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# AVEVA™ PI System™ for Western Energy Imbalance Market

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# AGENDA

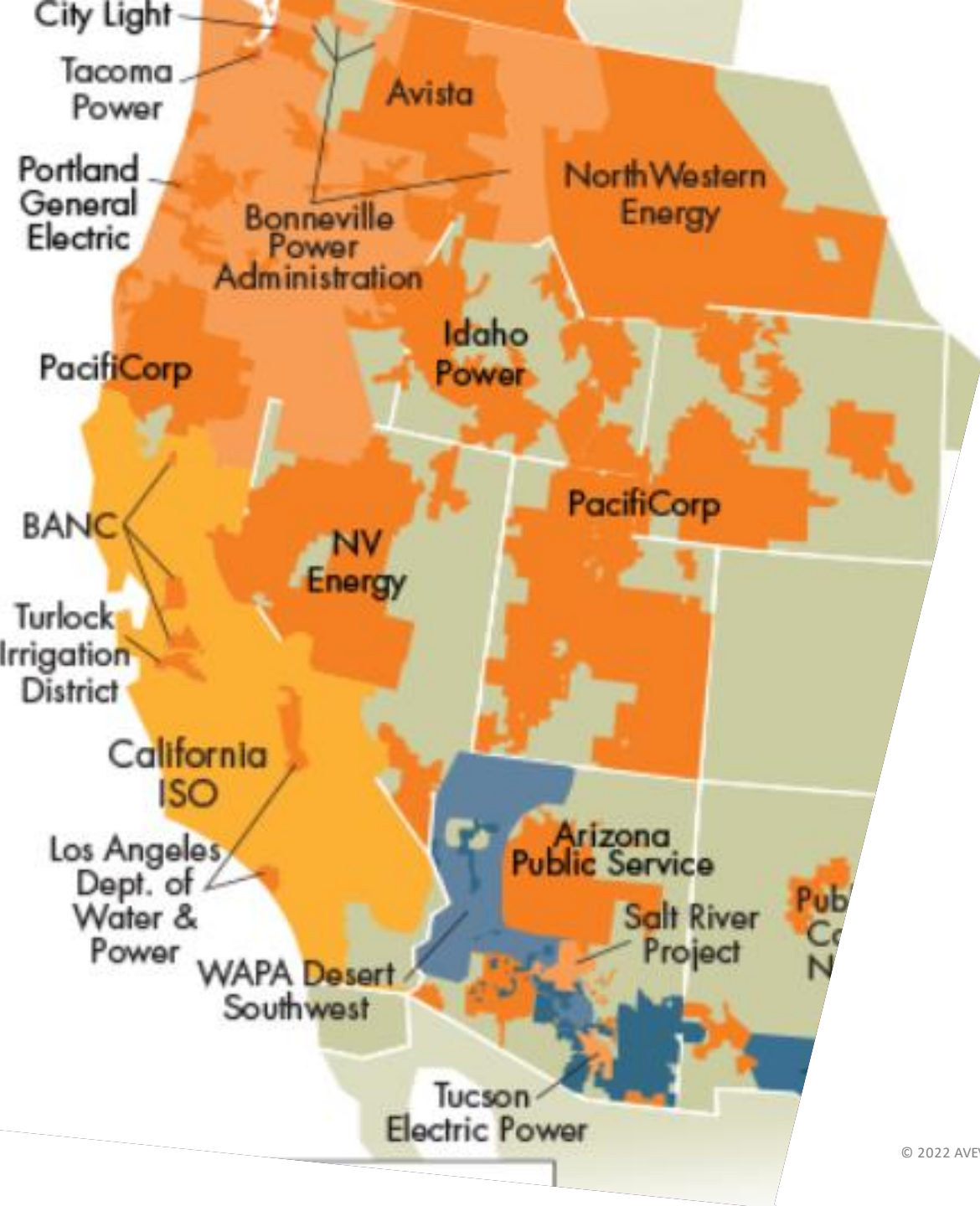
WEIM Introduction And Challenge

PI Integration and Technical Architecture

Solution

- EIM Asset Framework
- EIM Displays
- EIM Analysis

Future Opportunity and Improvements



## Western Energy Imbalance Market Introduction

- The Western Energy Imbalance Market (WEIM) is a real-time wholesale energy trading market that enables participants anywhere in the west to buy and sell energy.
- Reduces production costs by balances fluctuations in supply and demand by using lower-cost resources to meet real-time power needs.
- Allows for more efficient use and integration of renewable energy.
- Currently 22 entities
- 4.2 Billion gross benefits since Nov 2014



