



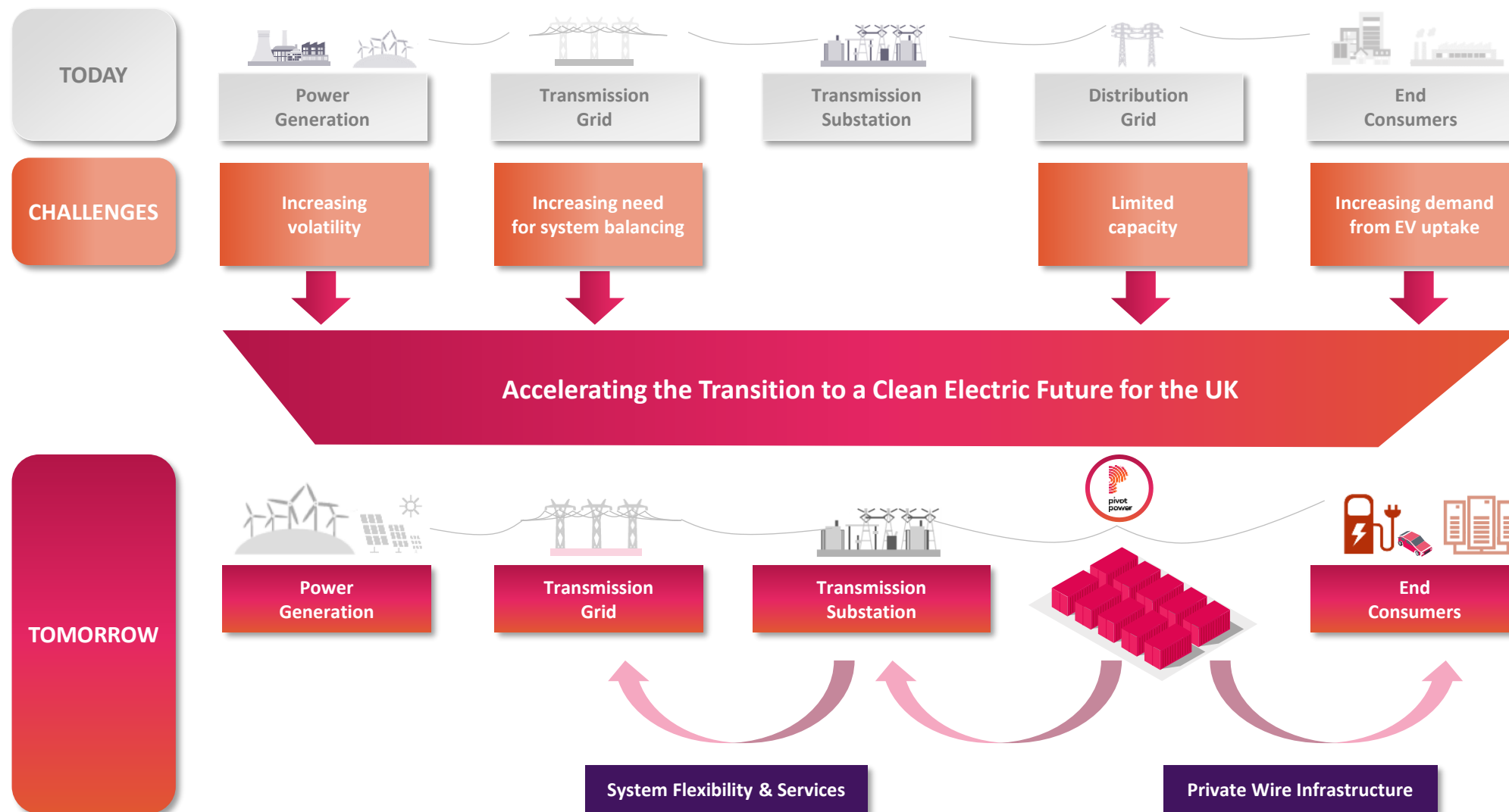
WHEN ENERGY STORAGE MEETS ELECTRIC VEHICLES: SMART SOLUTIONS FOR CRITICAL INFRASTRUCTURE CHALLENGES

18 NOVEMBER, 2020

POWER DRIVING CHANGE®

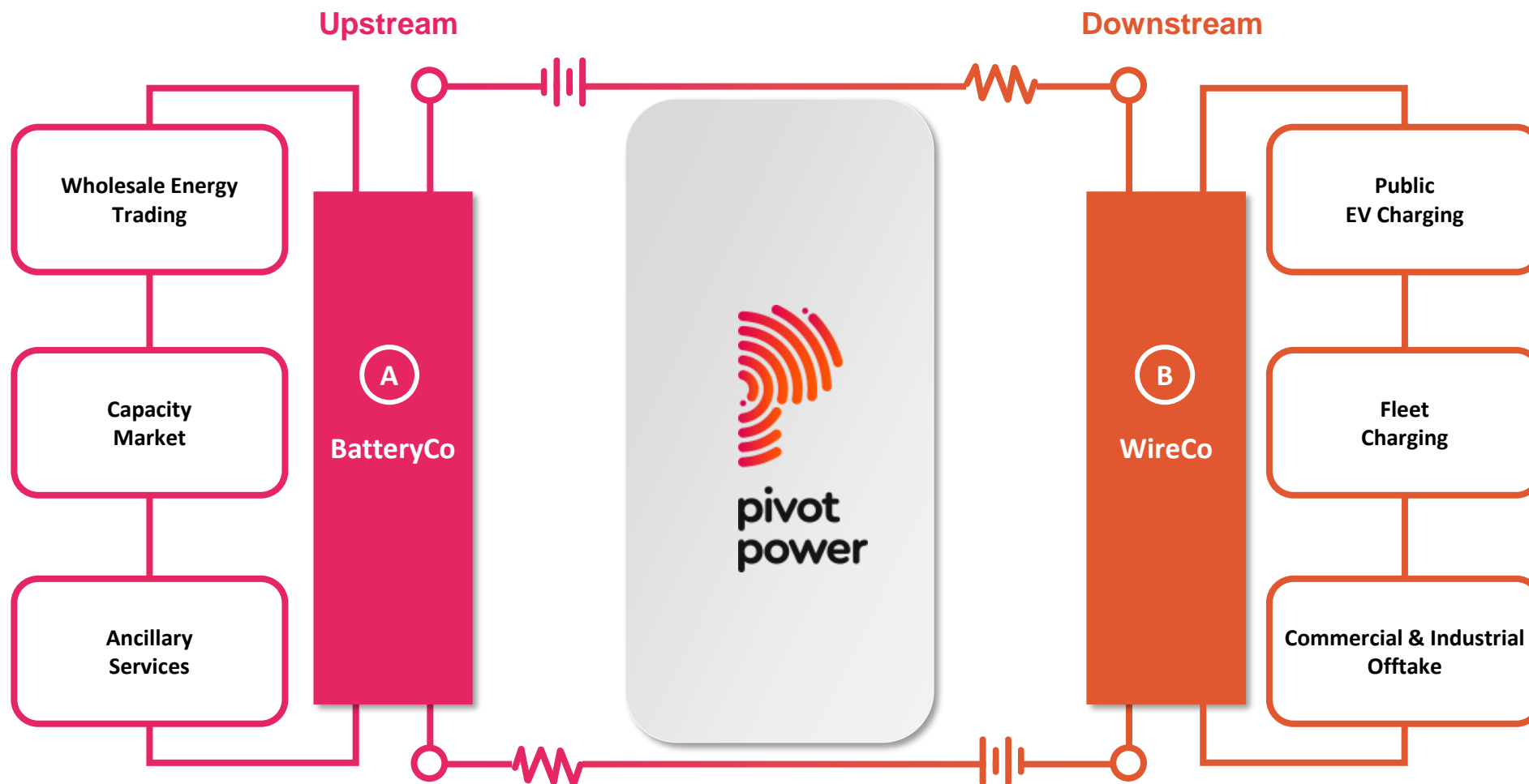
1. We need to agree on the challenges we face today if we're going to deliver on the solutions needed for tomorrow

