

**INTELLIGENT INTEGRATION OF
ESS INTO GLOBAL APPLICATIONS**

CIGRE e-seminar | 14 July 2021

AGENDA

- **Wärtsilä Overview**
- **GEMS Digital Energy Platform**
- **Case study: Singapore**
- **Case study: Fekola**
- **Case study deep-dive: Graciosa**

SPEAKER

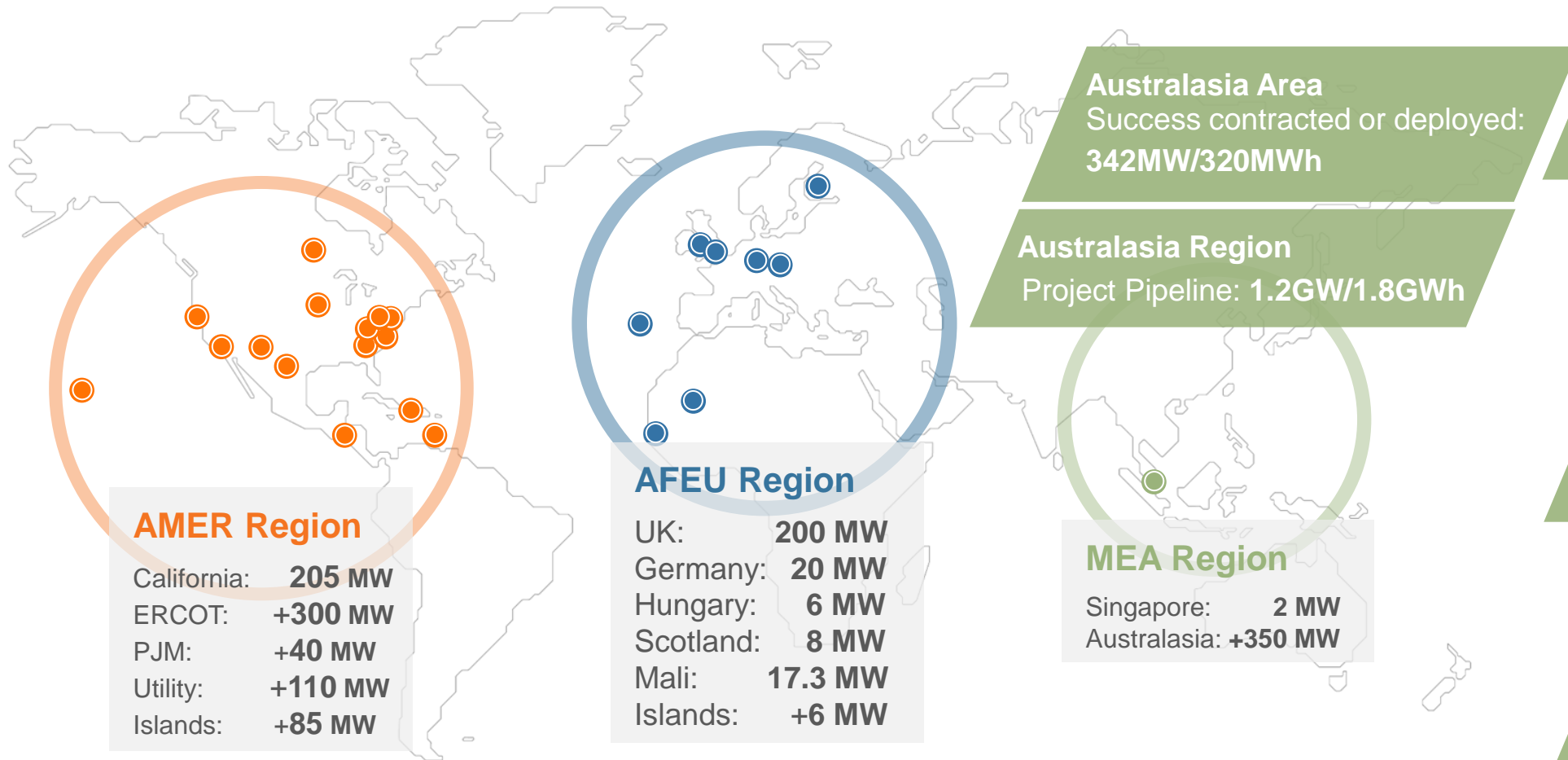


Wilhelm van Butselaar

○ Area Manager,
Energy Storage & Optimisation
Wärtsilä Energy

Over **1.5+ GW** in operation, deployed or contracted

HIGHLIGHTED PROJECTS:



