
AVEVAWORLD
PARIS

Meeting the challenges of a shifting energy market through data analytics

Kate Bowden and Raju Tiwari

Agenda

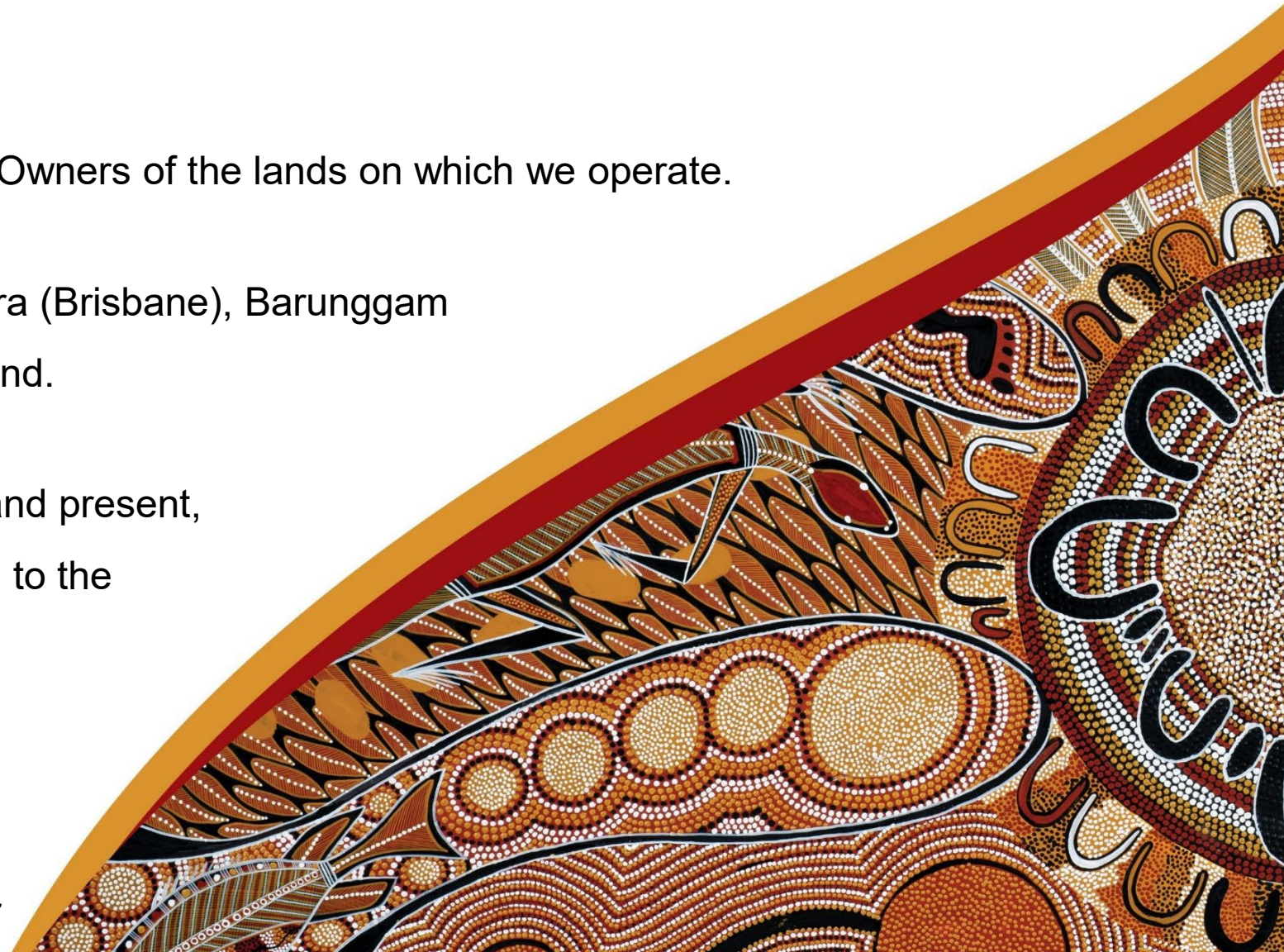
- Acknowledgement of Country
- About CS Energy
- Australia’s Electricity Market
- How have operations changed? What are the challenges of transition?
- How has CS Energy responded?
- What’s next?

Acknowledgement of Country

CS Energy acknowledges the Traditional Owners of the lands on which we operate.

We live, work, and learn on Turrbal, Yagera (Brisbane), Barunggam (Kogan Creek), and Gaangalu (Callide) land.

We pay our respects to their elders past and present, and recognise their continuing connection to the land, waters, and community.



Artwork: 'Connections' by Charlie Chambers Jnr

POWER | AUSTRALIA

CS Energy meets market demand through flexible plant operations

Challenge

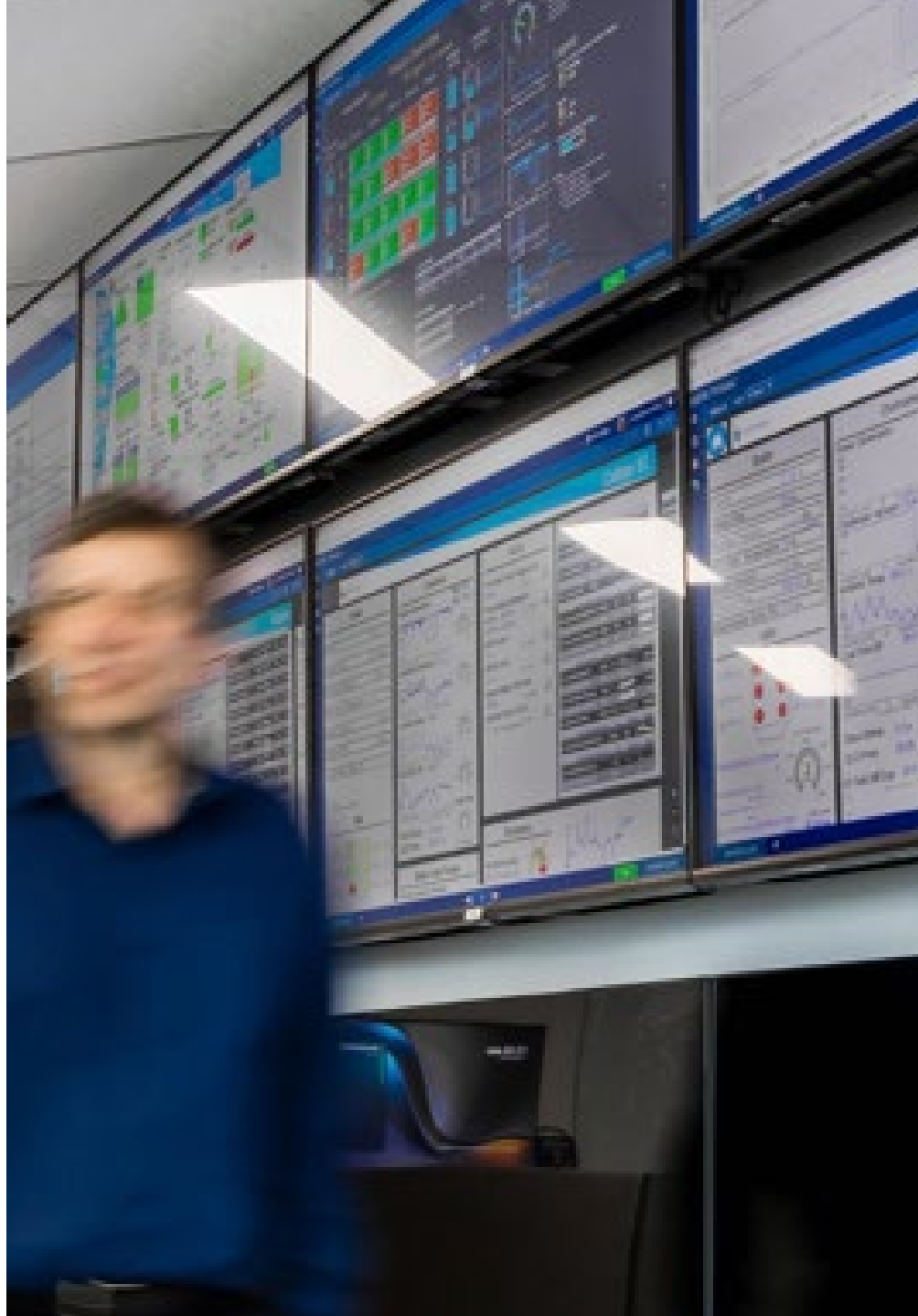
- Widely varying generation profiles as increased renewables enter the market resulting in negative energy prices
- Unplanned outages resulted in offline units during peak generation demand

Solution

- Leverage AVEVA™ PI System™ to streamline the operations and flex to market and weather conditions

Results

- **Forward planning of maintenance and plant operations based on forecasted weather and market demands (Shifting Outages)**
- **Real Time Monitoring and alerts of remote greenfield sites (Increased Safety and optimised critical resource allocation)**
- **Optimised Asset strategy**



Who is CS Energy?

CS Energy is a Queensland Government-owned energy corporation that was established in 1997. We are a major provider of electricity in Australia with an energy portfolio of more than 3,500 megawatts.