2



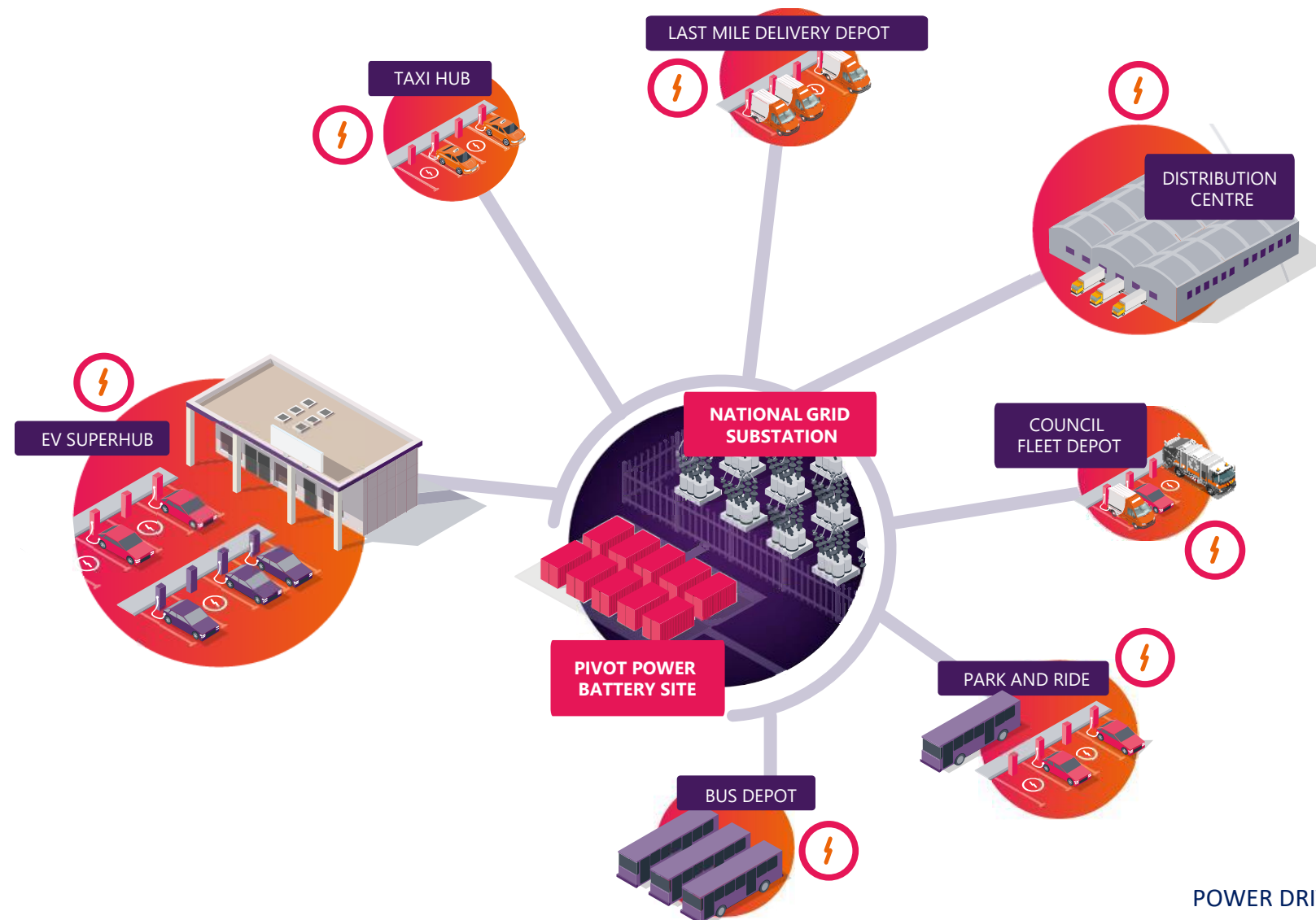
2. To deliver on the UK's net zero ambitions, we need multifaceted solutions

3



3. We need solutions that can accelerate the deployment for all electrified transport

4



4. There are 'many roads to zero' but the plan needs to be driven by local stakeholders

5



"THE BATTERY STORAGE DILEMMA"

THE MACRO LEVEL NEED FOR BATTERY STORAGE:
Ensuring the UK meets committed Net Zero targets by 2050

Renewables = Generation
(receiving subsidy support)

Trans. & Dist. Networks = Regulated Asset
(receiving an agreed return)

Security

Cost

**The
Energy
Trilemma**

Environment

Storage adds value via:

- More renewables able to be built
- Reduce curtailment

Storage adds value via:

- Deferring system upgrades
- Reduce risk of system level blackouts

Battery Storage





pivot
power

THANK YOU

POWER DRIVING CHANGE®





Wärtsilä Energy Storage and Optimisation

Wärtsilä has a long-proven track record **70+ grid-scale system installations** globally, **integrated** with wind, hydro, solar and thermal generation, and **optimised** by industry-leading GEMS energy management software.