Southeast Asia: grid stability and peaking; 2021



Singapore: grid reliability, renewable integration; 2020

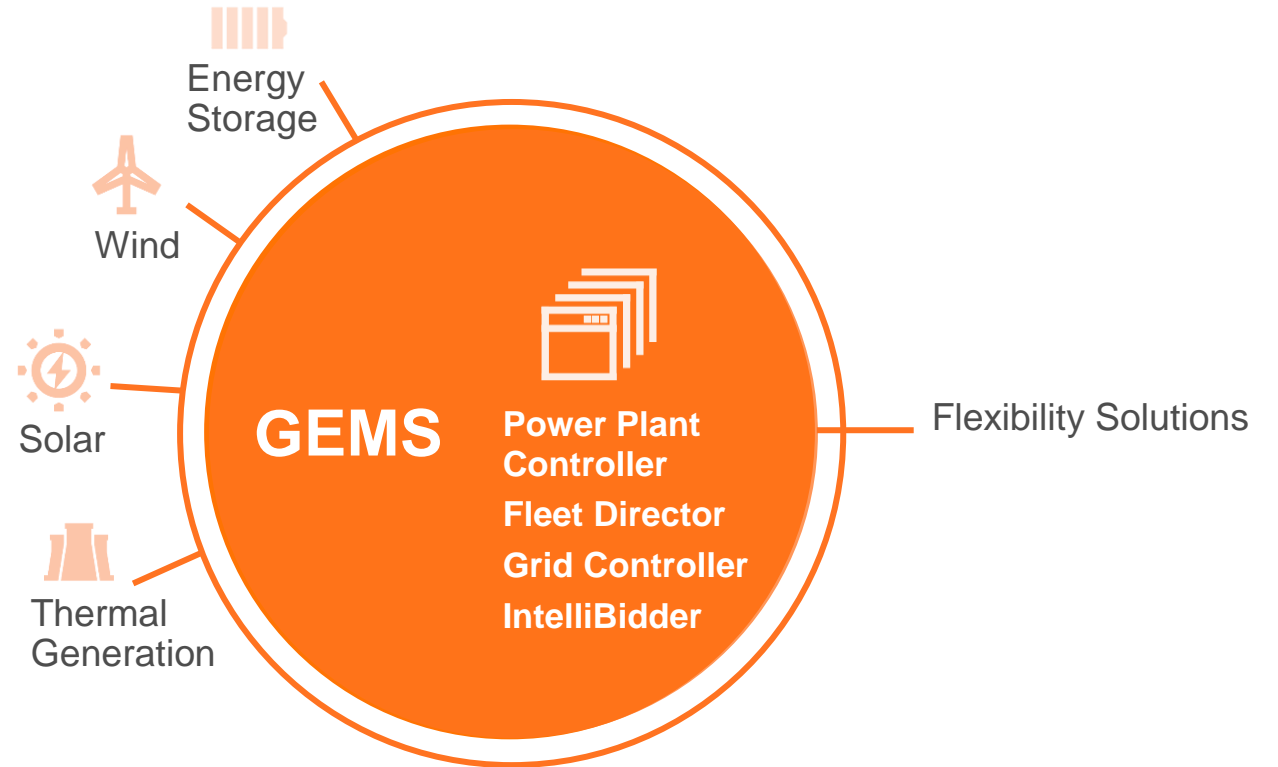


The Philippines: floating barge-mounted ESS, meeting grid requirements ; 2021

GEMS Digital Energy Platform

What is GEMS?

A suite of proprietary software products developed for building, monitoring and intelligently operating power plants and energy resources.



