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Leveraging Real Time Operational Data to Reduce Greenhouse Gas Emissions

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About TotalEnergies

Meeting the Energy Transition Challenge

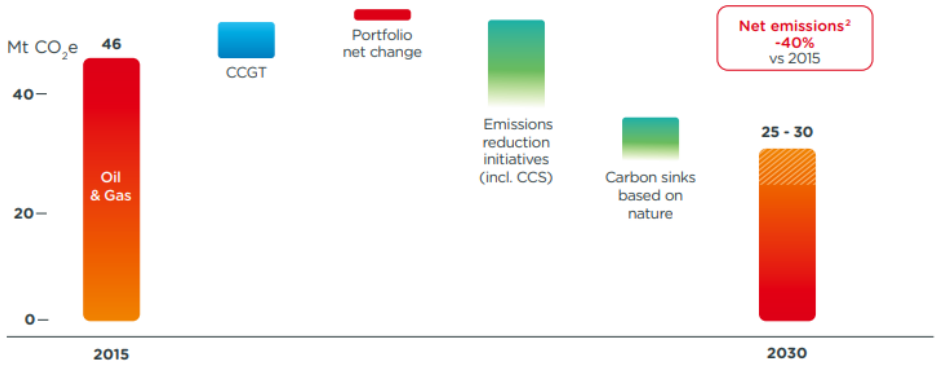
- Energy transition is underway however nowadays 81% of global energy needs are still met by fossil fuels (coal, oil, gas), posing a challenge to keeping global warming below 2°C, as per the Paris Agreement.

- TotalEnergies publicly committed in early 2019 to reduce net GHG Scope 1+2 emissions from operated activities by a minimum of 40% compared to 2015 levels.

- In 2022, TotalEnergies successfully implemented more than 110 GHG emissions reduction projects, demonstrating its commitment to sustainability.

- Generating energy savings in our operations offer's multiple benefits (Contributes to the global drive for energy efficiency, reduces our carbon emissions ,lowers our operational costs)

GHG Reduction Emissions over Operated sites



Source: Sustainability & climate 2023 progress report

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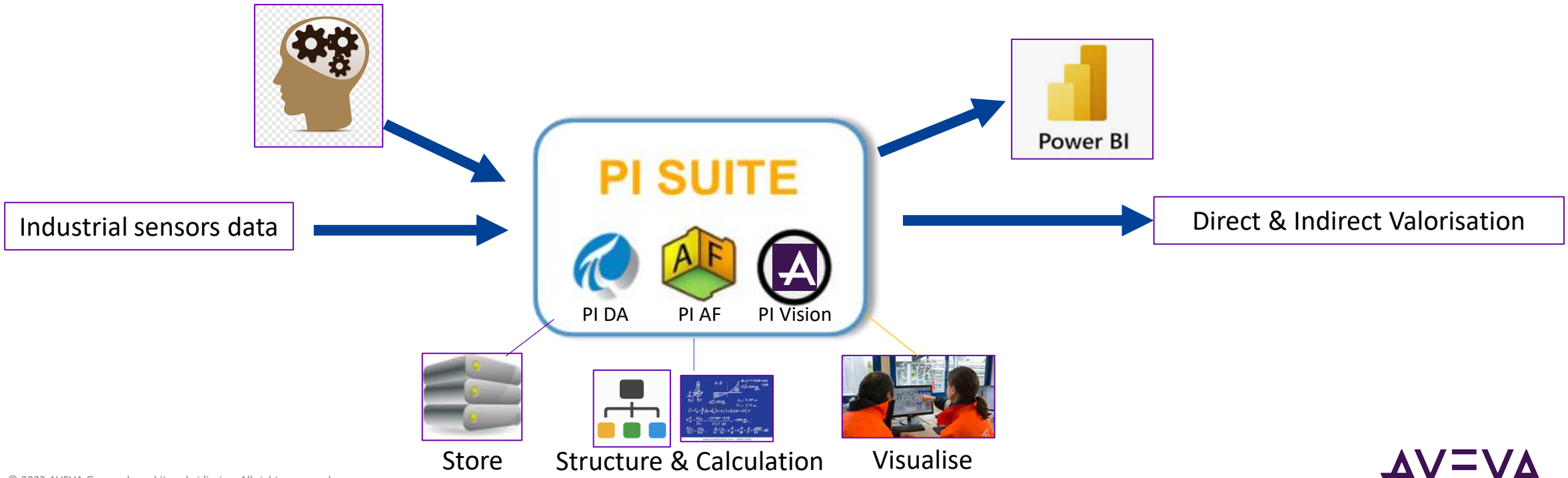
About Monitoring Center and PI

Our Objectives:

- **Data provider:** Recover and archive site instruments times series data.
- **Digital Solution maker:** Build, deploy and run monitoring applications
- **Digital Enabler:** Stream PI data to other digital solution

Some PI Facts

- 16 Affiliates
- 18 Years of Historical Data



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Oil & Gas – Worldwide Solution

Realtime monitoring of 85% Scope1 GHG emissions within the Company's E&P Operated asset

