



AVEVAWORLD

Challenges, Opportunities and Solutions for Digital LNG Operations

Franz Field
April 2025





Agenda

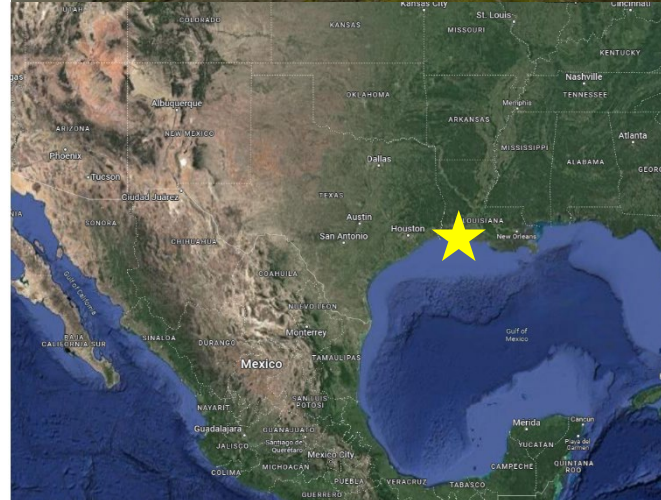
1. Introduction
2. Business Context
3. Field Wireless Data / Connected Worker
 - AVEVA Mobile Operator
4. Wireless Field Sensors driving Data-driven Operating Decisions
 - AVEVA PI System, PI Asset Framework, PI Vision, PI Connectors
5. Challenges & Lessons Learned
6. Questions

Cameron LNG

Louisiana Roots with Global Reach

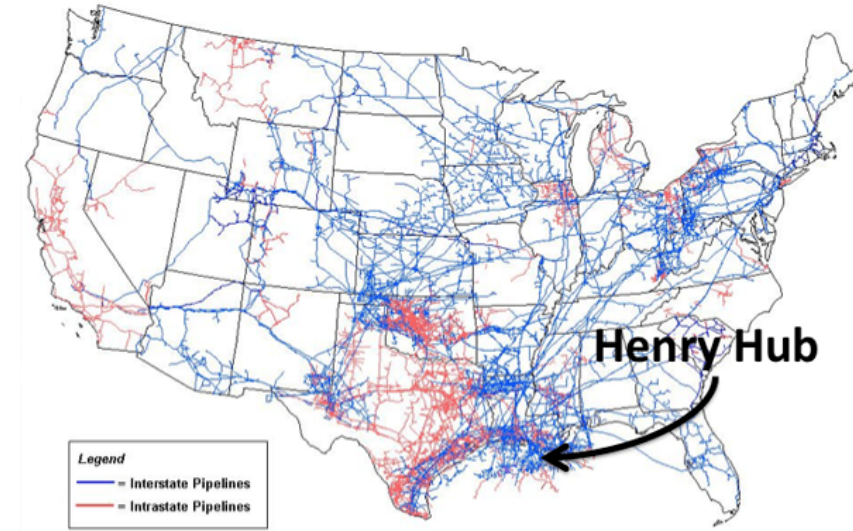
- 1 x World Scale LNG Export Facility COMPANY
- 3 Trains x 4.5 MTPA = 13.5 MTPA nominal capacity
Authorized export capacity of 14.95 MTPA (1.7 bcfd)
- Air Products APCI propane mixed refrigerant C3-MR
- GE/Baker Hughes Frame 7EA gas turbines
- Power supply = Entergy Louisiana Utility grid
- Tolling Agreement; no Upstream, No Trading, No Shipping

2014 AUG	Final Investment Decision
2019 MAY	Train 1 Commissioning
2020 AUG	Full Commercial Operations
2022 DEC	500 th Cargo
2025 JUL	1000 th Cargo



OPEX Business Model : POWER + PEOPLE + PRODUCTION

- Optimal Pipeline **gas supply** – options and interconnectivity
- Reliable GRID **Power**
- Modern LNG Facility – **instrumented for control**
- Plant Fiber communications infrastructure; **fiber connection to internet**
- Focused Business Model – Molecules from pipeline to LNG loading arms; Controllable OPEX.
- **Skilled** / Small workforce
- Resilient / Open / Friendly **Culture**
- Single Tenant / Cloud-first Business & Production IT Systems Infrastructure
- Right-sized **proven** LNG/Energy core application systems
 - SAP, Energy Components, UniSim, **PI System, Mobile Operator** (Intelatrac)
 - SmartPlant Instrumentation, P&ID, PDS 3D, SDx



Field Wireless Data / Connected Worker

Informed Operational Decisions / Enhanced Efficiency / Safer Operations

Challenge

- No access to real time information in the Field. 30-60 min loss of work time / day returning to office to get additional / confirm information
- Time-lag from data collected in Field being entered into digital systems
- Data collection, sharing, and analysis were time consuming and lower quality

Solution

- AVEVA Mobile Operator to streamline Operator Rounds Management data collection, access, analysis, and reporting
- Field Wireless Data System – 4G LTE CBRS

Results

- Enhanced Operator Efficiency / Time on Tools
- More, Faster, Better Safety Observations
- Better Quality Incident Reports with Field Photos
- Engaged workforce – same digital experience as in day-to-day life



CONNECT the Connected Worker

Field Wireless Data

- Bring Data to the Field – access data systems in the Field. Reduce round trips to offices to access information.
- Bring Field Data to the Office – data entry from the Field, sensor data. Reduce manual entry and data errors
- Electrical Safety in hydrocarbon processing areas : Digital devices must be rated for use in Hazardous Zone – Class 1 Div 2



- **Shift Operator Rounds – 2 shifts every 24 hours | 3 rounds**
- **Structured procedures to make Observations, Collect non-networked instrument data**
- **Write equipment maintenance requests if/when needed and sync directly to Maintenance System SAP**
- **Interfaces to SAP Preventative Maintenance, PI Data Infrastructure, Shift Logbook, Product Quality Sample collection**