GEMS Solutions Suite

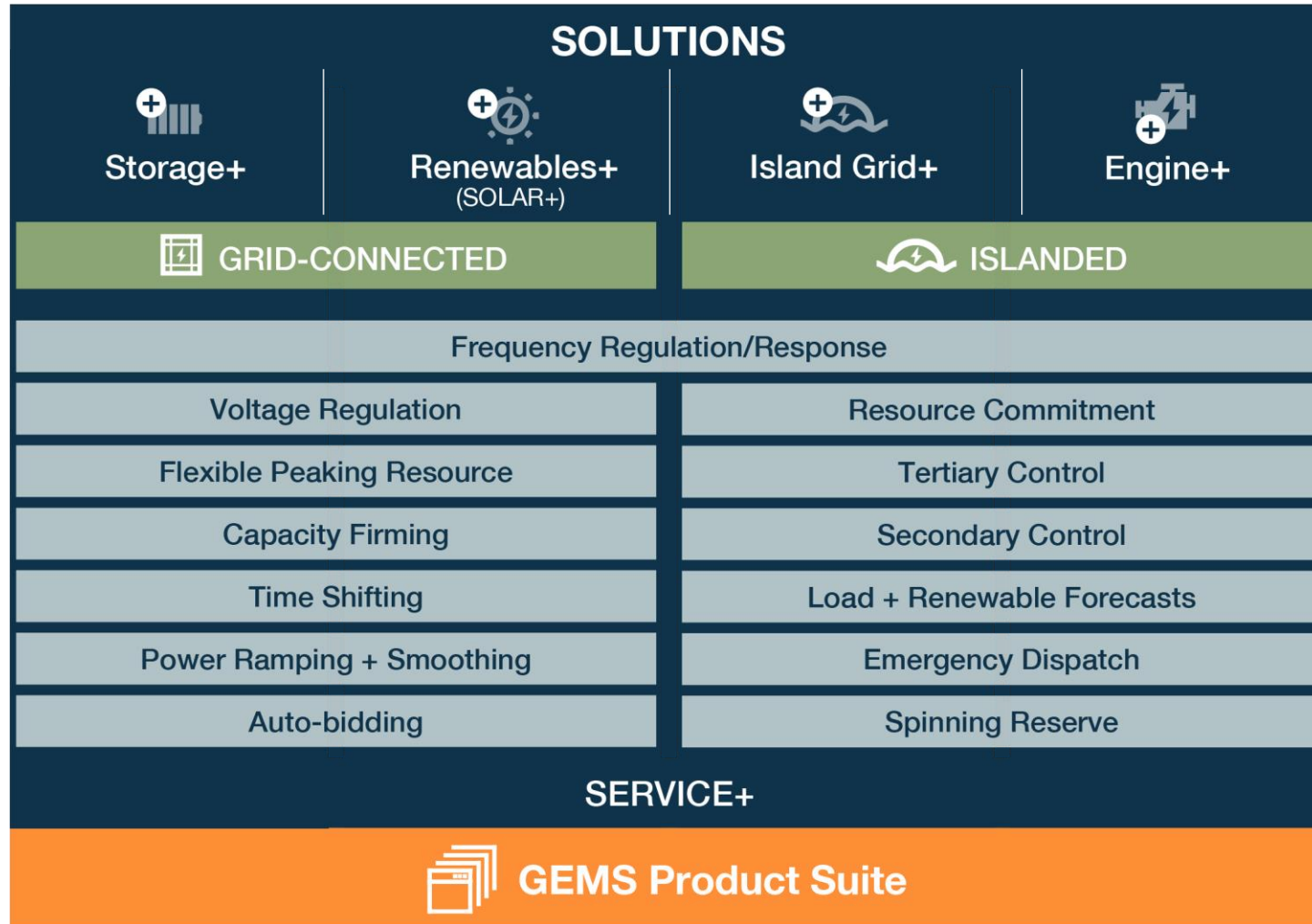
GEMS: The leading energy system management platform

Optimises all generation assets

Secure, flexible, scalable

Deployed in **85+** projects globally

GEMS SOLUTION SUITE



SUNSEAP, SINGAPORE

Utility-scale ESS helps move Singapore towards a low-carbon energy future

Preparation and testing for renewables integration of **2 GW of solar PV**

Use-case: FFR and Energy Shifting

Li-ion batteries (LFP)

Operated and optimised by **GEMS**

Participate in the **wholesale electricity market**



2.4 MW/2.4 MWh energy storage solution



Mitigate intermittency caused by solar and reduce peak demand



FEKOLA MINE, MALI

Microgrid control at a remote off-grid African mine

GEMS optimises energy production at a fuel-dependent, energy-intensive operational mining facility

