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Intensifying digital transformation through the incorporation of the AVEVA™ PI System™ Historian at ISA's Companies

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Agenda

- About ISA and its Companies
- Challenge, Solutions, and Benefits
- Business Challenge Addressed
- Implementation Details
- Success Stories
- Conclusion

isa

7 countries

3 business units:

Roads

Energy

Telecom

ISA is the largest energy transmission company in Latin America

AVEVA

We transmit energy throughout Latin America

while taking care of what you see the least

Energy

3,430
people [1]

99.998%
Reliability

In operation

48,844
Km of circuit

70,010
(controlled and non controlled companies)

106,288
MVA of transformation

137,376
(controlled and non controlled companies)

Under construction

4,671
Km of circuit

16,451
MVA of transformation

Information as of March 31, 2023

[1] ISA 2022 Integrated Report

We transmit energy throughout Latin America

while taking care of what you see the least

Energy

3,430
people [1]

99.998%
Reliability

In operation

30,350
Miles of circuit
43,502
(controlled and non controlled companies)

106,288
MVA of transformation
137,376
(controlled and non controlled companies)

Under construction

2,902
Miles of circuit

16,451
MVA of transformation

Information as of March 31, 2023

[1] ISA 2022 Integrated Report

We transmit energy throughout Latin America while taking care of what you see the least

Energy

4,700
people [1]

99.998%
Reliability

In operation

30,350
Miles of circuit
43,502
(controlled and non controlled companies)

106,288
MVA of transformation
137,376
(controlled and non controlled companies)

Under construction

4,434
Miles of circuit

20,237
MVA of transformation

Information as of March 31, 2023

[1] ISA 2022 Integrated Report

Business Challenge Addressed

POWER AND UTILITIES | COLOMBIA

48% of ISA's companies' Assets are Monitored by This Implementation

Challenge

- Assets and business processes not prepared to achieve the challenges of the electrical grid of the future and the acceleration of the energy transition
- Lack of data and low data quality to develop advanced analytics models
- Needed to improve asset outages and environmental impact through better decision-making model

Solution

- Deployed AVEVA™ PI System™ to streamline data collection, access, analysis, and reporting in 6 companies and 3 countries.

Results

- **48% of ISA's companies' assets are monitored by this implementation**
- **14 critical high voltage power transformers and 10 STATCOM's battery banks supervised by 2 real-time digital twins**
- **Avoiding Extract, Transform, and Load data saved 20 hours per month and accelerated innovation to boost other digital twins' capabilities**

ISA 2030 Strategy – Four Pillars

Strategy Mobilization Programs

Asset management, renewal, and maintenance: robotics, advanced O&M.

System security and reliability

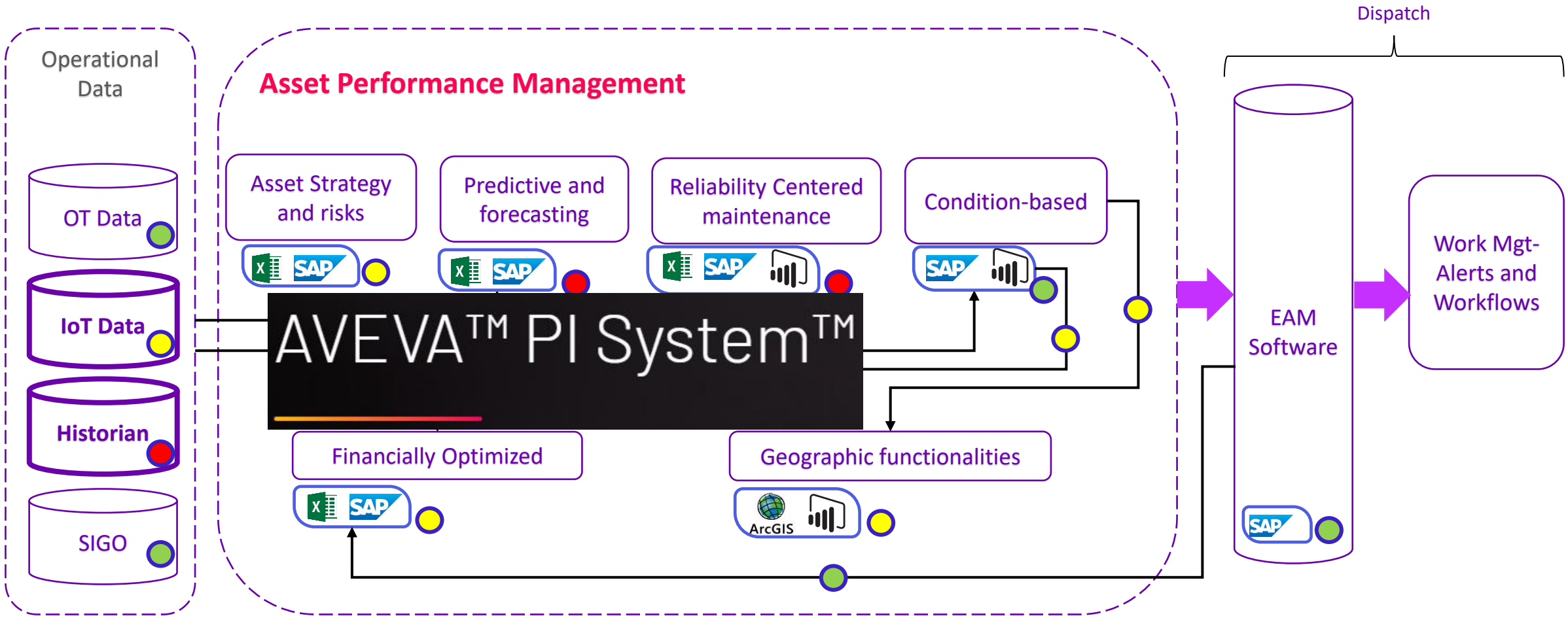
Intensified digitalization: implementation of digital solutions supported by big data and Analytics…

MP **Digital solutions architecture** — 2021

MP **Data historian Master Data** — 2022

MP **APM – Asset Performance Management and Analytics** — 2023 …

APM Assessment



IoT= Internet of Things
OT= Operational technology
APM= Asset Performance Management
EAM= Enterprise Asset Management
SIGO= Operational Information System