## Why the AVEVA PI System?

- WEIM introduces the need to manage a tremendous amount of data quickly and efficiently
  - Pre-hour submissions
    - Unit availability
    - Resource Plan
    - Bilateral Sales/Purchases
    - Bids
  - Real-time telemetry from SCADA to CAISO
  - Real-time market inputs into EMS
  - Real-time market adjustments
  - Post Analysis Data
- One common challenge nearly all WEIM entities encounter is providing real-time visualization and decision-making tools to ad operators in decision making



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# Systems

## CAISO

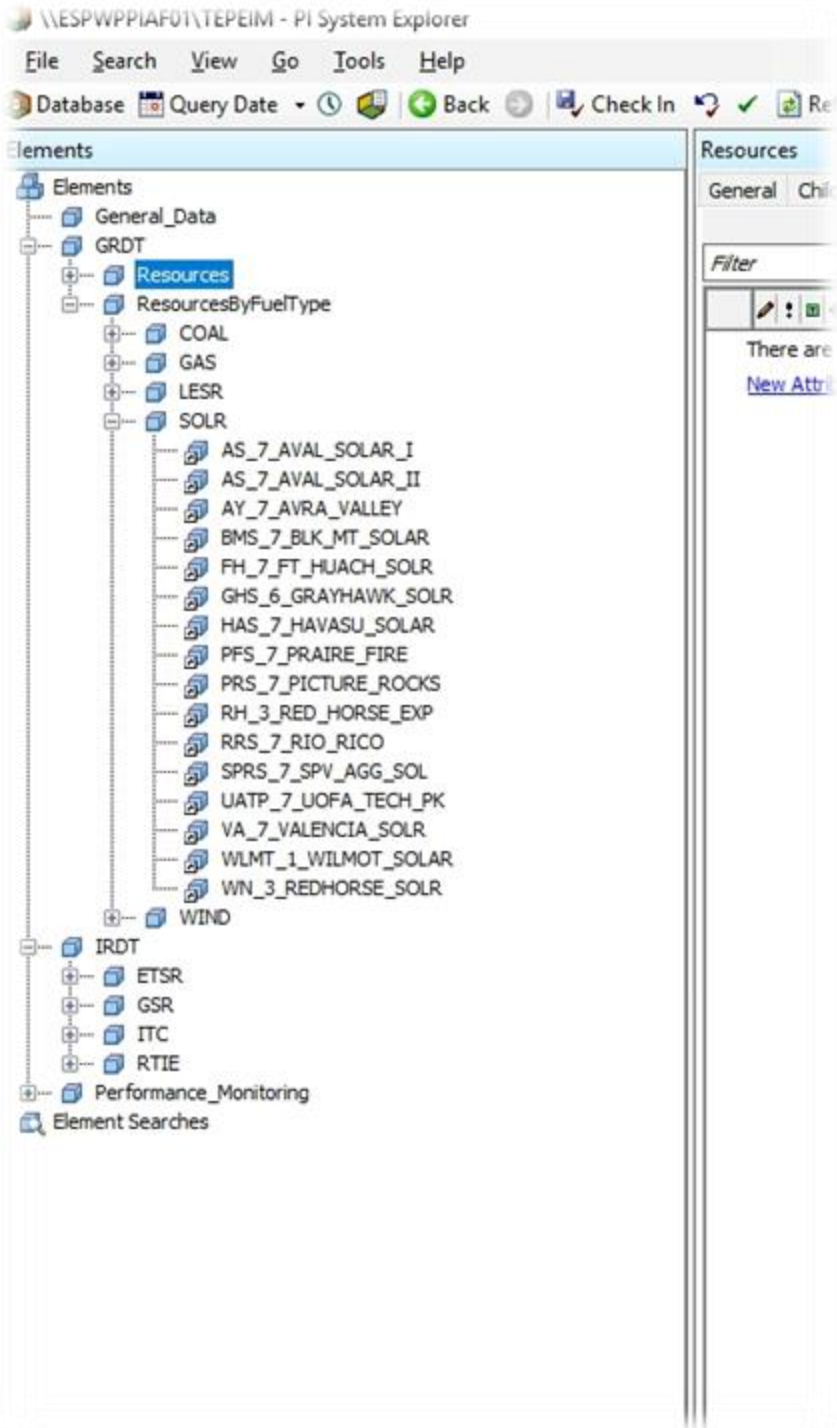
- BAOOP (Operations Portal)
- BSAP (Base Schedules)
- ADS (Dispatches)
- webOMS (CAISO OMS)
- SIBR (Bids)

