

# Wärtsilä Energy storage

June 2021



## Agenda

Energy market trends

Energy storage market

Wärtsilä Energy role & position

Wärtsilä Energy storage

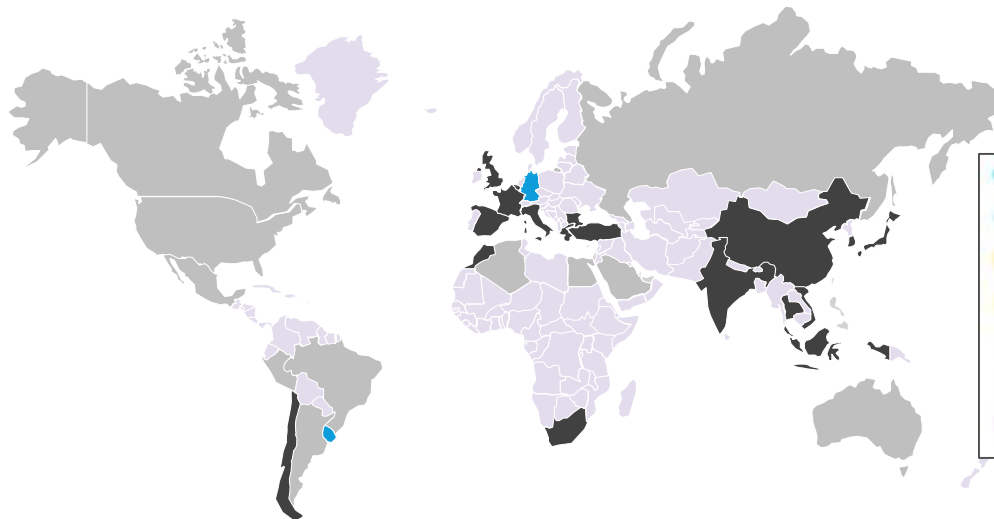
Project references

# **Energy market trends: what's driving the energy storage growth?**

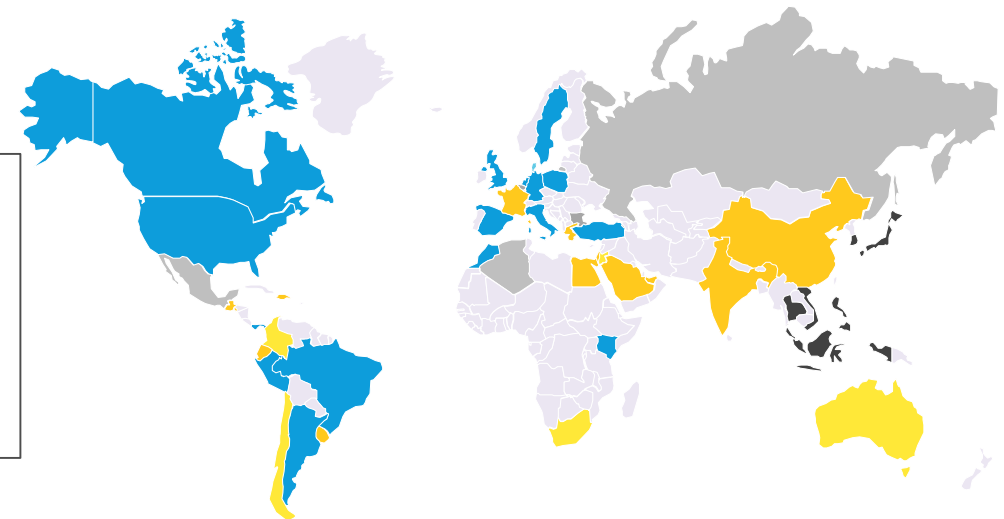
# PRICE ALONE WILL TURN MOST OF THE WORLD TO RENEWABLE ENERGY.

