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AVEVA™ PI System™ as the industrial sustainability platform

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Agenda

- What is sustainability?
- AVEVA™ PI System™ as the industrial sustainability platform
- AVEVA™ PI System™ sustainability customer stories
- How AVEVA accelerates sustainability journeys
- Call to action

What is sustainability?

What is sustainability?



“Meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

Source: United Nations

Digitalization and sustainability are creating new opportunities

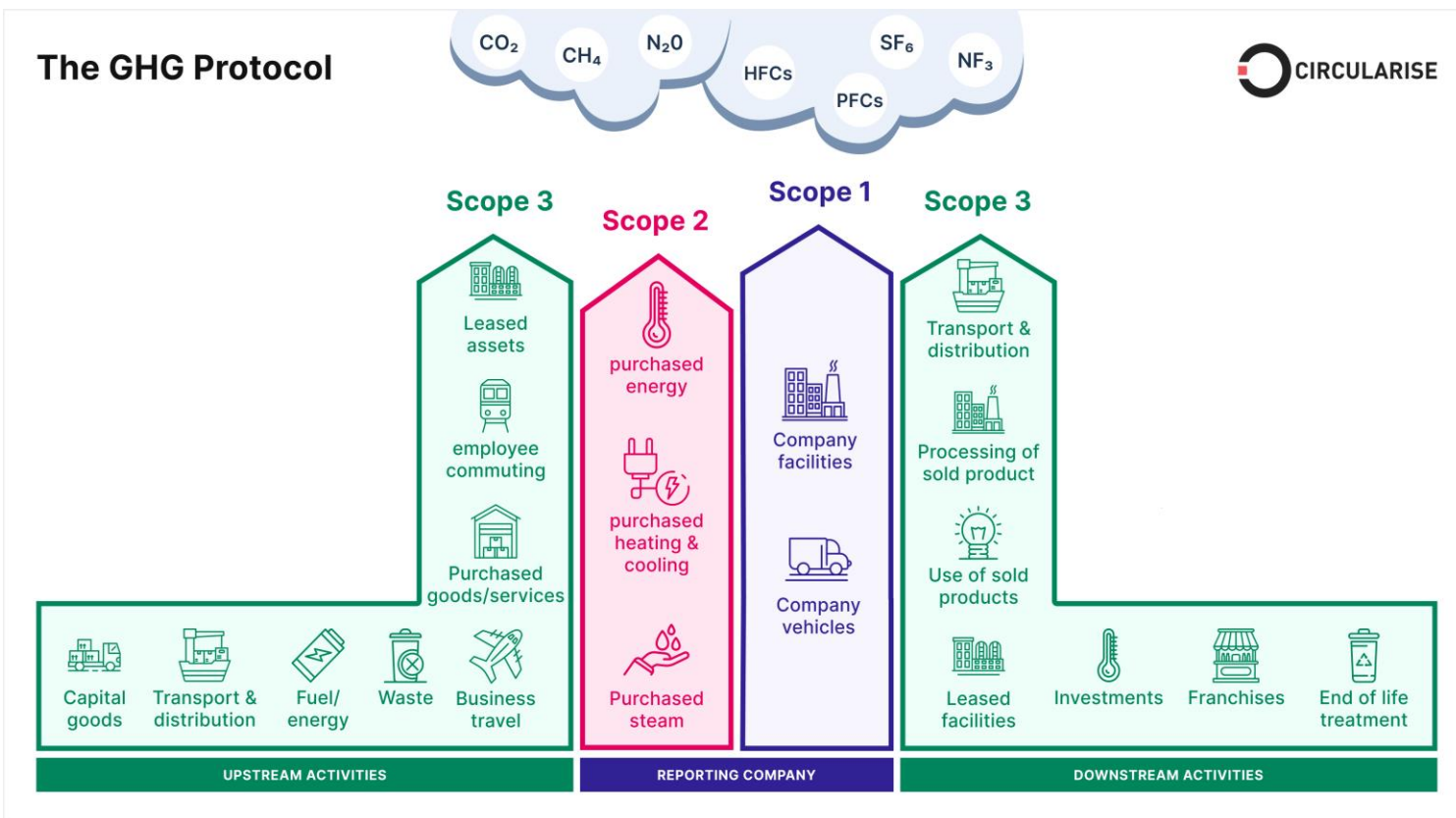


Realizing the **United Nations Sustainable Development Goals** could unlock **USD \$12 trillion** in new market opportunities per year by **2030**

A **1.5 °C future** requires a surge in annual investment in **clean energy projects and infrastructure** to nearly **USD 4 trillion by 2030** incl. **x 15 increase in efficiency investments** and **x 3 increase in renewables** by 2026