## EESC (BA)

- EMS (OSII/AspenTech Monarch)
- webEIM (EESC)
- webTrans
- webAccounting
- OATI DMZ (SQL Server Data Warehouse)

## PRSC (Marketing)

- webEIM (PRSC)
- webTrader
- webOMS (TEP OMS)
- webCalc



# Asset Framework Design

- Create a standard Asset Framework, for participation in WEIM, that contains all/most of the standard parameters common among all WEIM entities
- Able to integrate into the business processes/practices of updating CAISO resource templates to ensure that operational display are in sync with the market
- Allows flexibility between the static elements, while also allowing dynamic elements to evolve as needed

ID	Resource ID	MAX
	RES_ID	MAX
AS_7_AVAL_SOLAR_I		
AS_7_AVAL_SOLAR_II		
AY_7_AVRA_VALLEY		
BK_6_BLK_MTN_1		
BK_6_BLK_MTN_2		
BMS_7_BLK_MT_SOLAR		
BW_3_BORDERLANDS		
DP_7_DEMOSS		
FH_7_FT_HUACH_SOLR		
GHS_6_GRAYHAWK_SOLR		
GR_5_GILA_RIVER_2		
GR_5_GILA_RIVER_3		
HAS_7_HAVASU_SOLAR		
IHB_7_IRONHORSE_BAT		
IR_1_IRVICT_1		
IR_1_IRVICT_2		
IR_1_SUNDT_3		
IR_1_SUNDT_4		
IR_7_RICE_1		
IR_7_RICE_10		
IR_7_RICE_2		
IR_7_RICE_3		
IR_7_RICE_4		
IR_7_RICE_5		
IR_7_RICE_6		
IR_7_RICE_7		
IR_7_RICE_8		
Code	RESOURCE	RAMPRATE
		HEATRATE

# GRDT And IRDT As Foundation

The screenshot displays a software interface with a tree view on the left and a data table on the right. The tree view shows a hierarchy of elements including 'General\_Data', 'GRDT', 'Resources', 'ResourcesByFuelType', 'COAL', 'GAS', 'LESR', 'SOLR', 'IRDT', and 'Performance\_Monitoring'. The data table on the right shows the following data:

Name	Value	Time Stamp
Category: EIM-EMS		
Actual_Load_EMS	1146.4	1/25/2023 4:06:10.022 PM
High_Limit	500	1/1/1970 12:00:00 AM
Low_Limit	-500	1/1/1970 12:00:00 AM
NSI_EMS	-346.67	1/25/2023 4:06:10.025 PM
Category: EIM-OATI		
5MIN_FORECAST_OATI	1157.4	1/25/2023 3:10:00 PM
15MIN_FORECAST_OATI	1229.9	1/25/2023 3:45:00 PM
RTSI_OATI	-391.53 MW	1/25/2023 4:06:17.823 PM
5MINEXPORT	1690.1 MW	1/25/2023 4:06:17.823 PM
5MINIMPORT	-2081.6 MW	1/25/2023 4:06:17.823 PM



Check In Refresh New Element New Attribute

General\_Data

General Child Elements Attributes Ports Analyses Notification Rules Version

Filter

Name	Value	Time
Category: EIM-EMS		
Actual_Load_EMS	1146.4	1/25
High_Limit	500	1/1/1
Low_Limit	-500	1/1/1
NSI_EMS	-346.67	1/25
Category: EIM-OATI		
SMIN_FORECAST_OATI	1157.4	1/25
15MIN_FORECAST_OATI	1229.9	1/25
RTSI_OATI	-391.53 MW	1/25
SMINEXPORT	1690.1 MW	1/25
SMINIMPORT	-2081.6 MW	1/25

# Custom Data Elements

- Dispatch Operating Target (DOT)
  - Generation
  - Dynamic ETSR's
- Dispatch Operating Projection (DOP)
- Telemetry
- Unit Thresholds
- Resource Plan (Base Schedules)
- Net Schedule Interchange (NSI)
- Real Time Schedule Interchange (RTSI)
- Load Forecast
  - Internal
  - CAISO
- Etc.