180
COUNTRIES

72_{GW}
GENERATION

650+_{MW}
GLOBAL STORAGE
SYSTEMS DEPLOYED
OR AWARDED

The world's leading hybrid power systems provider integrating thermal, renewables and storage

WÄRTSILÄ ENERGY BUSINESS

Global energy storage leader and engine-based power plants systems optimiser with 650+ MW deployed or under contract globally

BEST-IN-CLASS CONTROL

Powered by advanced GEMS Solutions Suite technology, designed to optimise battery life and maximise battery monetisation strategies

A HYBRID FUTURE REALISED

Unprecedented capabilities to integrate and manage assets into a unified energy future—engines, solar, wind, and energy storage

Towards a **100%** renewable energy future

Introduce disruptive, **game-changing** software products and technologies to the global power industry

Wärtsilä is committed to safety at every level of our business:

Fire detection

Fire suppression

Emergency stop

Electrical safety

Monitoring and control

Cybersecurity

Risk mitigation

Product compliance with the most stringent codes and can minimise the risks and hazards associated with battery systems

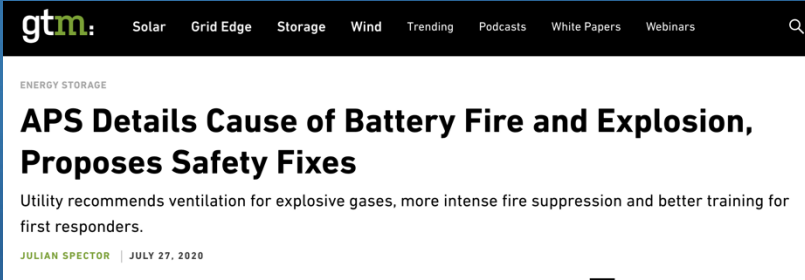
NFPA 855

NFPA 855 Standard establishes requirements for safe battery installations: battery designs and installation considerations—spacing between battery packs, related fire mitigation systems, and overall site clearance requirements

U.L. 9540A

The **U.L. 9540A Standard** focuses on the thresholds for thermal runaway, when a battery cell overheats and subsequently combusts: Any lithium-ion batteries, including LFP chemistries, can be subject to thermal runaway

Energy storage system safety is critical—for both software and hardware—especially as battery adoption grows exponentially



gtm: Solar Grid Edge Storage Wind Trending Podcasts White Papers Webinars

ENERGY STORAGE

APS Details Cause of Battery Fire and Explosion, Proposes Safety Fixes

Utility recommends ventilation for explosive gases, more intense fire suppression and better training for first responders.

JULIAN SPECTOR | JULY 27, 2020



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Research and analysis

Domestic battery energy storage systems

A review of the safety risks of domestic battery energy storage systems and measures to mitigate these.

GridSolv Quantum is designed with safety in the forefront

U.L. 9540A battery modules

Roof:

- Deflagration panel
- 30 min. fire rating

Walls:

60 min. fire rating

Floor:

30 min. fire rating

**NFPA 855
clearance in front**



Optional:

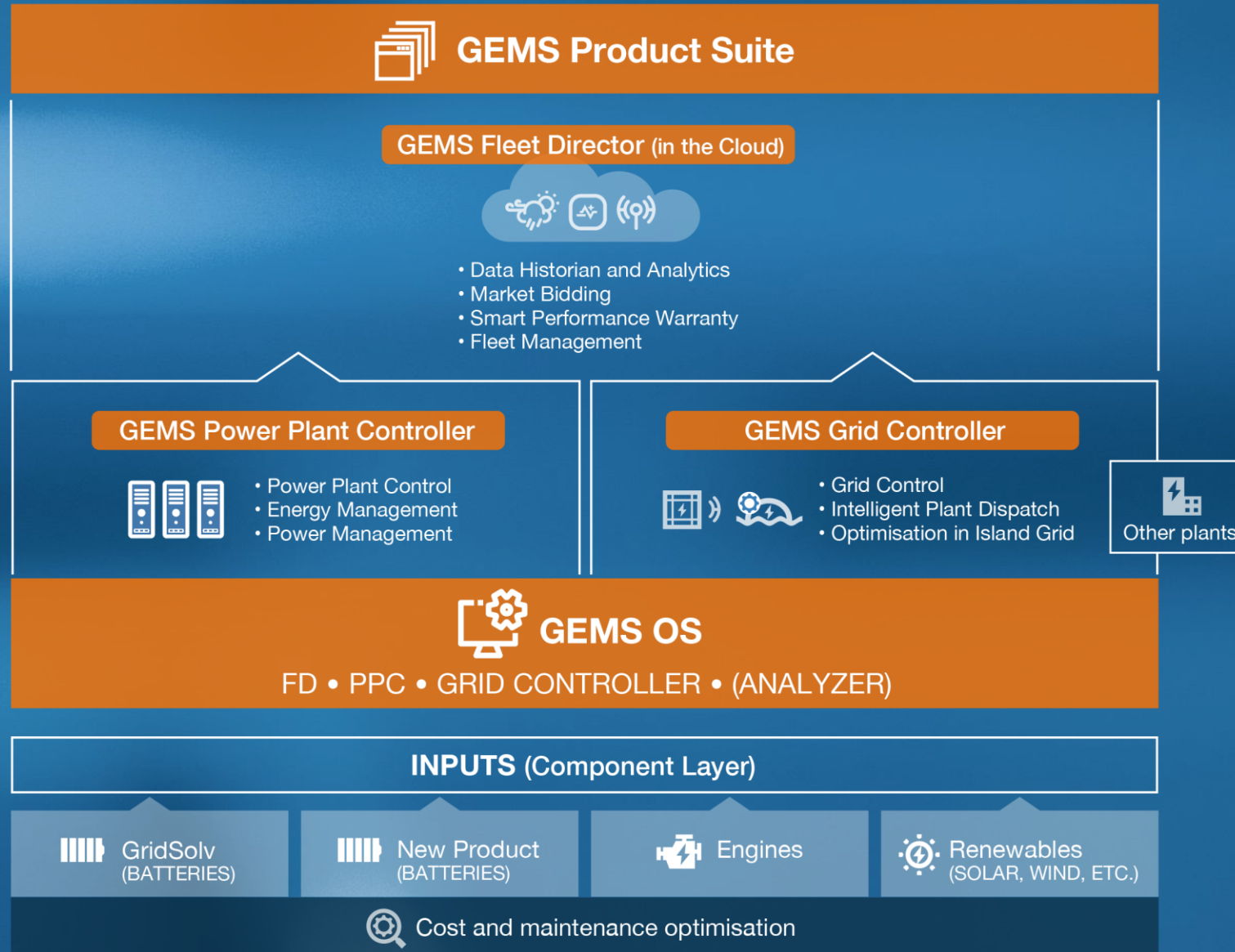
- CO sensor
- Aerosol suppression

Inside:

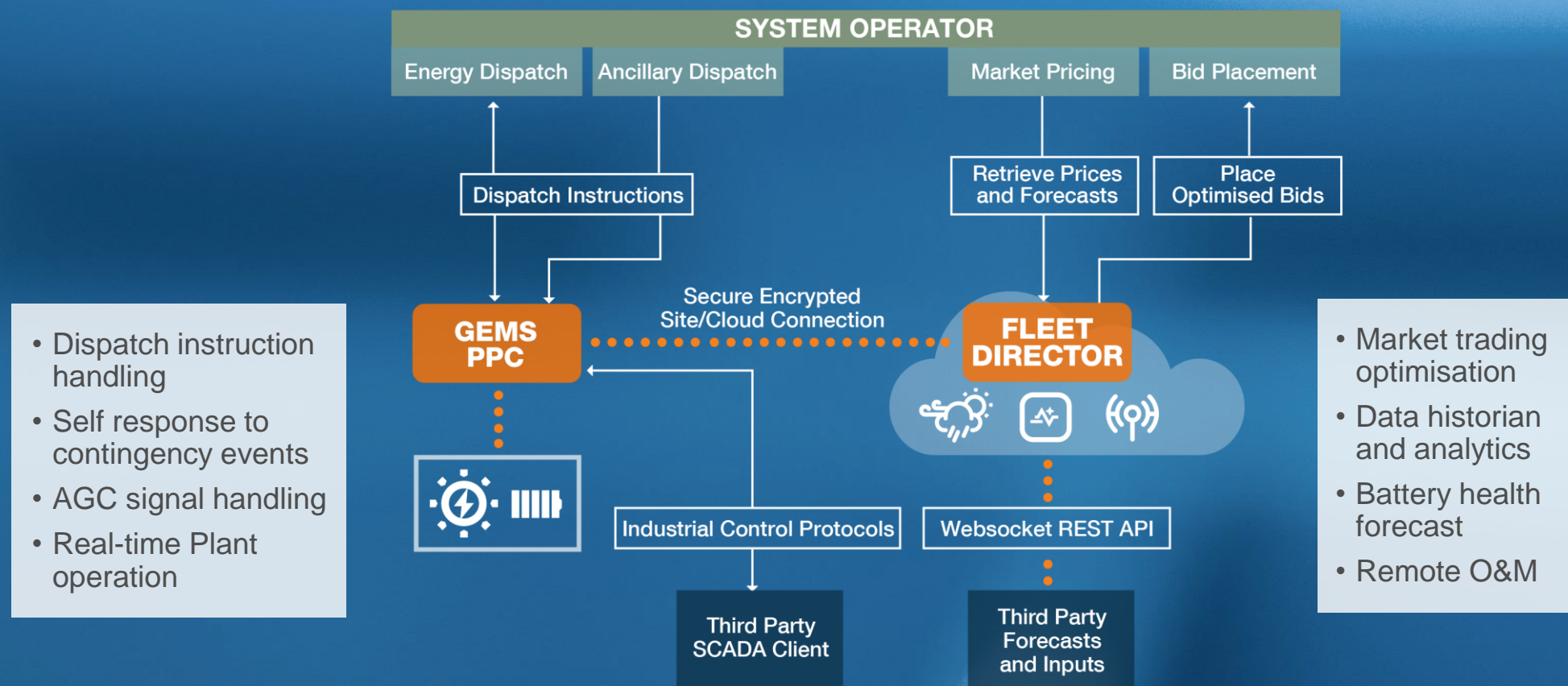
- Dry pipe
- H2 sensor inside

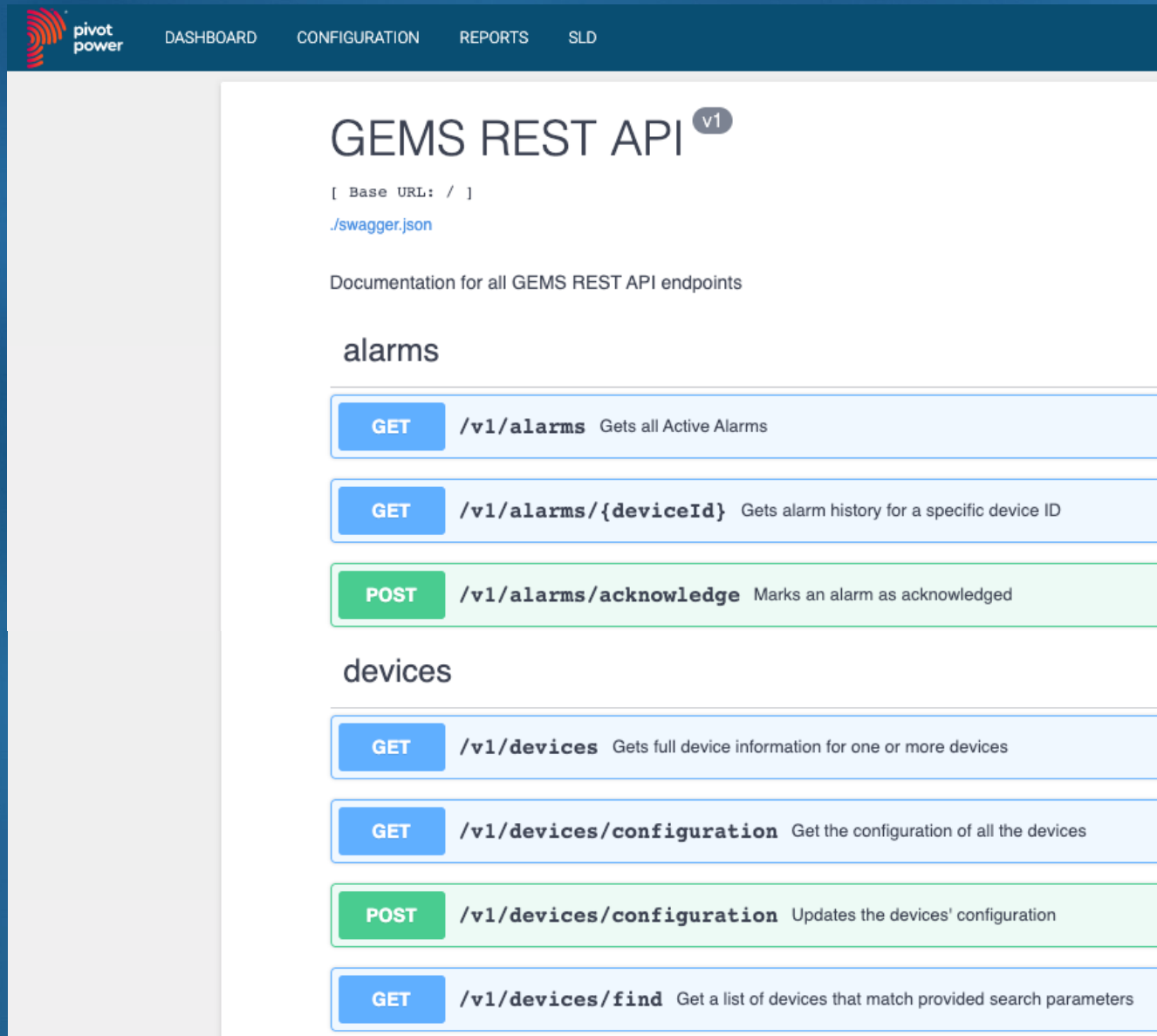
Sensors:

- Humidity and temperature
- Smoke



Wärtsilä GEMS: End-to-End Bidding and Dispatch Solution





GEMS REST API ^{v1}

[Base URL: /]
[./swagger.json](#)

Documentation for all GEMS REST API endpoints

alarms

Method	Endpoint	Description
GET	<code>/v1/alarms</code>	Gets all Active Alarms
GET	<code>/v1/alarms/{deviceId}</code>	Gets alarm history for a specific device ID
POST	<code>/v1/alarms/acknowledge</code>	Marks an alarm as acknowledged

devices

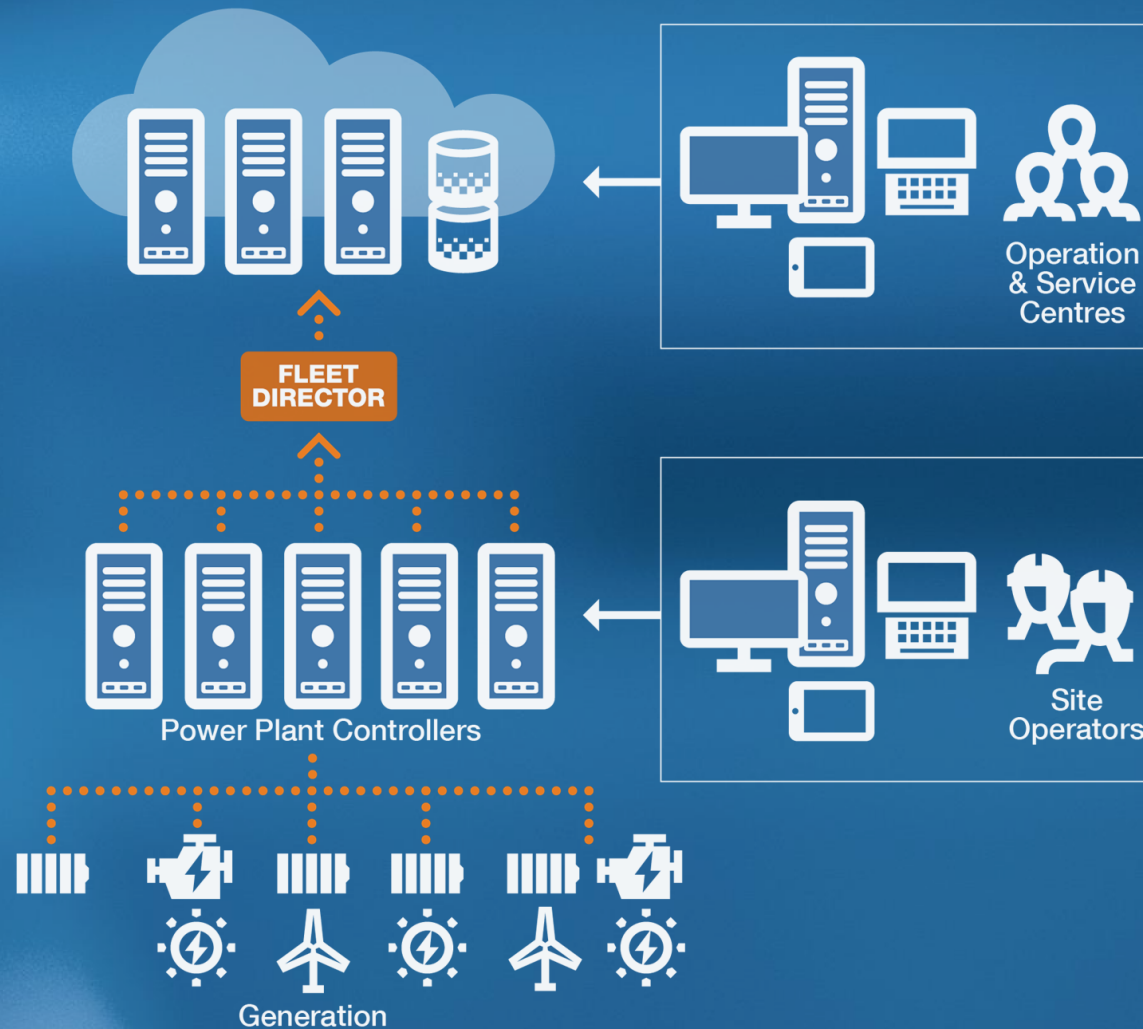
Method	Endpoint	Description
GET	<code>/v1/devices</code>	Gets full device information for one or more devices
GET	<code>/v1/devices/configuration</code>	Get the configuration of all the devices
POST	<code>/v1/devices/configuration</code>	Updates the devices' configuration
GET	<code>/v1/devices/find</code>	Get a list of devices that match provided search parameters

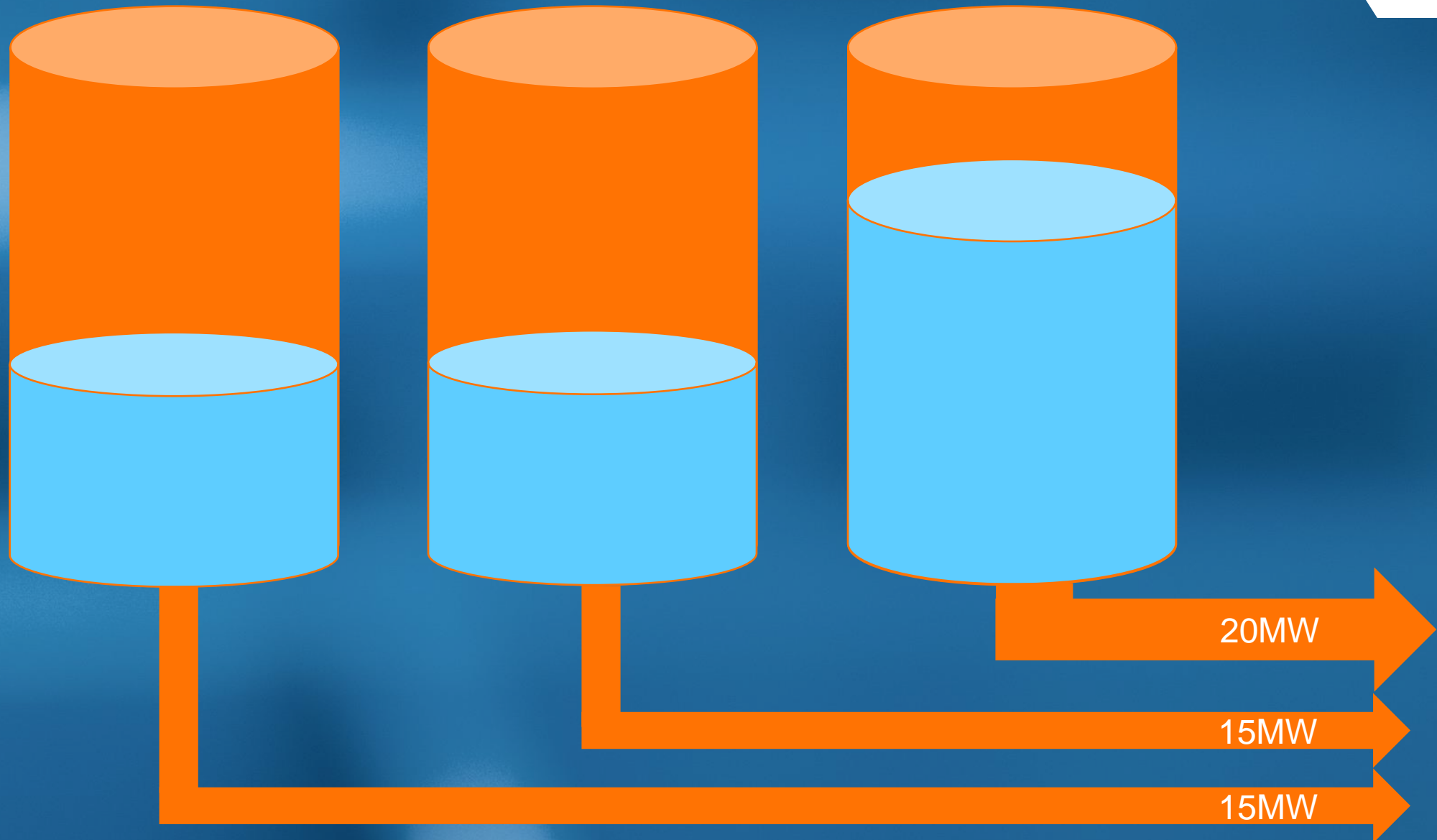
Wärtsilä GEMS:

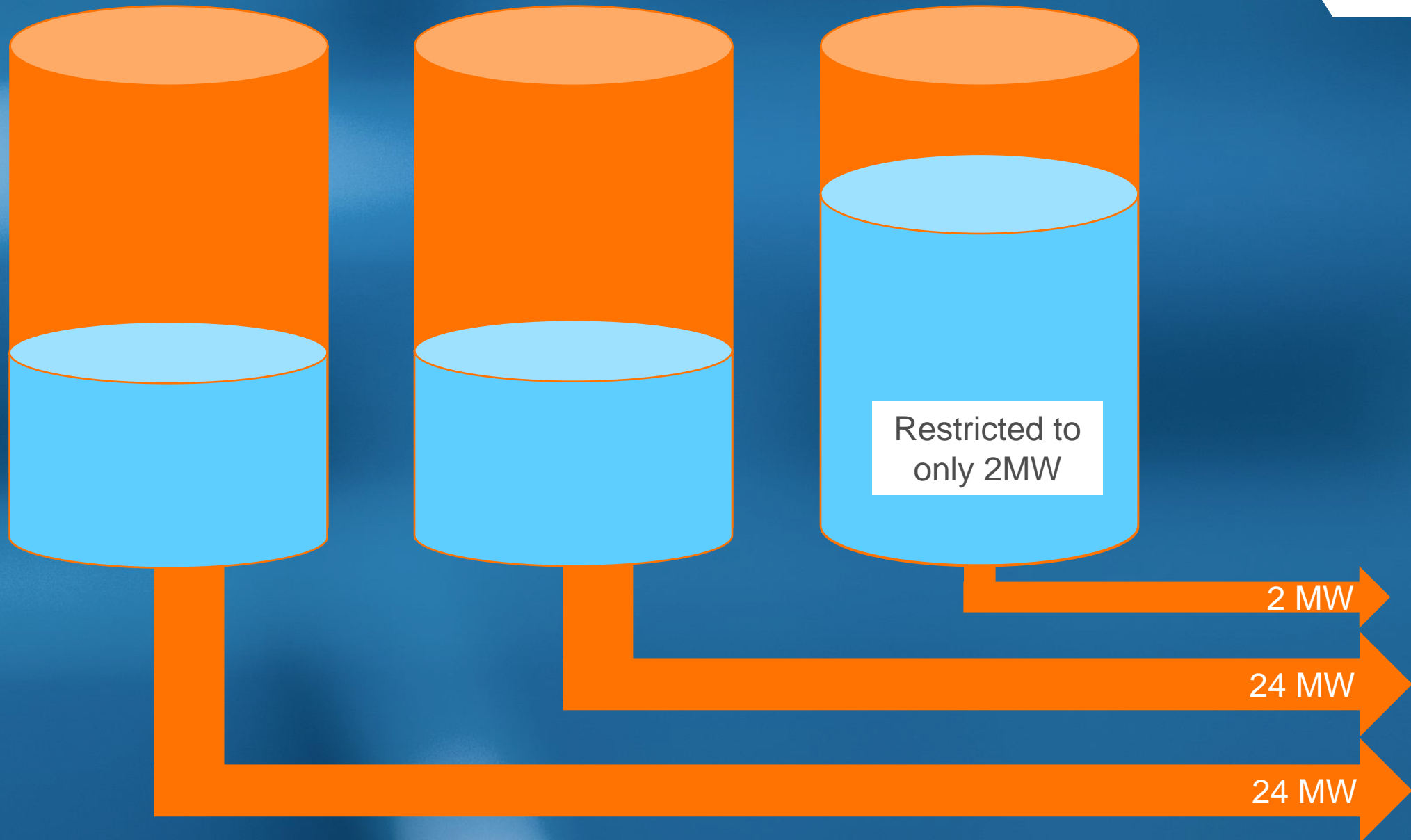
- Standard REST API
- Full access to all data
- Perpetual License Terms
- Highly Customizable
- Third-party Friendly
- Cyber Secure MFA