Reduce emissions: Scope 1, 2 & 3



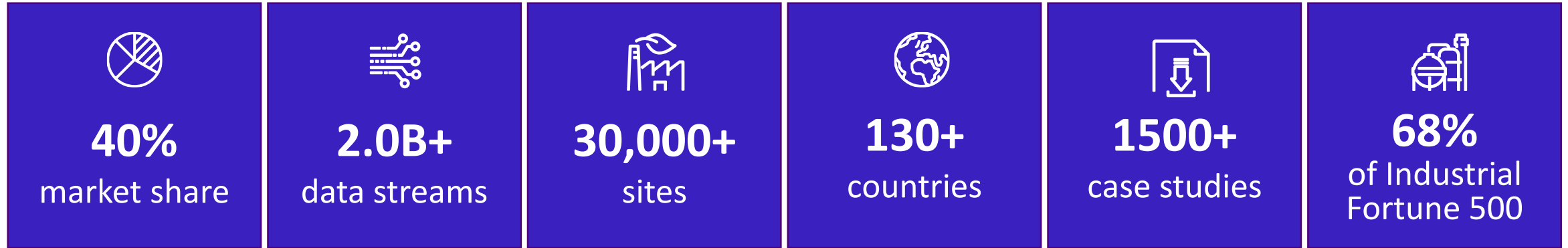
Emissions Type	Scope	Definition
Direct emissions	Scope 1	Emissions from operations that are owned or controlled by the reporting company
Indirect emissions	Scope 2	Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company
	Scope 3	All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions

Source: GHG Protocol

AVEVA™ PI System™ as the industrial sustainability platform

AVEVA

AVEVA™ PI System™: Industrial data backbone for digital transformation



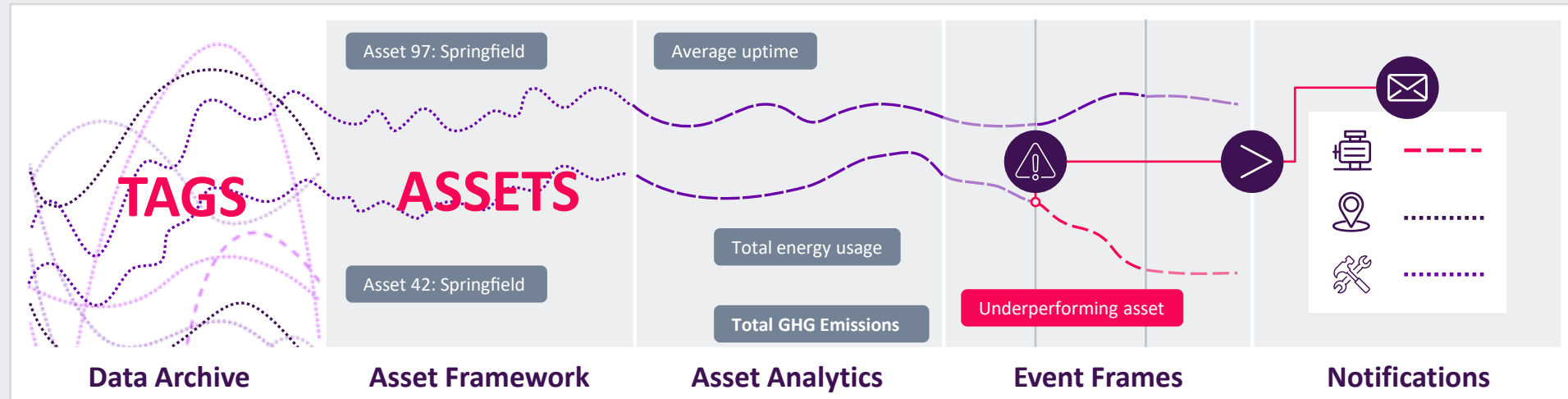
INDUSTRIAL DATA INFRASTRUCTURE BACKBONE



Enabling faster sustainability discovery & analysis

- *How do you measure & track your sustainability now?*
- *Is data in disparate, siloed systems & databases?*
- *Is it collecting, storing & contextualizing all necessary data?*

Any organization's sustainability journey needs to begin with PI



How can you keep improving your sustainability?

