

The background of the image is a deep purple with a pattern of glowing, intersecting diagonal lines in shades of cyan and magenta, creating a diamond-like grid effect. Centered in the middle of the image is the text "AVEVAWORLD" in a bold, white, sans-serif font. The letter "E" is stylized with three horizontal bars.

AVEVAWORLD

ACCELERATE INDUSTRIAL INTELLIGENCE

Situational Awareness with On-Prem Data + Cloud Forecasting for Control Centers

2026



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**What is the
purpose of XM?**

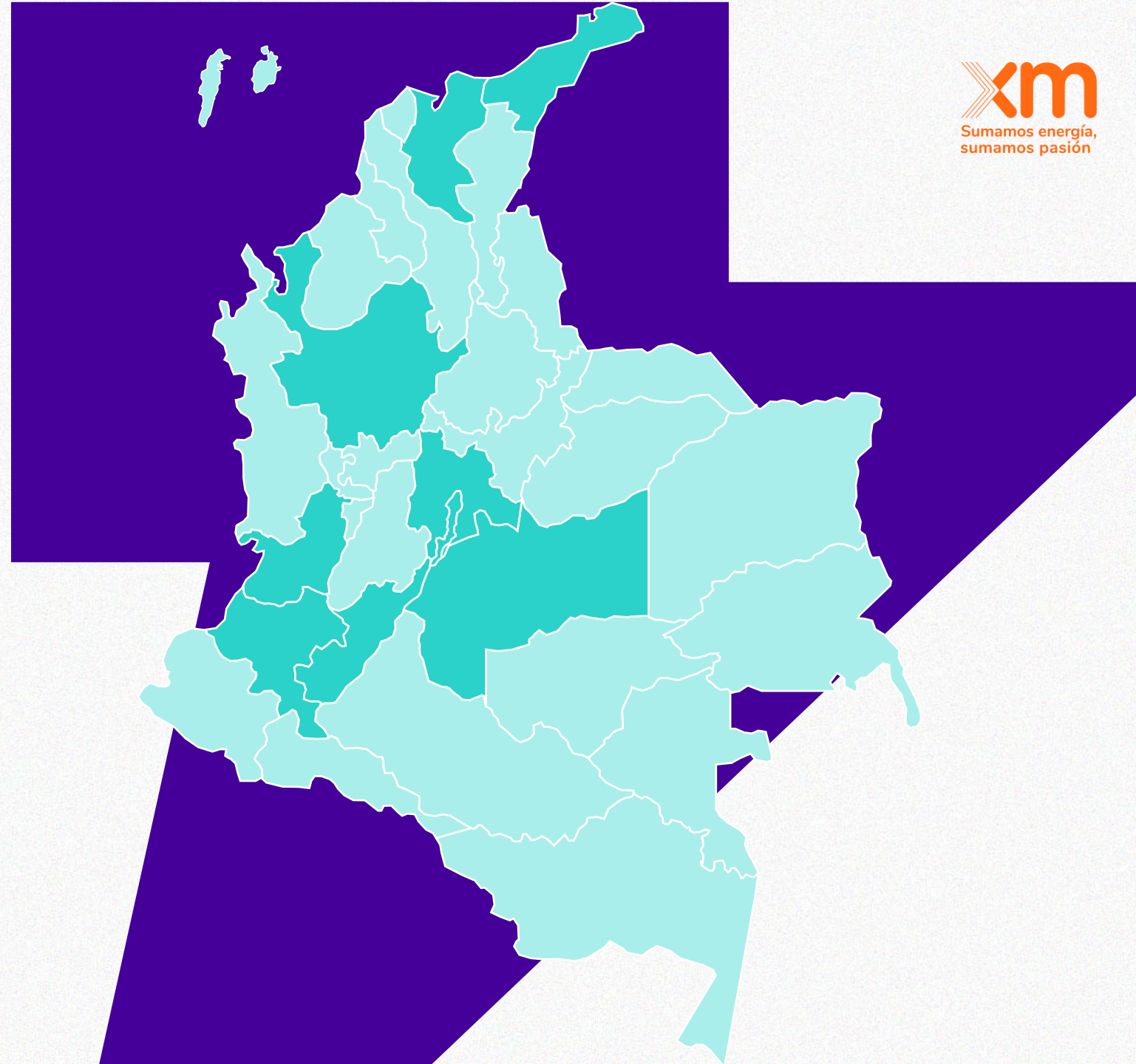
XM – Role in Colombia's Power System

Operator of the National Interconnected System (SIN):