Analysis Templates Notification Rule Templates

Name: DOT\_ADS\_Variance\_Calc\_Exp  
 Description: Calculates difference between  
 Categories:  
 Analysis Type:  Expression  Rollup  
 Enable analyses when created from templates

Calc\_Exp  
 Calc\_Exp  
 Calc\_ExpV4

ices\IR\_1\_SUNDT\_4

Expression	Value at Evaluation	Value at Last T
PrevEvent('DOT_ADS','*-1s')		
NextEvent('DOT_ADS','*-1s')		
//Use DOT Val of NetDOT Convert(TagVal('DOT_ADS',vCurrentDOTTime),"MW")		
//OLD //Round down to the nearest 5 minutes. Tags come in mid-5-min interval. //OLD Convert(PrevVal('DOT_ADS',vDOTTimeToUse),"MW") PrevEvent('GenActuals_EMS','*')		
Convert(TagVal('GenActuals_EMS','*'),"MW")		
if not BadVal(vDOTTagVal) then convert(ABS(float(vGenActualsTagVal) - vDOTTagVal),"MW")		
SecSinceChange('GenActuals_EMS')/60		
SecSinceChange('DOT_ADS')/60		
if (vMinSinceGenActualsUpdate > 5 AND 'GenActuals_EMS' > .01) then "STALE" else (if vMinSinceDOTUpdate > 5 then "N/A" else (if (Abs(vVariance) > 'DOT_ALARM Max' OR Abs(vVariance) > 'DOT_ALARM Pct' else "NORMAL"))		

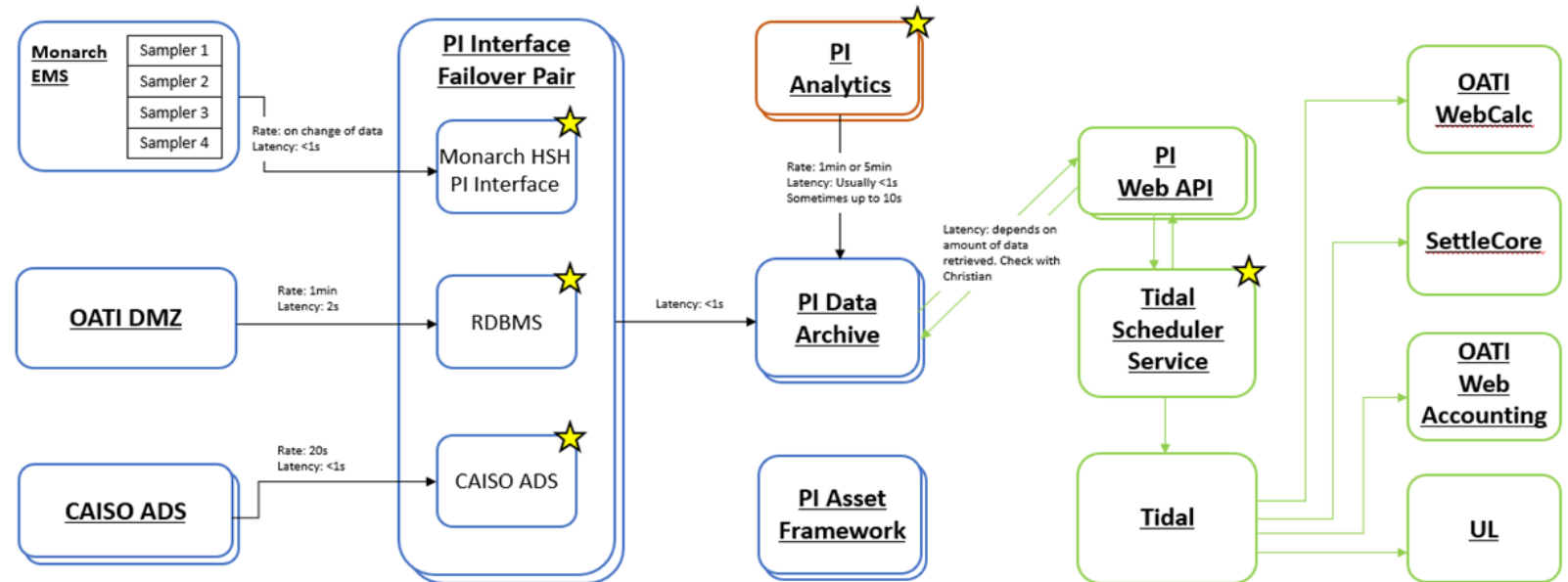
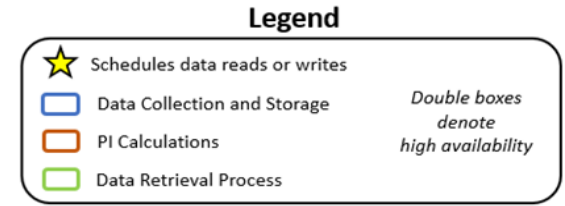
Periodic  
 12m 30s Configure  
 Advanced...