Major Milestones

2022 : Added Field Wireless Data / CBRS network to Site

2023 : Mobile Operator 2020 R2 on Ecom Ex-Cover 6 Pro D2

2024 : Full roll-out : dedicated mobile handheld for each Operator

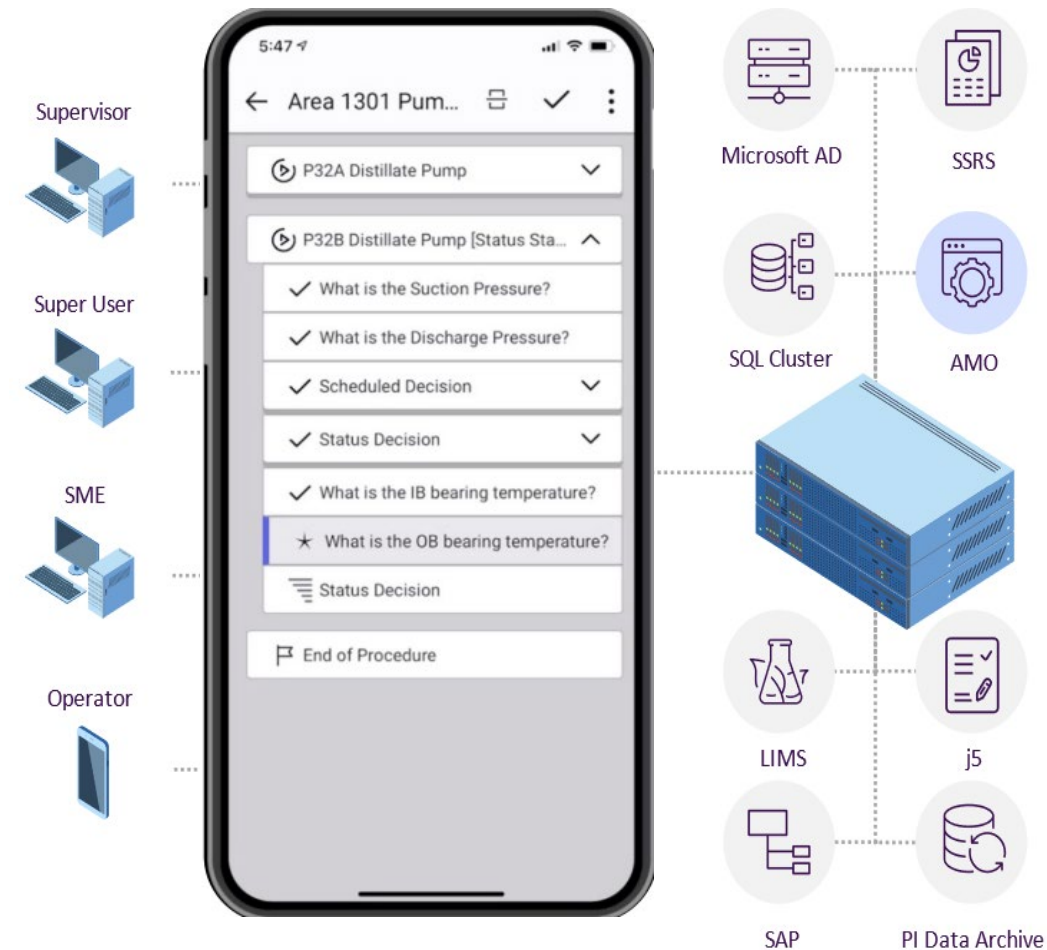
2025 : Extending capabilities : Safety Observations; Incident Reporting from handheld with Enablon mobile application

2025+

ShiftLogbook

Electronic Safe Work Permit (ePTW)

Aveva Mobile Operator



Field Wireless High-Speed Data

Private 4G LTE Band 48 (CBRS) Installation

- **Cost-effective high speed wireless data for Field Operations**
- **Support operational intelligence in the Field.**
 - Not for process control.
 - Not connected to control systems network
- **High Security – eSIM /SIM required for access**
- **Independent of Public Carrier LTE Network**
- **2-3 LTE Cellular Radios cover 1 mile x 3 mile site**
- **CBRS / LTE Band 48 ease of use, no spectrum licensing**
- **LTE Band 48 Support in most all modern mobile devices – Apple & Android**
- **5G upgrade compatible**



Mobile Devices for Field Use

- Electrical Safety : Class 1 DIV 2
 - Apple iOS - Industrial cases; UL-certified
 - Android – Pepperl+Fuchs eCOM
- 4G LTE Band 48 (CBRS) for High Speed data in the field



Ecom Ex-Cover Pro



Ecom Tab-Ex Model



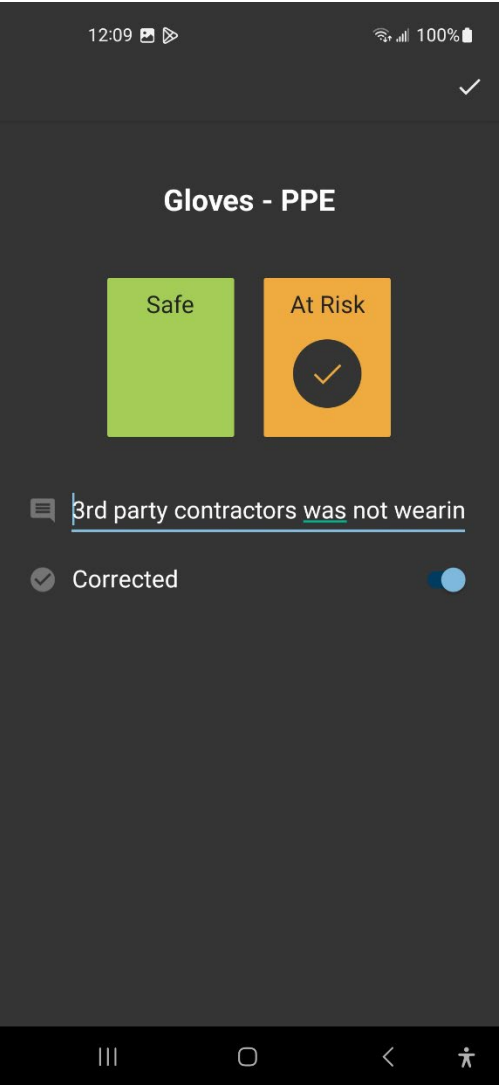
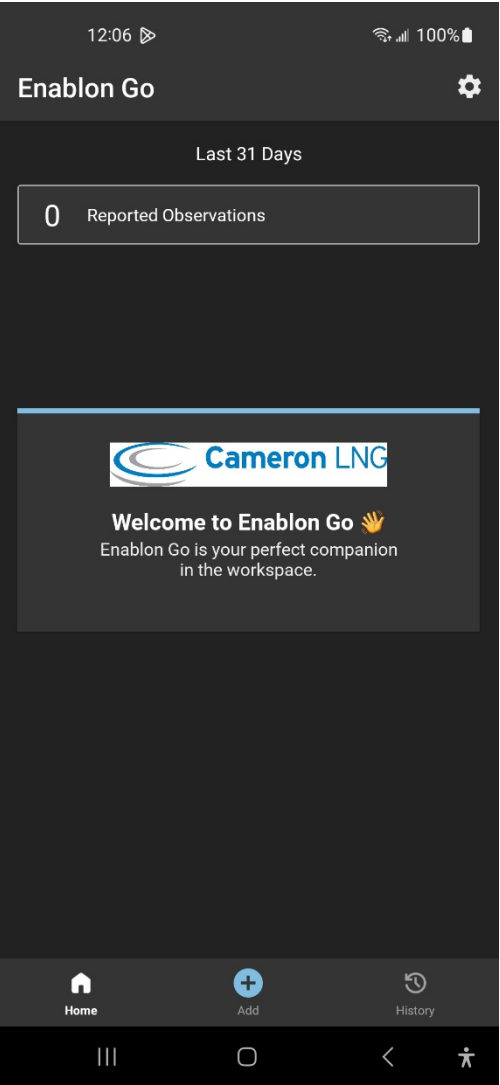
Apple iPad +
Otterbox UL Case