Challenge

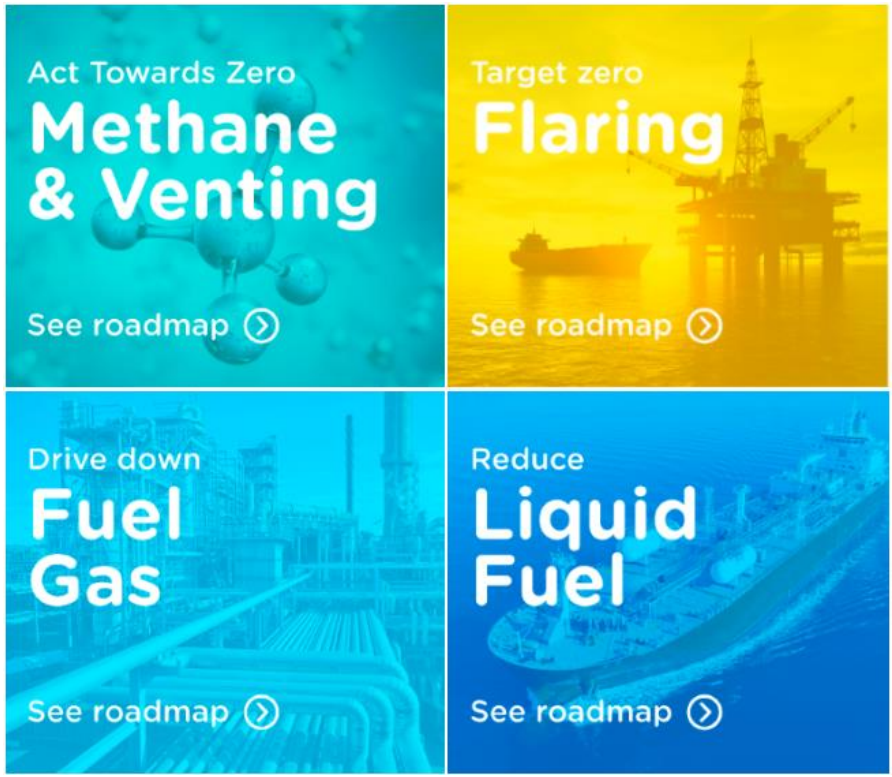
- Transform our operational practices toward greenhouse gases focus and environmentally friendly perspective by maximizing the utilization of existing field data and software resources
- Deploy an efficient, cost-effective digital solution that can be rapidly scaled up to broaden the range of monitored asset emissions,

Solution

- Centralized and standardized approach, with a PI-AF model built once and then applied to hundreds of equipment and assets, supplying real-time data calculations, analysis and KPIs

Results

- **Successful development of industrialized monitoring tool within a three-year timeframe**
- **Headquarters and operating centers relying on the solution's displays consistently for daily discussions and operational decision-making.**
- **Efficiently identification of poorly performing equipment and undesired process deviations that contribute to GHG emissions.**



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“To effectively reduce emissions and enhance energy efficiency, it is first needed to calculate and display this data through relevant indicators in suitable time for operational follow up.”

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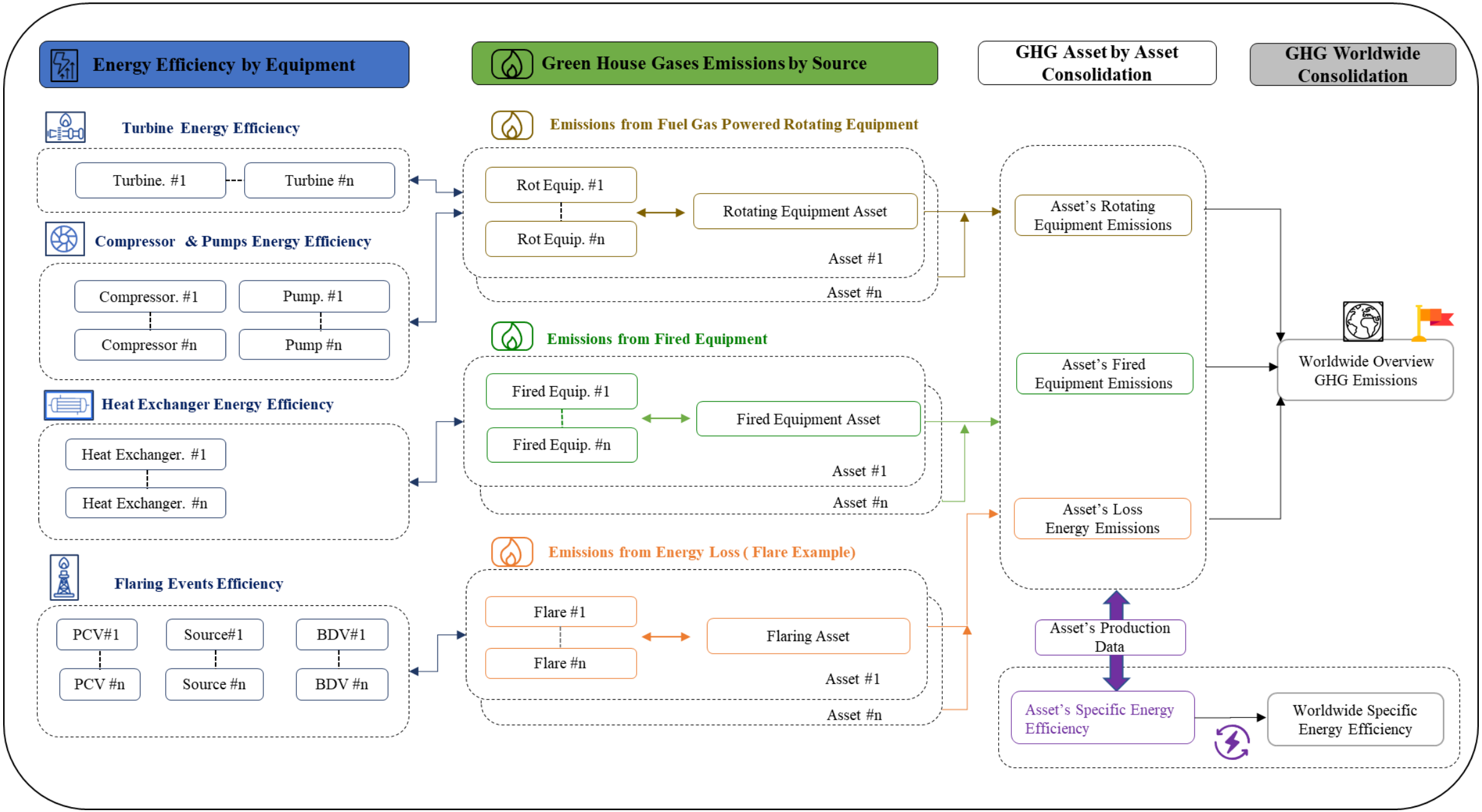
GHG & EE Real-time Monitoring Deployment Challenge