Real-time supervision, coordination, and control of Colombia's electrical system to ensure reliability, security, and operational continuity.

Energy Market Administrator:

Operates and manages the wholesale electricity market, ensuring transparent, efficient, and competitive energy transactions.



Operator of the National Interconnected System (SIN)

- **Real-time supervision and monitoring** of the national grid through the National Control Center
- **Continuous balance management** between electricity generation and demand across the system
- **Centralized dispatch coordination** of generation and transmission assets
- **Frequency and voltage control** to maintain system stability and power quality
- **Detection and management of contingencies** (failures, outages, disturbances)
- **Rapid response and corrective actions** to ensure operational security across the entire SIN





Challenges and implemented solutions

Challenges

Challenges	Description
Integration of Disparate Data	Operational data from SCADA systems can be inconsistent and difficult to integrate due to the diversity of formats and sources and device configuration errors on field.
Data Volume and Cloud Processing Costs	SCADA operational data often comes in very large volumes. In many cases, this volume is not necessary for accurately identifying the statistical behavior of signals, yet it represents a significant cost in processing.
Accurate Forecasting of Key Variables	The lack of advanced tools to predict the behavior of critical variables can limit responsiveness and planning capacity.
Data Centralization on a Hub	A centralized data hub enables the consolidation of operational data from SCADA and multiple corporate systems within a hybrid infrastructure, improving integration, governance, and accessibility.
Data Visualization and Accessibility	Control center operators require fast and clear access to processed information in order to make informed decisions.

Solutions

Challenges	Proposed Solutions
Integration of Disparate Data	Leverage PI Asset Framework to standardize raw data, ensuring that information is consistent and usable.
Data Volume and Cloud Processing Costs	Use PI Asset Framework to cleanse and enrich raw data, guaranteeing that the information is practical and valuable.
Accurate Forecasting of Key Variables	Provide existing cloud-based machine learning and statistical models with higher-value input data to generate precise forecasts, delivering critical insights for decision-making.
Data Centralization on a Hub	Use PI Data Archive along with interface and connector products to ingest data from SCADA systems and corporate in-house applications developed across both on-premises and cloud environments. This approach enables seamless centralization of operational data within a hybrid infrastructure, improving integration, governance, and accessibility.
Data Visualization and Accessibility	Utilize AVEVA PI Vision to display forecasted and processed information, enabling intuitive and accessible visualization for operators.

Key points to achieve Proposed Solutions



Governance and Architecture

- Governance framework
- Infrastructure
- Technology



Integration

- Consolidated information in a single point
- Forecasting, simulation, estimation, measurement