# EIM Analysis Points

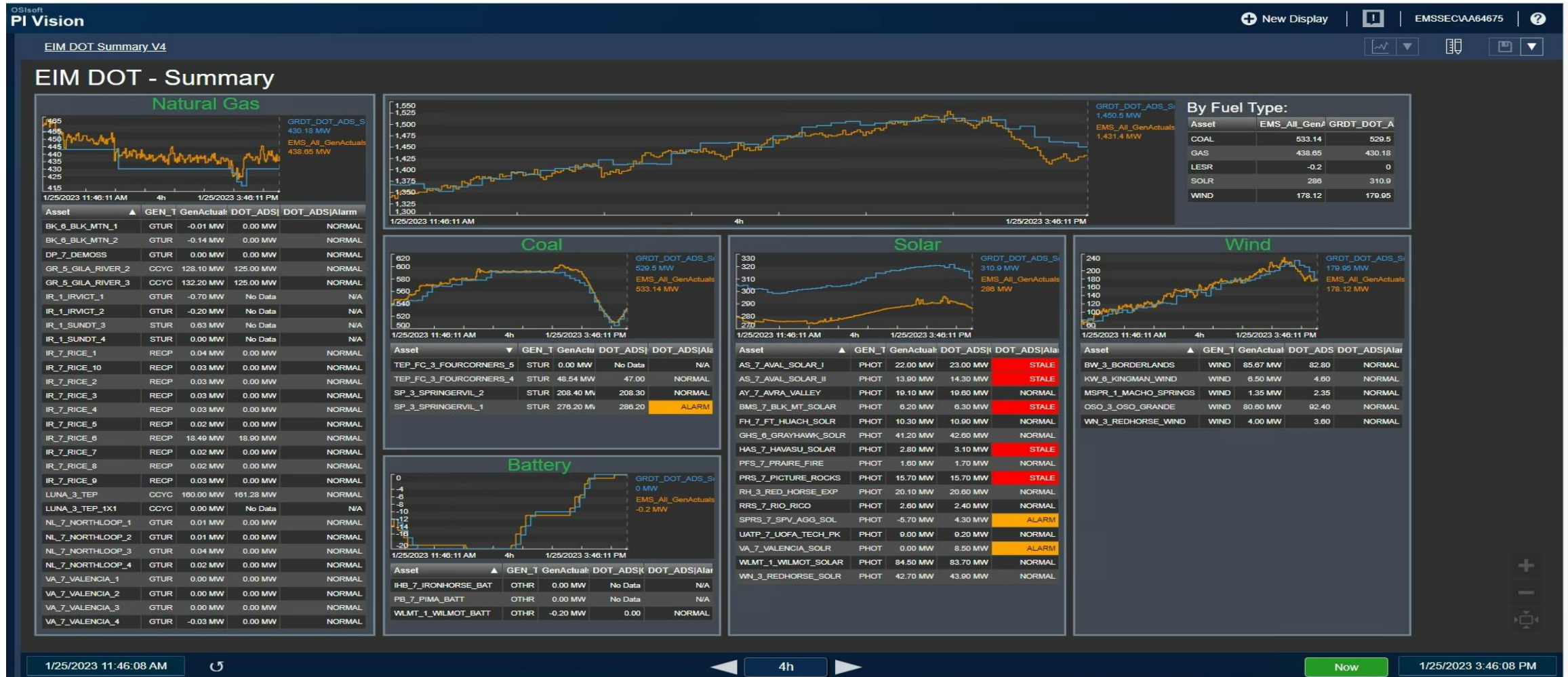
- DOT Variance Alarms
- Telemetry Staleness
- Telemetry Floor/Ceiling
- ITC Limits
- Integration Health Checker
- Etc.