The transition has been **extremely fast** and is only accelerating

**MOST COMPETITIVE SOURCE OF NEW BULK GENERATION IN 2014**



**MOST COMPETITIVE SOURCE OF NEW BULK GENERATION IN 1H 2020**

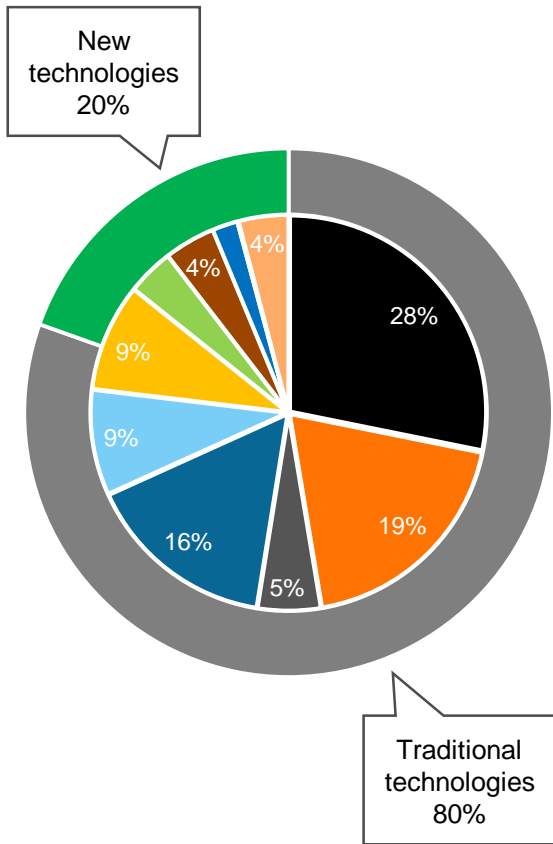


- Onshore wind
- Offshore wind
- Utility PV – fixed axis
- Utility PV – tracking
- Natural Gas – CCGT
- Coal
- Not covered

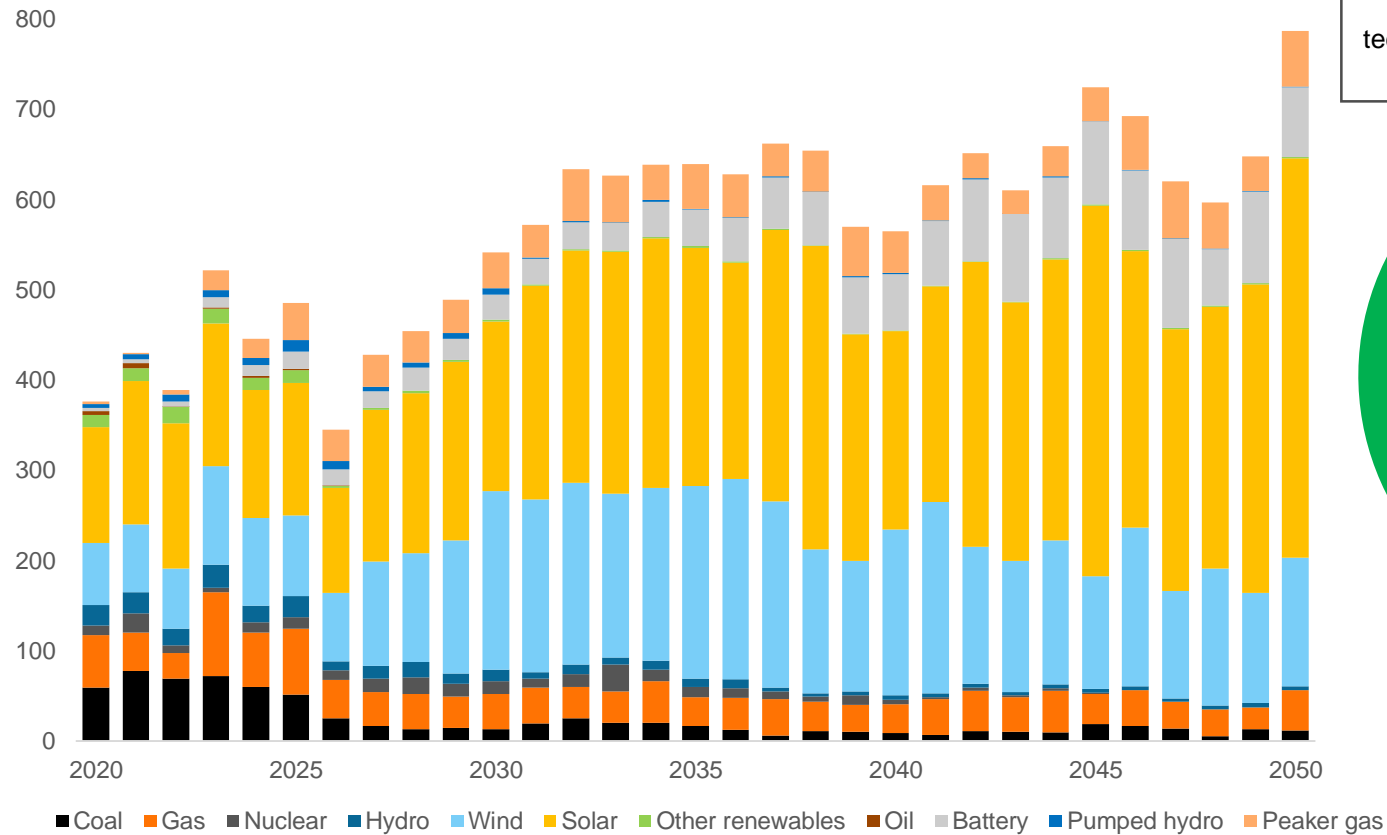
Source: BloombergNEF, Note: Reflective of the cheapest benchmark project for each technology and market