Short payback period with long-term savings

Maximised **asset efficiency** and hybrid system optimisation for improved power reliability

Sustainable **clean energy** solution: reduced carbon emissions and operational costs



17.3 MW/15.4 MWh energy storage solution for a remote off-grid mine



Integrates multiple renewable assets, including existing **30 MW** of solar and **64 MW** power generator

GRACIOSA, PORTUGAL

Grid control, integration and optimisation

Boosts **renewable energy consumption**

Eliminates the dependency on 17,000 liters of diesel per month

Dispatch optimisation, solving unit commitment

Tertiary control, **secondary control**

Spinning reserves compliance (N-1)

Load forecasting, **renewable forecasts**

Grid forming **battery inverters**

Capable of operating grid **without diesel gensets running**



Enabling 100% renewables for the island of Graciosa, population ~4,000



The Graciosa Hybrid Renewable Power Plant will enable **1 MW of solar, 4.5 MW of wind power and 6 MW/3.2 MWh energy storage**



Integrates renewable energy sources while simultaneously optimising multiple generation assets

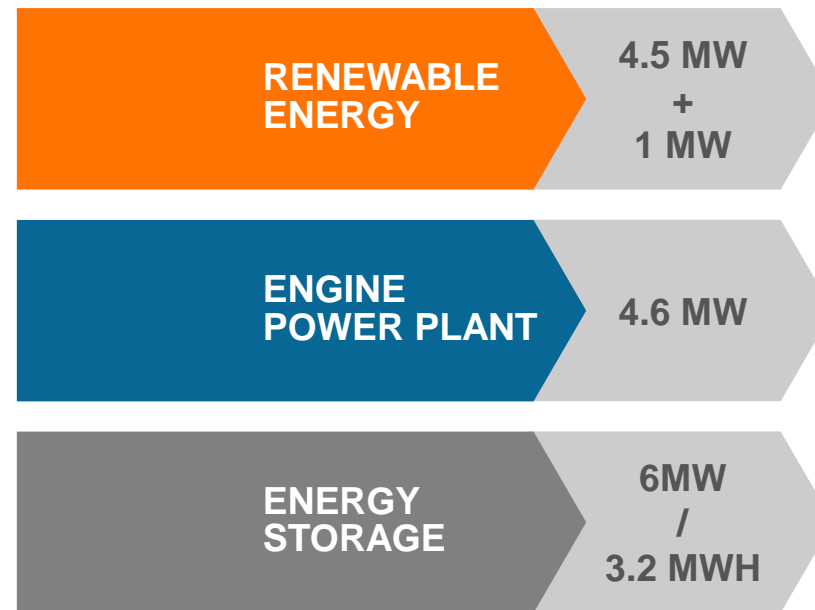


RES 0%

RES 65%

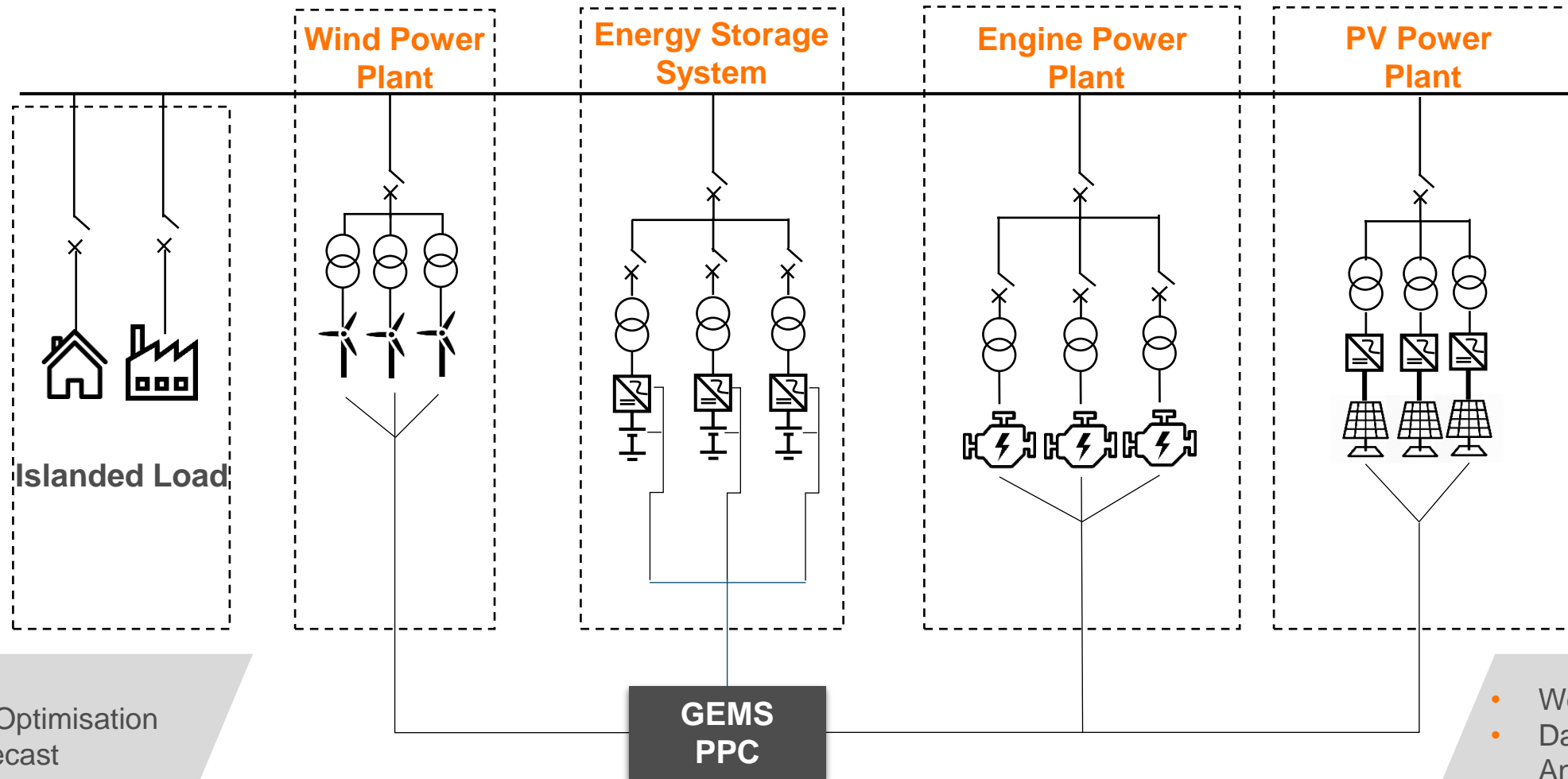


TRANSITION



RES = Renewable Energy Sources

GEMS MICROGRID CONTROLLER



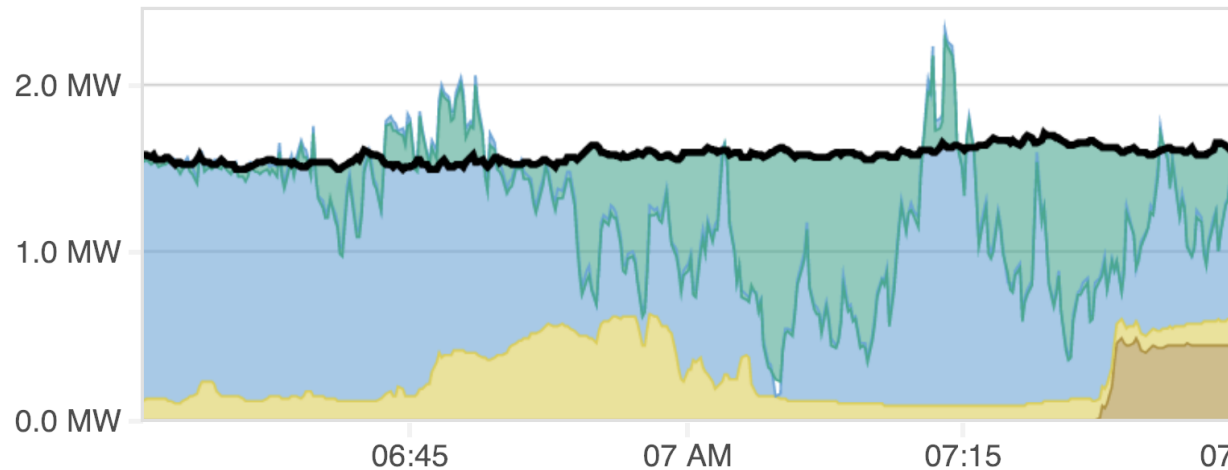
- Dispatch Optimisation
- Load Forecast
- Renewable Forecast