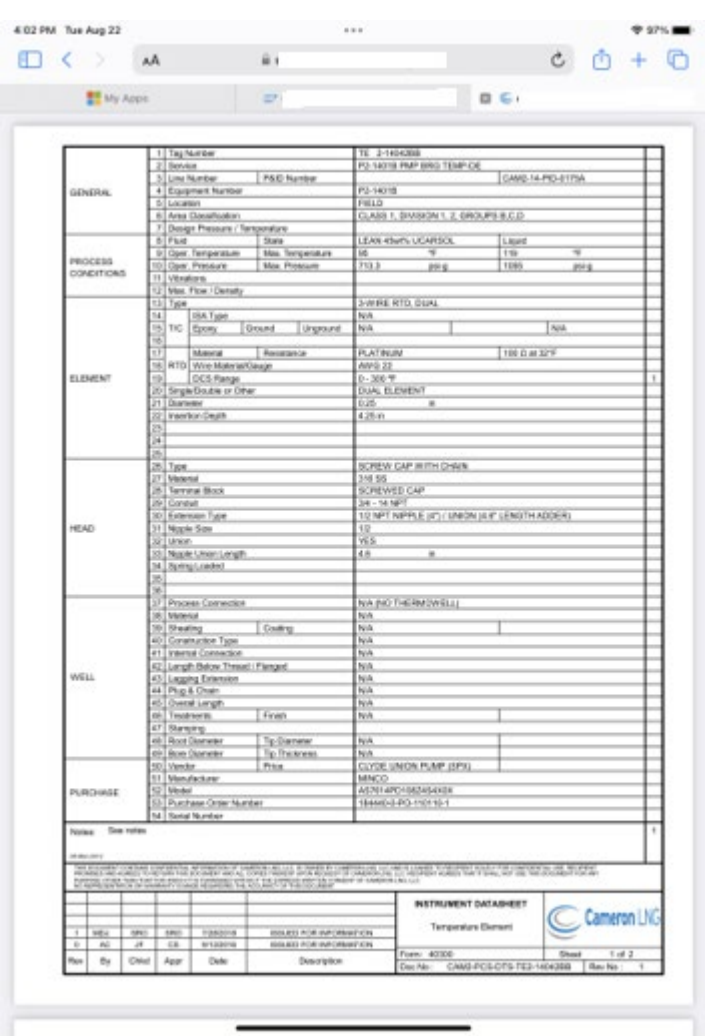
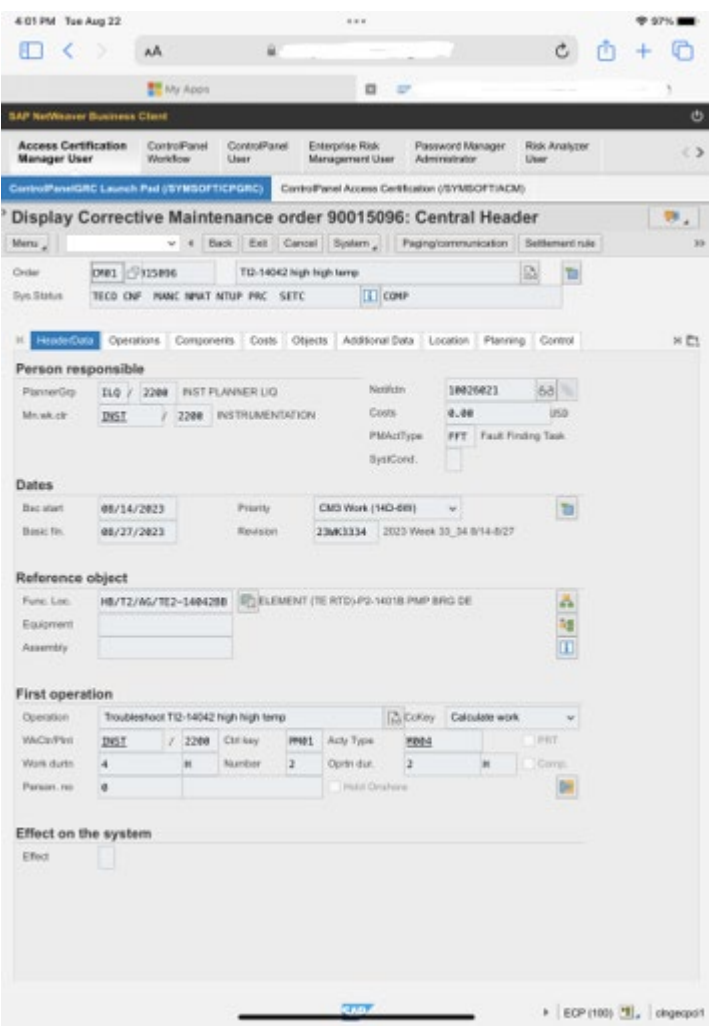
Digitizing Field Operations



Mobile Safety Observations



Mobile Access to Maintenance System Records



Informed Operational Decisions / Enhanced Efficiency / Safer Operations

Challenge

- No access to real time information in the Field. 30-60 min loss of work time / day returning to office to get additional / confirm information
- Time-lag from data collected in Field being entered into digital systems
- Data collection, sharing, and analysis were time consuming and lower quality

Solution

- AVEVA Mobile Operator to streamline Operator Rounds Management data collection, access, analysis, and reporting
- Field Wireless Data System – 4G LTE CBRS

Results

- Enhanced Operator Efficiency / Time on Tools
- More, Faster, Better Safety Observations
- Better Quality Incident Reports with Field Photos
- Engaged workforce – same digital experience as in day-to-day life



Wireless Industrial Field Sensors – Low Cost / Electrically Safe PI Analytics

ENERGY / OIL / GAS | USA

Optimize production operations with enhanced situational awareness at low cost

Challenge

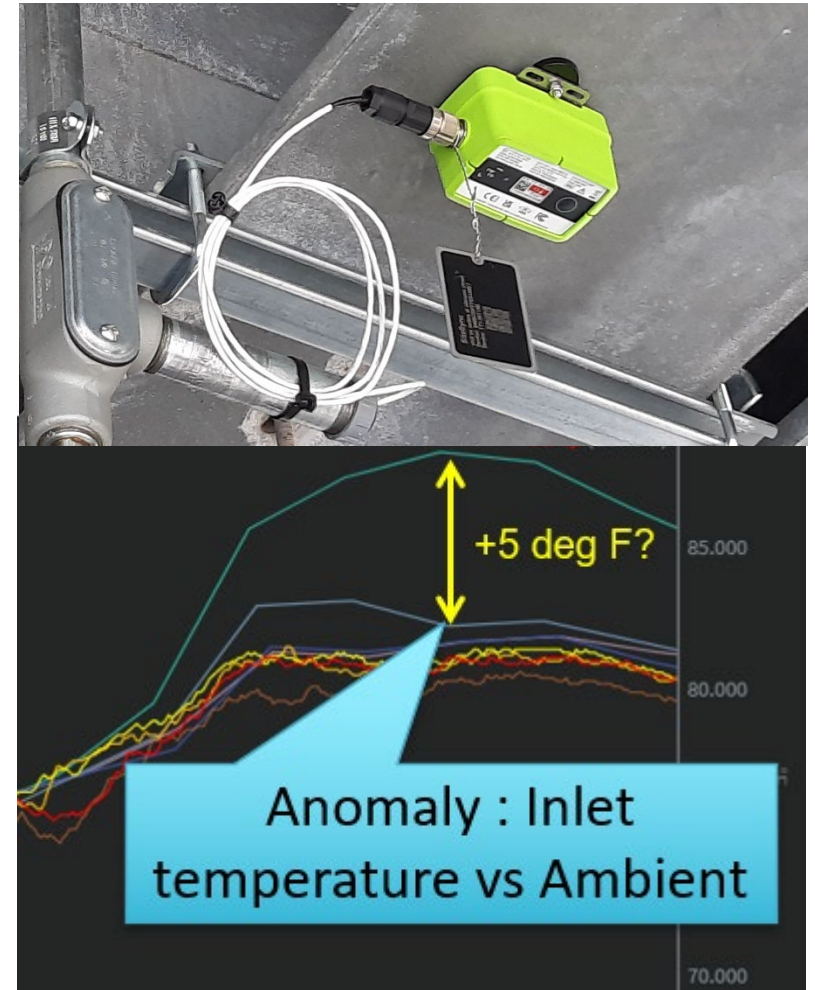
- No field instrumentation installed for certain business challenges
- Installing traditional field instrumentation for these scenarios is cost prohibitive
- Data collection, sharing, and analysis performed manually or not at all
- Time consuming and lower quality