# Technical Integration Diagram

## Technical Integration to PI



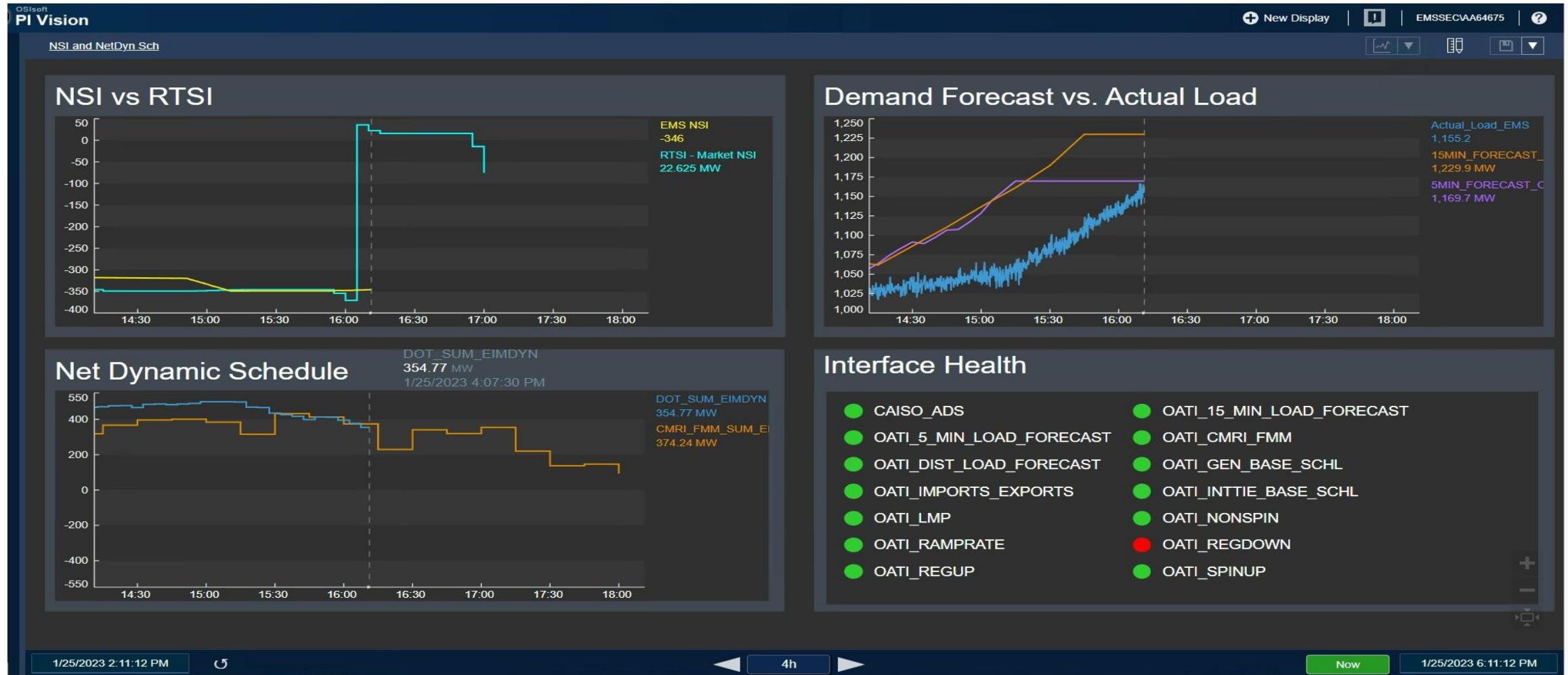
# DOT Summary Display



# Unit Details Display



# NSI, Forecast and Health Check Displays





# Real-time Operational Analytics

- Provides aggregated real-time information on performance within the market
- Provides information on where the market is driving the BA and potential future misalignment
- Provides operators information to minimize financial impacts on the settlements



## What's Next

- Additional Displays and Alarms
- Model Maintenance Improvements
- Expansion of the AF model to include the BA grid
  - Overlays of market data onto the BA framework
  - Allows additional analysis of grid operations vs. market solution
- Utilization of EIM AF for KPI and Dashboards



# 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.

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