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Coal-fired generation

1 **Callide B Power Station** – 700 MW
2 **Callide C Power Station** – 848 MW, 50/50 JV
3 **Kogan Creek Power Station** – 750 MW
4 **Gladstone Power Station** – 1,680 MW, trading rights

Renewables and firming

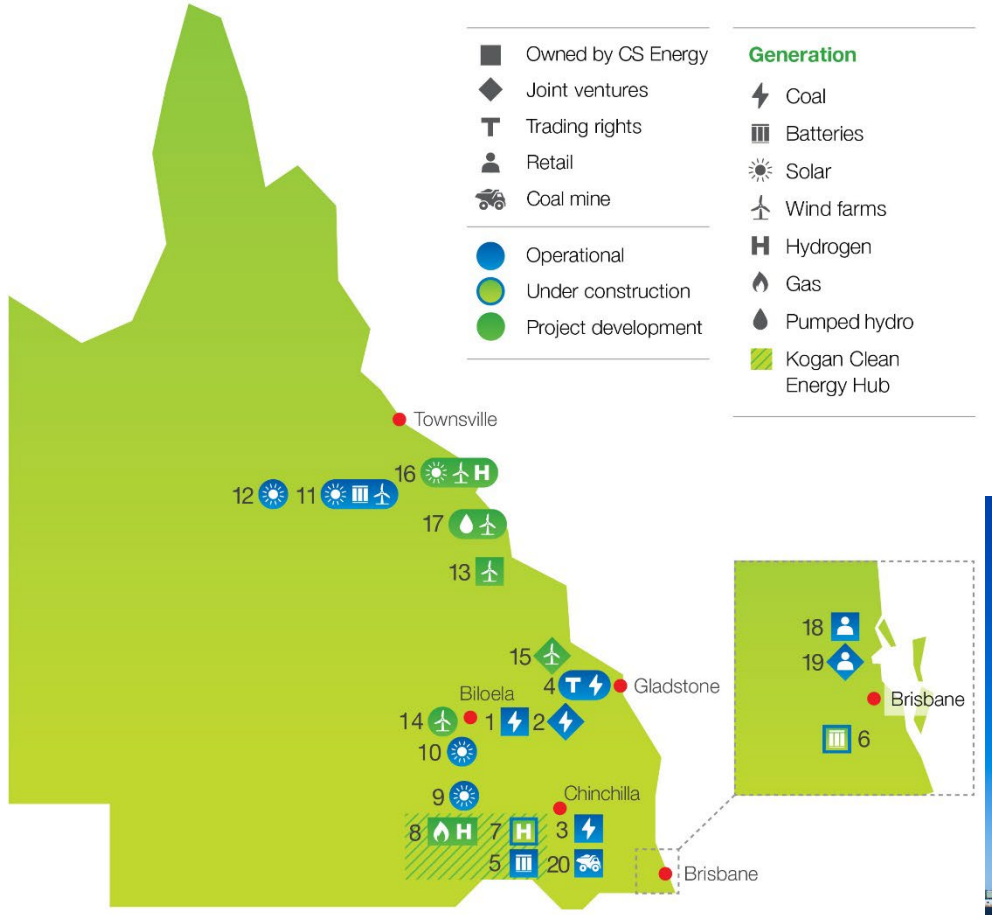
5 **Chinchilla Battery** – 100 MW/200MWh
6 **Greenbank Battery** – 200MW/400MWh
7 **Kogan Renewable Hydrogen Demonstration Plant**
8 **Brigalow Peaking Power Plant** – 400 MW
9 **Columboola Solar Farm** – 162 MW, Power Purchase Agreement
10 **Moura Solar Farm** – 56 MW, Power Purchase Agreement
11 **Kennedy Energy Park** – 60 MW, Offtake Agreement
12 **Hughenden Solar Farm** – 15 MW, Power Purchase Agreement
13 **Lotus Creek Wind Farm** – 285 MW
14 **Banana Range Wind Farm** – 230 MW, multi-party project
15 **Boulder Creek Wind Farm** – 228 MW, 50/50 JV
16 **HyNQ** – multi-party project
17 **Capricornia Energy Hub** – 1.4 GW, multi-party project

Retail

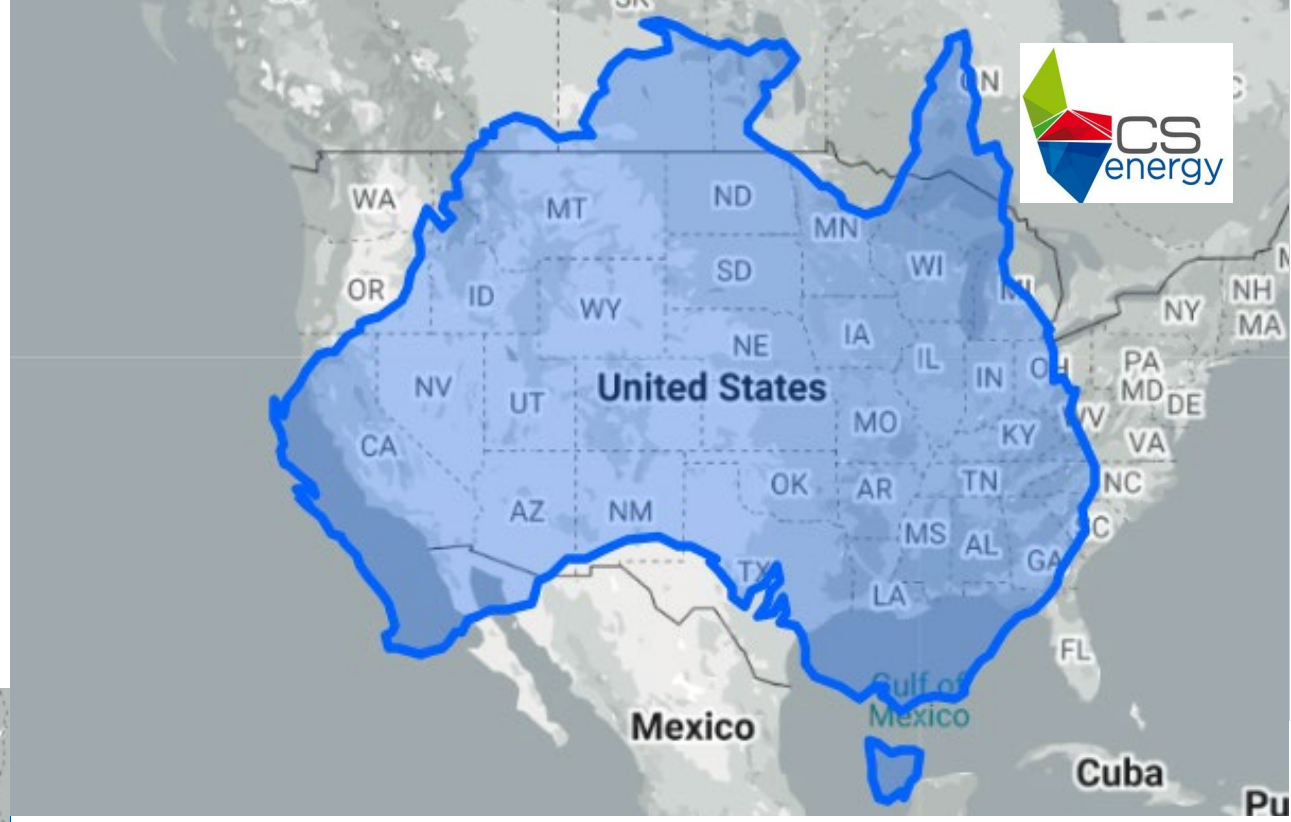
18 **Large commercial and industrial – Queensland**
19 **Alinta Energy 50/50 joint venture – South East Queensland**

Coal assets

20 **Kogan Mine** ML 50074 – 130 Mt, MDL 335 – 400 Mt

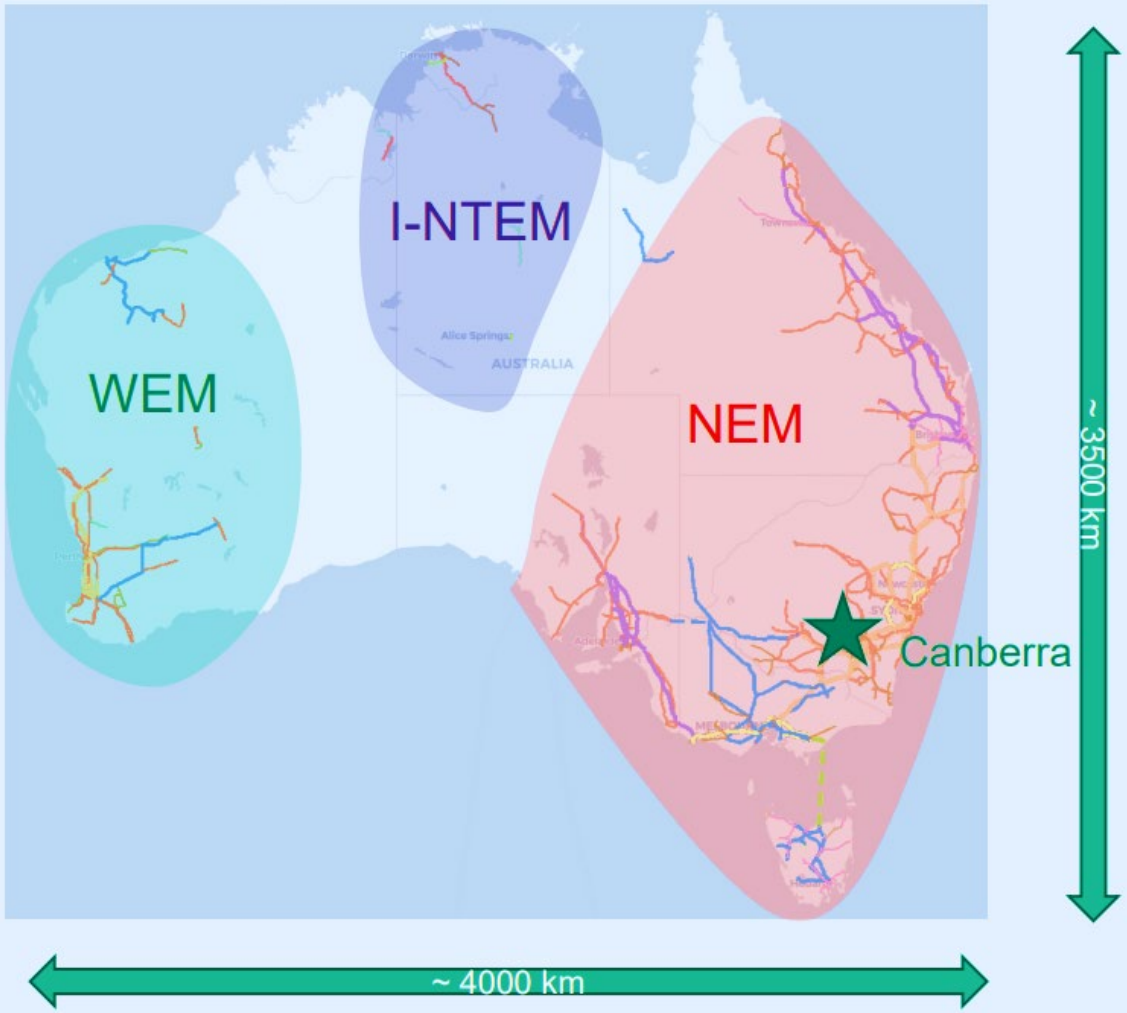


How is Australia different from other countries?