Solution

- AVEVA PI Infrastructure, PI AF, PI Vision, PI Connectors, Seeq
- Low cost industrial field sensors for use in Electrically Safe/Hydrocarbon risk areas
- LoRaWAN wireless technology fit for purpose for Industrial use – wide area, few gateways = low cost
- Low data rate / battery powered – no power + network installation required

Results

- **AVEVA PI Industrial Data Infrastructure empowers data analytics for enhanced visibility to operational business challenges**
- **Safer Operations**
- **LoRaWAN wireless infrastructure provides a platform for multiple current and future solutions at minimal cost / production operations impact**

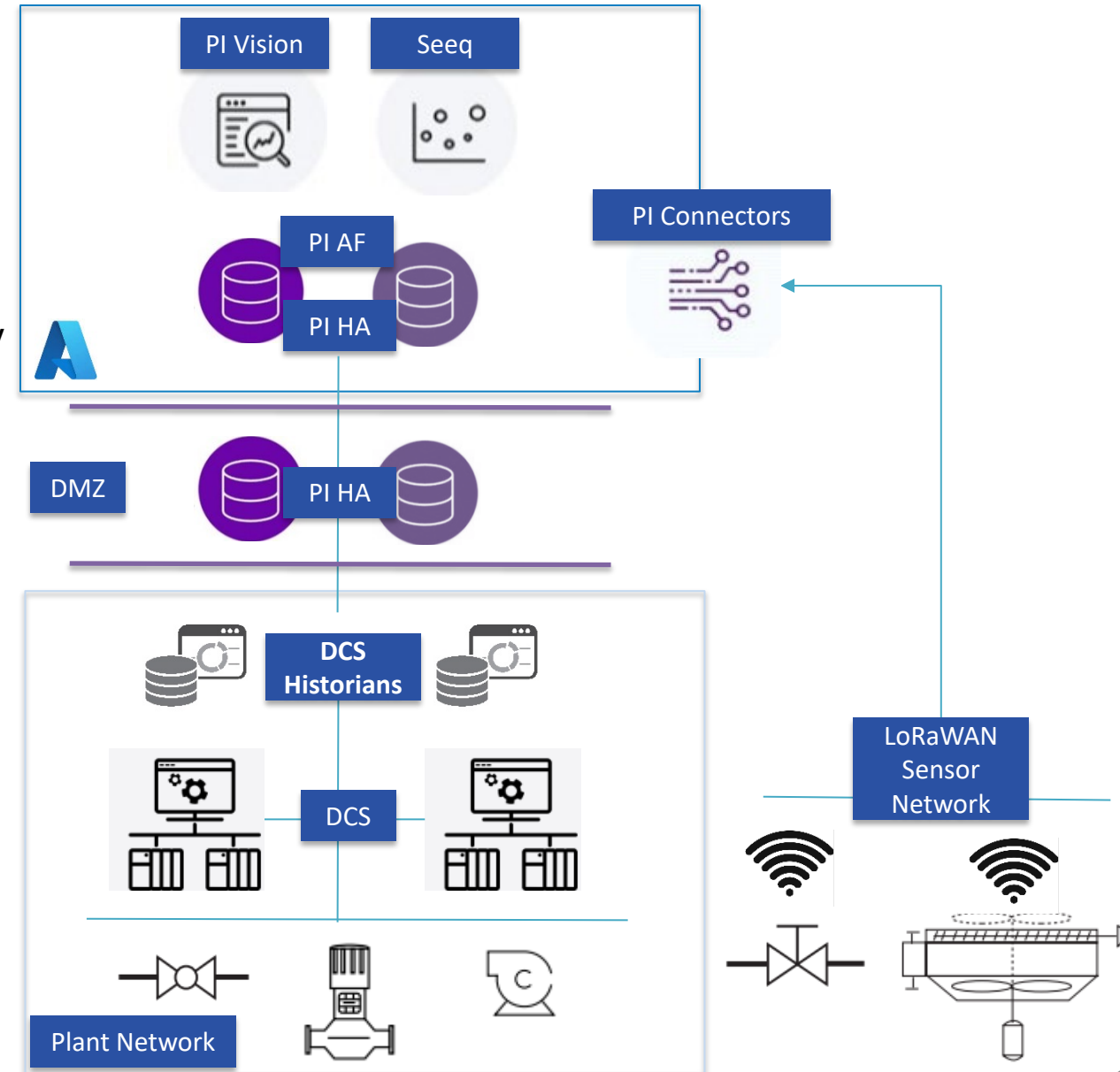


Democratize plant data across the Enterprise

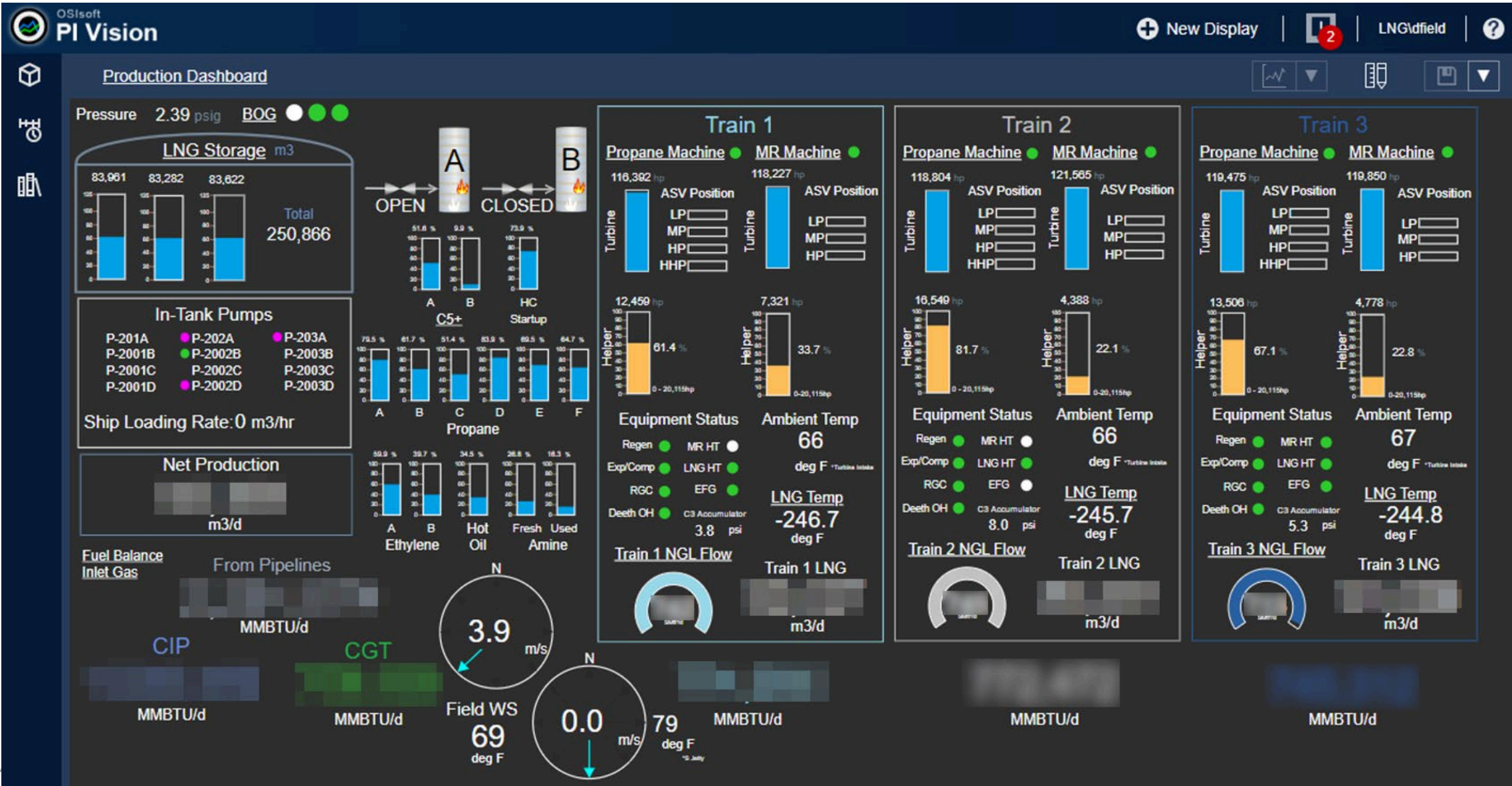
- Majority of all Control System / DCS data is available in PI System
 - ~70,000 PI tags
- PI Vision to democratize DCS graphics and frequently used graphics to understand current plant conditions