- Weather Subscription
- Data Storage and Analytics
- Remote O&M

GEMS MICROGRID FREQUENCY CONTROL

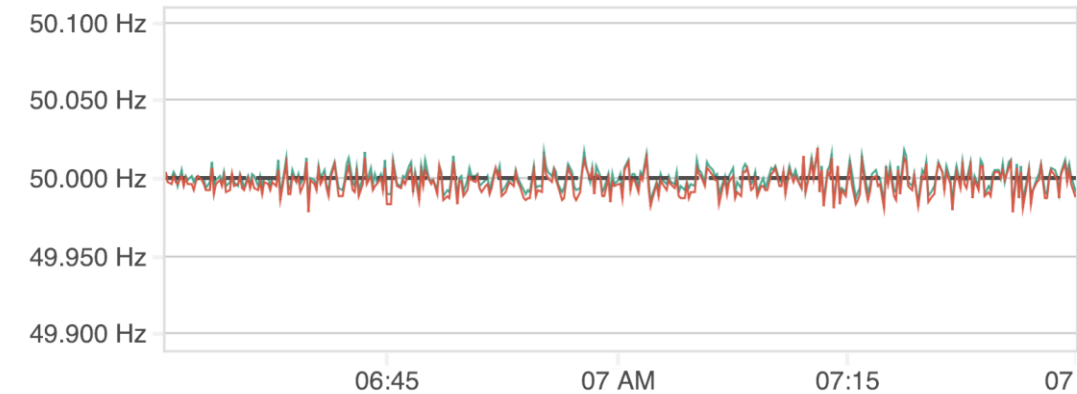
Microgrid Stacked Power Plot

- Load Meter AC Real Power
- Battery Power Plant AC Real Power
- Wind Power Plant AC Real Power
- PV Power Plant AC Real Power
- Diesel Power Plant AC Real Power



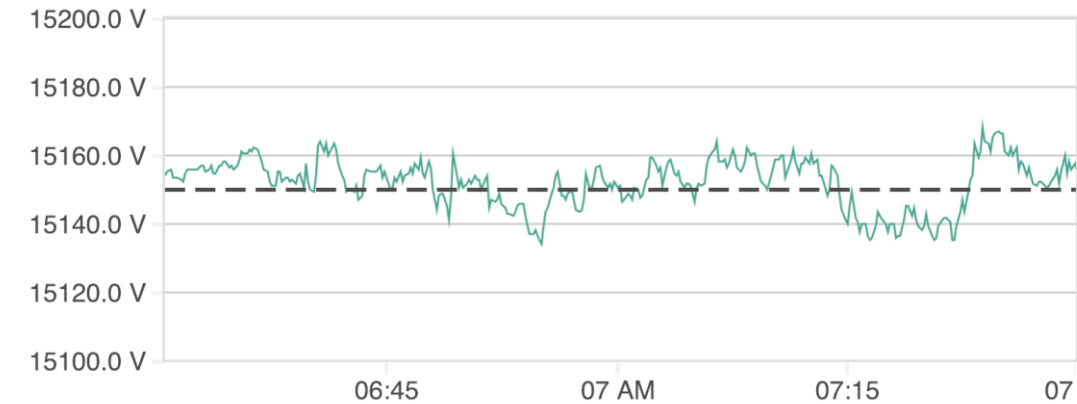
Frequency

- BPP Voltage Meter 1 Frequency
- Micro Grid Frequency Setpoint
- BPP Voltage Meter 2 Frequency