Generating Value from Data

- Current data models
- New operational needs

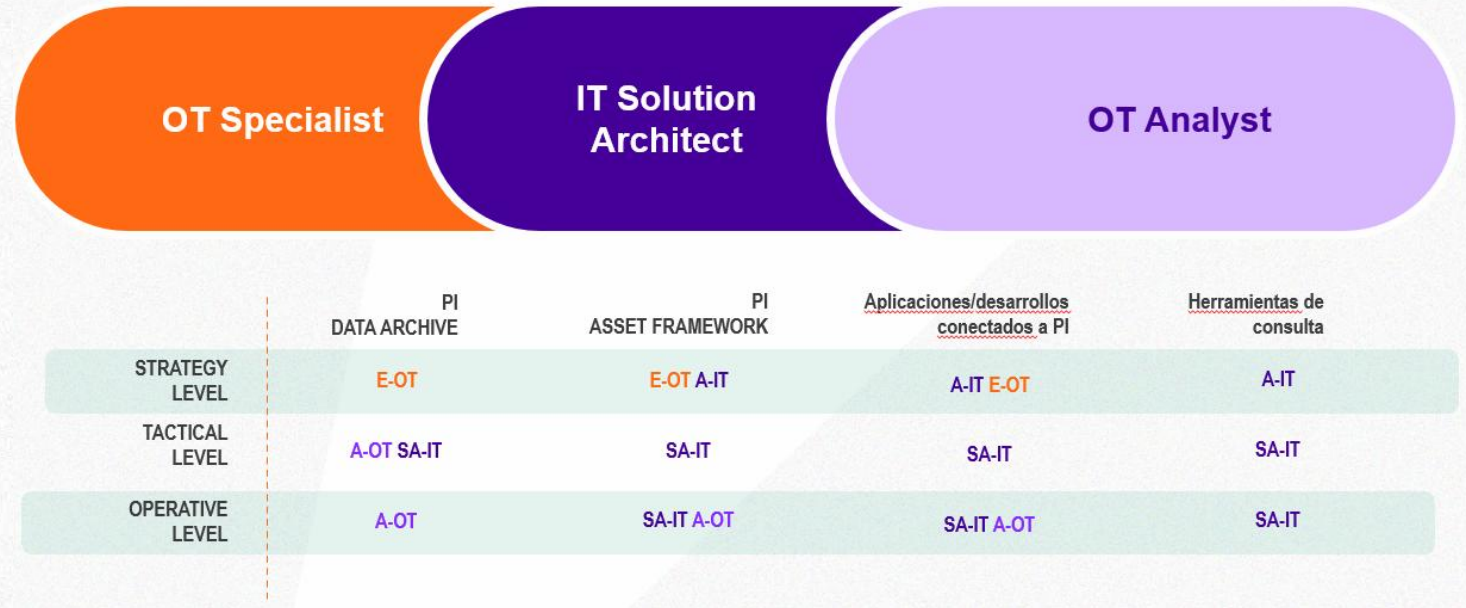


Visualization

- Operational variables (time series)
 - Analysis results
- Scenario-based insights
- Customized visualization