Implementing AVEVA portfolio for creating a centralized solution

Site Data

Site 1- Country 1

Data Server

Users

SIE Network

Interface

SII Network

DCS

Plant

Site 2- Country 1

Site 1- Country 2

Site n- Country n

PI2PI

Headquarters - France

Users

Data Visualization

SIE Network

Data Server

Data Analysis

Data Valorization

Data Structuration

GHG Sources (Flares, Rotating &, Fired Equipment's)
Energy Efficiency Equipment's

Process Data:
Gas Composition
Equipment's Datasheets
Realtime Data (Pressure, Flow, Temperature)

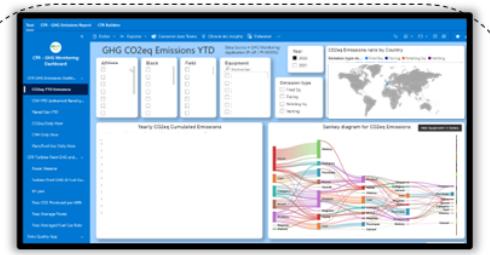
Data Analysis

GHG Calculation:
Company Manuals (API Compendium, IOGP Report, US EPA)

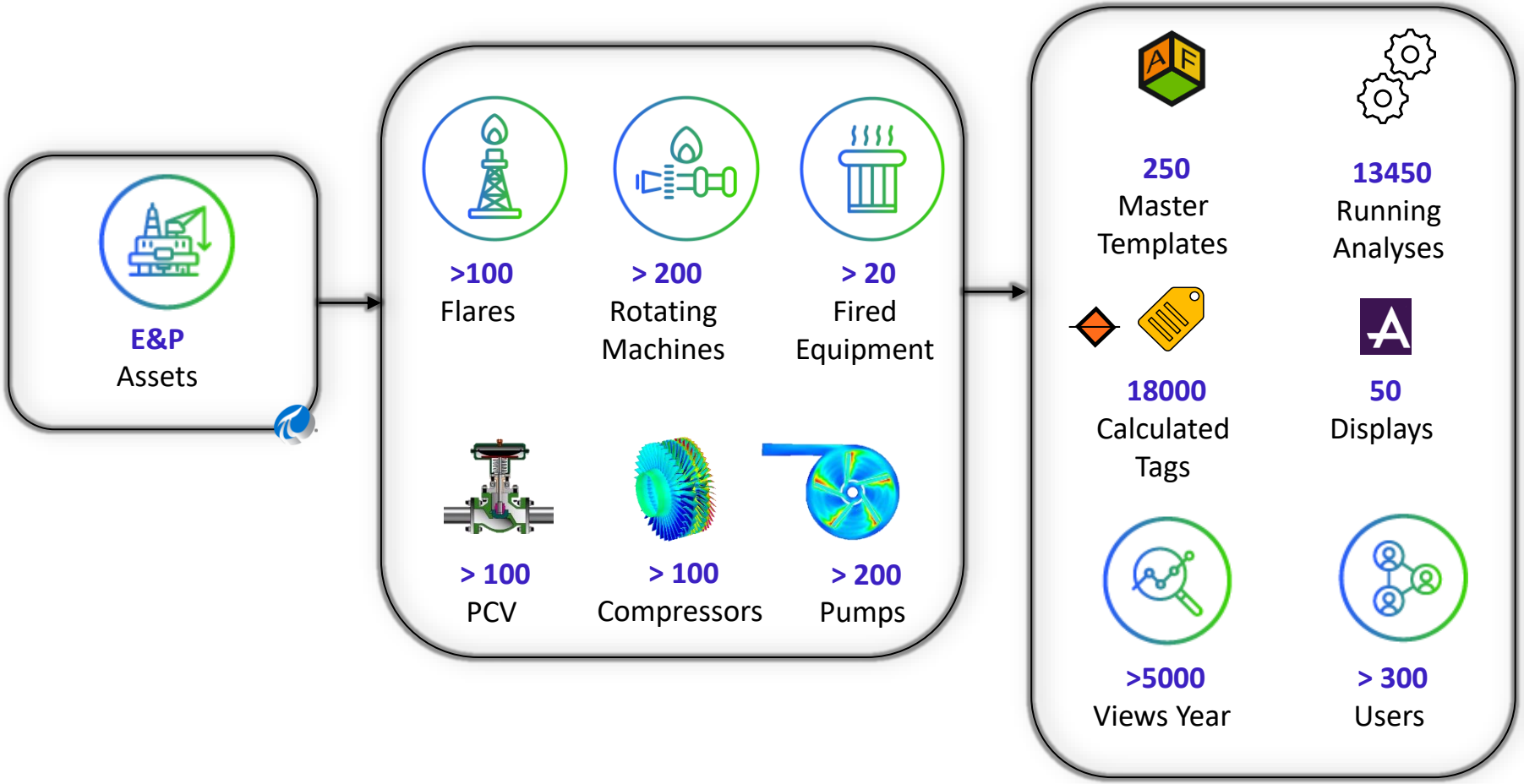
EE Calculation:
Company Manuals (GPSA,ASME,)