- PI Asset Framework (AF) for calculated values, e.g. environmental reporting
 - ~5000 AF assets
- PI data feeds Commercial Hydrocarbon Accounting and Scheduling, Operations Shift Logbook
- Critical systems for Analysis, Production Planning and Optimization

2023 : Seeq rollout – Engineering Data Workbench

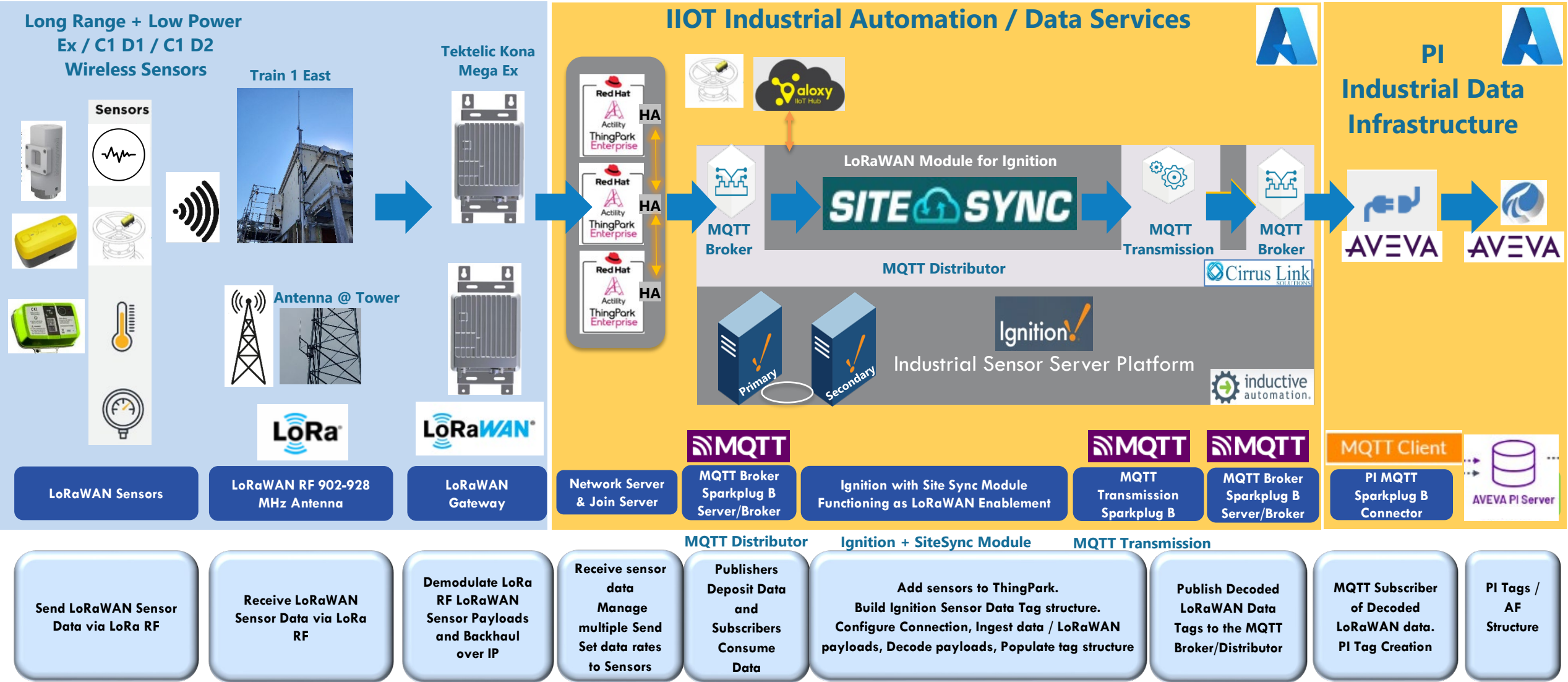
2024+ : Wireless Field Sensors – additional data sources to PI using PI Connectors



Production Operations Dashboard with PI Vision



LoRaWAN + PI Industrial Data Architecture



Hot Air Recirculation (HAR) effect on ACHE performance



LNG Industry Challenge : HAR impacts LNG Production

Understand / Correlate
temperature profile across Air-
Cooled Heat Exchangers

Understand / Correlate ambient
temperature across site under
different weather and wind
conditions to Heat Exchanger
Performance and resulting
Production