Coverage Level
- High
- Medium
- Low

*Source: Self build – Based on: Gartner APM Market Guide

Successful Implementation

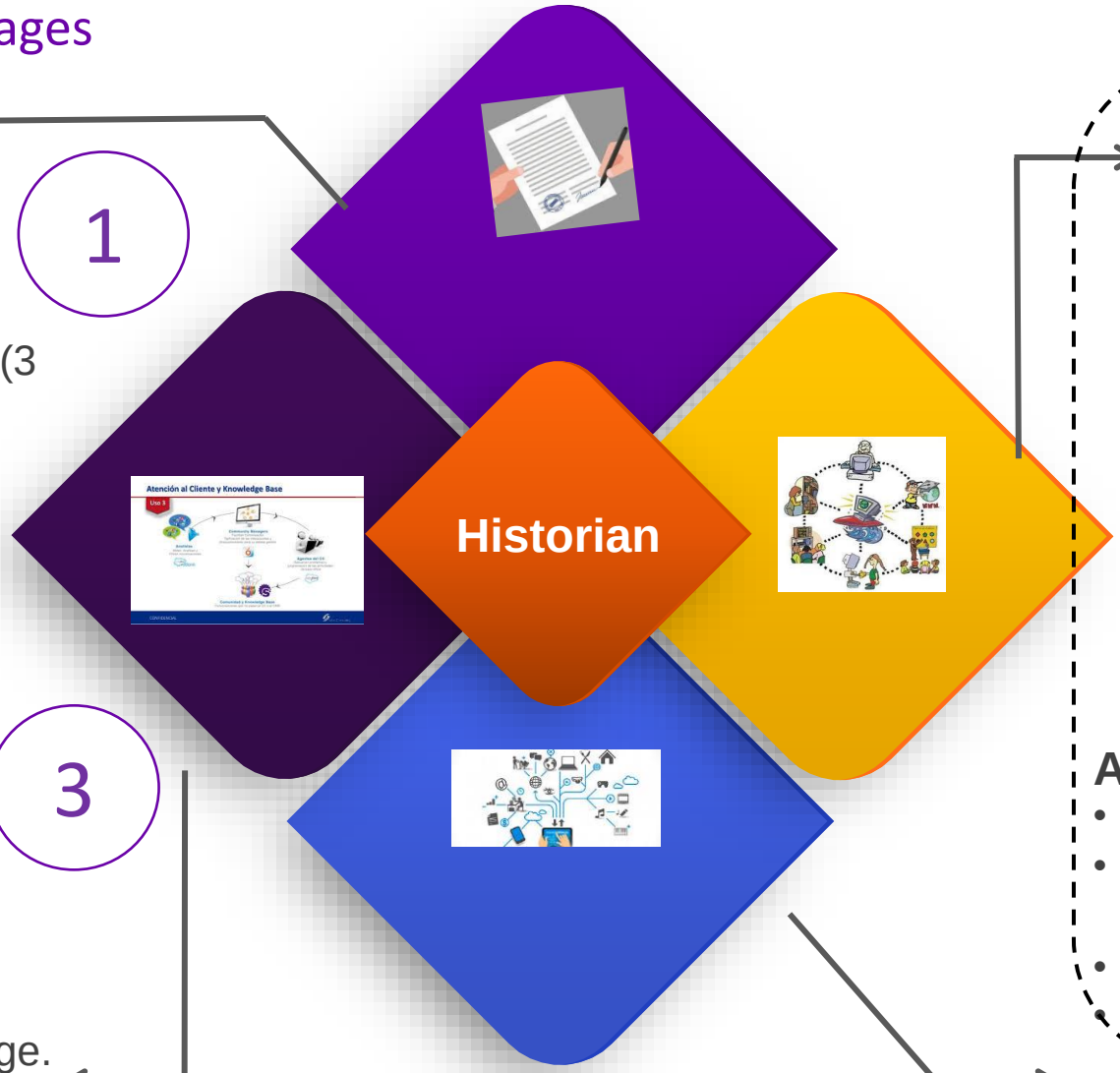
Project Developed in Stages

2

Contracting Process

1

- Technical assessment
- Negotiation
- Conditions for execution- (3 countries, 5 companies)



Information Model

- Assessment of the main data needs
- Define technical data models
- Analytics needs
- Data sources required
- Who is going to use the information?

Governance Model: Continuity, Development and Sustainability

3

- Support and maintenance scheme
- Implementation and models evolution
- Required team and knowledge.

Architecture

- Fulfill requirements of business
- Scalable architecture at ISA's companies
- Backups and infrastructure
- Communications and integrations

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Benefits

Focused on Data Management and the Continuous Improvement

01 Proactive monitoring in real time to improve decision making in maintenance and operations.

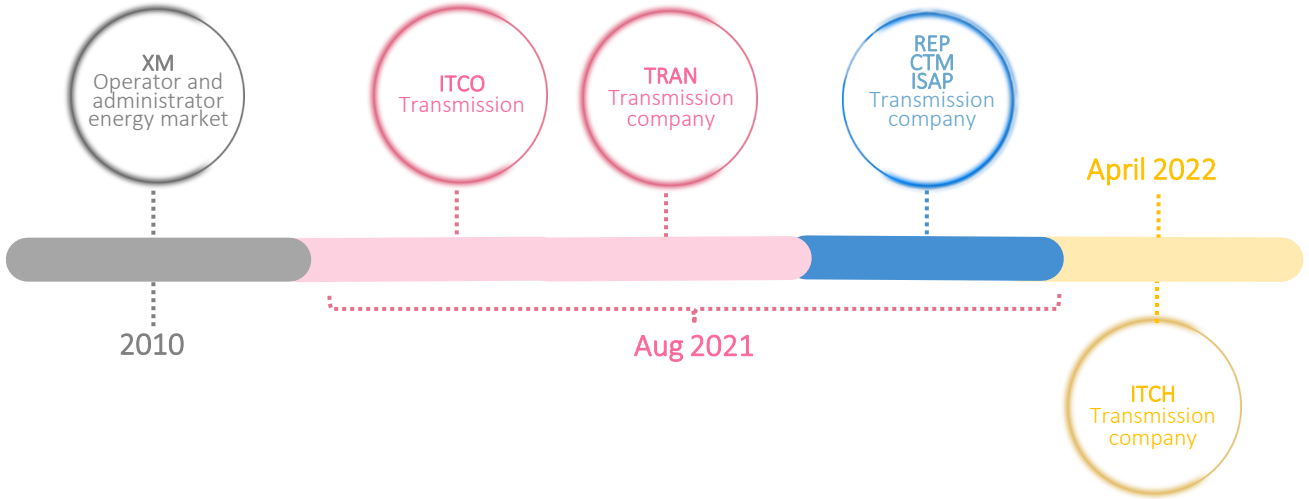
02 Minimize assets maintenance and define assets health based on Analytics.