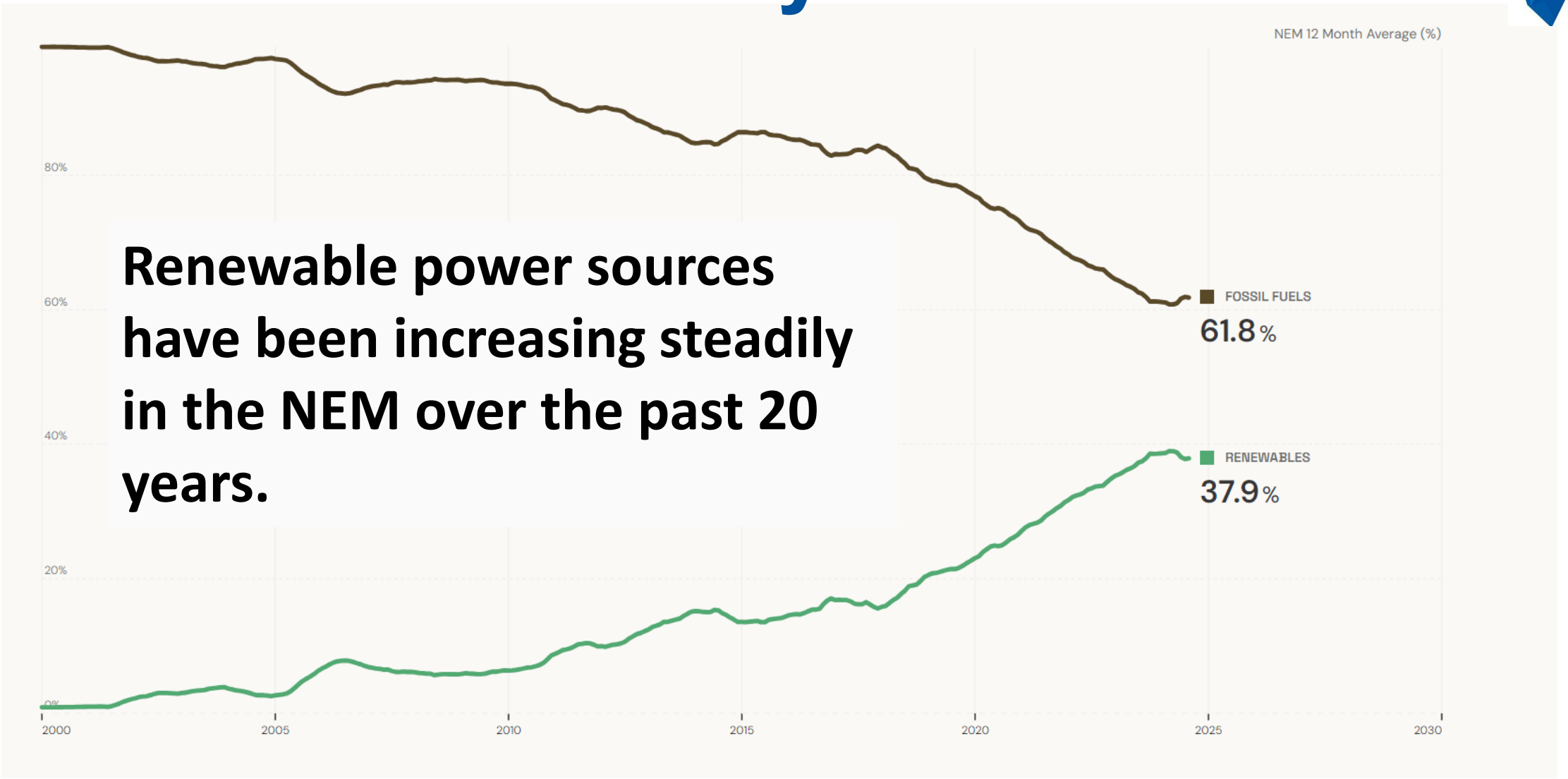
Metric	Australia	Europe	United States
Land Size	7.7 M km^2	10.2 M km^2	9.8 M km^2
Population	~27.1 M	~745.1M	~345.4 M
Renewables - Capacity	38%	23%	22%
Renewables - Consumption	9%	12.4%	9%

Australia's electricity market



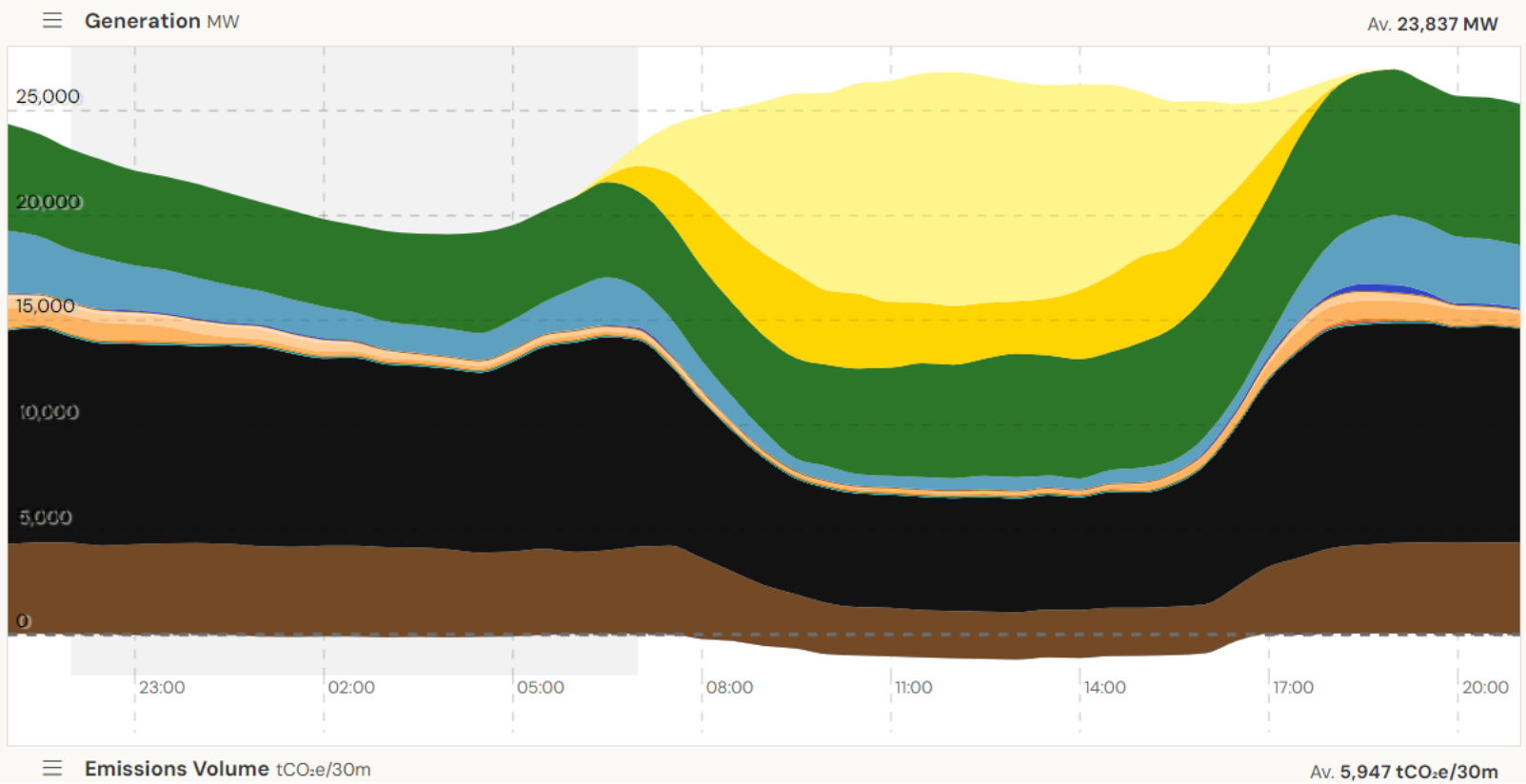
- 3 separate grid networks.
- NEM connects 5 states and 1 Territory
- I-NTEM connects 1 Territory
- WEM connects 1 State
- 5 time zones across the country (4000km, 2 hour difference between East and West Coast)

Australia's electricity transition



Renewable power sources have been increasing steadily in the NEM over the past 20 years.