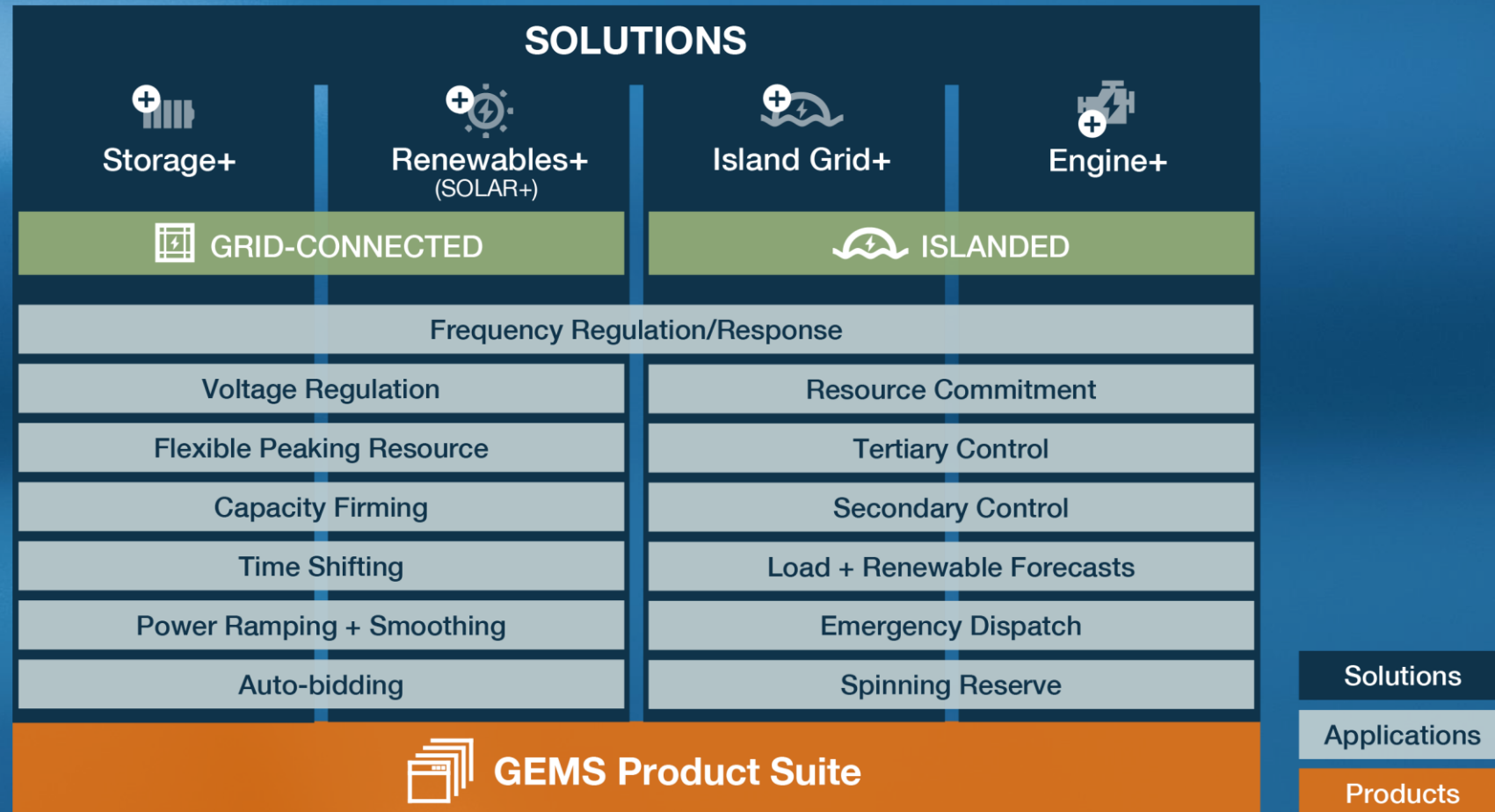
GEMS DEPLOYMENTS

IEC 62443 Certified









Recent ES&O Deployments



Grid-balancing services for clean, smart and flexible power

The projects will provide balancing services for the UK grid, including **frequency response**, electricity **market trading** and **reactive power** services

GEMS software will optimise various assets and **future-proof resources under a single portfolio**—storage, EV infrastructure, grid fluctuations

Both projects are expected to be online by early 2021



Cowley, Oxford



Two **50 MW / 50 MWh EEQ energy storage** systems to accelerate a clean electric future in the UK



Kemsley, Kent



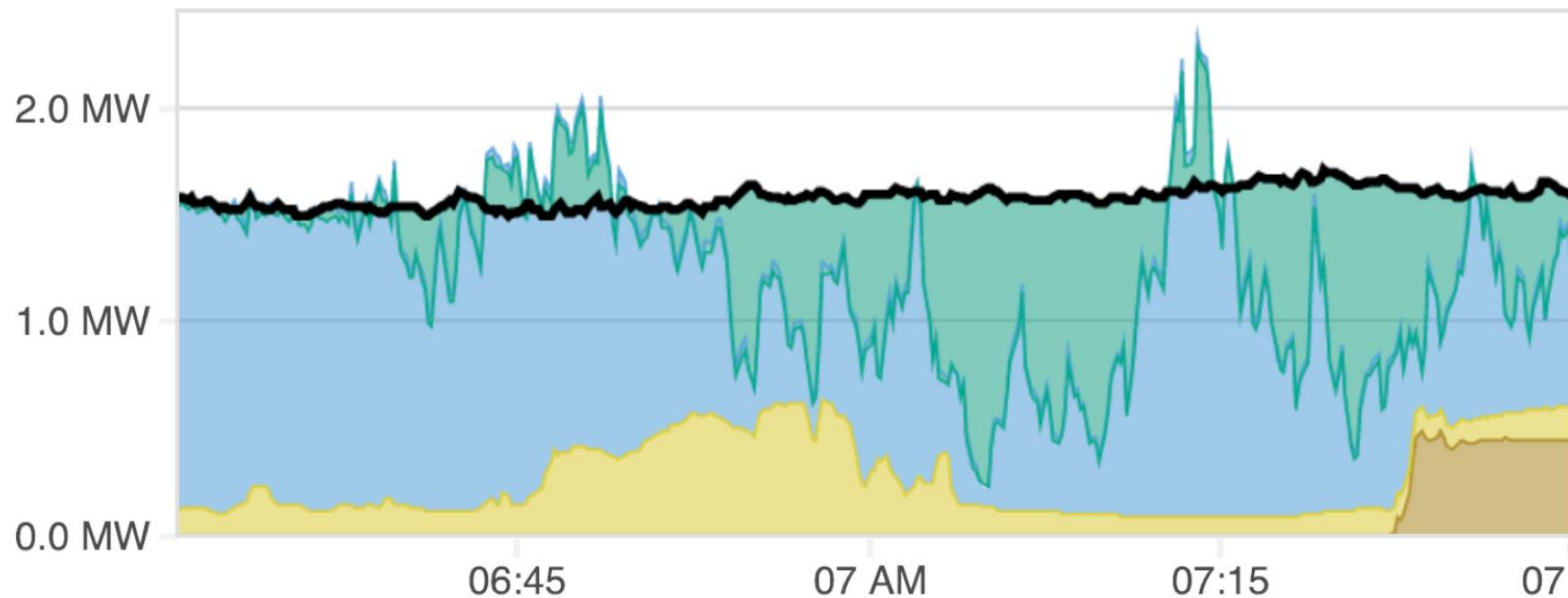
Transmission-connected **energy storage** and high-volume power connections will provide **essential capacity** for rapid EV charging infrastructure