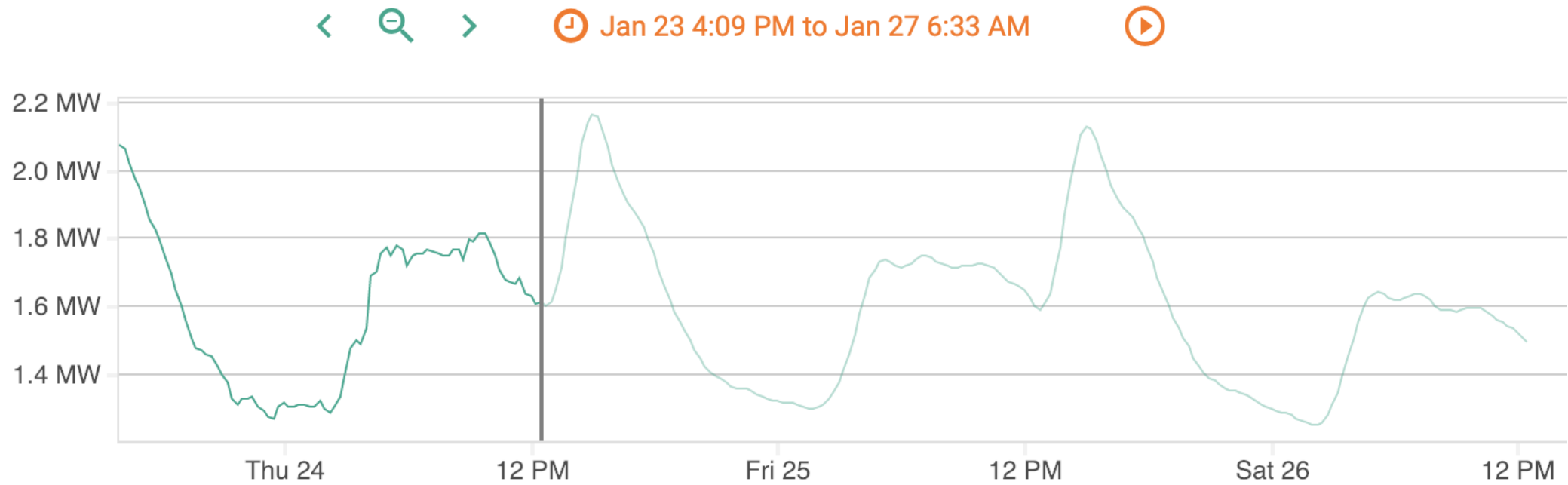


Voltage

- BPP Voltage Meter 1 AC Voltage
- Micro Grid AC Voltage Setpoint



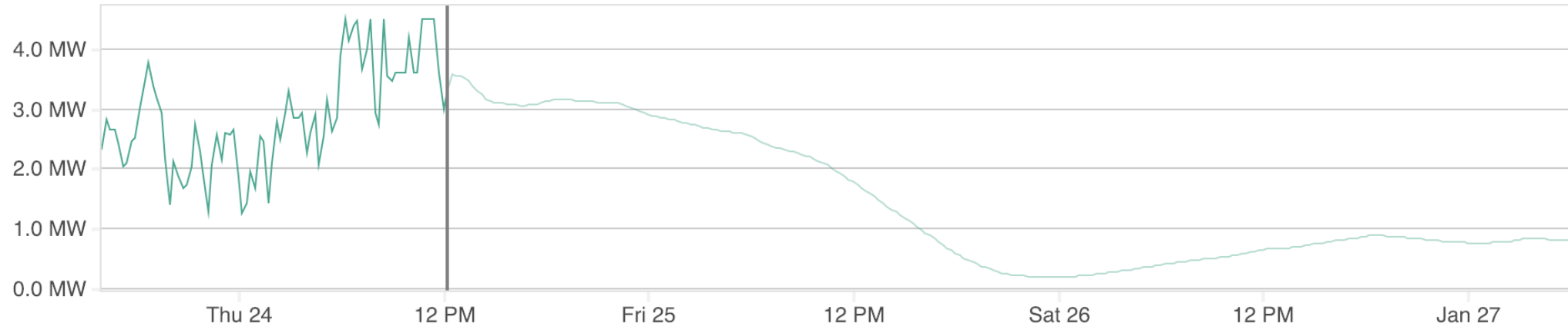
GEMS CONSUMER LOAD FORECASTING



GEMS RENEWABLE ENERGY FORECASTING

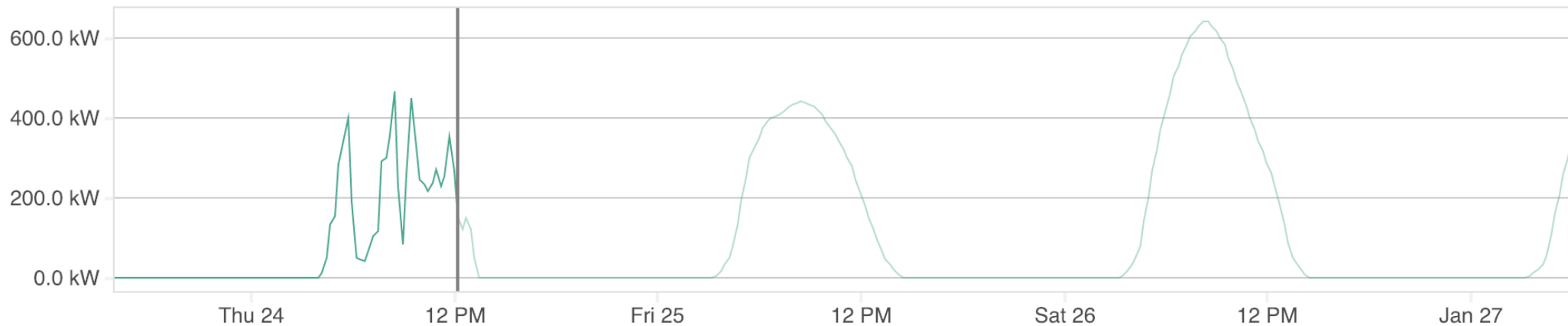
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Wind Forecast Wind Power