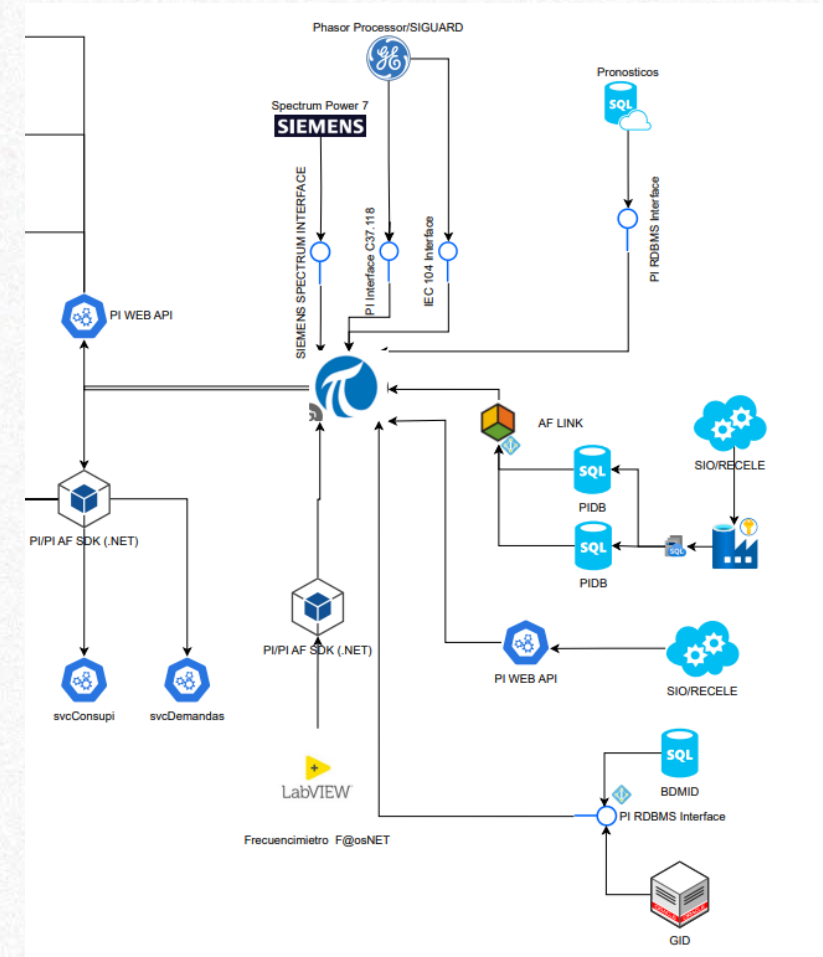
Governance and architecture

- **Dedicated IT/OT Team:** A specialized crew was formed with explicit focus on IT/OT operations.
- **Governance Model Implementation:** Governance framework was established using a RACI designation.
- **Joint IT/OT Design:** The infrastructure and technology architecture was defined collaboratively by IT and OT teams.



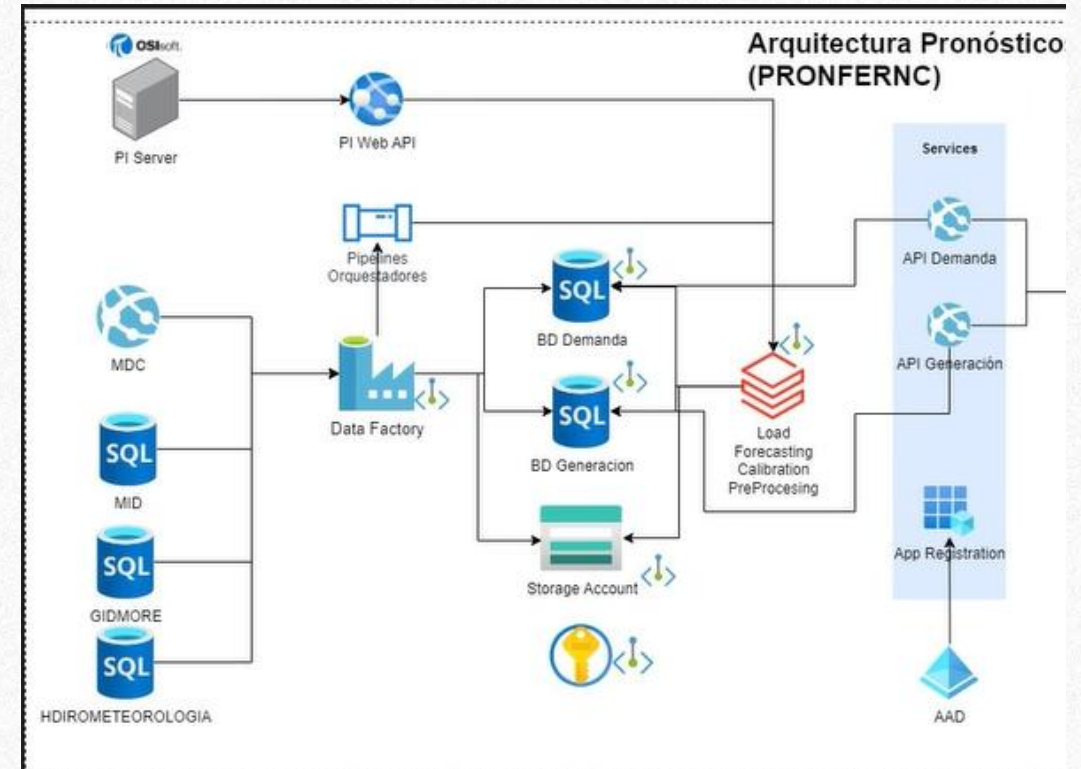
Integration

- **Architecture for Data Ingestion:** An architecture was designed to ingest information into AVEVA PI Data Archive. This includes data originating from in-house applications developed across both on-premises and cloud environments.
- **Operational Data Extraction:** A complementary architecture was implemented to extract operational data from the PI Data Archive and move it into cloud environments.
- **Enable Forecasting Models:** The extracted data is processed for machine learning models dedicated to forecasting, ensuring accurate predictions and actionable insights.