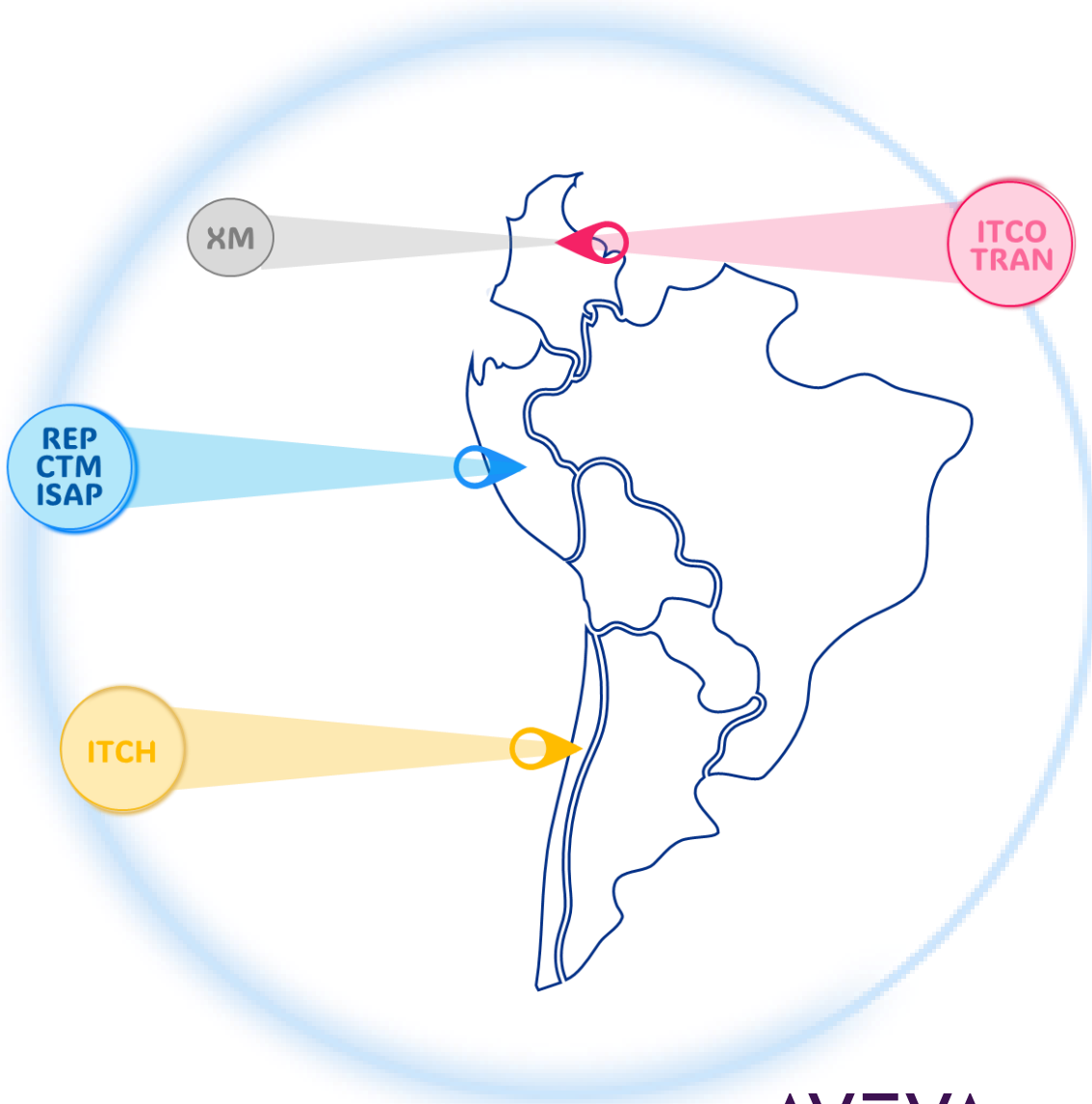
03 Improve the information availability for all business processes.

04 Cost efficiency and minimize operational risks

Involved Companies

PI System Implementation





IMPLEMENTATION TECHNICAL DETAILS

How did we do it?

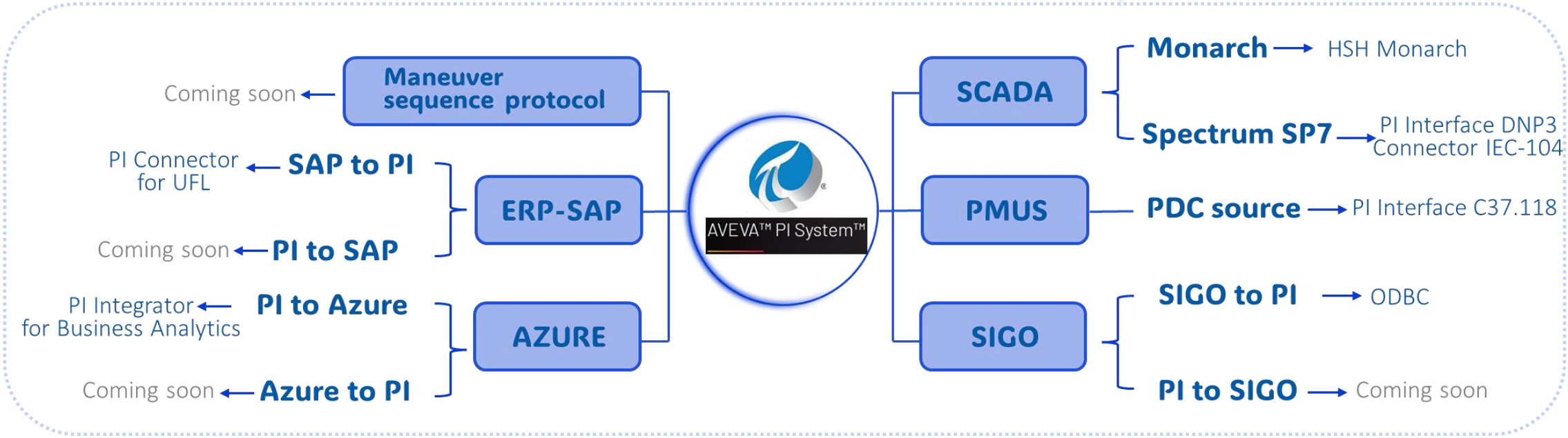
Agreements between different cultures and customs

Interfaces and Connectors

isa CONEXIONES QUE INSPIRAN

Energy

Interfaces and Connectors



ERP - SAP: SAP Enterprise resource planning.
AZURE: Microsoft Cloud platform
SCADA: Supervisory Control And Data Acquisition
PMU: Phasor Measurement Unit
SIGO: Operational Information System. Inhouse Software.
Maneuver sequence protocol: web application that allowe maneuver management. Inhouse Software.

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Criteria Implemented

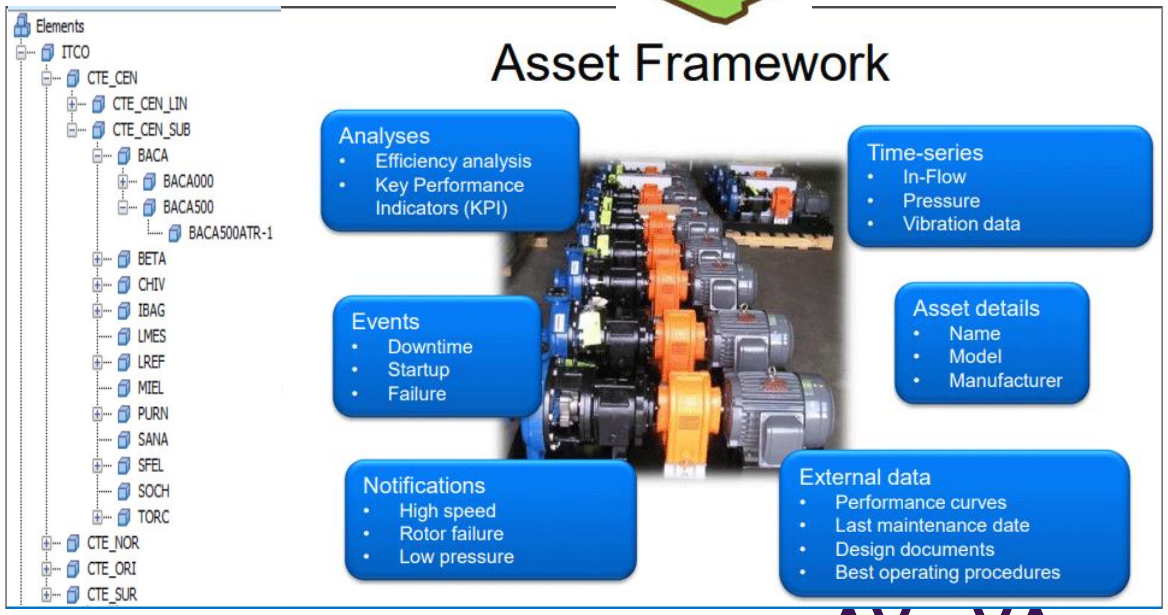
Homologation and Approval

PI TAG Is the key

- Data structure approved for ISA and it's companies
- Allows communication between SIGO – SAP and PI
- Facilitates data sharing