**In 2020, renewable energy projects captured nearly 50% of all new generation built. By 2030, analysts estimate that to rise to 67%.**

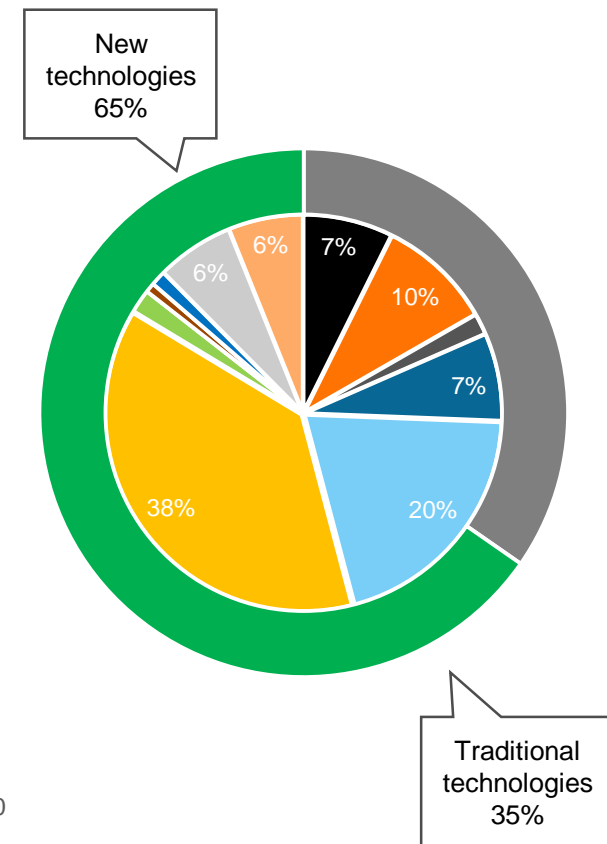
**Capacity mix 2019 (7.4 TW)**



**Annual gross capacity additions 2020–2050 (GW)**

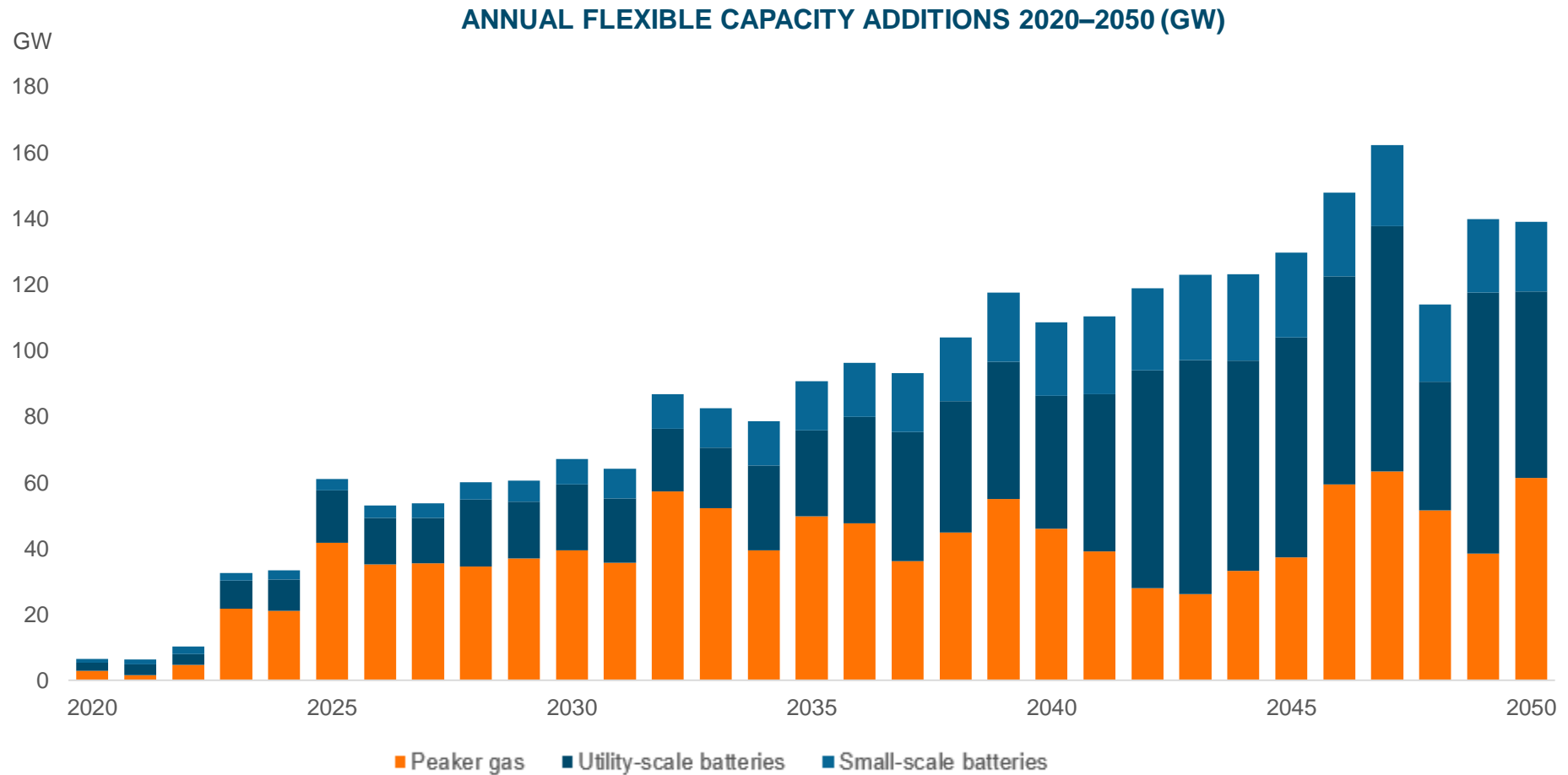


**Capacity mix 2050 (20.4 TW)**

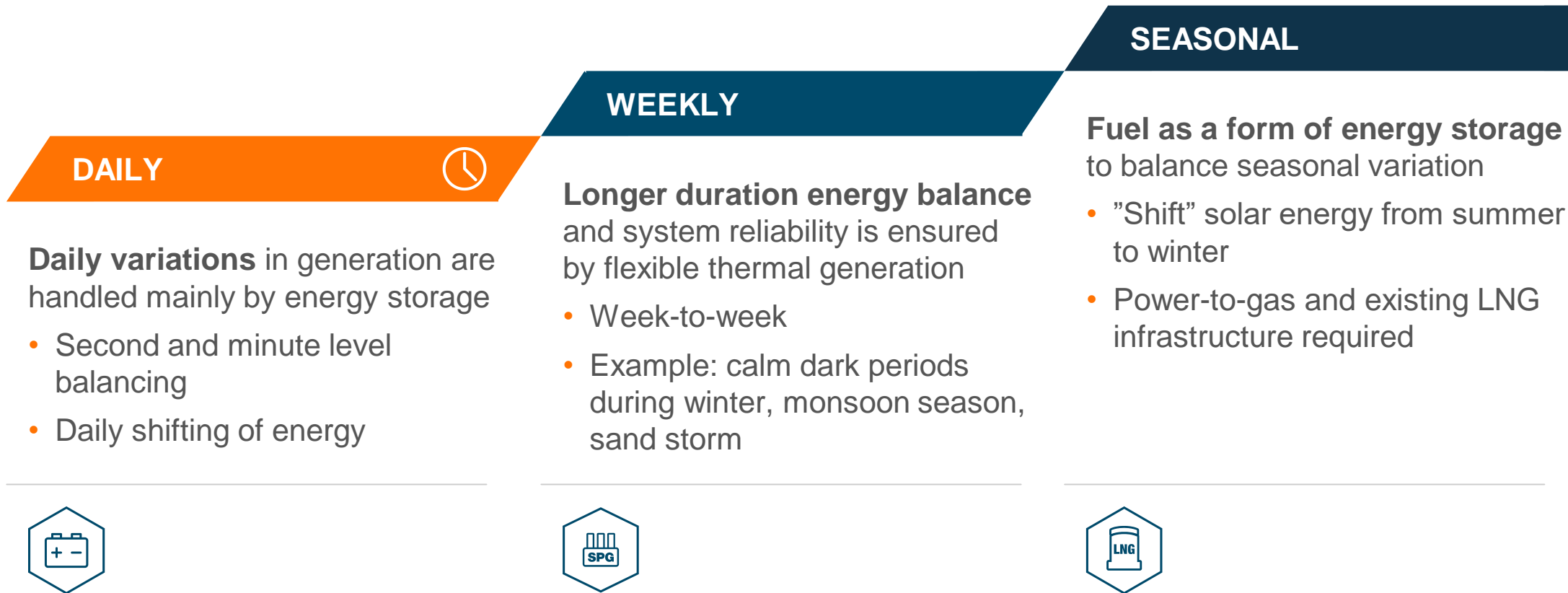


# Flexibility is needed to balance intermittent renewables

Energy storage and Peaker gas CAGR ~30% in the next decade