NEM daily energy mix



18 Sep 2024, 9:00 PM – 19 Sep 2024, 9:00 PM AEST

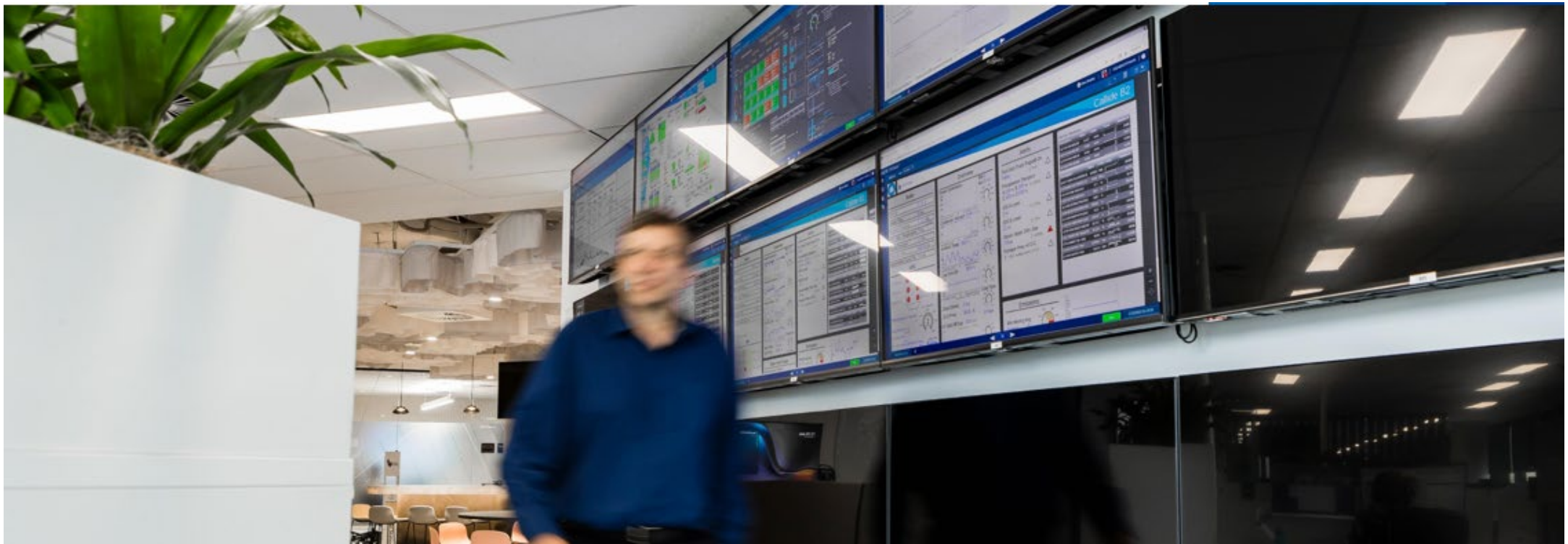
Detailed

Sources	Energy GWh	Contribution to demand	Av.Value $/MWh
Solar (Rooftop)	81	14.0%	-$23.04
Solar (Utility)	34	5.8%	-$15.31
Wind	126	21.8%	$31.01
Hydro	37	6.3%	$54.52
Battery (Discharging)	1.0	0.2%	$53.63
Gas (Waste Coal Mine)	1.2	0.2%	$34.26
Gas (Reciprocating)	0.8	0.1%	$94.32
Gas (OCGT)	5.3	0.9%	$65.05
Gas (CCGT)	8.2	1.4%	$54.58
Gas (Steam)	2.0	0.3%	$33.60
Distillate	0.2	0.03%	$54.99

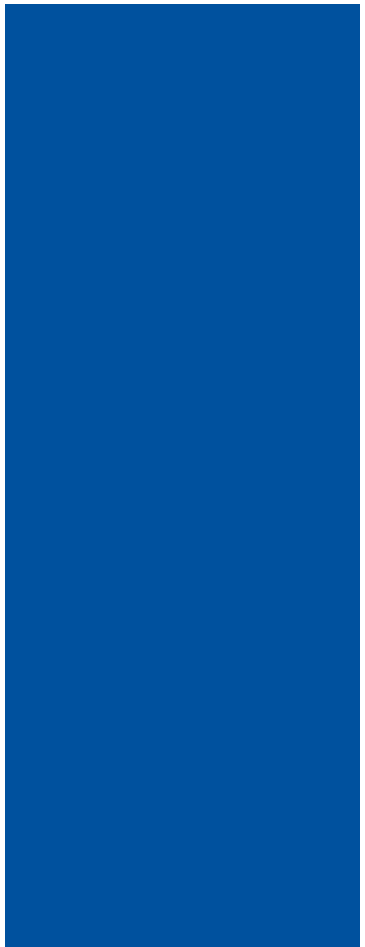
What does this mean for CS Energy?

- Increased solar take up results in widely varying demand for electricity during the day
- Baseload power provision is disincentivised to maintain constant supply at times of negative prices
- Generation profiles are highly dependent on the weather
- **How do we make our plants more flexible to support the take up of renewable power opportunities?**
- **How to utilise battery storage to manage peak periods?**

How has CS Energy responded?



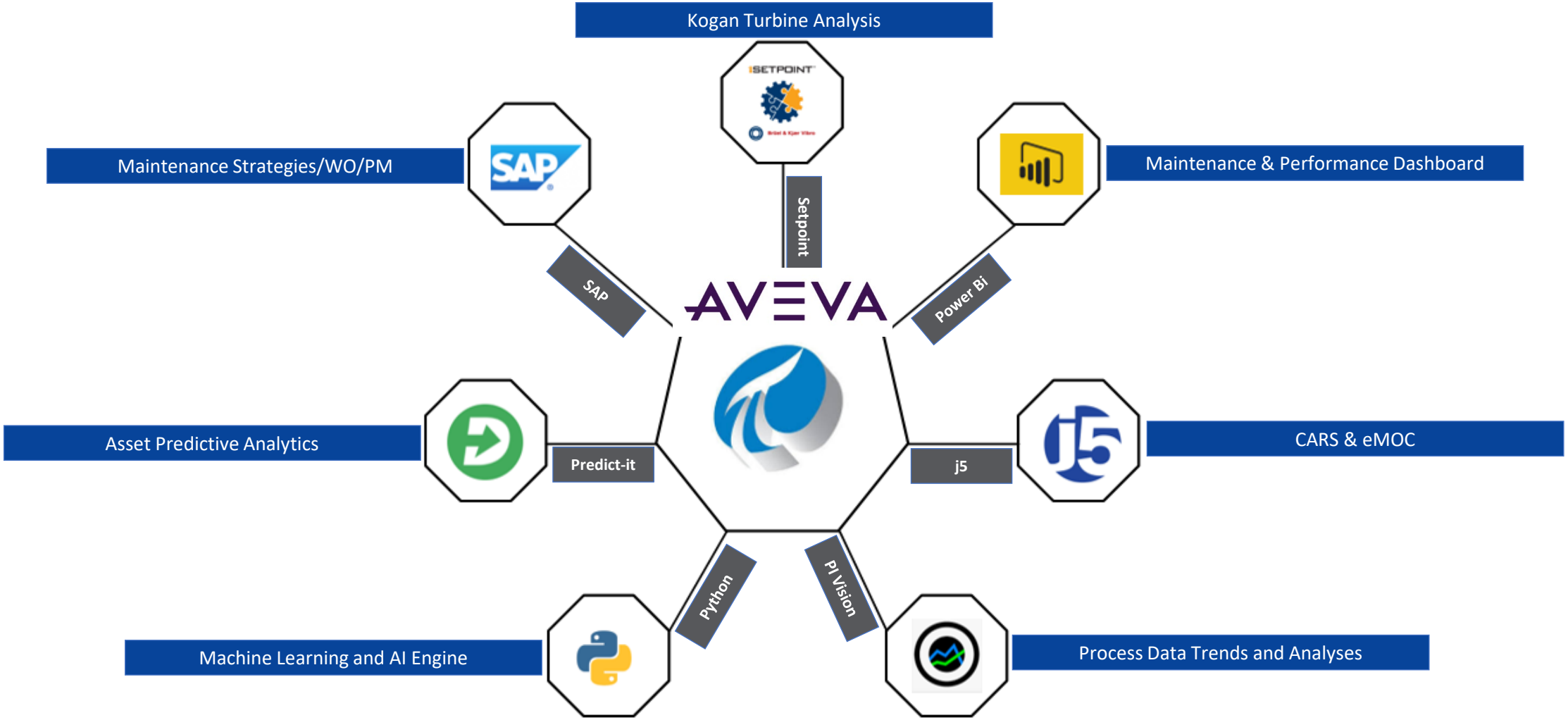
Data analytics



- Flexible Plant Operations – adjusting plant output
- Managing maintenance / outages to meet demand profile, Seasonal preparedness
- Battery deployment

AVEVA PI System

Operational strength through interconnected data and functionality



Flex plant operations using PI

Real Time Monitoring

Real time operating summary of the entire power generation portfolio in PI Vision

Plant flexibility

Ramp up and ramp down based on pool price and plant conditions

Forward planning

Forecasted weather and future data tags – Forward planning and risk mitigation

Run hours

Execute maintenance strategies based on equipment run hours rather than calendar based

