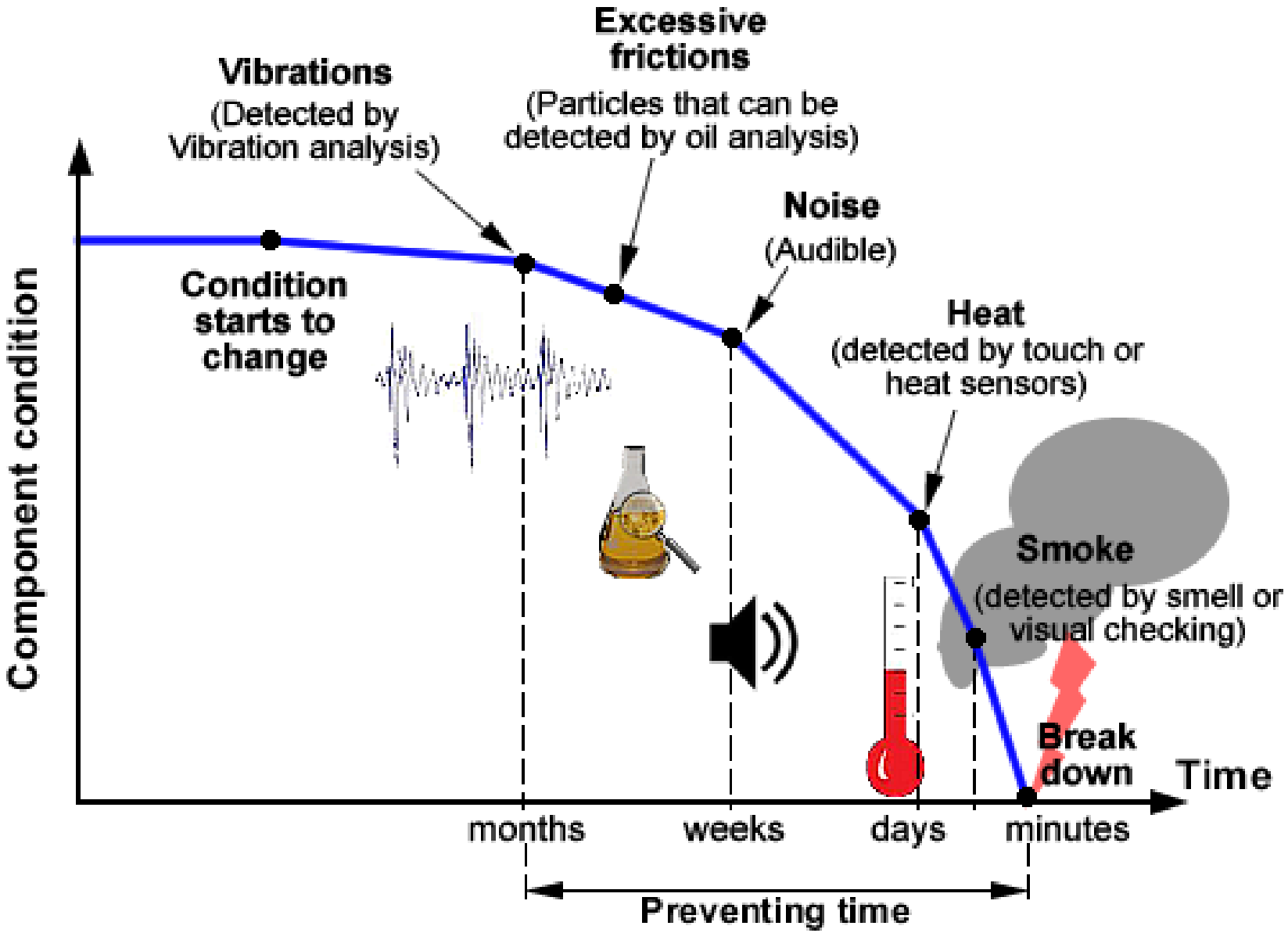
Duke Nuclear

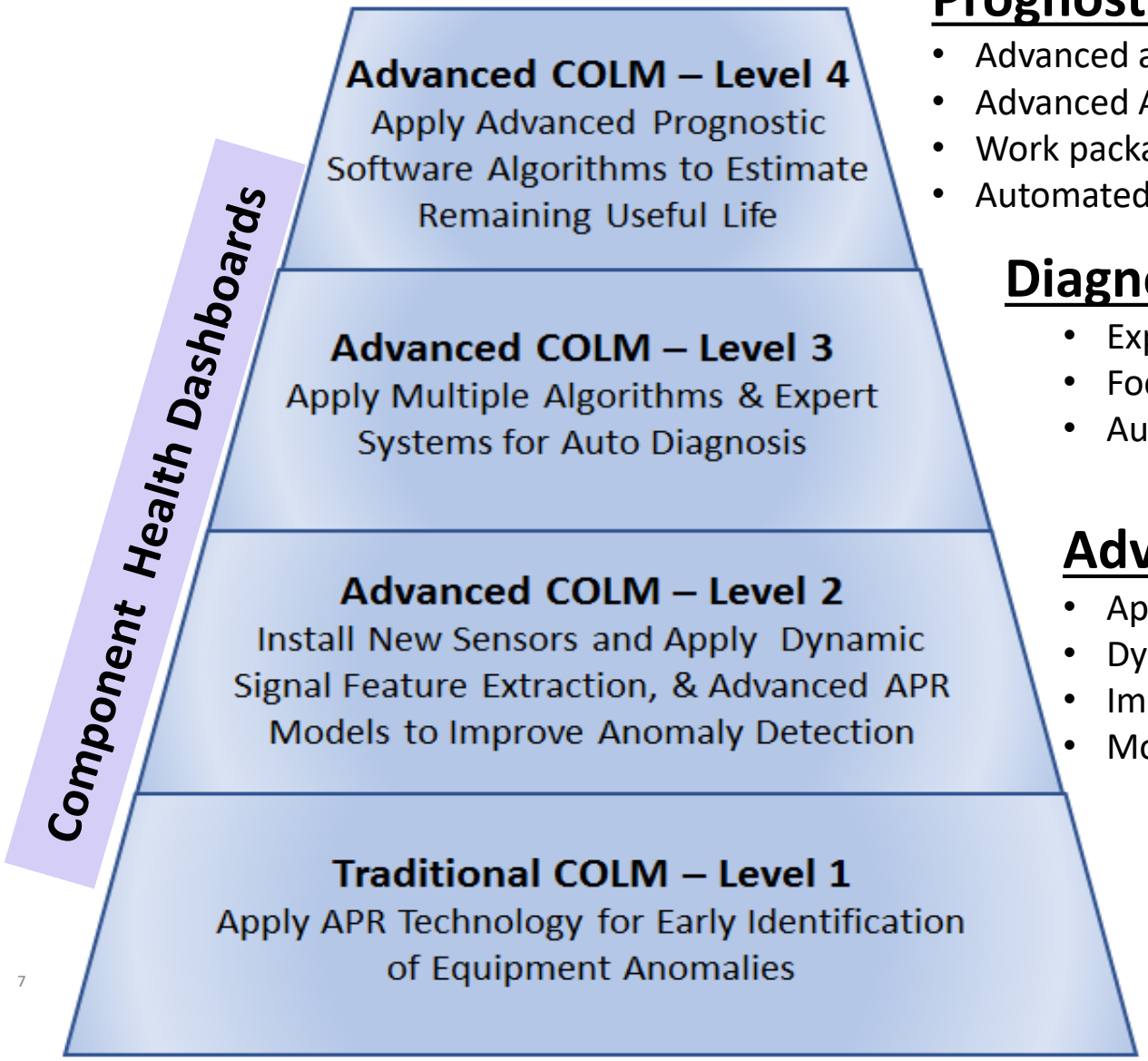
- 6 Sites
- 9 Pressurized Water Reactor
- 2 Boiling Water Reactors

Equipment Reliability is Crucial

- Maximize sites' available capacity
- Ensure reliable safety and critical systems
- Manage resources and budget wisely



Progression of Continuous Online Monitoring



Prognostics – Level 4

- Advanced algorithms to predict remaining useful life (RUL)
- Advanced Artificial Intelligence (AI) and prescriptive technologies
- Work packages associated with identified failure types
- Automated detection, diagnosis, work scheduling & inventory mgt

Diagnostics – Level 3

- Expands FMEA Analysis use to speed up diagnosis
- Focus on specific failure mechanisms
- Auto diagnose certain failures modes, based on sensor inputs

Advanced COLM – Level 2

- Apply FMEA analysis to influence addition of more online sensors
- Dynamic signal feature extraction and inclusion in APR models
- Improved "Anomaly Detection"
- More effective diagnosis of equipment issues

Traditional COLM – Level 1

- M&D Center uses existing/available sensors/process data to apply APR software/models to provide for monitoring & alerting of major/critical plant components to "Identify Anomalies"

PI is a key enabler to COLM

- Common data repository from diverse sources of information.
- Broad audience : Operations, Engineering, Chemistry, Radiation Protection, and more.
- Foundation to layer advanced analytics