PI WEB API

Data Visualization



Implementation perimeter & outcomes



Objective:

Monitor direct emissions (Scope 1) within site boundaries.

GHG Emissions:

Modular design to identify major GHG contributors.
Started with Fuel Gas combustion emissions.
Expanded to Energy Loss emissions (e.g., Flaring, Venting).
Calculates emissions per equipment, offering comprehensive tracking.
About 85% of emissions from operations effectively monitored.

Energy Efficiency:

Calculates Specific Energy Efficiency (SEE) for each asset.
Focus on individual equipment (turbines, compressors, pumps, heat exchangers) and system-wide Energy Performance Indicators

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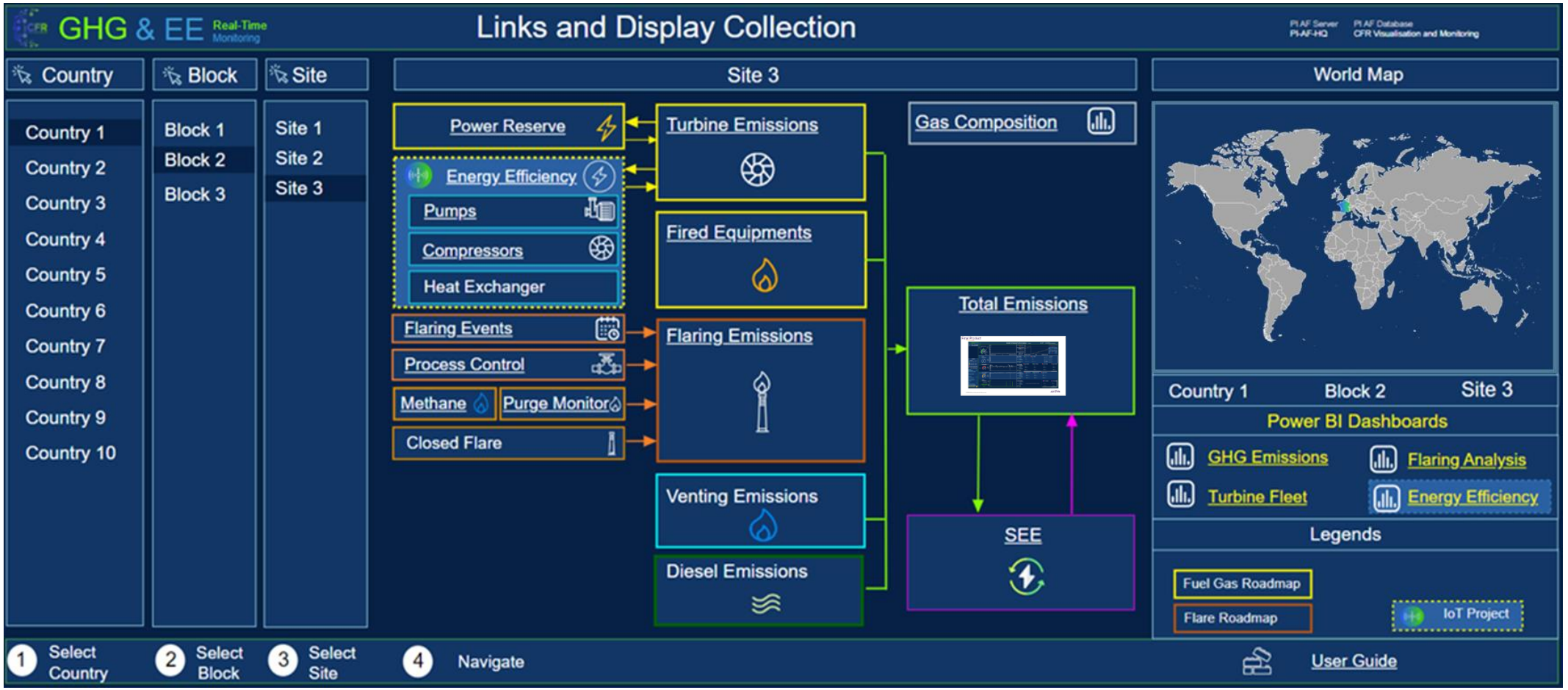
Final Product