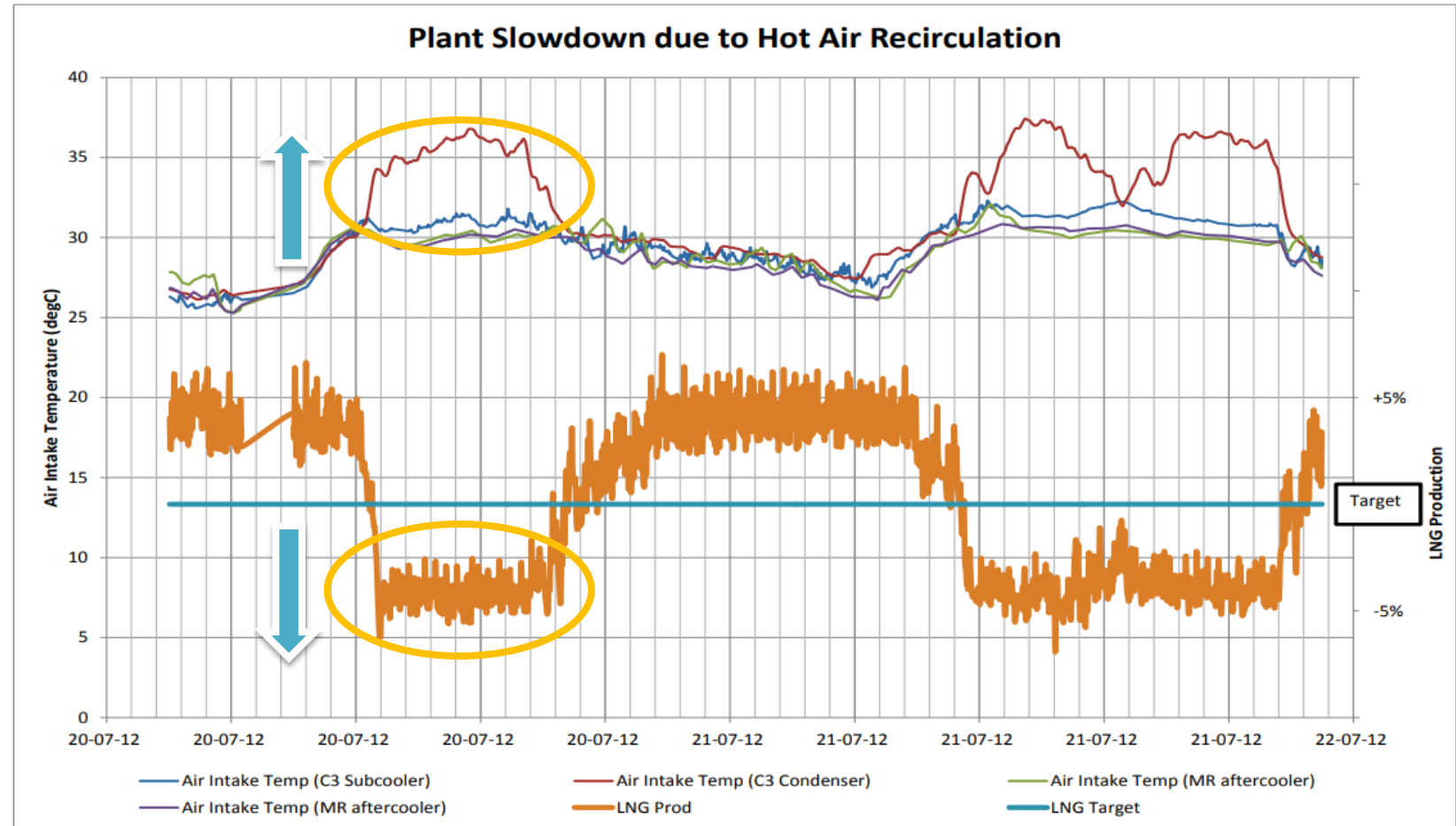


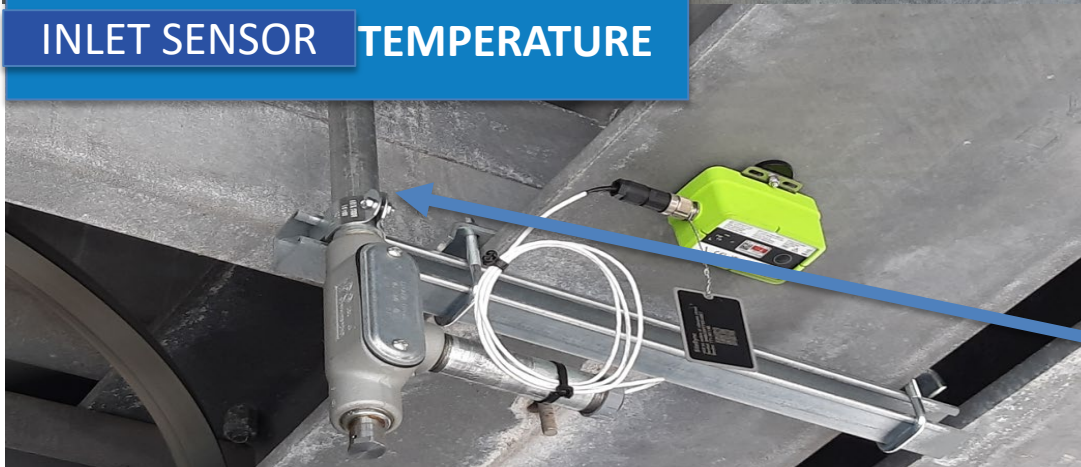
Figure 4. Plant Slowdown Due To HAR for MLNG Tiga