Planned outage

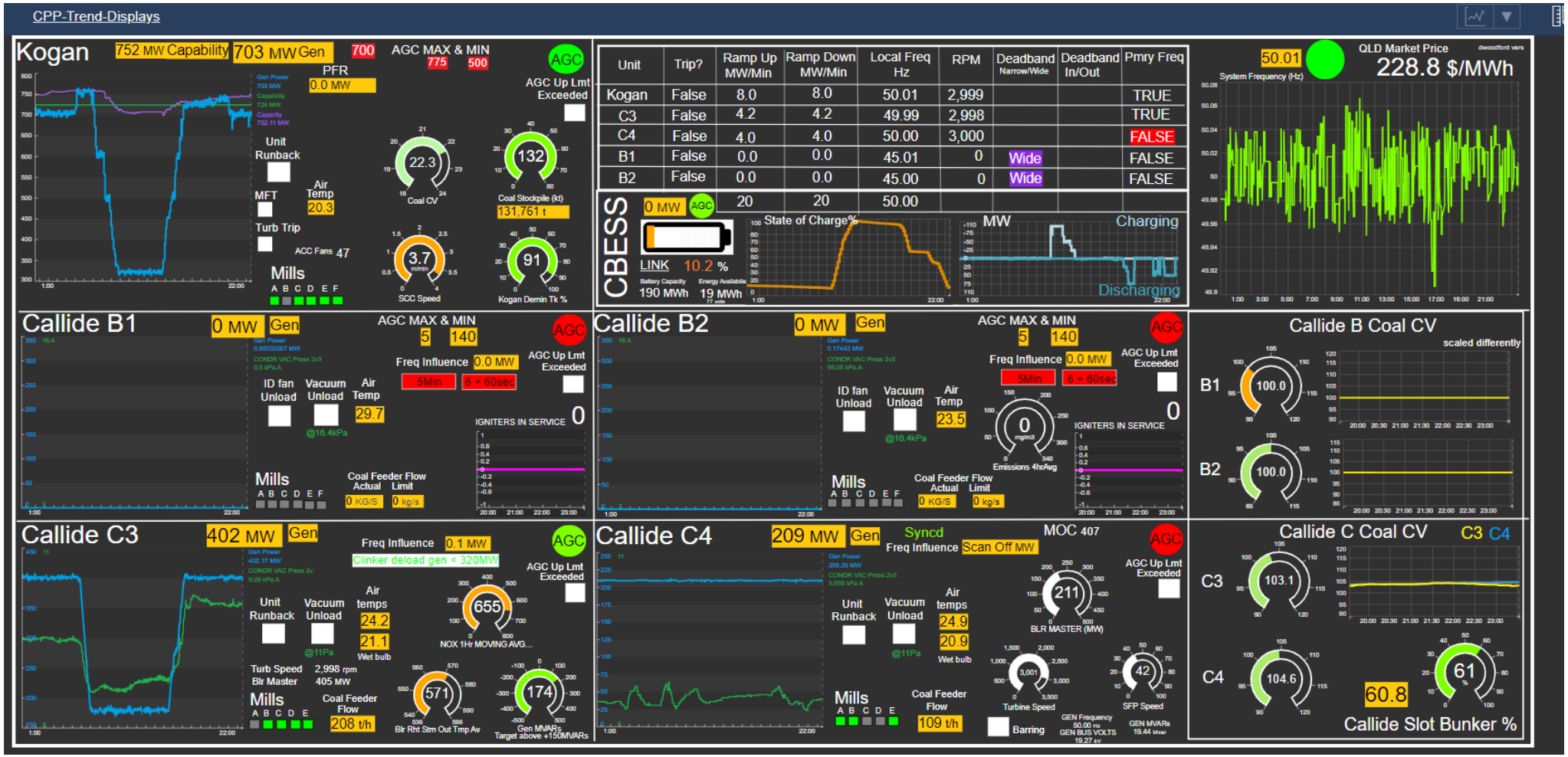
Planned outages based on real time asset conditions/historical and forecasted conditions

Flex plant operations using PI

Real time monitoring

Real time operating summary of the entire power generation portfolio in PI Vision

- 6 Assets
- 2 PI Corp Servers
- 100+ Interfaces
- 2000 + Displays
- 50+ Data Sources
- 5k + Analysis

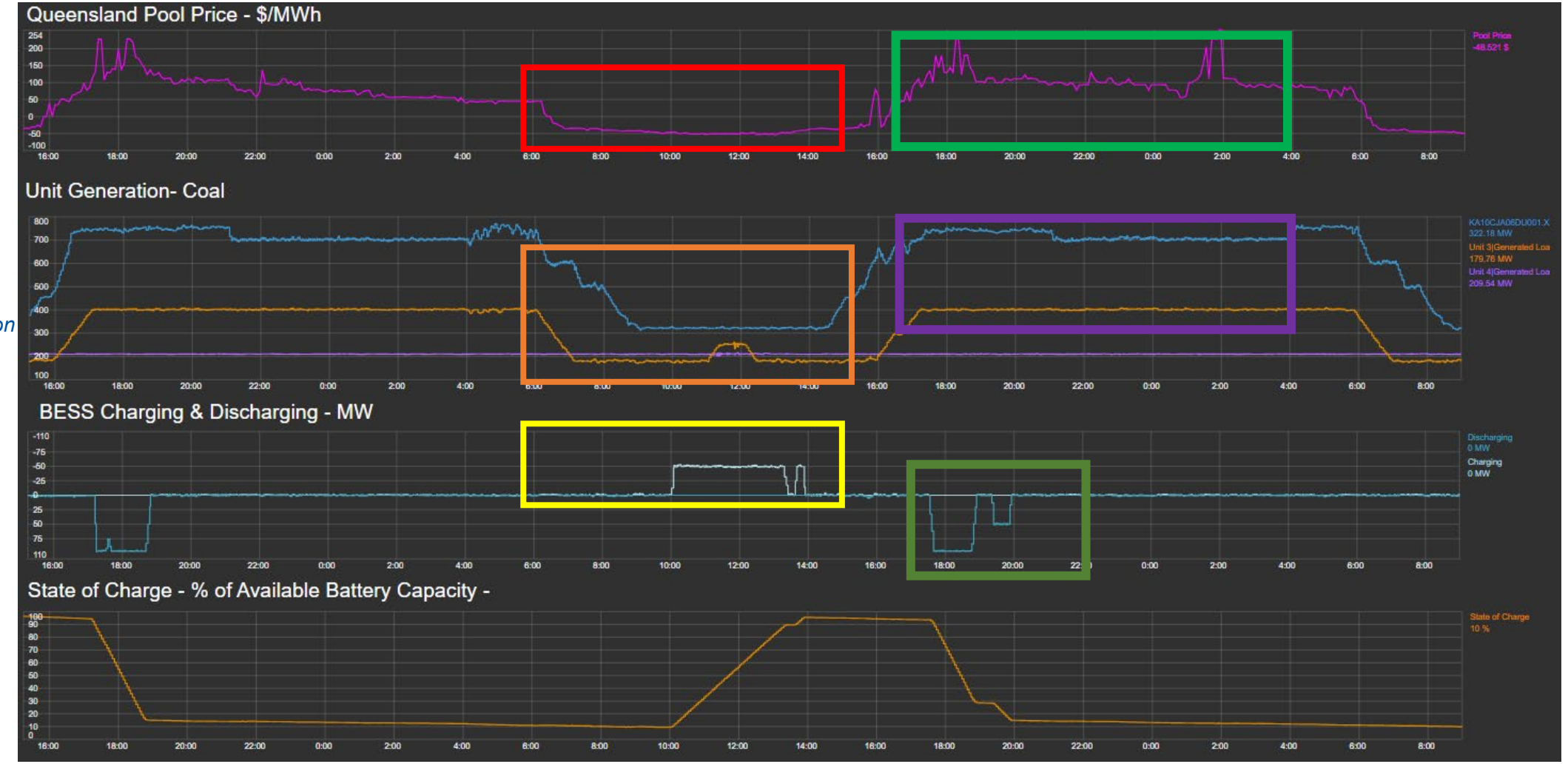


Flex plant operations using PI

Operating Summary of all assets based on Pool Price in the market

Plant flexibility

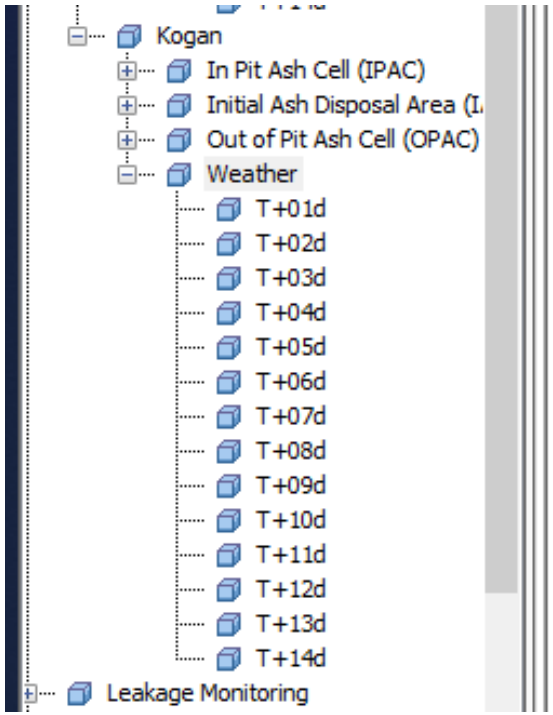
Ramp up and ramp down based on pool price and plant conditions