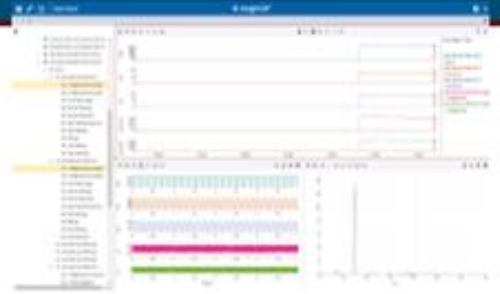
Continuous Online Monitoring

Wireless Gauge Readers

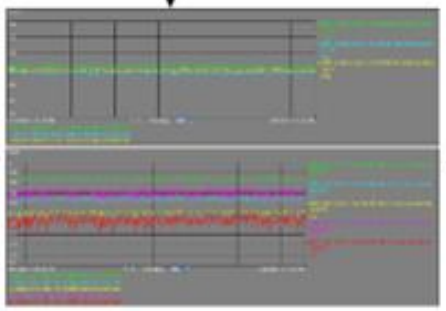
Vibration Monitoring

Temperature Monitoring

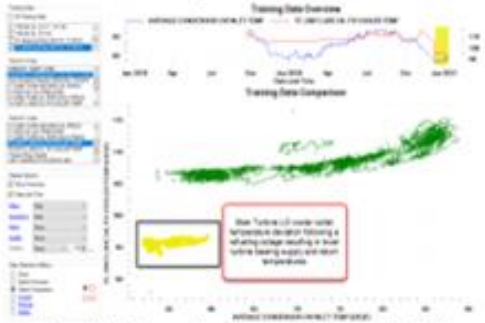
Current and Voltage Monitoring



Monitoring Software - InsightCM



OSI Software - PI



Predictive Software - PRiSM

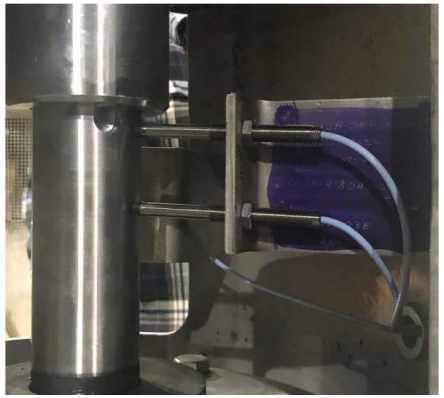
Advanced Analytics

Remote Monitoring

Sensors

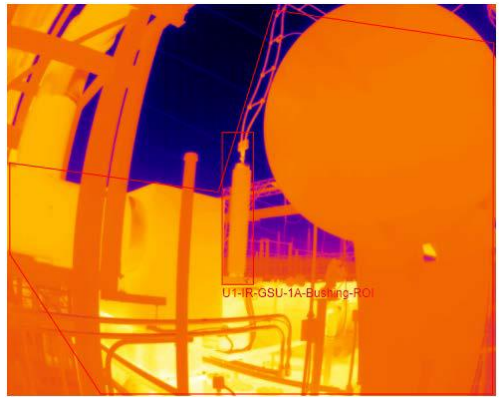
Accelerometers

Proximity Probes



CTs and PTs