COMPANY	SOURCE	SUBSTATION ID	VOLTAGE LEVEL	EQUIPMENT	VARIABLE
ITCO	SCADA	CERR500	ATRAF01_5A1-4	I1	Estimated
ITCO	SCADA	CERR500	ATRAF01_5A1-4	I1	Q
ITCO	SCADA	CERR500	ATRAF01_5A1-4	I1	Value

Taxonomy and hierarchy



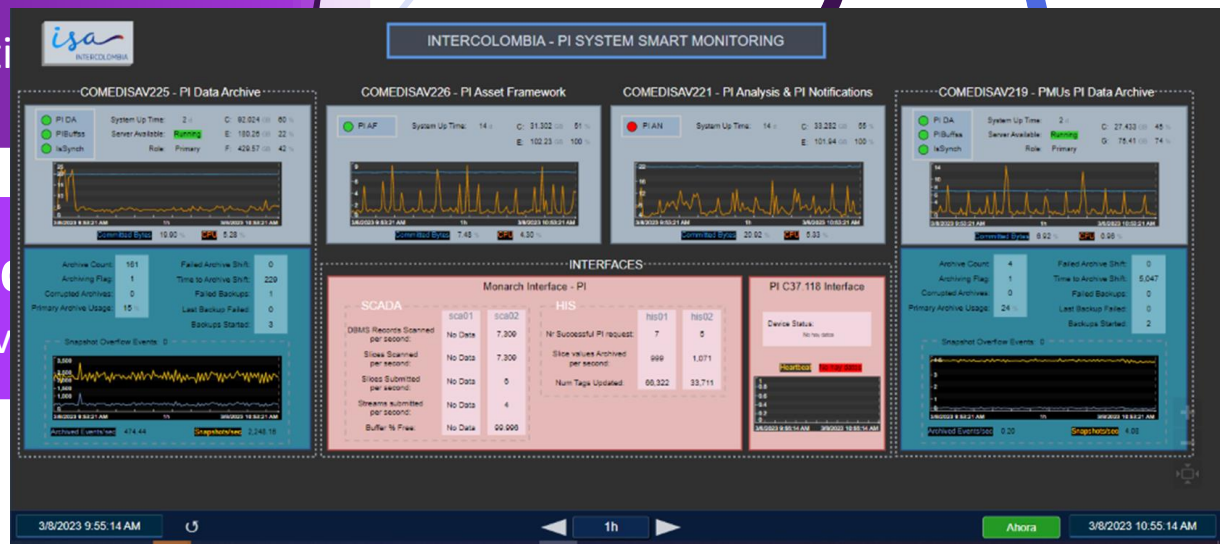
Governance and Monitoring

Committees

Strategic: Roadmap, resources and ISA2030 alignment

Tactical: Agile backlog, prioriti

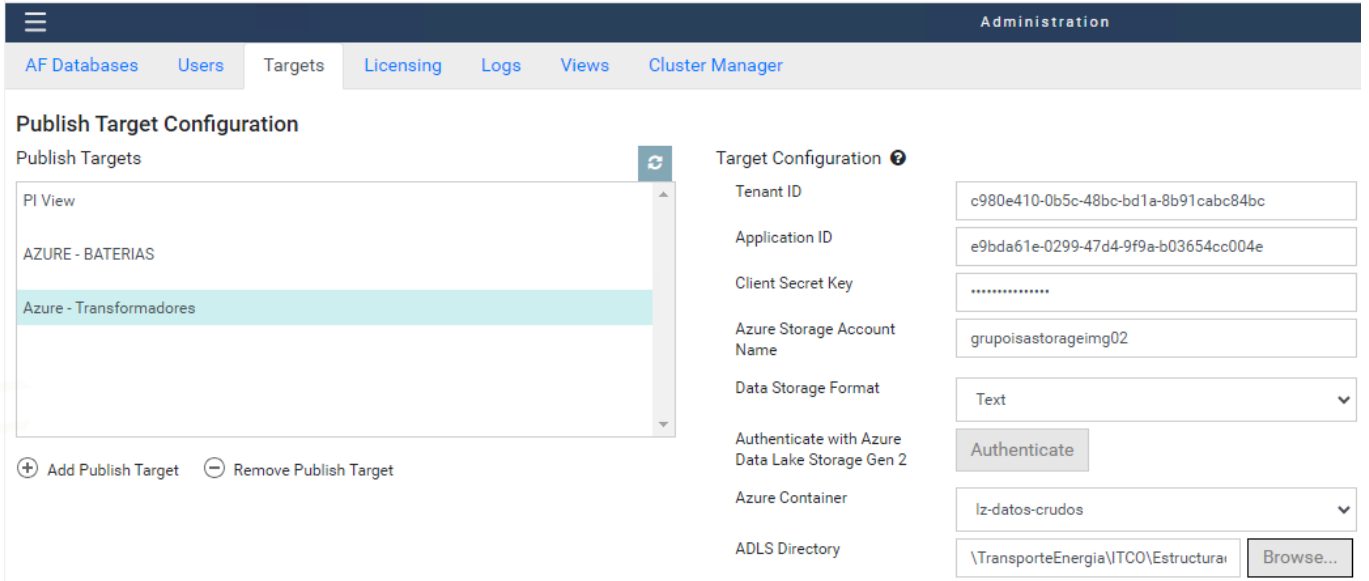
Operational - Centralize
homologation – Support and dev