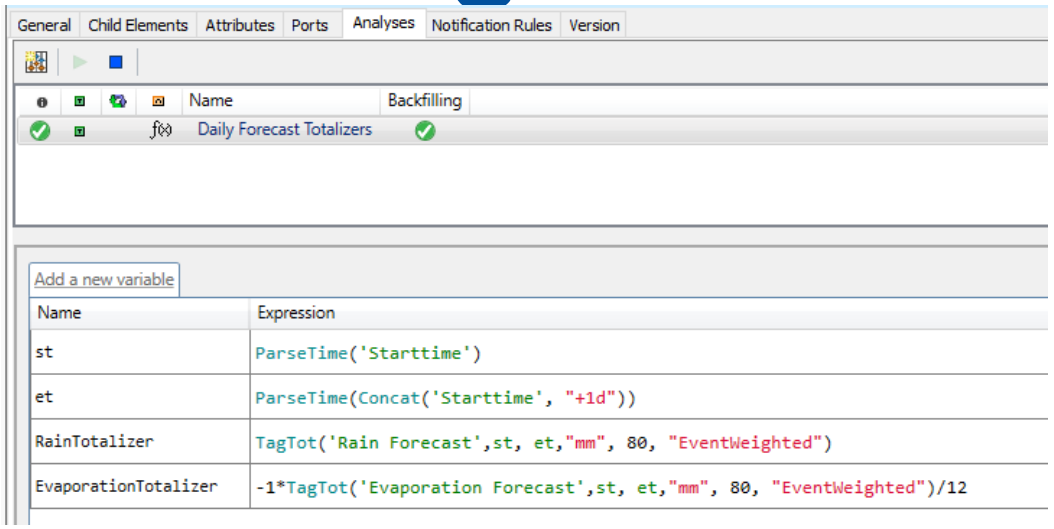


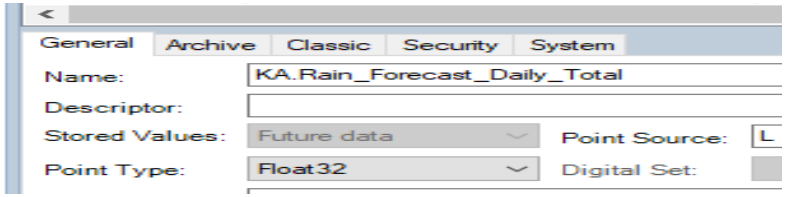
Flex operations- forecasting

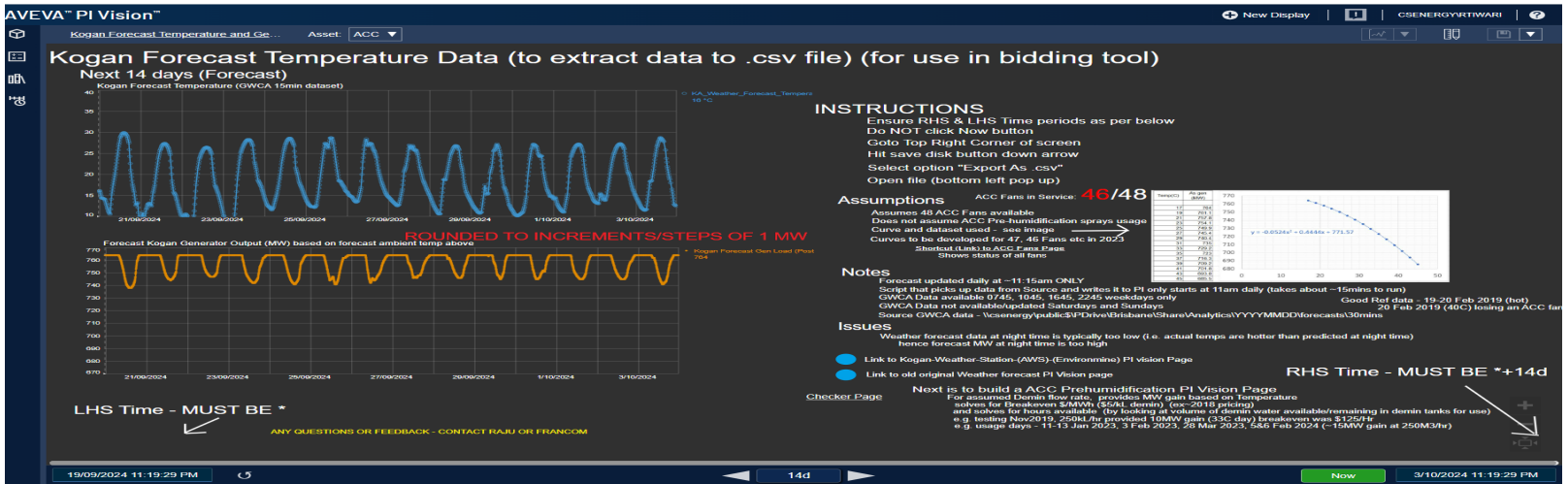
Forward planning

Forecasted weather and future data tags – Forward planning and risk mitigation









Driving value-Maintenance strategy

Run hours

Execute maintenance strategies based on equipment run hours rather than calendar based

Asset management strategy

- Calendar Time based strategy

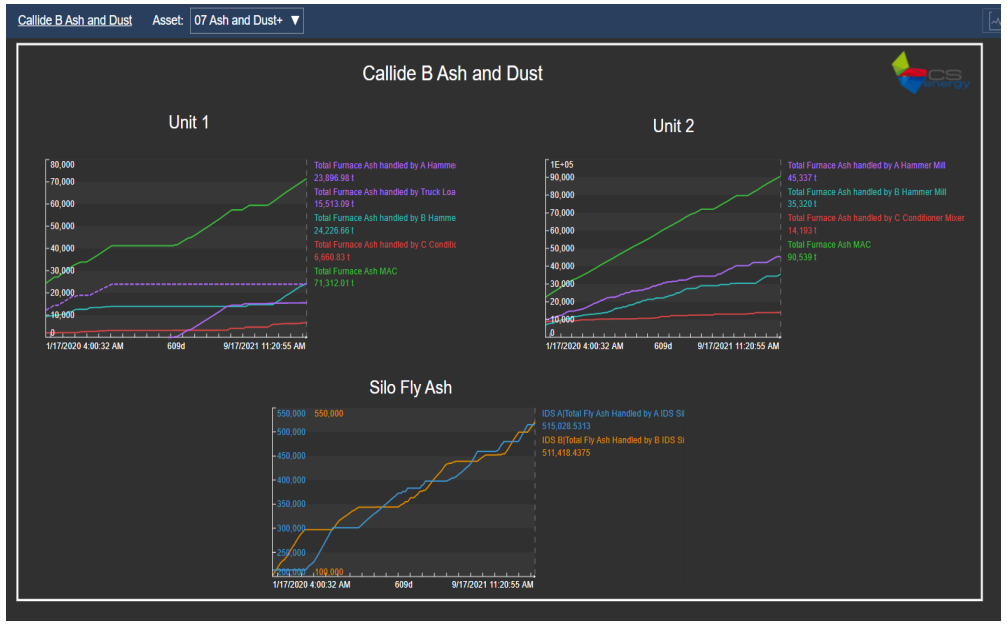
Asset management strategy

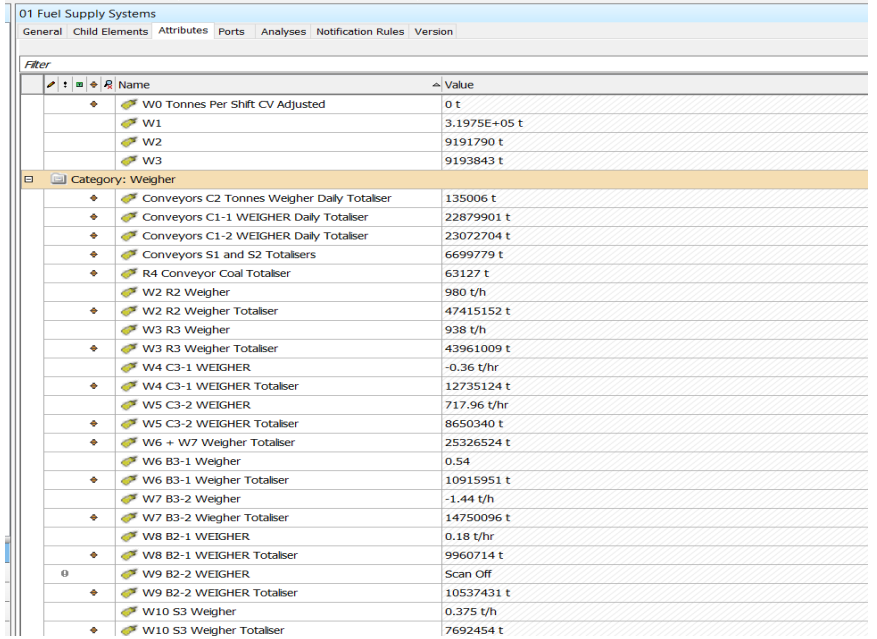
- Flexible condition-based maintenance
- Use real time data
- Equipment performance.