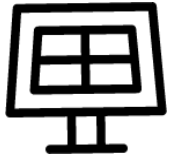
# The 100% renewable energy system requires multiple forms of flexibility



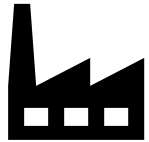
# Global decarbonization agenda accelerates need for renewables and flexibility



To achieve set **climate targets** the energy system needs to be **decarbonised** and transform to a renewable based system



**Renewables** already today provide the **lowest cost bulk generation** in 70% of the world and in 2030 in 100%



Several countries have commitments to **phase out coal and nuclear** and this inflexible capacity will be replaced by renewables and flexible capacity in the form of flexible power plants and storage



Flexibility is needed in the energy system to **maximize the use of renewables**, but also to provide **firm capacity** due to the **intermittent** nature of renewables



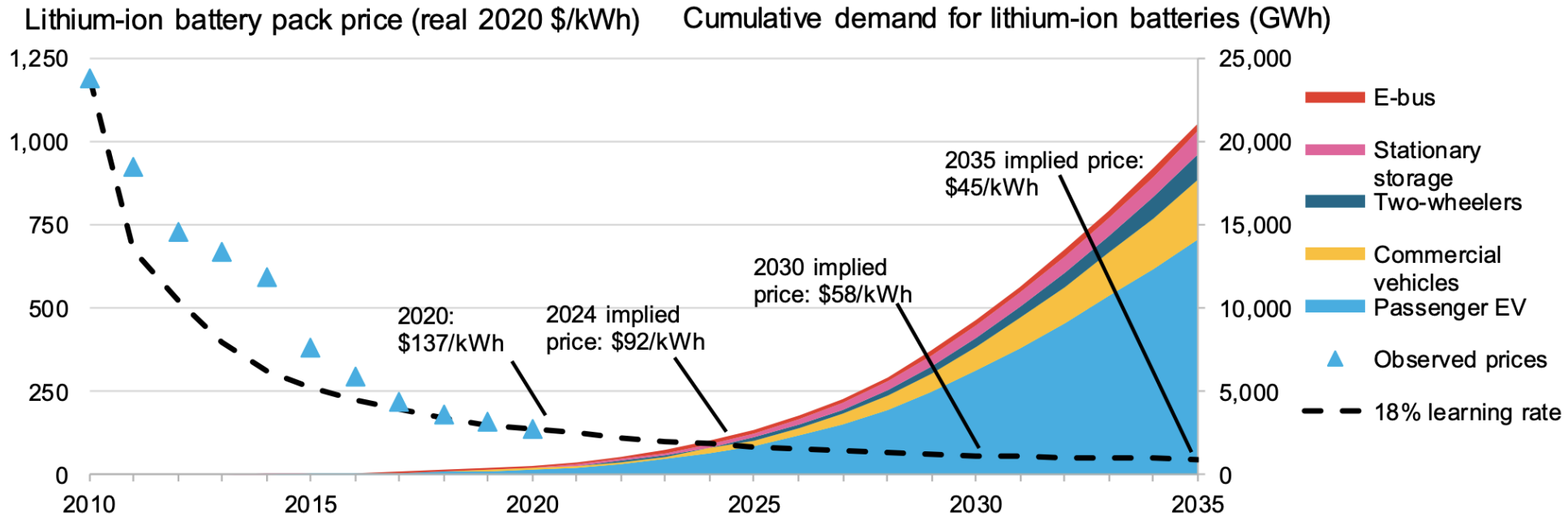
Lack of sufficient balancing capacity in the system will lead to renewable **curtailment**, **system instability** and **higher generation cost**