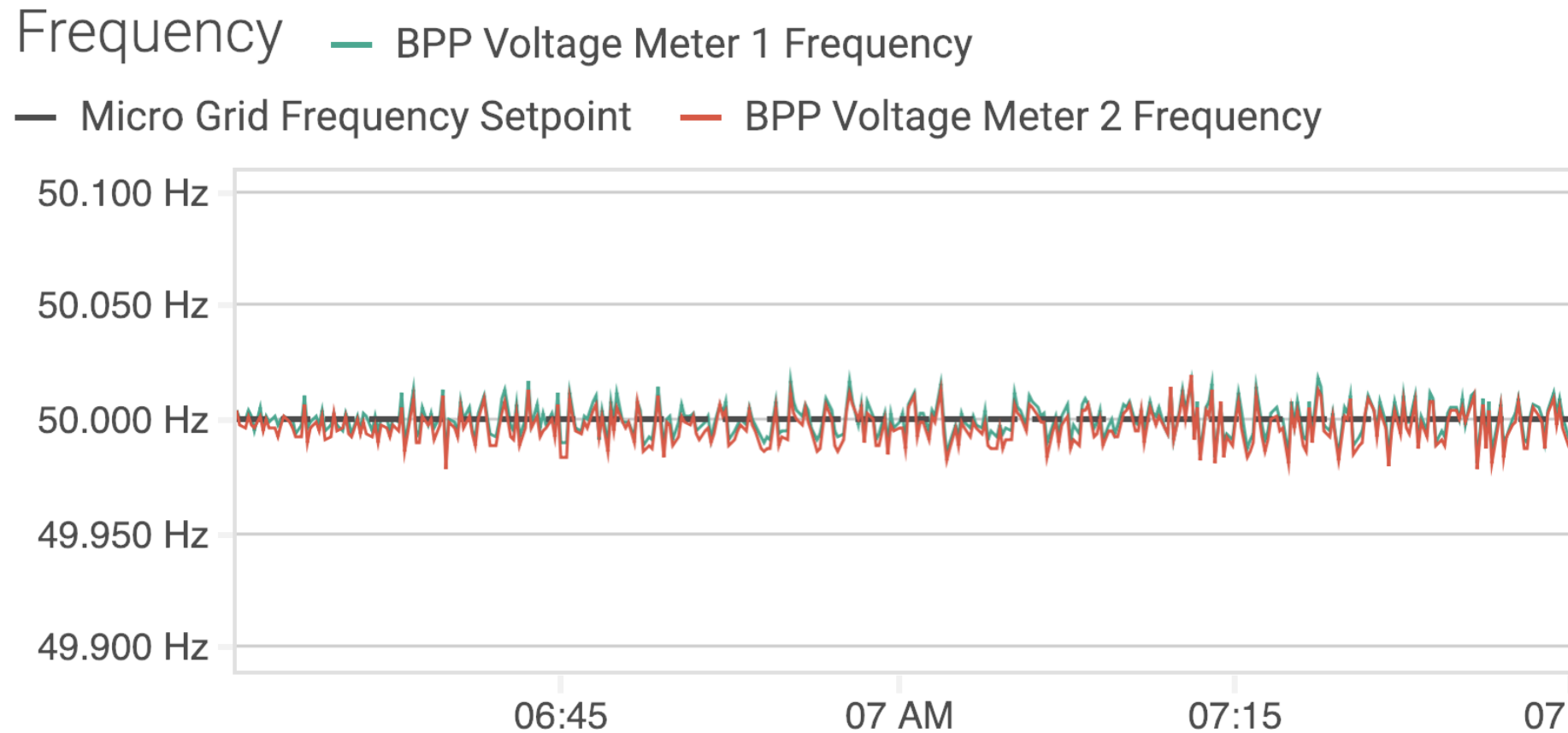


The projects will contribute to greater UK National Grid **stability** and **flexibility**, improving route to market for **clean power solutions** and reducing carbon footprints

Microgrid Stacked Power Plot

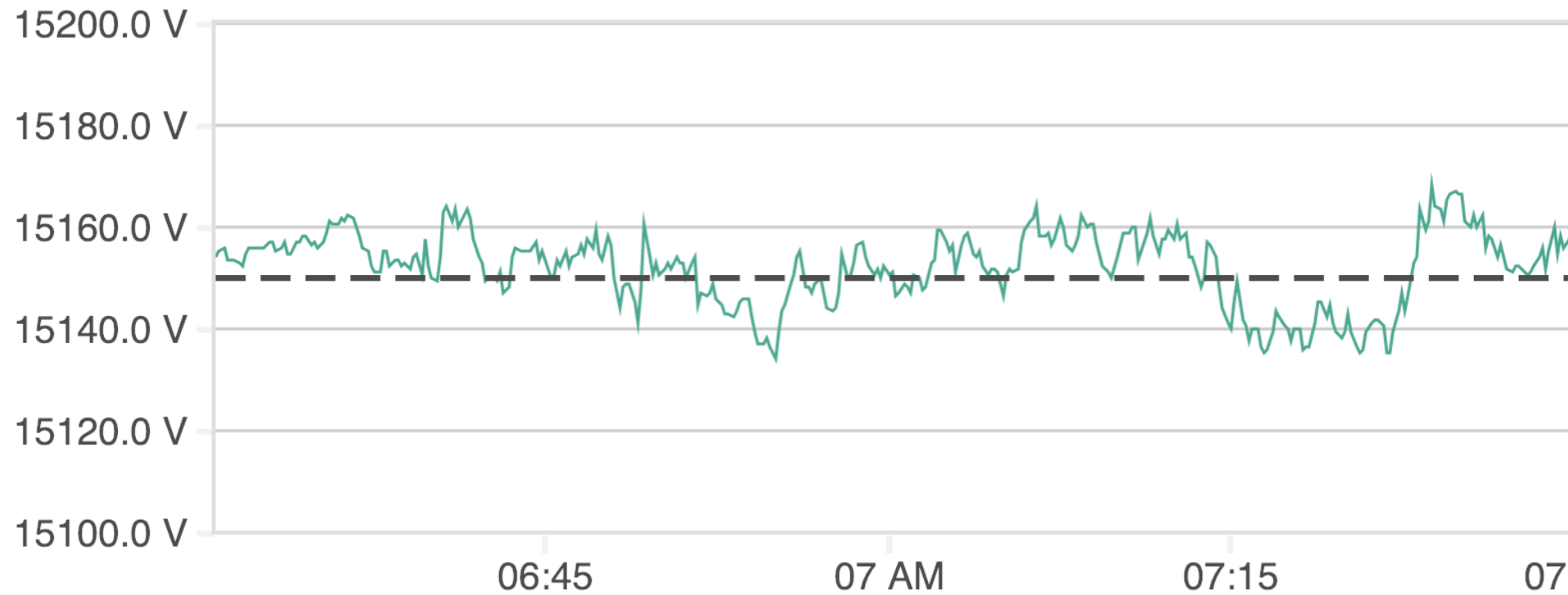
- Load Meter AC Real Power
- Battery Power Plant AC Real Power
- Wind Power Plant AC Real Power
- PV Power Plant AC Real Power
- Diesel Power Plant AC Real Power





Voltage — BPP Voltage Meter 1 AC Voltage

— Micro Grid AC Voltage Setpoint



Q&A



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