Benefits

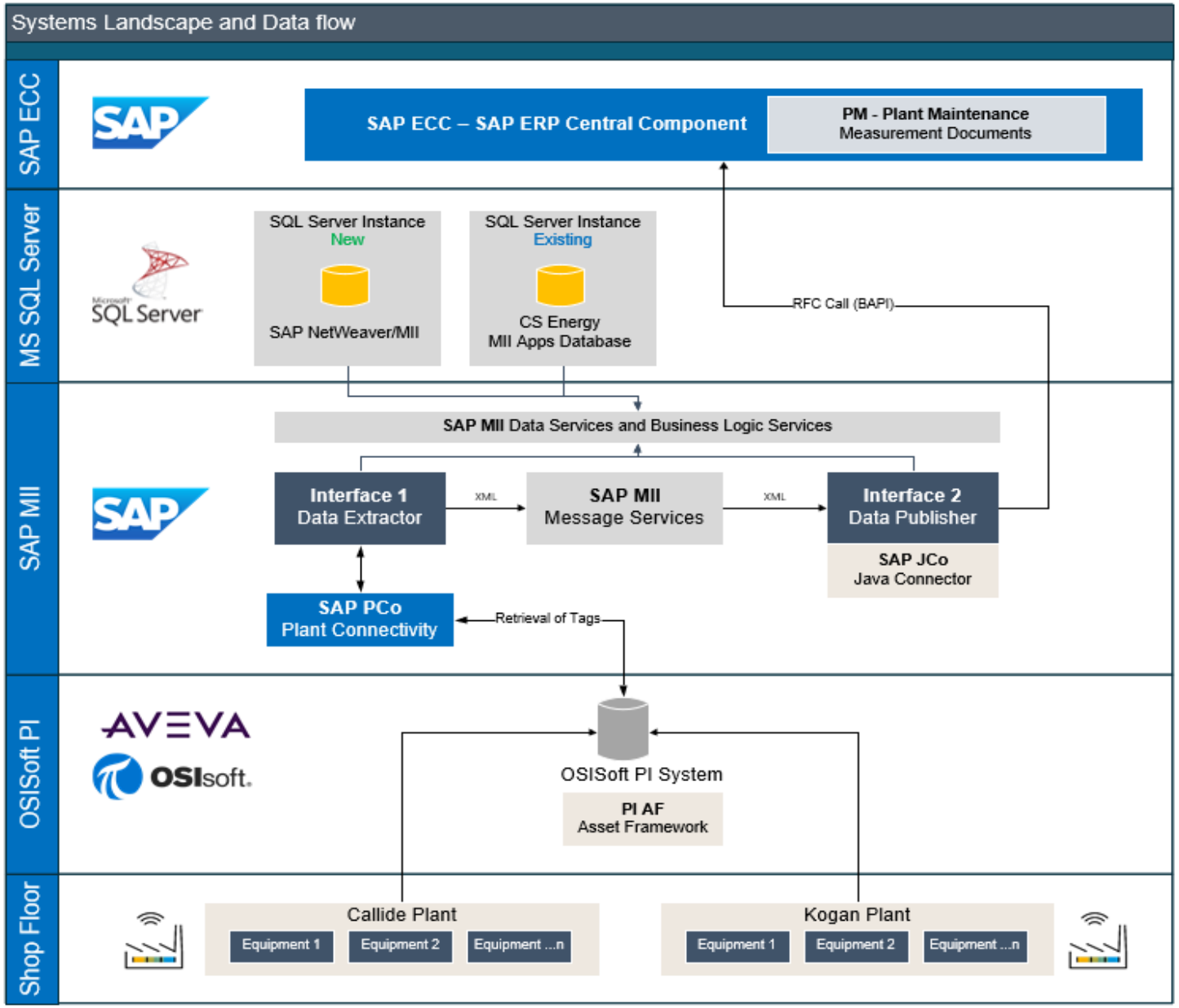
Material Cost

Labour optimised

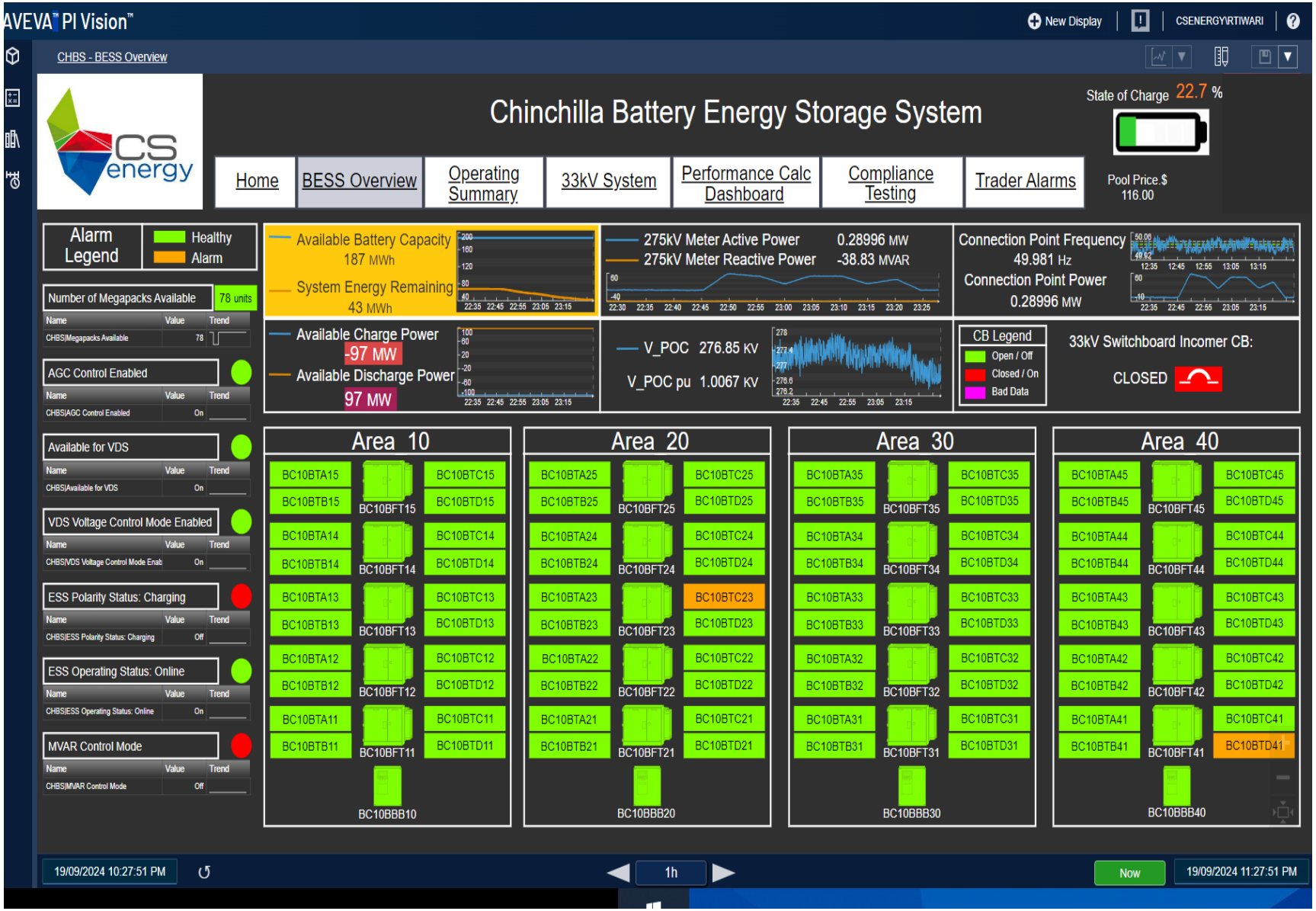




Architecture - Maintenance Strategy



CHBS Dashboard- Battery



CHBS Dashboard shows:

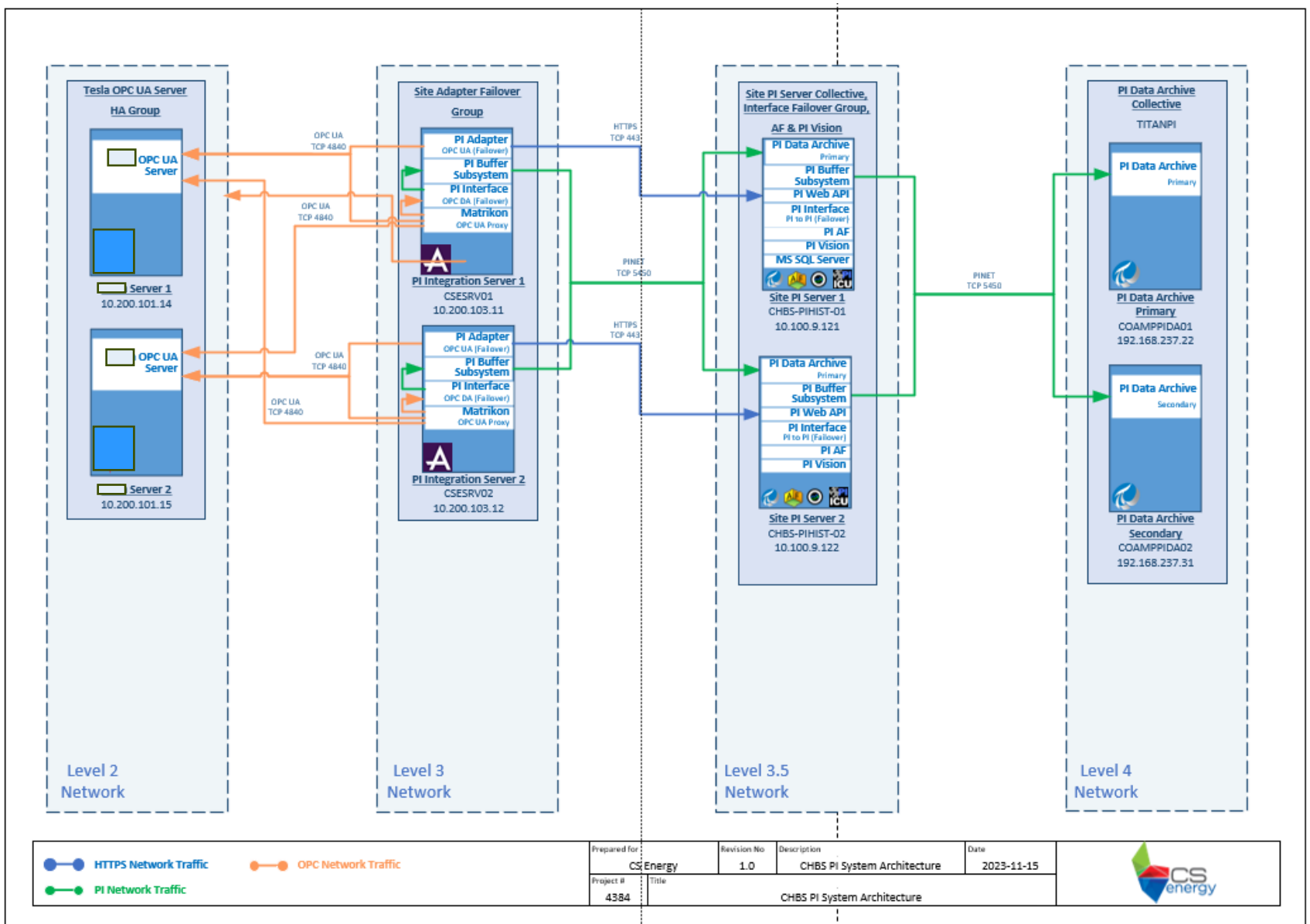
- Total Battery Output
  - Available Battery Capacity
  - System Energy Remaining
  - Active and Reactive Power
  - Connection Point Frequency
- Number of Megapacks available (CHBS is made of 80 megapacks each delivering 1.25 MW)
- Lower half of the dashboard has overview of the process alarms
- Operating Summary Tab provides the performance in Real Time

CHBS Megapack Level Dashboard

CHBS Megapack level dashboard shows:

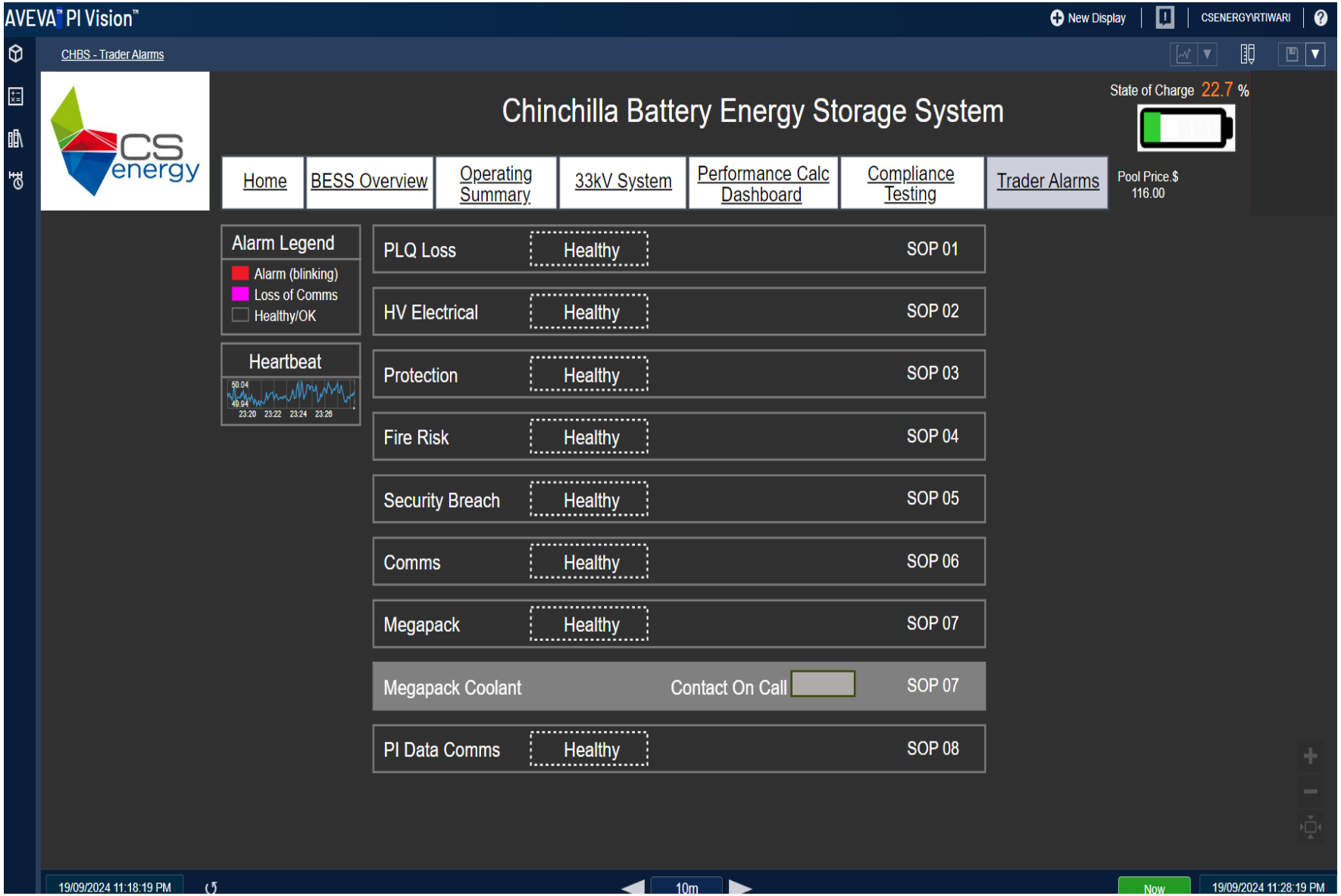
- Trending Analog data
  - Available Charge Power
  - Available Discharge Power
  - Active Power Output
  - Maximum Battery Temperature
  - SOC (State of Charge)
- AC breaker Digital Status
- All the Process megapack alarms with the process data

CHBS PI Architecture- Battery



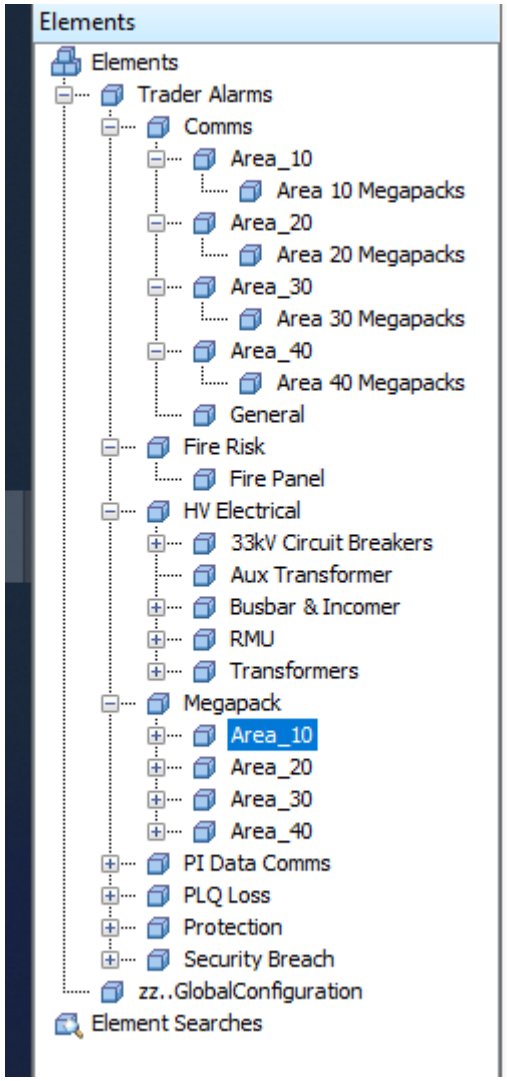
- PI UA Adapter as the OPC UA interface
- PI Adapter on the OT side rather than the DMZ side
- Server maintenance outage is always dependent on the vendor outage schedule
- Data loss will not occur for outages on DMZ or IT
- New Polling feature of PI OPC UA adapter updates the digital tag status with timestamp details

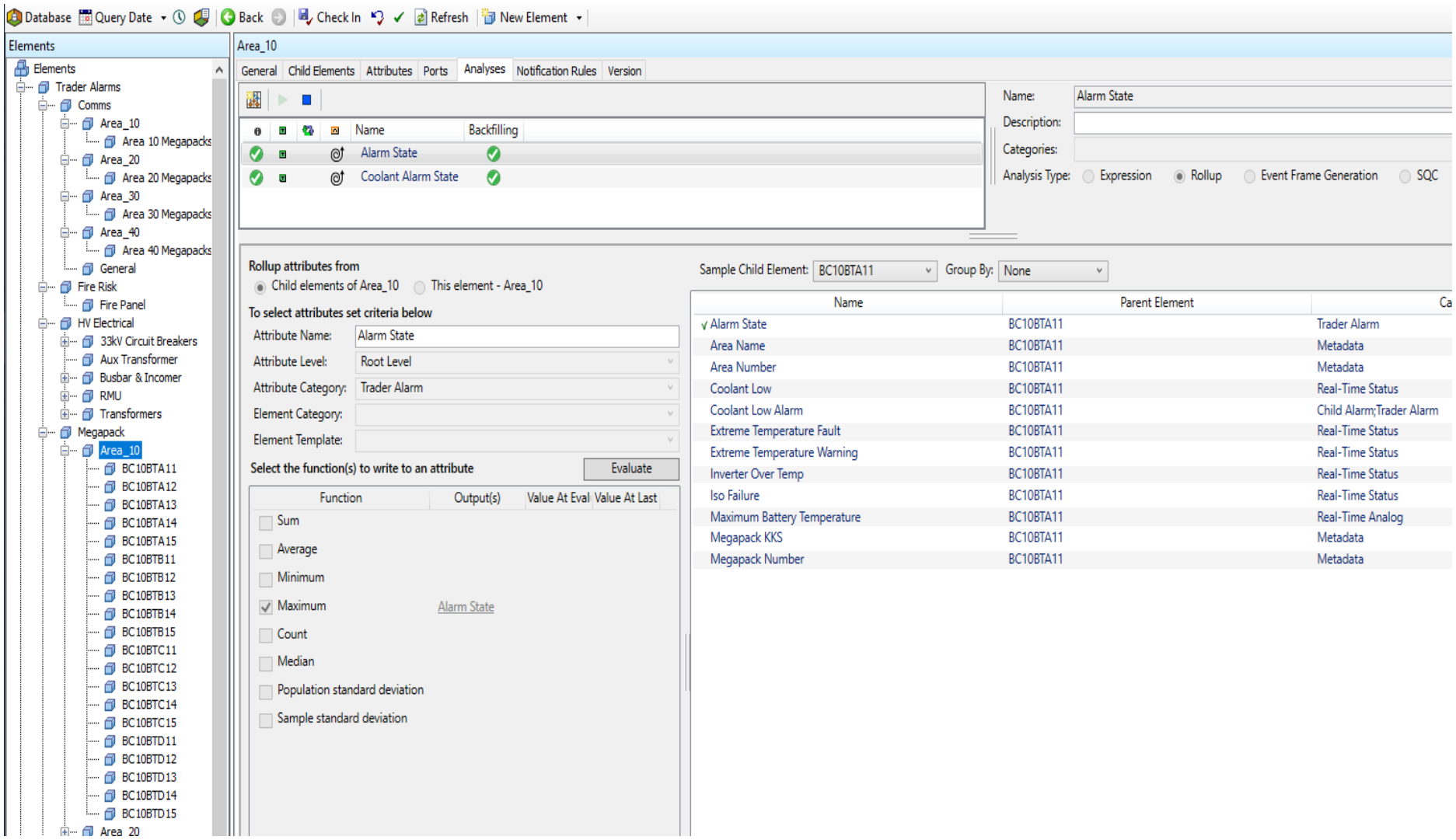
Critical alarms- BESS



- Critical Alarms have been categorised as per system criticality
- Pi Alarm Dashboard for assists with market regulation compliance
- Physical Traders can run the Battery Operations from Corporate office
- PI notifications are enabled for any critical alarms
- Historical data is used to compare RTU/Scada with PI alarms and fault finding

AF hierarchy and Rollup





What's next?

- Implementing Predictive Analytics across thermal and renewable assets
- Intensive monitoring of plant condition under flexible operations
- Regulatory Compliance Reporting (Availability, Environmental and Reliability)
- Improve Commercial Availability
- Analyse battery performance over the medium term


CS
energy