Optimized storage & access to massive volumes of operational data







Add structure and meaningful context to your operations data

Transform raw data into actionable KPIs using streaming calculations

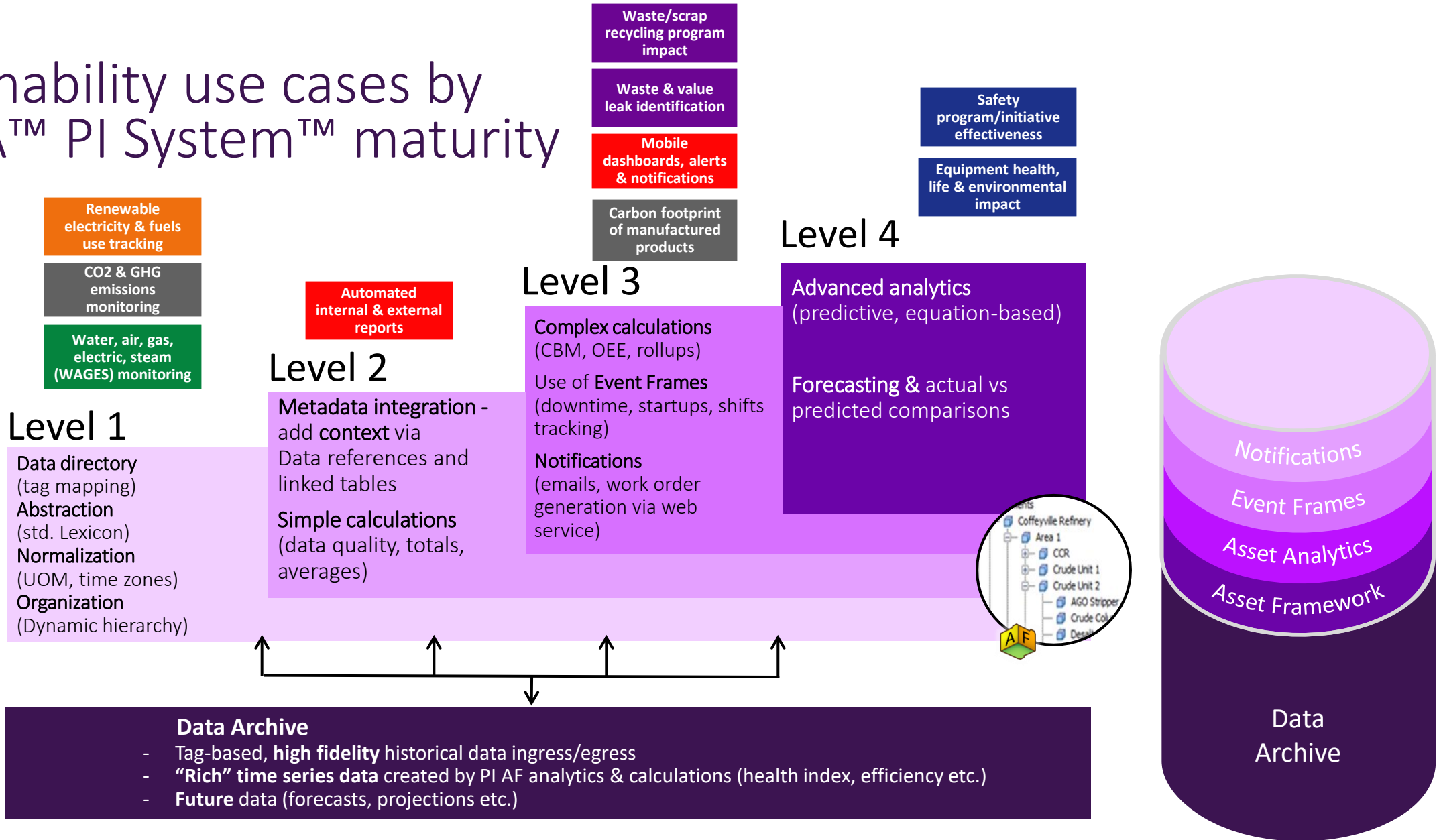
Automatically **pinpoint important events** in your operations

Send automatic alerts to the right people with the right information

AVEVA™ PI System™ drives sustainability outcomes

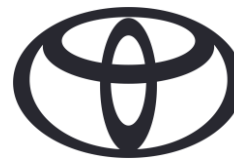
 <p>Minimize utilities usage</p>	 <p>Reduce emissions</p>	 <p>Improve circularity</p>	 <p>Shift to renewables</p>	 <p>Improve safety & asset life</p>	 <p>Automate reporting</p>
Reduce usage by up to 30%	Decrease emissions by up to 35%	Reduce waste up to 50%	Increase renewables use up to 75%	Extend equipment life up to 40%	Increase reporting efficiency up to 25%
Water, air, gas, electric, steam (WAGES) monitoring	CO2 & GHG emissions monitoring	Waste & value leak identification	Renewable electricity & fuels use tracking	Equipment health, life & environmental impact	Automated internal & external reports
Energy footprint of manufactured products	Carbon footprint of manufactured products	Waste / scrap recycling program impact		Safety program/initiative effectiveness	Mobile dashboards, alerts & notifications

Sustainability use cases by AVEVA™ PI System™ maturity levels



Sustainability customer stories

AVEVA



Toyota reduces energy consumption by 35% & CO2 emissions by 28%

Challenge

- Reduce energy consumption and CO2 emissions at all European plants
- Create single, centralized energy monitoring system (EnMS) to communicate with all plant devices & collect data automatically
- Different plants had large disparities in data monitoring capabilities & lacked standardization

Solution

- Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

- **35% reduction in energy consumption**
- **28% drop in CO2 emissions (equivalent to 300-acre forest or 30,000 trees)**
- **Cut energy data aggregation & validation time from 8 plants from hours to seconds**





Pfizer ensures COVID-19 vaccine production quality & targets with lower energy use