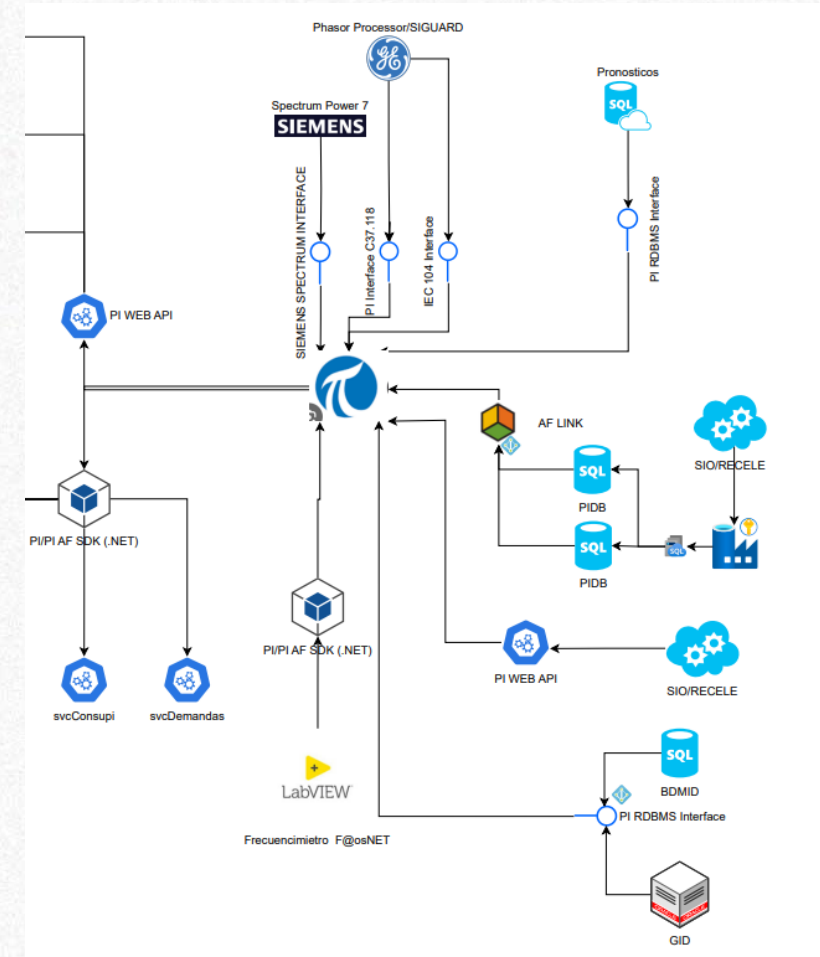
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Generating Value from Data

- **Leverage existing PI Data Archive:** Utilize already available operational SCADA data as the foundation for advanced analytics and decision-making.
- **Model business context with PI Asset Framework (AF):** Structure and contextualize operational data according to business needs, enabling standardized and reusable information models.
- **Integrate enterprise data sources:**
 - Enrich operational data by incorporating:
 - Technical asset parameters
 - Scheduled maintenance plans
 - Generation scheduling programs
 - Weather forecasts
 - Electrical demand forecasts



Generating Value from Data

- **Enable contextualized and enriched datasets:** Combine operational and enterprise data to create a unified, high-value data layer for analysis.
- **Improve forecasting and planning capabilities:** Use enriched data to enhance prediction of key variables and support proactive operational decisions.
- **Support centralized data hub strategy:** Align with a hybrid data architecture to consolidate SCADA and IT systems into a governed, accessible data ecosystem.