LoRaWAN Wireless Industrial Temperature Sensor

OUTLET SENSOR TEMPERATURE

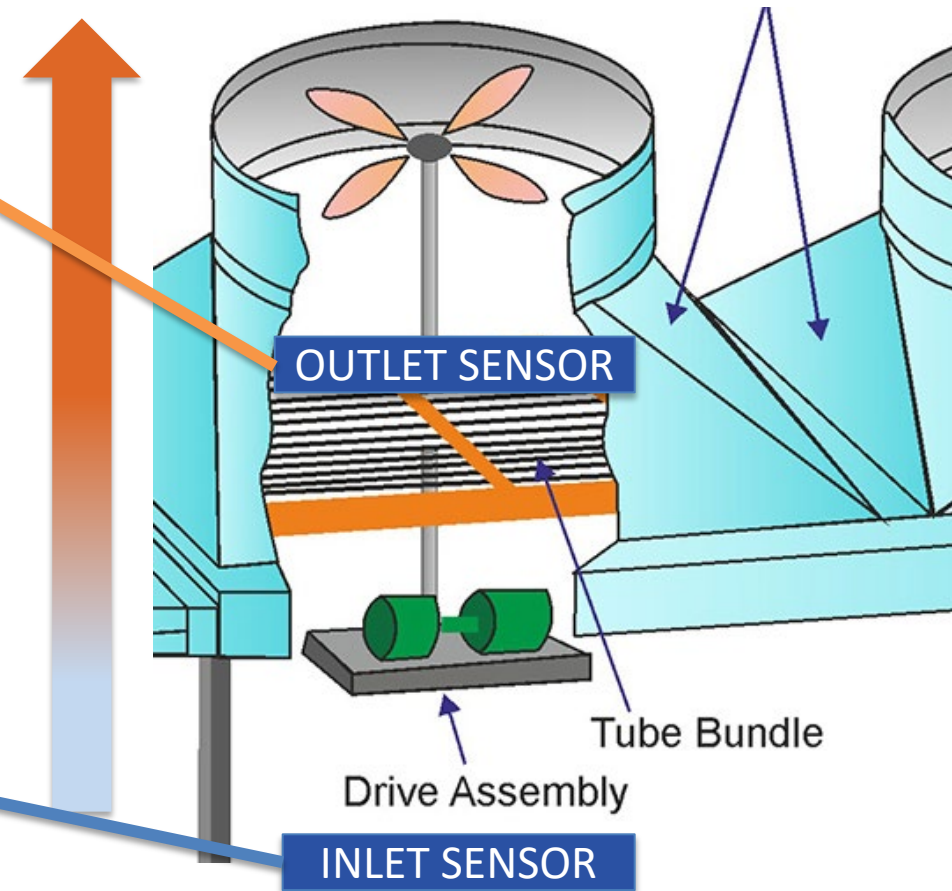


INLET SENSOR TEMPERATURE

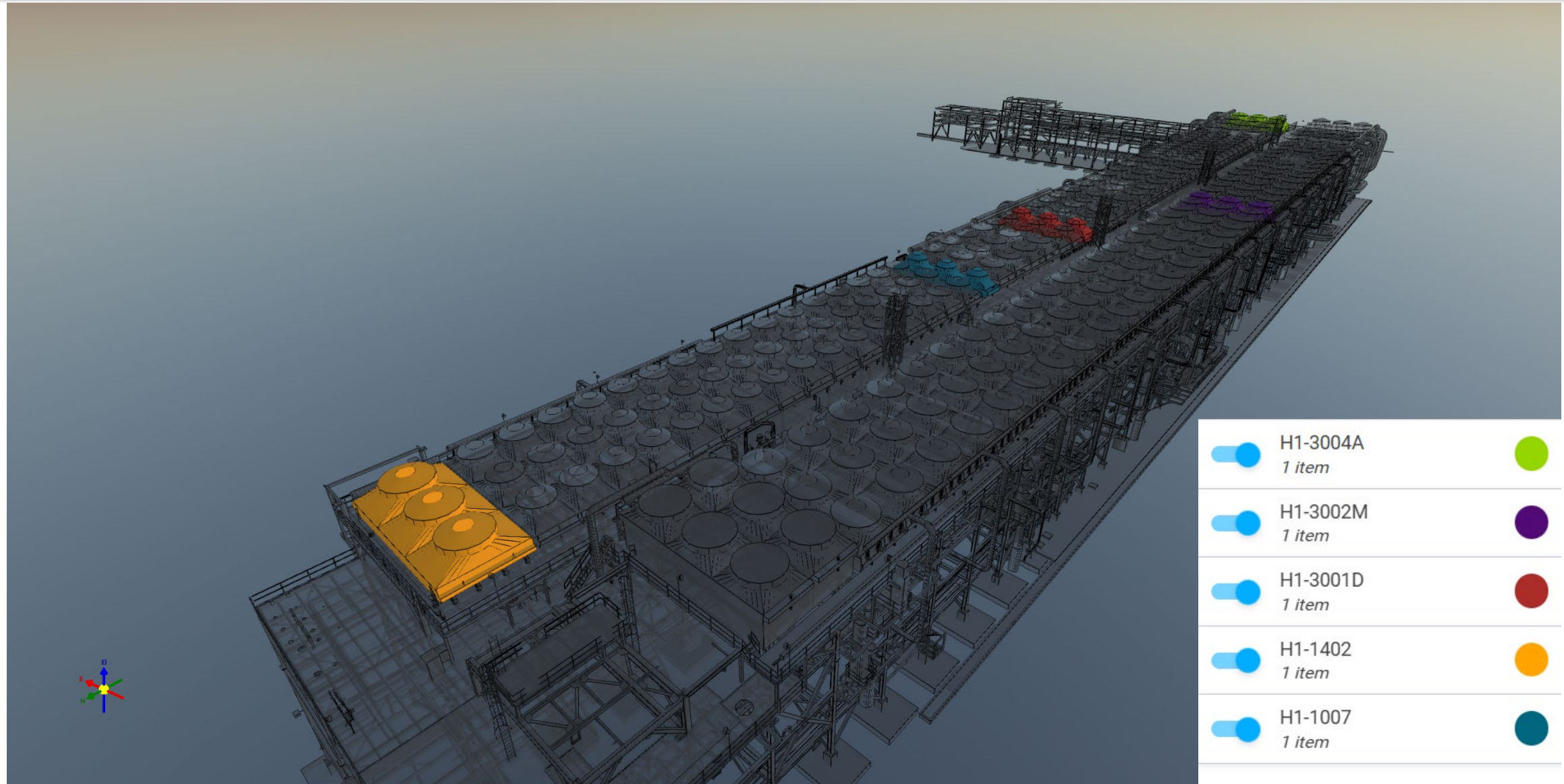


Deliver inlet and outlet temperature readings for 100's of heat exchangers to drive analytics and performance assessment/improvement.

Low-cost low impact to production operations.