Challenge

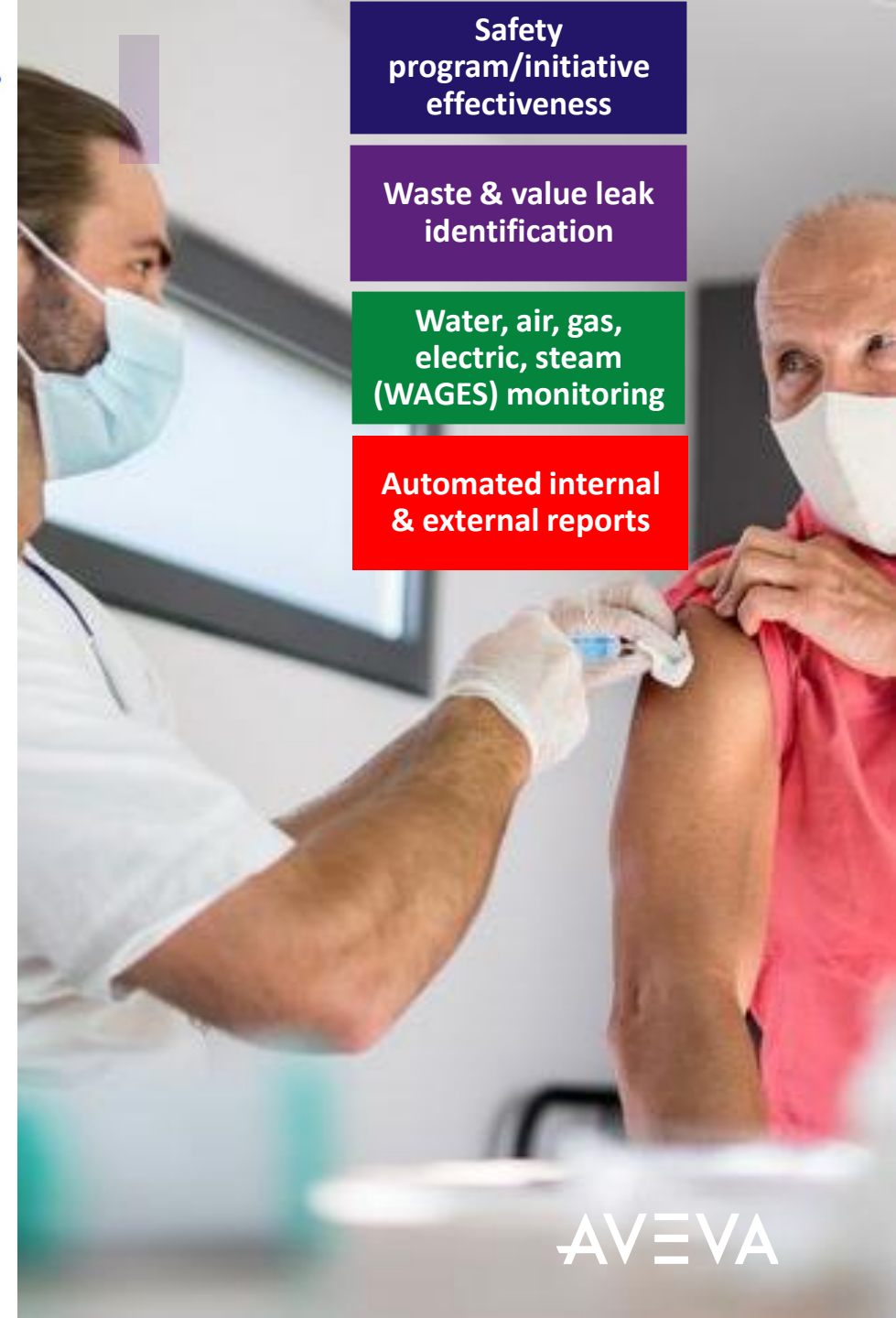
- Constant acceleration of efforts for full data visibility across existing and new assets in COVID program
- Regulatory compliance during unprecedented concurrent deployment of phase 2 & 3 trials
- Re-invention & innovation to meet deadlines in areas of equipment, delivery & processes
- Ramp-up target dose production from 100 million in Q3 2020 to 2.5 billion in 2021

Solution

- Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

- **Delivered 3.2 billion doses by the end of 2021, exceeding dose production target**
- **Three critical projects were enabled by AVEVA PI System data:**
 - **Freezer farm analytics hub for cold chain monitoring**
 - **mRNA concentration prediction for ensuring batch quality**
 - **Real-time scheduling for capacity modeling & de-bottlenecking**



Safety program/initiative effectiveness

Waste & value leak identification

Water, air, gas, electric, steam (WAGES) monitoring

Automated internal & external reports



Kellogg's saves \$3.3 million in energy & water costs and claimed \$1.8 million in rebates