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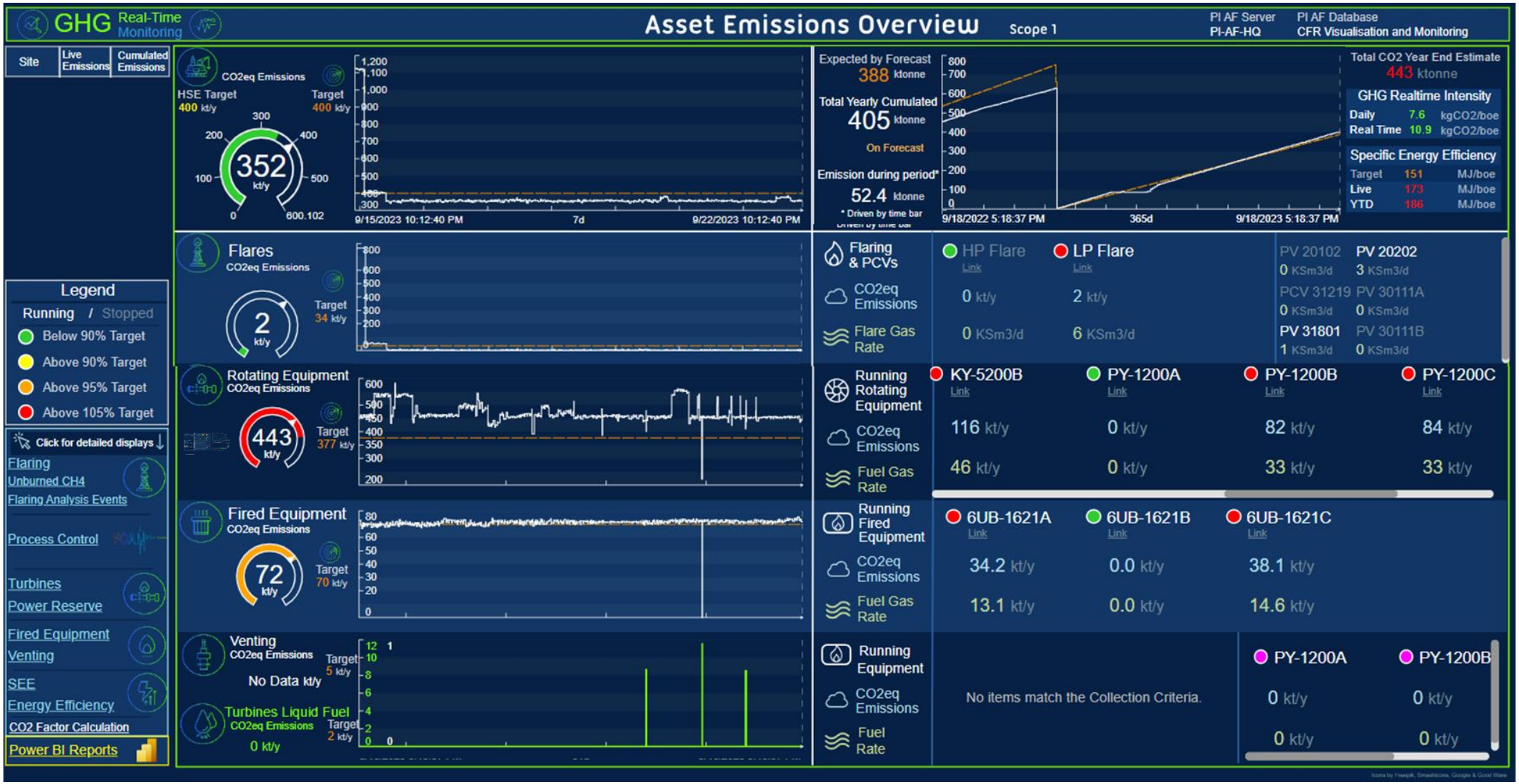