Success Stories

Boosting Digital Twins’ Capabilities

Battery Banks Anomaly Detection Model



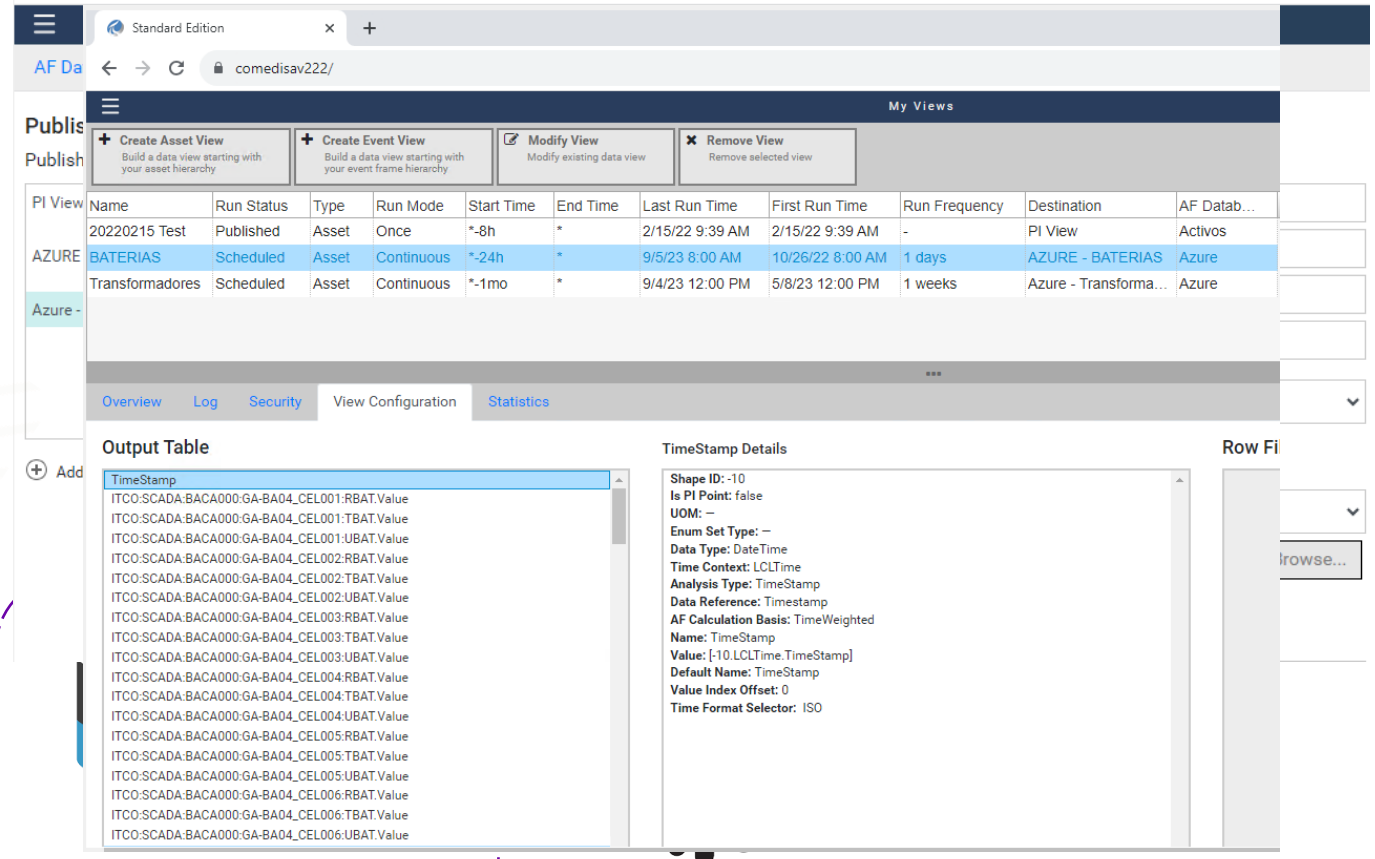
PI integrator for Business Analytics

- Cells voltages
- Cells temperature
- Cells internal resistance
- Bank voltage
- Bank current
- Bank ripple voltage

Azure Datalake

Anomaly Detection Model

Battery Banks Anomaly Detection Model



PI integrator for Business Analytics

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- Cells temperature
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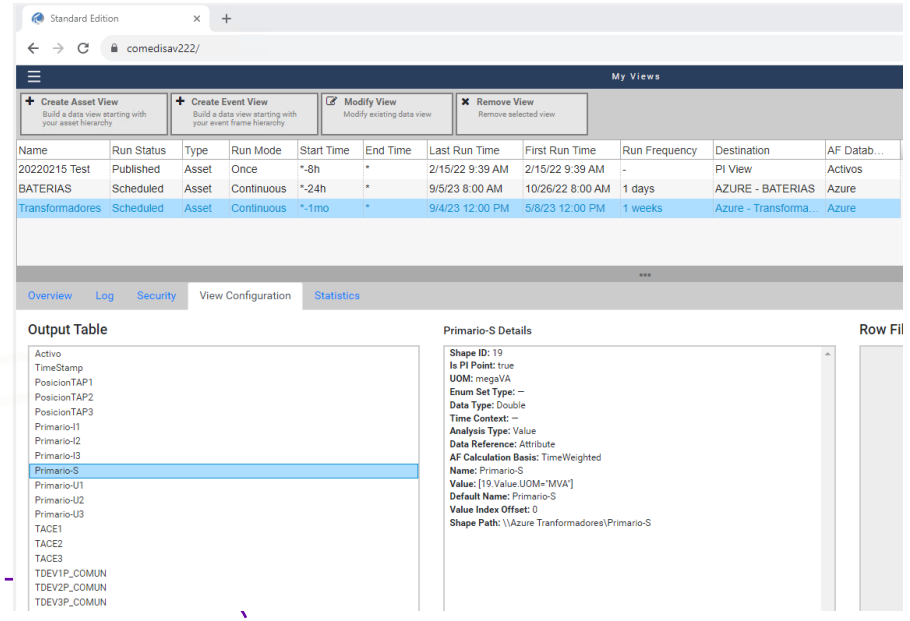
- Bank ripple voltage

Power Transformers Anomaly Detection Model



- Currents
- Voltages
- Power
- Oil temperature
- Winding temperature

PI integrator for Business Analytics

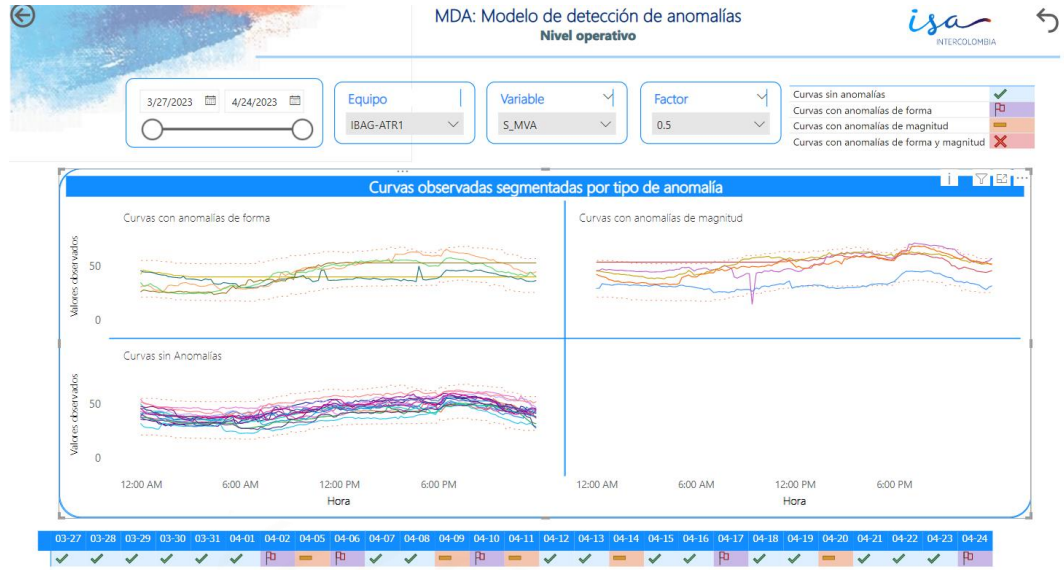
Web Service

- DGA analysis
- Nominal data

Azure Datalake

Anomaly Detection Model

Power Transformers Anomaly Detection Model



- Currents
- Voltages
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PI integrator for Business Analytics