Challenge

- Meet company-wide 10-year energy-reduction targets for natural gas, electricity, and water usage
- Without data-informed view of plant energy use, difficult to optimize energy efficiency

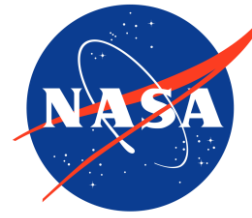
Solution

- Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

- Annual savings of \$3.3 million in energy and water costs, and an additional \$1.8 million in rebates, in one plant alone
- AVEVA PI System responsible for 30 out of 35 sustainability initiatives
- Achieved consistent downward trend in natural gas, energy, and water usage (reduced kW / Ton consumption by 30% since 2005)
- Increased OEE to 80%, eliminating waste & improving circularity





NASA reduces energy use by 14,500 MWh annually in just one building

Challenge

- Problems with meter data quality, gaps detected after issues
- Old system focused on summary reporting for agency data calls
- Problem with night, weekend & holiday energy consumption
- Existing tools required levels of permission & training not possible for all staff

Solution

- Deployed AVEVA PI System to streamline data collection, access, analysis, and reporting

Results

- For even one building, NASA expects annual savings from that building to reach 14,500 MWh (equivalent to planting 1,225,400 trees/year)
- Weekend savings of over 3,000 kWh (250 trees planted)
- Data platform for monitoring building level demand at different time scales & periods to find efficiencies & overconsumption



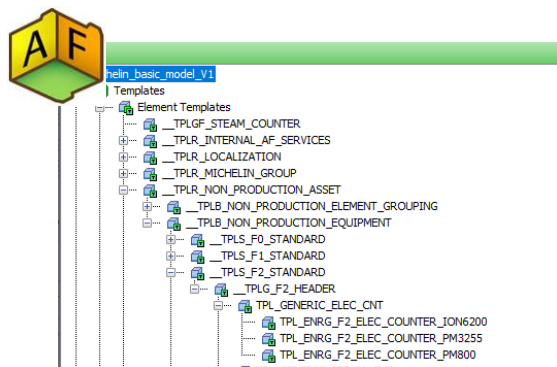
How AVEVA accelerates your sustainability journey



Stop thinking tags, start thinking assets

Build once, deploy many!

Counter object



- Better alignment with Operations, Maintenance & Engineering
- Scalable & consistent
- Less time to develop & deploy
- Safer, fewer errors
- => Structure & context for enterprise analytics

TPL_ENRG_F2_ELEC_COUNTER_ION6200	
General	Attribute Templates
Filter	
Name	
Template: __TPLB_NON_PRODUCTION_EQUIPMENT	
DESCRIPTION	
ELEMENT_NAME	
PARENT_NAME	
Template: __TPLG_F2_HEADER	
CODE_TAG_BODY	
CODE_TAG_FULL	
CODE_TAG_KEY_ELEMENT_NAME	
Template: TPL_GENERIC_ELEC_CNT	
Frequency	
kWh_del	
Template: TPL_ENRG_F2_ELEC_COUNTER_ION6200	
I4	
I_a	
I_avg	
I_b	
I_c	
I_demand	
I_peak_demand	
Impuls	
kVA_demand	
kVA_peak_demand	
kVA_total	
kVAh_a	

Meta data

Sensor 'tag' data

Calculations, analytics & workflows

AVEVA

PI Digital Twin Library (Please review AWC Presentation on Wed, Oct 25 from 16:30 – 17:00 in PI System User track for more information)

Base Library

- Container
- Sensors
- Calculations

Asset Libraries

- Centrifugal Pump
- Compressor
- Gear Reducer
- Electric Motor
- Valve
- Heat Exchanger

Asset Classes

Asset Super Classes

Accessory Libraries:

- Vibration Monitoring
- PID, Composition
- OEE
- Energy/Sustainability
- Forecasting
- SAP, Maximo
- Asset Specification storage
- Geographic Tracking
- AVEVA Predictive Analytics
- AVEVA Process Simulation
- AVEVA Connect – AIM

PIVision:

- Anomaly Display: Discovery, Overlays, Annotate
- Asset Displays by class
- Accessory Displays by class
- HOME Screen navigation organizer

MS PowerBI:

Asset Dashboard

PI digital twin AVEVA™ PI Vision™ dashboard templates



The dashboard displays a hierarchical tree structure for asset management, organized into levels L1 through L5. The tree is as follows:

- L1 - BusinessUnit: ABC
- L2 - Site: PQR, TUV, XYZ
- L3: S1, S2
- L4: Add new symbols with AF attributes to the collection.
- L5: Add new symbols with AF attributes to the collection.