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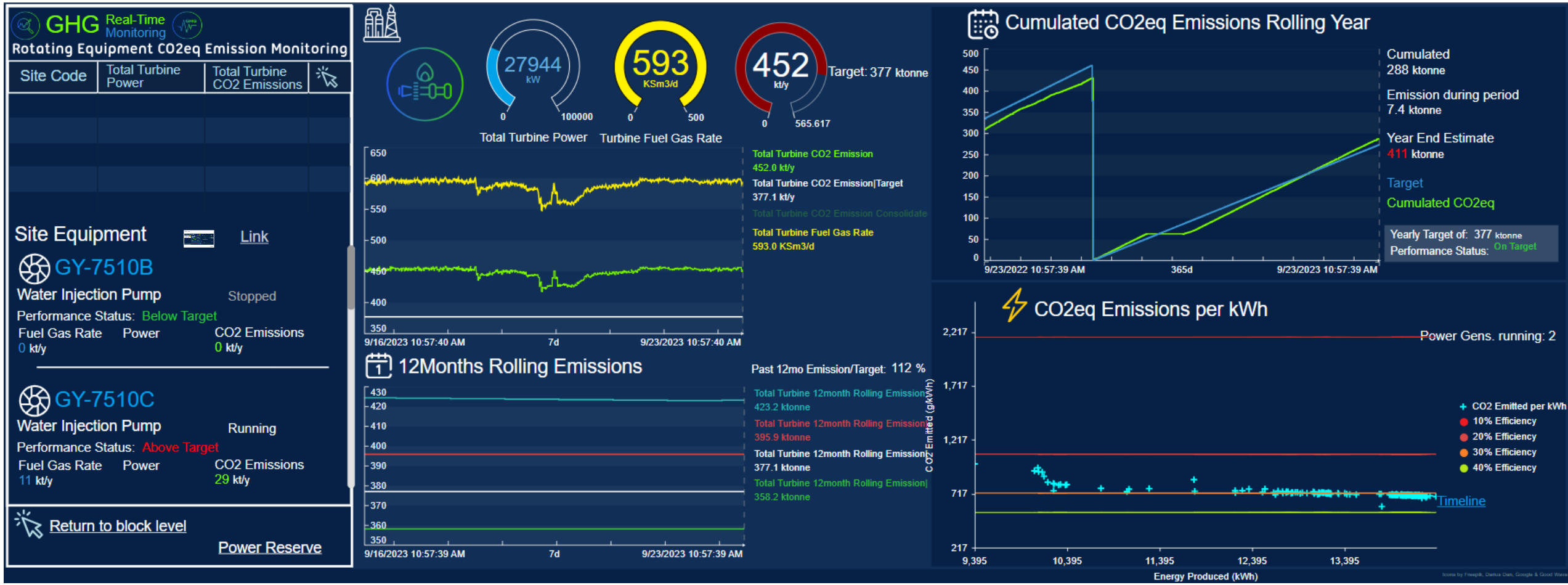

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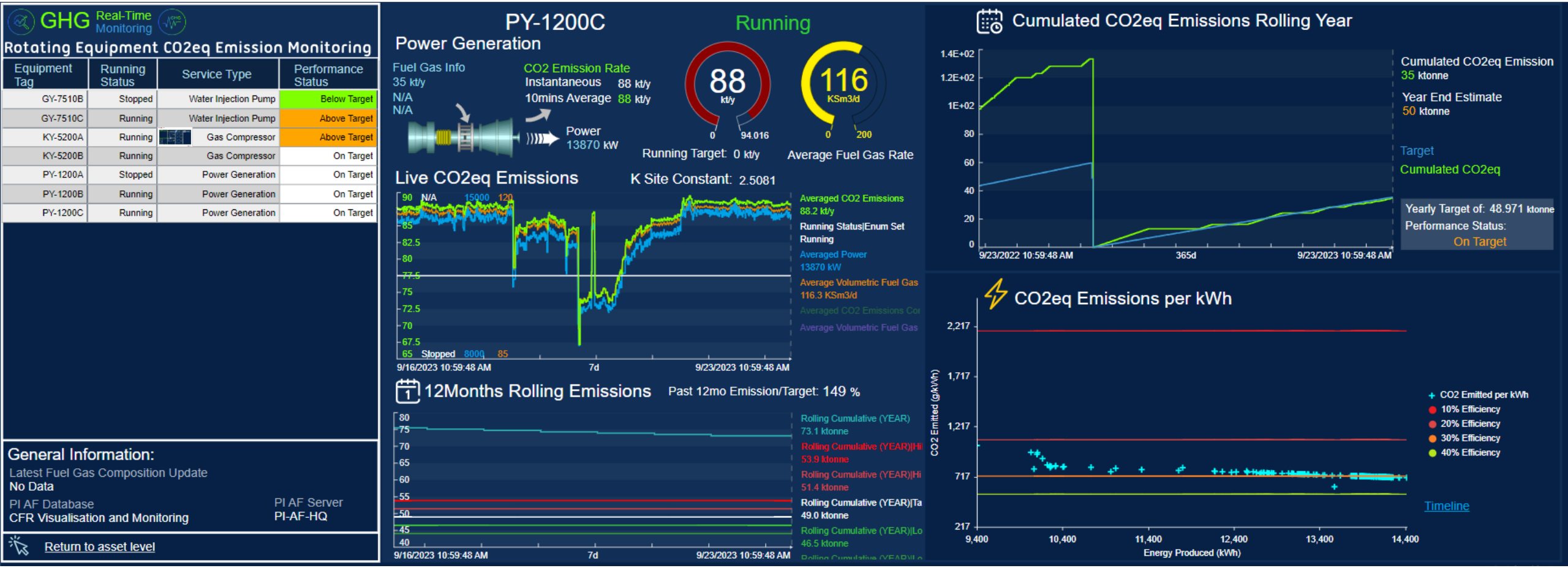