Web Service

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- Nominal data

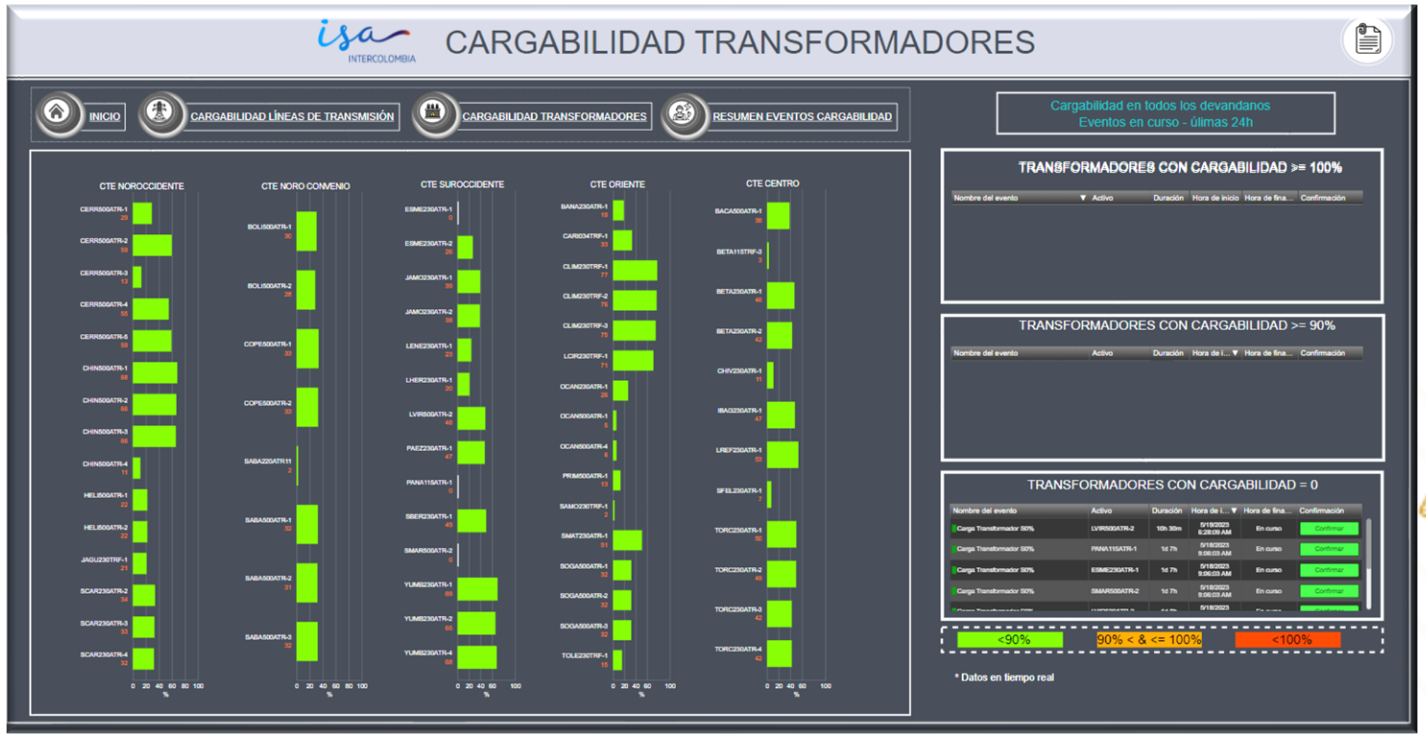
Azure Datalake

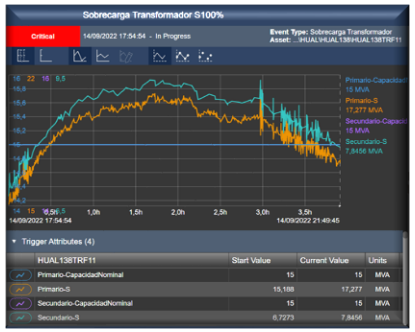
Anomaly Detection Model

Success Stories

AF Analytical Models

Power Transformers Loading

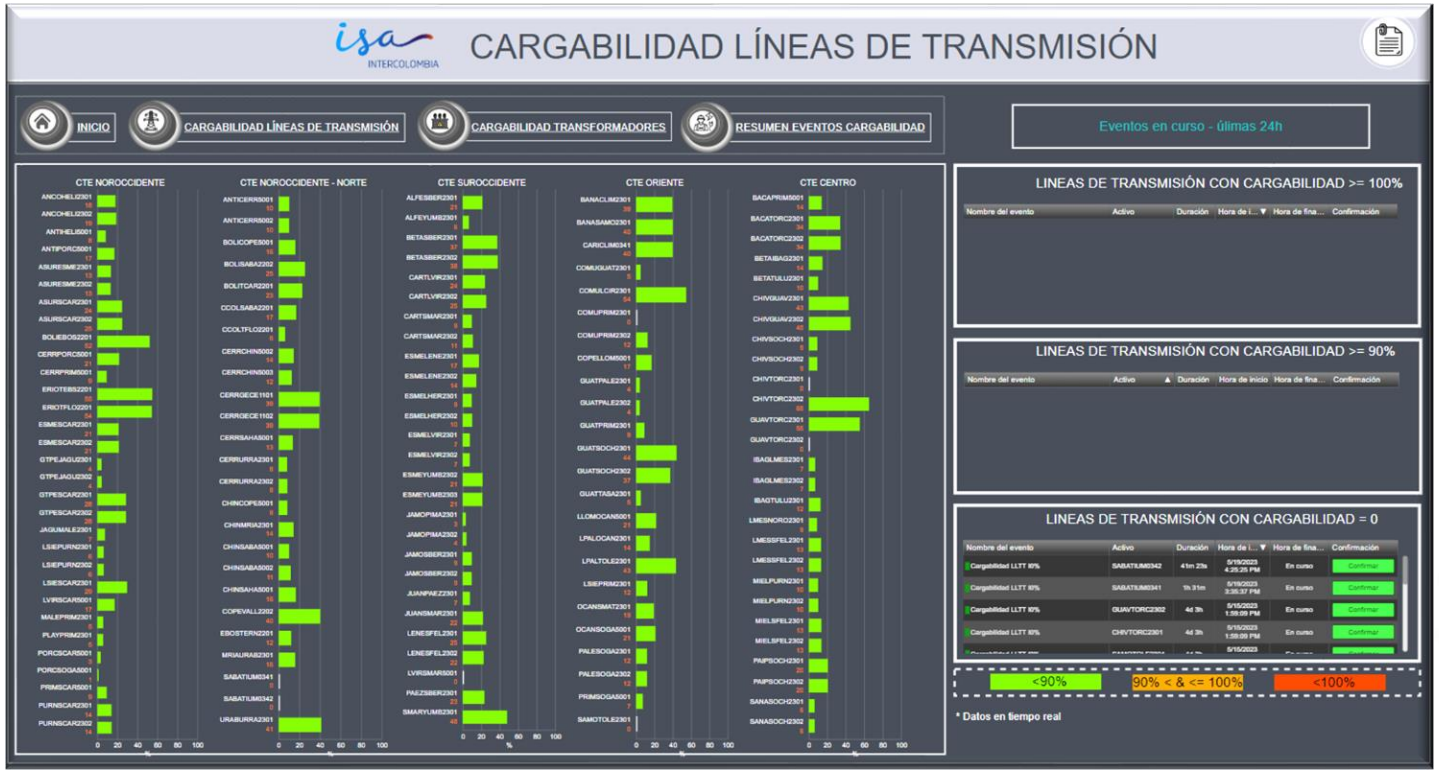


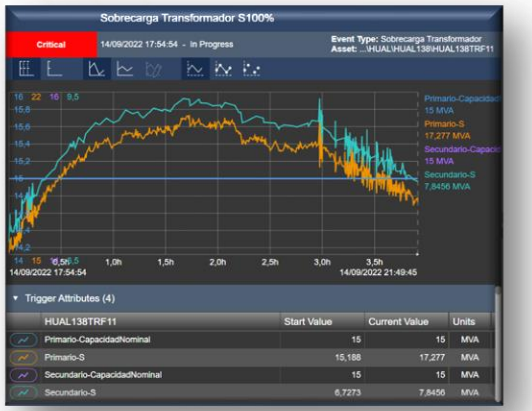


Thermal analysis from transformer load, winding, and oil temperatures

It will prevent the transformer from working above it's capacity, thus, extending the asset useful life.