LoRaWAN Temperature Sensor Locations – Train 1 ACHE Pilot



LoRaWAN Gateway Locations – Train 1 Pilot



LoRaWAN Gateway at
East Powerhouse



Train 1

LoRaWAN Gateway at
Radio Tower



Wireless Weather Stations—Temp / Wind Speed / Wind Direction



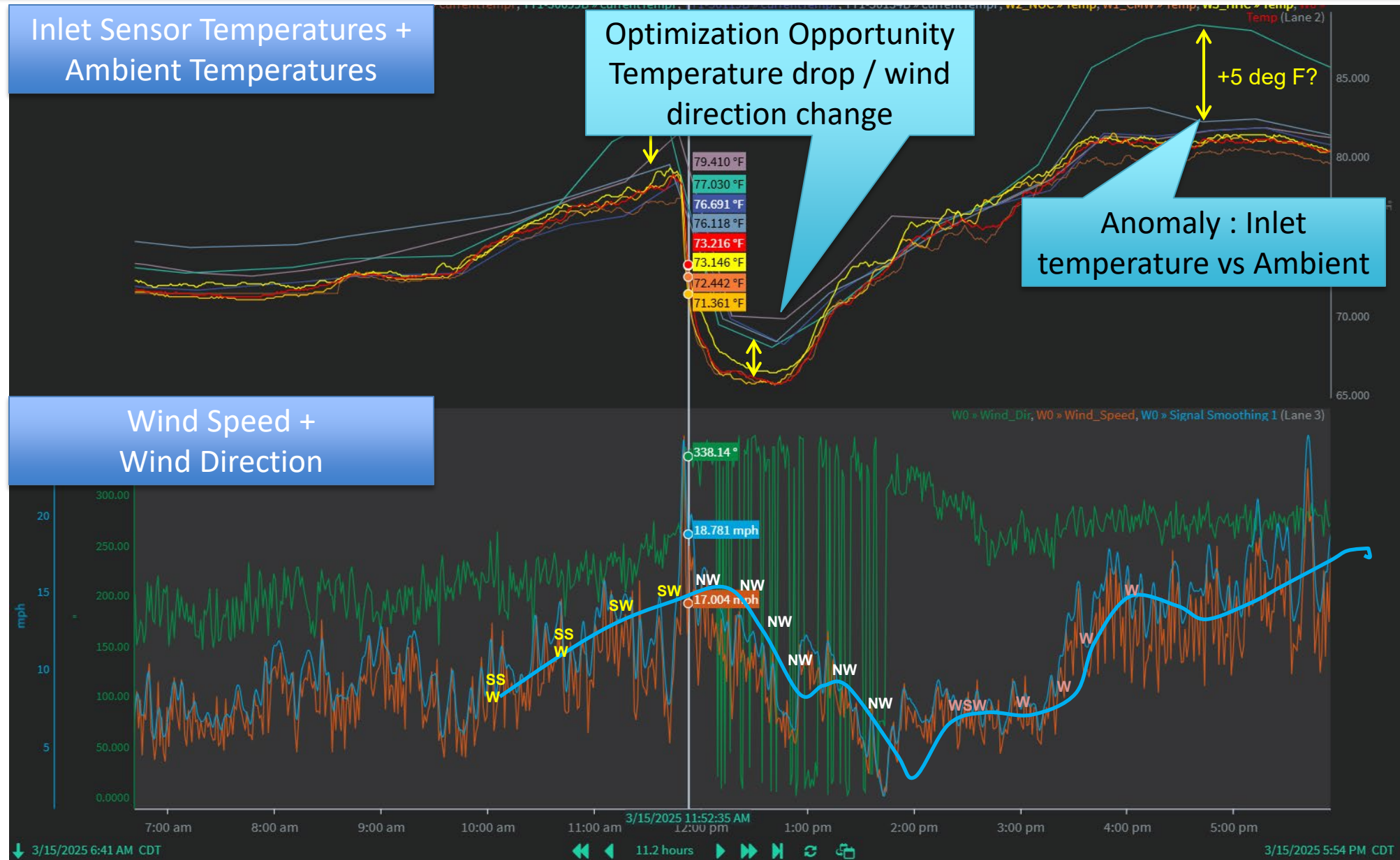
ACHE Performance – PI Data Analysis example

Weather Sensors

- Wind Speed
- Wind Direction
- Ambient Temperature

Wireless Temperature Sensors

- ACHE Inlet Ambient Temperature
- ACHE Outlet Ambient Temperature



Challenge

- Field work requires process lines to be removed from service and locked out for days/weeks, months depending on scope/scale of works.
- Many 100's of manual valves that are not instrumented. No alert mechanism if valves are opened or closed until process conditions change
- Cost effective method to ensure manual valve movements are tracked and alerted to maintain safe operations



Solution

- Industrial valve sensors that track any movement of valve handles
- LoRaWAN electrically safe valve position sensor
- Position data sent as soon as movement is detected, otherwise polling interval
- PI Vision Screens to visually view current conditions and any unexpected activity.
- PI AF logic for alerting unexpected activity

PSV1-25209A H1-2511 Defrost Gas Outlet	PSV1-25209D H1-2511 Defrost Gas Outlet
Inlet V-MT: BL1-25320(LO)physicalPosition 100 3/24/2025 10:39:23 AM	Inlet V-MT: BL1-25309(LO)physicalPosition 0 3/24/2025 10:30:07 AM
Outlet V-MT: BL1-25313(LO)physicalPosition 100 3/24/2025 10:20:49 AM	Outlet V-MT: BL1-25311(LO)physicalPosition 100 3/24/2025 10:07:09 AM
Bypass H-QT: BL1-25742(CSC)physicalPosition 17 3/24/2025 10:32:58 AM	



Quarter-Turn Valves





Multi-Turn Valves



BENEFITS REALIZED

- **Modern Industrial Wireless Technologies deliver solutions to LNG Field Operations challenges at low cost**
- **\$\$ Millions avoided through modern Industrial IOT solutions delivered for \$ Thousands**
- **Safer Operations**
- **Enhanced Production Opportunities**
- **Wireless data infrastructure is a powerful strategic investment. One installation unlocks multiple opportunities and use cases with current and near future industrial sensors and mobile devices**

CHALLENGES

Implementation Partners / Expertise for Industrial Digital Solutions is on downward trend and accelerating.

- **Difficult to identify and access expertise**
- **Limited resources are split across multiple projects leading to implementation delays**
- **Industrial Systems and Application Providers challenged to effectively service clients**

Digital Change Management – Educating the organization on new technologies; taking everyone along for the ride.

- **Prove with working solutions; then scale**
- **Keep expectations low, overdeliver to counteract the execution challenge**

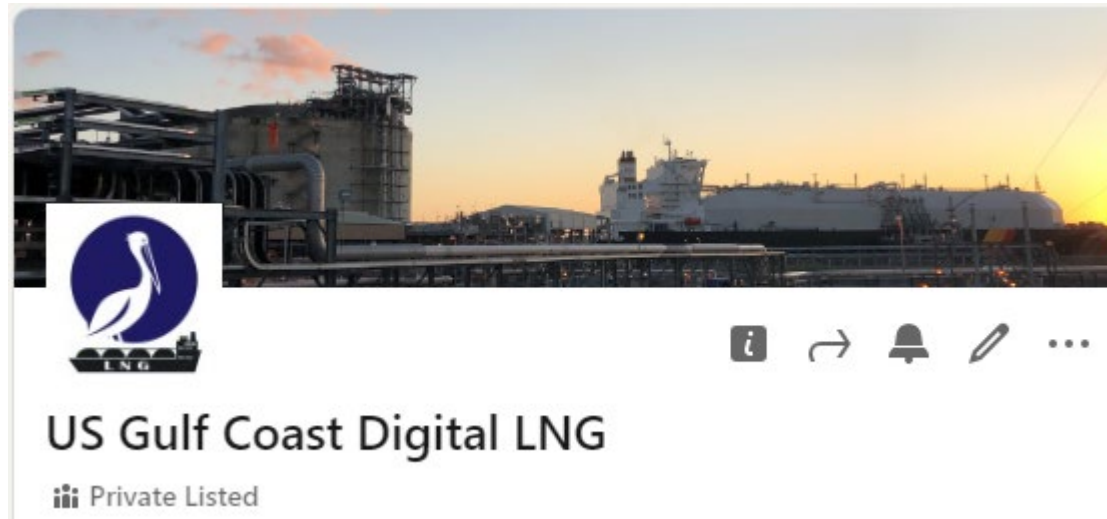
Energy Industry digital participants must collaborate effectively with Technology Industry to accelerate solutions

Thank You!



IT/Digital Leader

<https://www.linkedin.com/in/franz-field/>



US Gulf Coast Digital LNG Industry Working Group
<https://www.linkedin.com/groups/14312452/>

Low cost / Low fidelity Vibration Sensor for Fin Fan motor predictive maintenance

Vibration + Acoustic
Ambient + Surface Temperature

Replace / reduce monthly high fidelity vibration monitoring round to lower frequency.

Wireless Vibration sensor performance change triggers engineering / maintenance visit to inspect / conduct high fidelity vibration assessment

90+ fin fan motors per train x 3 Train = material reduction in monthly vibration round effort.