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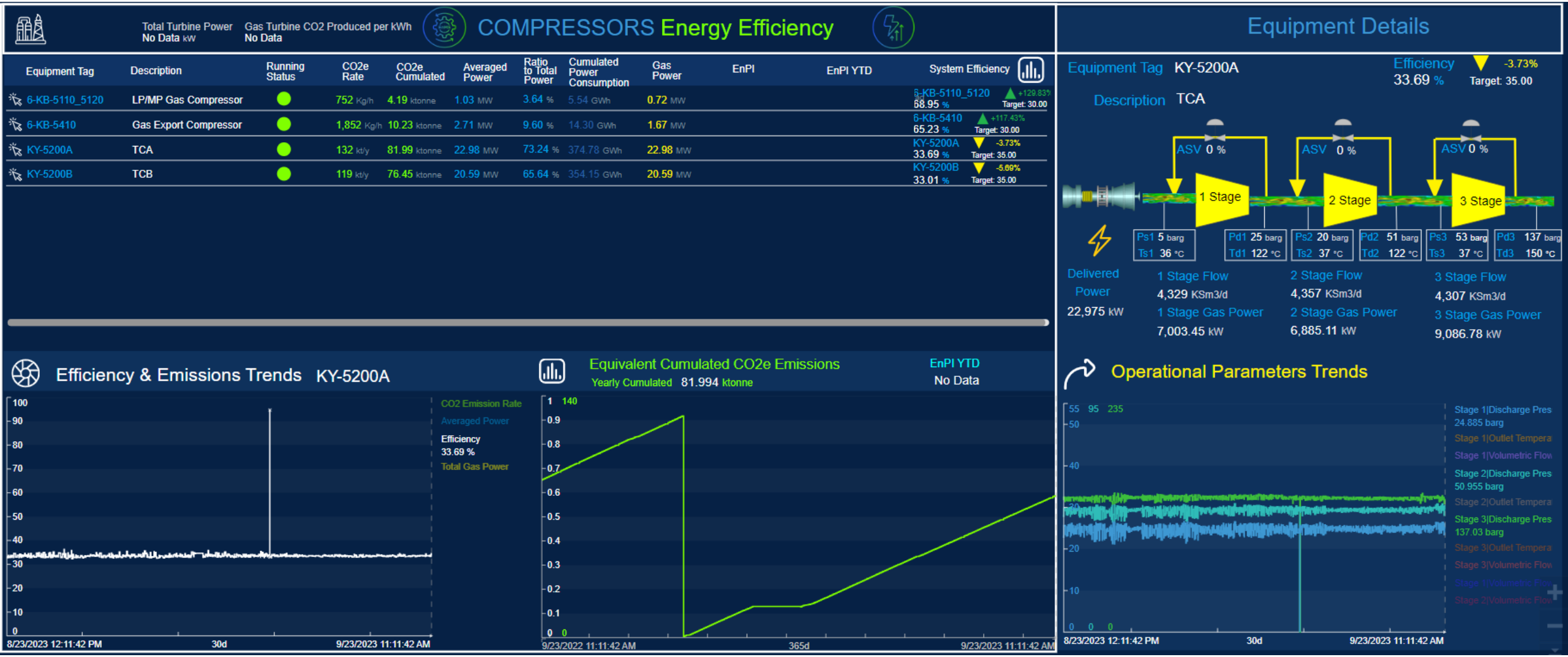

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“Now that we've established all the monitoring tools, let's proactively identify opportunities to reduce greenhouse gas emissions”

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Use Cases

- Purge Gas Optimization
- Categorizing flaring sources to decrease flared gas
- Detecting Passing Valves
- Detection of Process Control Anomalies to reduce flared gas
- Optimize the power delivery configuration to reduce emissions

- Reducing emissions by recycling less gas on compression system
- Reducing emissions by adjusting Water Injection pump pressure
- Detection of anomalies in pumps performance
- Reducing power consumption through gas compressors
- Closed Flare performance analysis

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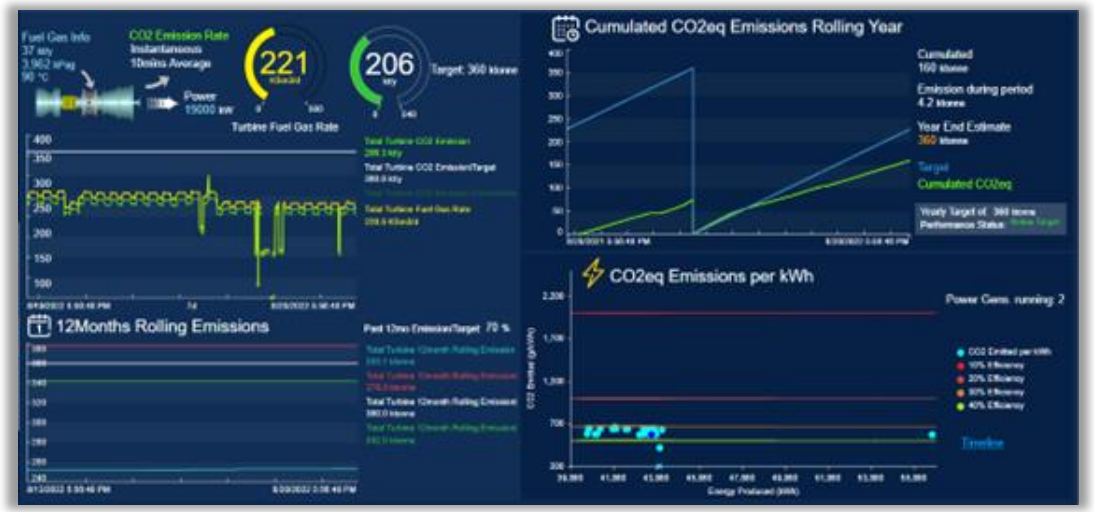
Study Case : Optimize the power delivery configuration to reduce emissions