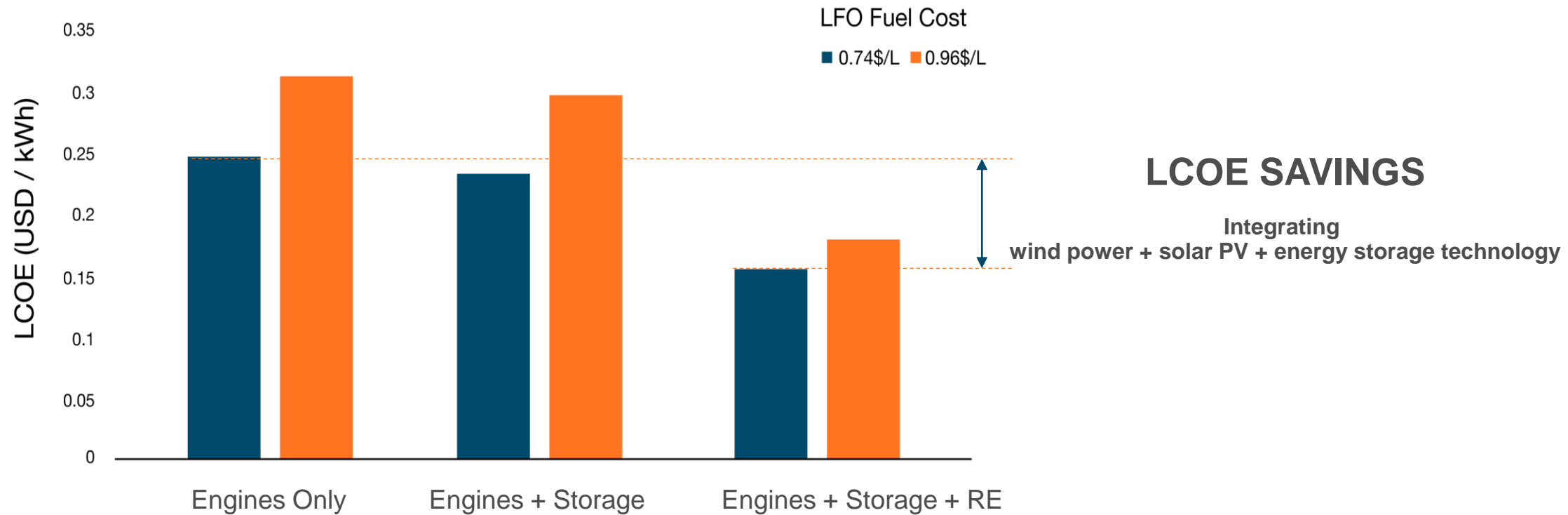


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PV Forecast PV Power




LCOE SAVINGS ACHIEVED VIA RENEWABLE INTEGRATION





Enabling a **100% renewable** energy future



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