Primary Assets (ABC.XYZ.P201):

Detail ABC.XYZ.E9001	Detail ABC.XYZ.P231	Detail ABC.XYZ.P251
Detail ABC.XYZ.J.2307	Detail ABC.XYZ.P232	Detail ABC.XYZ.P252
Detail ABC.XYZ.P201	Detail ABC.XYZ.P233	Detail ABC.XYZ.P253
Detail ABC.XYZ.P202	Detail ABC.XYZ.P234	Detail ABC.XYZ.P254
Detail ABC.XYZ.P215	Detail ABC.XYZ.P235	Detail ABC.XYZ.P255
Detail ABC.XYZ.P216	Detail ABC.XYZ.P236	Detail ABC.XYZ.P256
Detail ABC.XYZ.P217	Detail ABC.XYZ.P237	Detail ABC.XYZ.P257
Detail ABC.XYZ.P218	Detail ABC.XYZ.P238	Detail ABC.XYZ.P258
Detail ABC.XYZ.P219	Detail ABC.XYZ.P239	Detail ABC.XYZ.P259
Detail ABC.XYZ.P220	Detail ABC.XYZ.P240	Detail ABC.XYZ.P260
Detail ABC.XYZ.P221	Detail ABC.XYZ.P241	Detail ABC.XYZ.P261
Detail ABC.XYZ.P222	Detail ABC.XYZ.P242	Detail ABC.XYZ.P262
Detail ABC.XYZ.P223	Detail ABC.XYZ.P243	Detail ABC.XYZ.P263
Detail ABC.XYZ.P224	Detail ABC.XYZ.P244	Detail ABC.XYZ.P264
Detail ABC.XYZ.P225	Detail ABC.XYZ.P245	Detail ABC.XYZ.P265
Detail ABC.XYZ.P226	Detail ABC.XYZ.P246	Detail ABC.XYZ.P266
Detail ABC.XYZ.P227	Detail ABC.XYZ.P247	Detail ABC.XYZ.P267
Detail ABC.XYZ.P228	Detail ABC.XYZ.P248	Detail ABC.XYZ.P268
Detail ABC.XYZ.P229	Detail ABC.XYZ.P249	Detail ABC.XYZ.P269
Detail ABC.XYZ.P230	Detail ABC.XYZ.P250	Detail ABC.XYZ.P270

Accessories on ABC.XYZ.P201:

ABC.XYZ.P201.APA-BFWP-P	42.9 %
ABC.XYZ.P201.EFF	29 %
ABC.XYZ.P201.EFF.FOR	69.2
ABC.XYZ.P201.MTR.JI	40.9 kW
ABC.XYZ.P201.MTR.NPL	200 kW
ABC.XYZ.P201.MTR.PWR	38.6 kW
ABC.XYZ.P201.MTR.VI.DE.V	26.2 g PkToPk
ABC.XYZ.P201.TI-345	122.8 °C
ABC.XYZ.P201.VI.DE.H	15.4 g PkToPk
ABC.XYZ.P201.VI.DE.H.BPIR	14.4 g Peak
ABC.XYZ.P201.VI.DE.H.BPOR	10.4 g Peak
ABC.XYZ.P201.VI.DE.H.BSF	31.3 g Peak
ABC.XYZ.P201.VI.DE.H.lmb	96.0 g Peak
ABC.XYZ.P201.VI.DE.V	2.6 g PkToPk

Secondary Assets (ABC.XYZ.P201.MTR): STOPPED

PI DIGITAL TWIN
OSsoft, Now part of AVEVA

8/10/2021 8:59:19 AM

The dashboard displays a detailed view of the Vibration Sensor asset (ABC.XYZ.P201.VI.DE.H). The asset is currently STOPPED. The dashboard shows a time-series plot of the sensor data, with a peak value of 12.7411 g. The plot shows a significant increase in vibration levels starting around 8:10 AM on 8/10/2021. The dashboard also displays a table of events, including a 'Wake From Sleep' event on 8/20/2019 at 9:00:17 PM. The dashboard includes a 'Pump/Centrifugal' status indicator and a 'STOPPED' status indicator. The dashboard also displays a table of 'OverBig/Defect Causes' and 'OverBig/Defect Corrective Actions'. The dashboard also displays a table of 'Sensors' and 'Calculations'.

Event Name	Severity	Reason	Acknowledged By	Acknowledgment
ABC.XYZ.P201.VI.DE.H.Wake From Sleep	Info	Wake From Sleep		8/20/2019 9:00:17 PM

OverBig/Defect Causes:

check of quality and oil level, if damaged ball bearings inner race or outer race bearing assembly at next opportunity.

OverBig/Defect Corrective Actions:

check of quality and oil level, if damaged ball bearings inner race or outer race bearing assembly at next opportunity.