Site Power Generation Overview

Site Power Generation CO2 Emissions



Introduction
Focus: Power Reserve Module
Significance: GHG Emissions Implications
Key Metric: Power Reserve (Required vs. Delivered)

Efficiency and Load
Correlation: Turbine Efficiency & Load
Maximizing Efficiency: Load Optimization
Inefficiencies

Scenario: Excess Power Reserve
Consequence: Lower Efficiency, Increased GHG Emissions

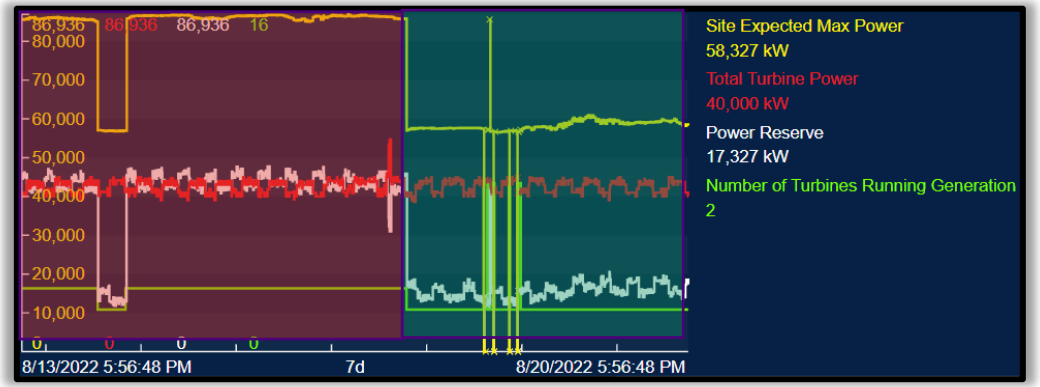
Reliability vs. Redundancy
Considerations: N+1 Configurations
Context: Reliability vs. Efficiency Trade-off

Result: Equipment Deactivation
Impact: Reduced Power Demand, GHG Emissions
Enhanced Efficiency: Closer to Optimal Operating Point
Emission Reduction

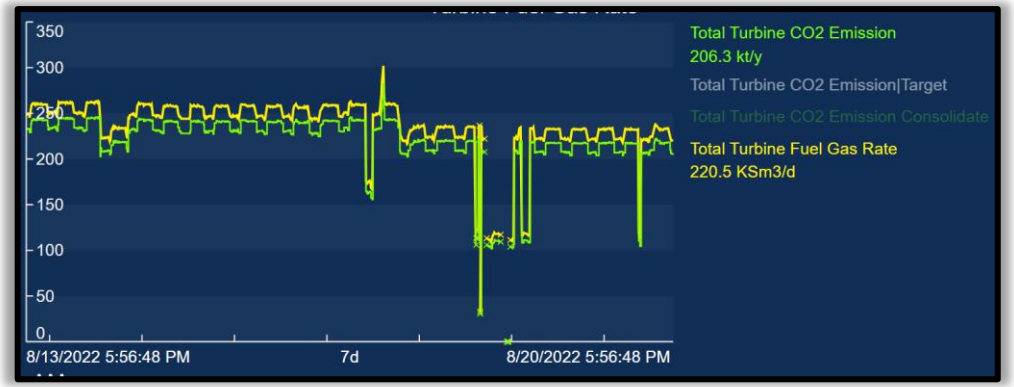
Achievement: 15% CO2 Emission Reduction Annually

Study Case : Optimize the power delivery configuration to reduce emissions

Power Reserve at Site Level



Turbine CO2 Emissions



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Conclusions and Take-aways

- **Achievements:**
  - Effective reduction in GHG emissions through practical & cost-effective solutions.
  - Tangible benefits observed across the company.
- **Strategy & Approach:**
  - Standardized model: Built once, applied across multiple assets.
  - Streamlined process for quick industrialization, allowing expanded monitoring and real-time data analysis.
- **Benefits of Real-Time Tool:**
  - Instant Insights: Real-time visibility on operational changes.
  - Operational Excellence: Informed decision-making based on comprehensive data.
  - Emission Reduction: Identification and benchmarking emissions from equipment.
  - Financial & Environmental: Boost in revenues and a decrease in environmental impact.
- **Operational Improvements:**
  - Easy optimization of energy efficiency and emissions through minor adjustments.
  - No capital expenditure needed—focus on studying existing configurations.
  - Identify major contributors with just a few clicks, initiating impactful emission reduction projects.
- **Final Thoughts:**
  - Shift in operational practices towards a greenhouse gas focus.
  - Demonstrated feasibility of reducing GHG emissions in pursuit of a net zero carbon energy transition.

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AVEVA

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Please remember to…

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