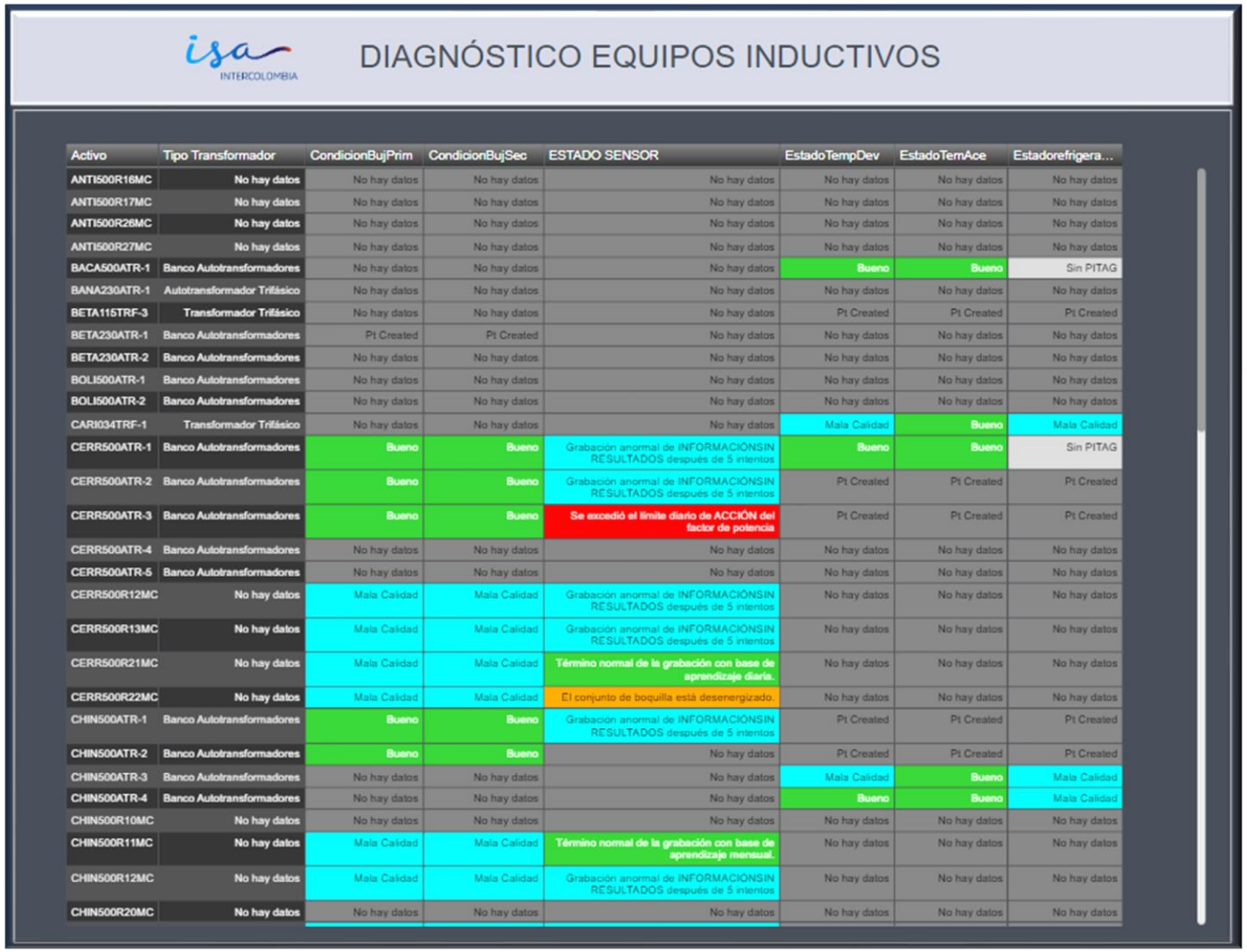
Transmission Line Loading





Loading information based on the current at the ends of the line. It considers the existence of line reactors.
It will prevent the transmission line from working above it's nominal capacity, thereby reducing operational risks.

Inductive Assets Monitoring



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DIAGNÓSTICO EQUIPOS INDUCTIVOS

Activo	Tipo Transformador	CondicionBujPrim	CondicionBujSec	ESTADO SENSOR	EstadoTempDev	EstadoTemAce	Estadorefrigera...
ANTI500R16MC	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
ANTI500R17MC	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
ANTI500R26MC	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
ANTI500R27MC	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
BACA500ATR-1	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	Bueno	Bueno	Sin PITAG
BANA230ATR-1	Autotransformador Trifásico	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
BETA115TRF-3	Transformador Trifásico	No hay datos	No hay datos	No hay datos	Pt Created	Pt Created	Pt Created
BETA230ATR-1	Banco Autotransformadores	Pt Created	Pt Created	No hay datos	No hay datos	No hay datos	No hay datos
BETA230ATR-2	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
BOLI500ATR-1	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
BOLI500ATR-2	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
CARI034TRF-1	Transformador Trifásico	No hay datos	No hay datos	No hay datos	Mala Calidad	Bueno	Mala Calidad
CERR500ATR-1	Banco Autotransformadores	Bueno	Bueno	Grabación anormal de INFORMACIÓNSIN RESULTADOS después de 5 intentos	Bueno	Bueno	Sin PITAG
CERR500ATR-2	Banco Autotransformadores	Bueno	Bueno	Grabación anormal de INFORMACIÓNSIN RESULTADOS después de 5 intentos	Pt Created	Pt Created	Pt Created
CERR500ATR-3	Banco Autotransformadores	Bueno	Bueno	Se excedió el límite diario de ACCIÓN del factor de potencia	Pt Created	Pt Created	Pt Created
CERR500ATR-4	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
CERR500ATR-5	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
CERR500R12MC	No hay datos	Mala Calidad	Mala Calidad	Grabación anormal de INFORMACIÓNSIN RESULTADOS después de 5 intentos	No hay datos	No hay datos	No hay datos
CERR500R13MC	No hay datos	Mala Calidad	Mala Calidad	Grabación anormal de INFORMACIÓNSIN RESULTADOS después de 5 intentos	No hay datos	No hay datos	No hay datos
CERR500R21MC	No hay datos	Mala Calidad	Mala Calidad	Término normal de la grabación con base de aprendizaje diario.	No hay datos	No hay datos	No hay datos
CERR500R22MC	No hay datos	Mala Calidad	Mala Calidad	El conjunto de boquilla está desenergizado.	No hay datos	No hay datos	No hay datos
CHIN500ATR-1	Banco Autotransformadores	Bueno	Bueno	Grabación anormal de INFORMACIÓNSIN RESULTADOS después de 5 intentos	Pt Created	Pt Created	Pt Created
CHIN500ATR-2	Banco Autotransformadores	Bueno	Bueno	No hay datos	Pt Created	Pt Created	Pt Created
CHIN500ATR-3	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	Mala Calidad	Bueno	Mala Calidad
CHIN500ATR-4	Banco Autotransformadores	No hay datos	No hay datos	No hay datos	Bueno	Bueno	Mala Calidad
CHIN500R10MC	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos
CHIN500R11MC	No hay datos	Mala Calidad	Mala Calidad	Término normal de la grabación con base de aprendizaje mensual.	No hay datos	No hay datos	No hay datos
CHIN500R12MC	No hay datos	Mala Calidad	Mala Calidad	Grabación anormal de INFORMACIÓNSIN RESULTADOS después de 5 intentos	No hay datos	No hay datos	No hay datos
CHIN500R20MC	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos	No hay datos

It shows the bushings monitoring condition alarms, the winding and oil temperature levels, and the refrigeration system.