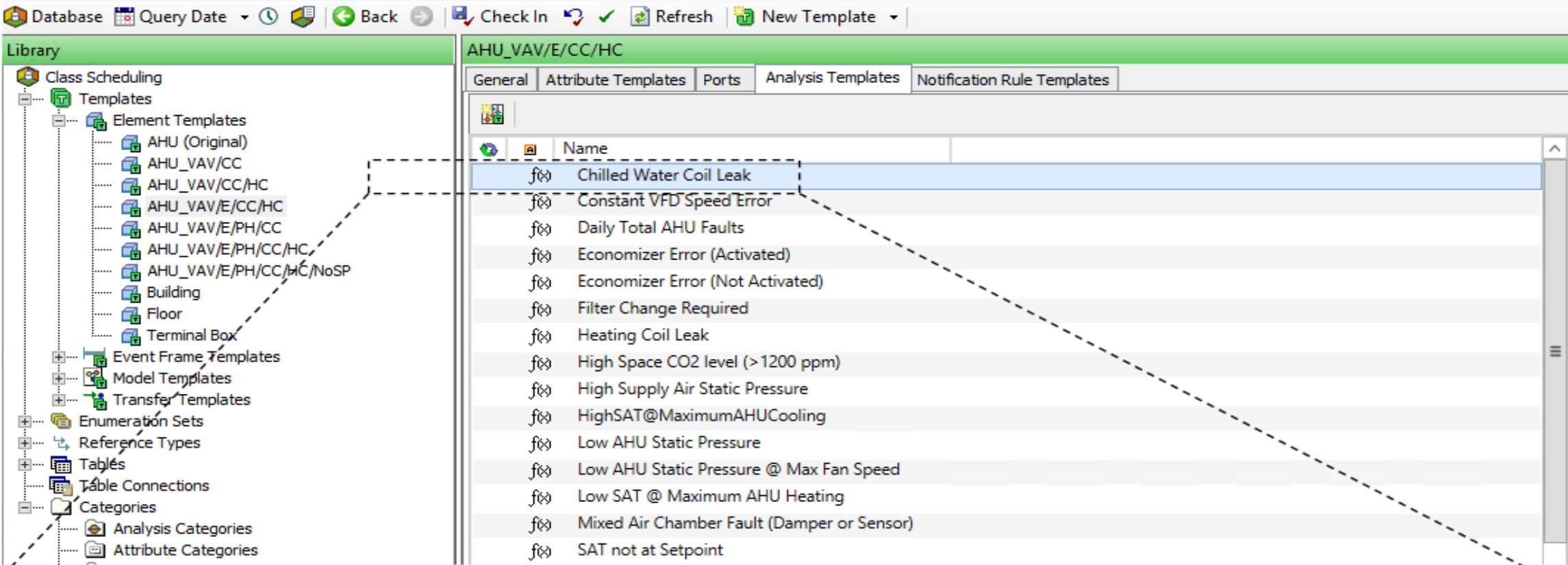
Sensors:

ABC.XYZ.P201.VI.DE.H.BSF
ABC.XYZ.P201.VI.DE.H.BPIR
ABC.XYZ.P201.VI.DE.H.BSF
ABC.XYZ.P201.VI.DE.H.lmb

Calculations:

ABC.XYZ.P201.VI.DE.H.lmb

Ecosystem partners have Asset Framework Libraries

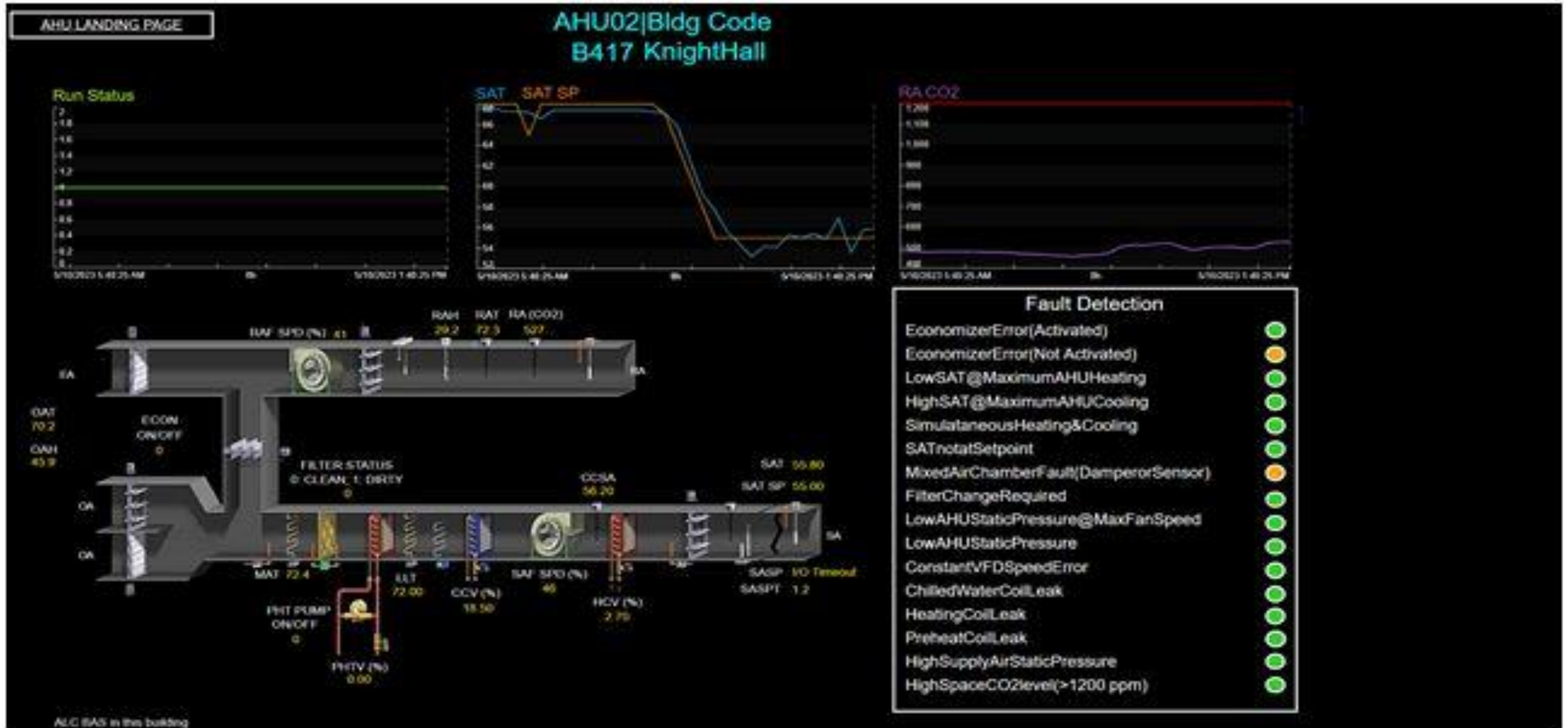


The screenshot shows the Asset Framework Library interface. On the left is a tree view under 'Library' with categories like 'Class Scheduling', 'Templates', 'Event Frame Templates', 'Model Templates', 'Transfer Templates', 'Enumeration Sets', 'Reference Types', 'Tables', 'Table Connections', and 'Categories'. Under 'Templates', 'Element Templates' is expanded, showing various AHU configurations. The 'AHU_VAV/E/CC/HC' template is selected. On the right, the 'General' tab is active, displaying a list of templates. The 'Chilled Water Coil Leak' template is highlighted.

Name	Expression	Output Attribute
ChilledWaterCoilLeakFaultTest	//Cooling Coil If (('CCSupplyAirTemperature' * 1.1) < 'MixedAirTemperature') and 'CoolingValveCMD' < 5 and 'Run'=1 then "Fault" else "Good"	ChilledWaterCoilLeak FaultTest
ChilledWaterCoilLeakFaultStatus	If TimeEq('ChilledWaterCoilLeak_FaultTest', '-2h', '*', "Fault") = 7200 then 1 else 0	ChilledWaterCoilLeak FaultStatus
ChilledWaterCoilLeakPIVisionFault	//0=No Fault, 1=Fault condition exist but time delay hasn't been met, and 2=Fault Condition exist and time delay has been met If ChilledWaterCoilLeak_FaultTest = "Good" and ChilledWaterCoilLeak_FaultStatus = 0 then 0 else if ChilledWaterCoilLeak_FaultTest = "Fault" and Chilled	ChilledWaterCoilLeak PIVisionFault

Name	Expression	Output Attribute
ChilledWaterCoilLeakFaultTest	//Cooling Coil If (('CCSupplyAirTemperature' * 1.1) < 'MixedAirTemperature') and 'CoolingValveCMD' < 5 and 'Run'=1 then "Fault" else "Good"	ChilledWaterCoilLeak FaultTest
ChilledWaterCoilLeakFaultStatus	If TimeEq('ChilledWaterCoilLeak_FaultTest', '-2h', '*', "Fault") = 7200 then 1 else 0	ChilledWaterCoilLeak FaultStatus
ChilledWaterCoilLeakPIVisionFault	//0=No Fault, 1=Fault condition exist but time delay hasn't been met, and 2=Fault Condition exist and time delay has been met If ChilledWaterCoilLeak_FaultTest = "Good" and ChilledWaterCoilLeak_FaultStatus = 0 then 0 else if ChilledWaterCoilLeak_FaultTest = "Fault" and Chilled	ChilledWaterCoilLeak PIVisionFault

Ecosystem partners have AVEVA PI Vision template screens



Call to action

AVEVA

Call to action

Step 1



Identify a test case

Consider relevant use cases & identify one use case. Consider equipment with high energy/emissions or criticality

Outcome

Mutual understanding of use case to develop & evaluate

Step 2



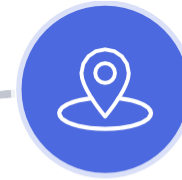
Build and deploy data model

During workshop, define success criteria & work together to develop & deploy initial use case

Outcome

Use case achieved with AVEVA/partner support & success criteria understood

Step 3



Confirm value

Evaluate use case developed against defined success criteria to confirm value of solution

Outcome

Potential value identified & use case utilized as example for future roll-outs

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ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com