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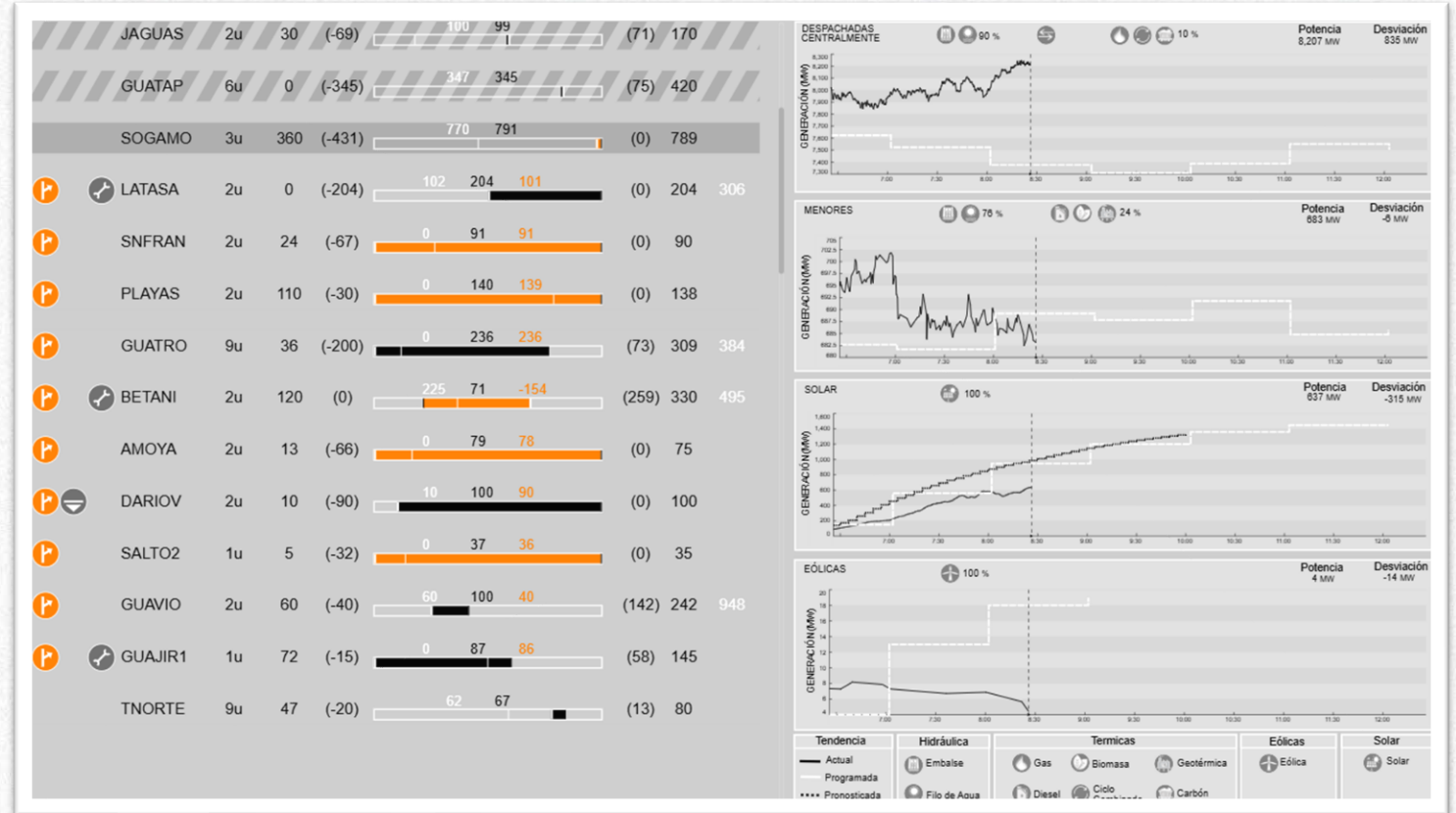
General Child Elements Attributes Ports Analyses Notification Rules Version