Evaluates the data quality.

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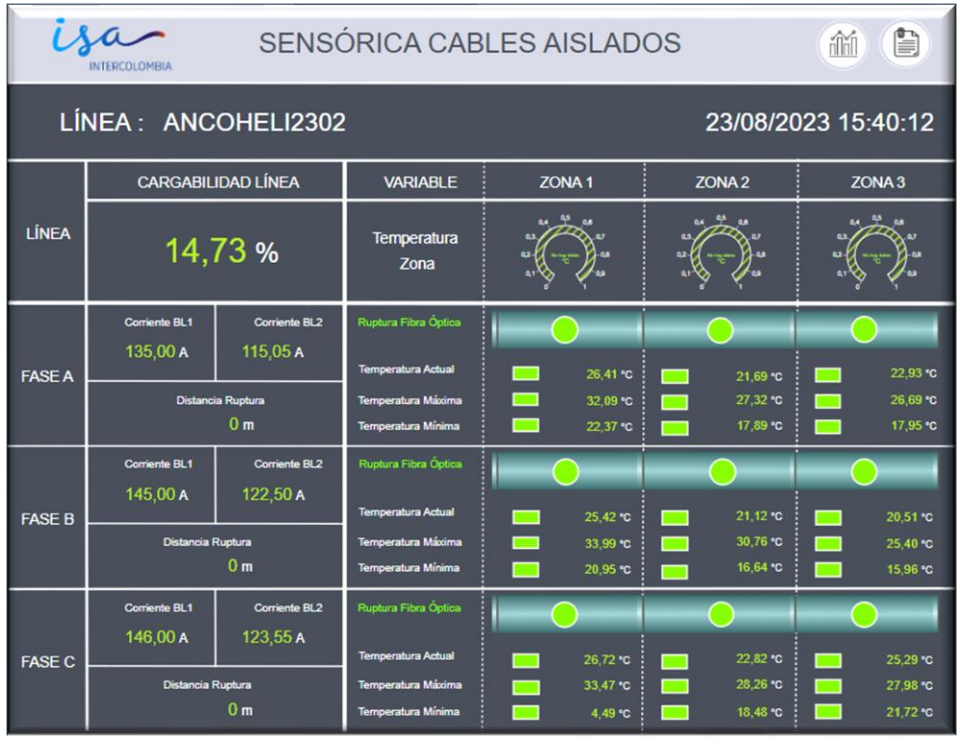
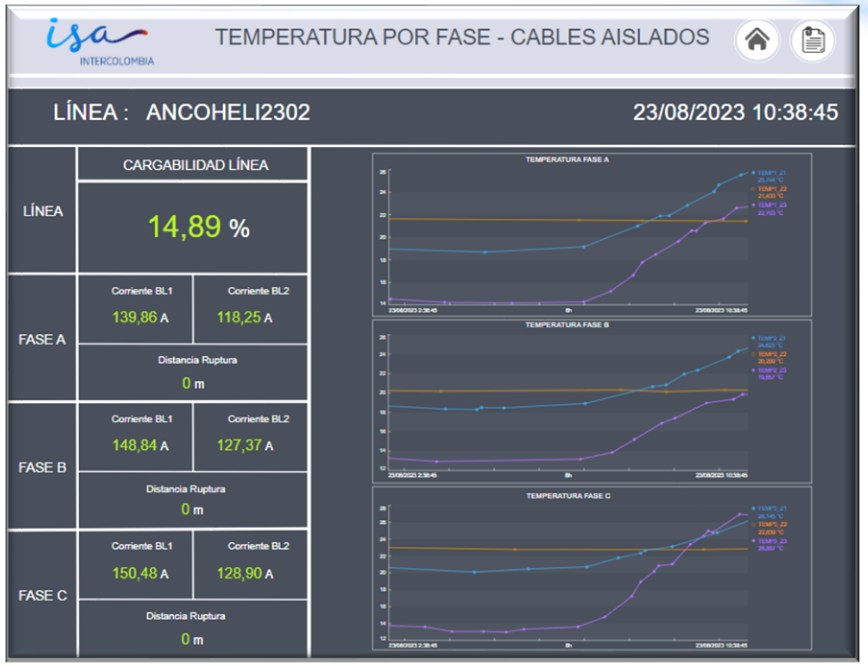
Insulated Power Cables monitoring



Generates visual alarms based on sensor diagnostics according to acceptable thresholds.



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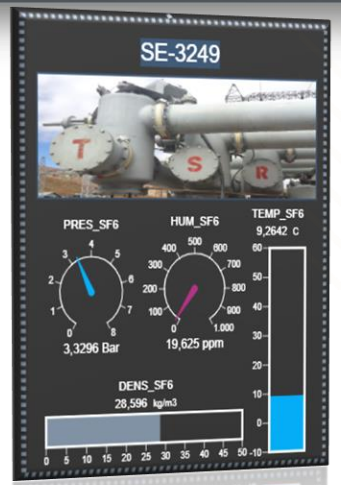
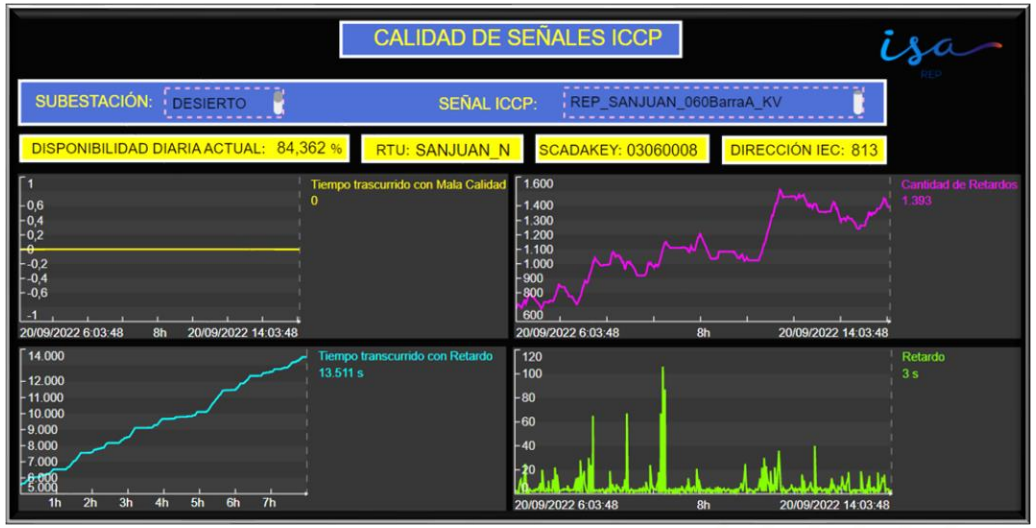
Another Models Developed



SF6 Leaks



ICCP signals quality

Angular deviation with PMUs and it's quiality

Conclusion

- Around 400 employees at 6 companies have been trained in the use of PI System tools
- 10 months governance and monitoring running
- 2 digital twins under enhancement
- 17 PI Vision displays
- 7 Asset Framework analytic models
- 6 team members ensuring the value to the business
- 20 hours saved per month due to data processing

Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

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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

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