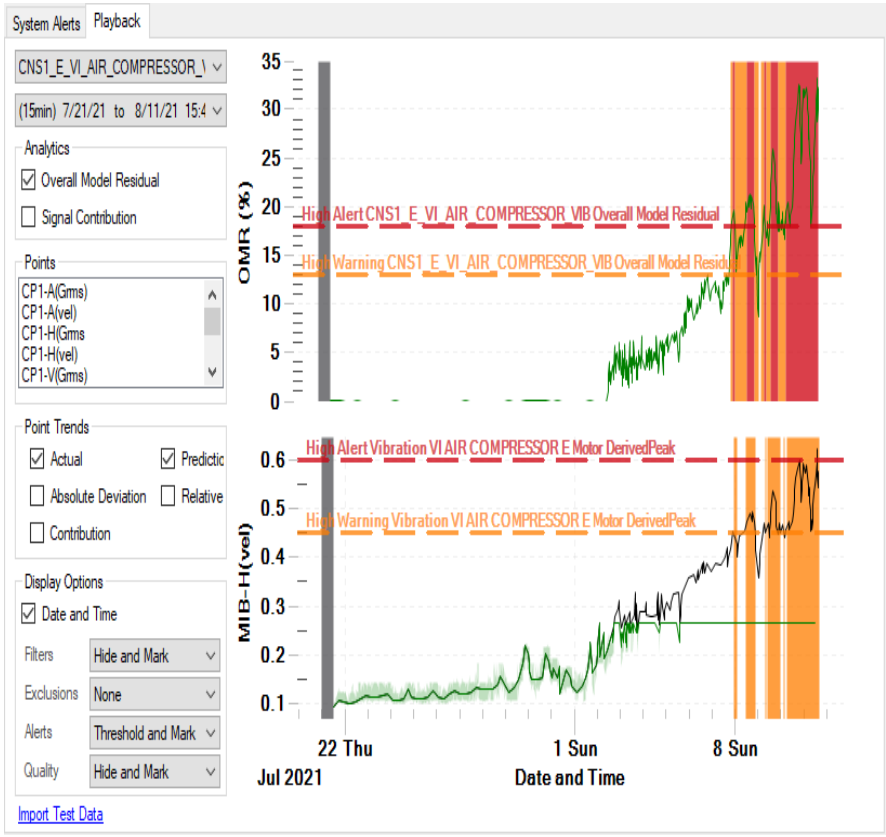
Infrared Cameras



Wireless Gauge Readers

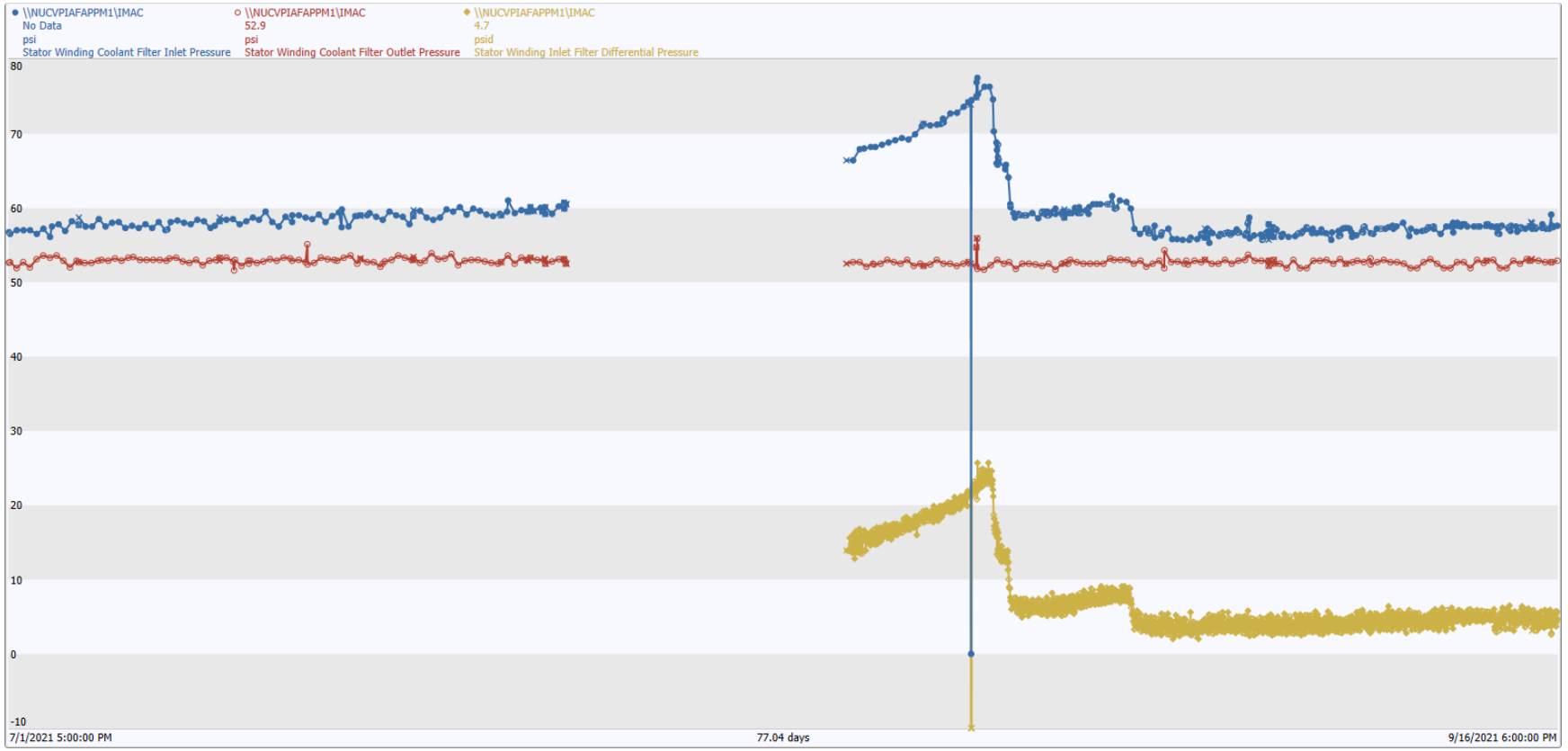
Early detection of coupling misalignment

Synergy among diverse sensors and analytics



Trending filter pressures with WGRS

Synergy among diverse sensors and analytics



Conclusion

- Progression towards diagnostics and prognostics
- Leverage PI to capture key info from diverse sources
- Enable business to optimize Equipment Reliability with resources.

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