Filter

	Name	Value
Category: Cálculos		
	MaximoTecnicoUnidadesEnLi...	162
	MinimoTecnicoUnidadesEnLinea	7,5
Category: Condiciones Despliegue		
	DesplegarRecurso	False
	DesplieguePruebas	Excluded
	MostrarReserva	False
	PrecioOrdenamiento	110008817500
Category: Despliegue PT Vision		
	Campo7String	(-125)
	Campo11String	(0)
	ColoresBarra	0
	DespachoActual	128
	DespachoBarra	12,8
	DesviacionActual	4
	DisponibilidadTotalPlanta	128
	GeneracionActual	133
	GeneracionBarra	13,3
	MaximoBarra	12,8
	MaximoCampo11Despliegue	0 MW
	MaximoGlobal	128 MW
	MinimoCampo7Despliegue	-125
	MinimoGlobal	8
	MinimoGlobalBarra	0,8
	MostrarDesviacion	0
	MostrarDisponibilidadTotalPla...	0
	MostrarMinMax	0
	MostrarPruebas	0
	MostrarRecursoAGC	0
	MostrarRecursoMarginal	0
	Precio	87624
	StringUnidadesEnLinea	1u
	ValorDesviacion	0
Category: Medidas de despacho		

Visualization

- Enhance visualization and decision support:
Deliver meaningful, context-rich insights to operators and planners for faster and more informed decision-making.





Visualization



What's Next

What's Next



POC PI System on Cloud (Azure)

- Validate an AVEVA PI System deployed in Azure (VMs + ExpressRoute) to support cloud-based analytics workloads.



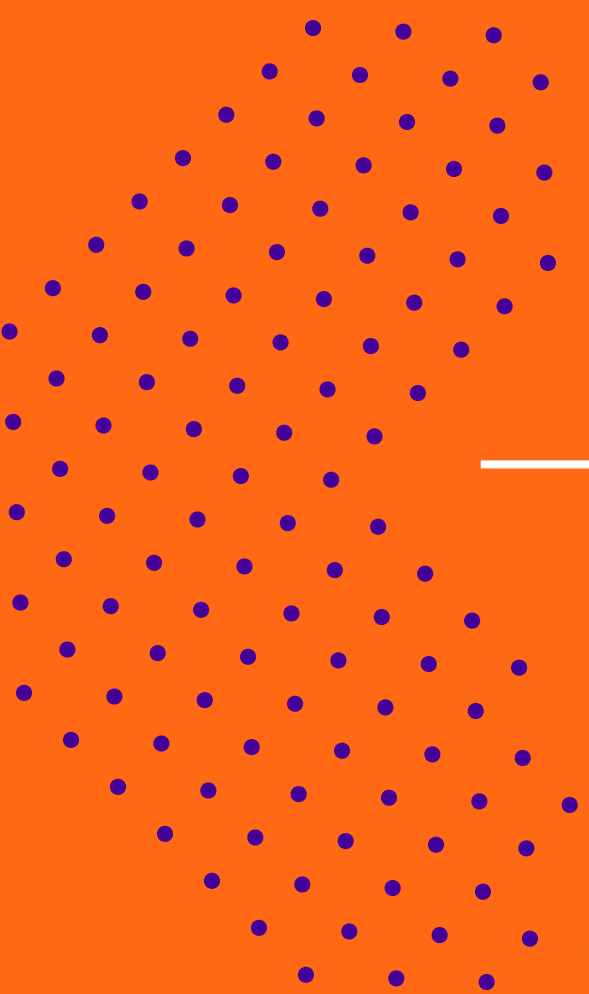
AVEVA CONNECT Implementation (Industrial Data Hub)

- Aggregate and contextualize real-time operational data
- Eliminate OT/IT data silos through unified integration
- Enable embedded analytics and visualization capabilities
- Reduce infrastructure footprint with a SaaS-based model
- Securely share data across teams and partners



Development of Contextual Models & Situational Awareness Visualizations

- Deliver situational awareness to operational users
- Enable consumption of enriched, contextualized data
- Support faster and more informed decision-making across identified business use cases



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