# Energy storage market

# Industry drivers forming tailwinds for energy storage

Dramatic drop in price makes storage competitive with conventional solutions. Current pricing is supporting accelerated growth both among transportation sector and stationary storage







Source: BloombergNEF

6 December 16, 2020

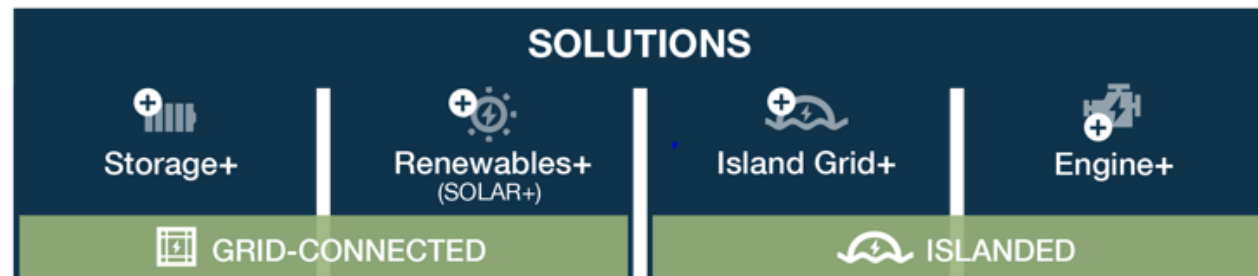
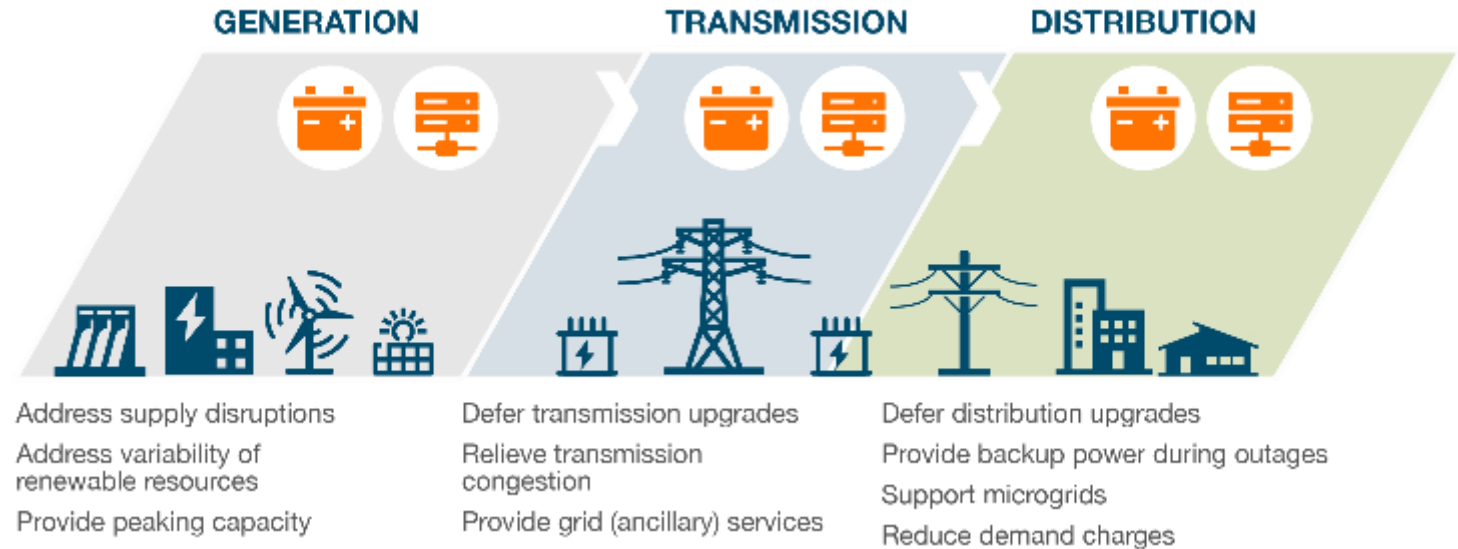
**BloombergNEF**

# Customer, use cases & offering

## Customer types

-  UTILITIES
-  COMMERCIAL USERS
-  INDEPENDENT SYSTEM OPERATORS (ISOs)
-  INDEPENDENT POWER PRODUCERS (IPPs)

## Where energy storage fits in the energy system:



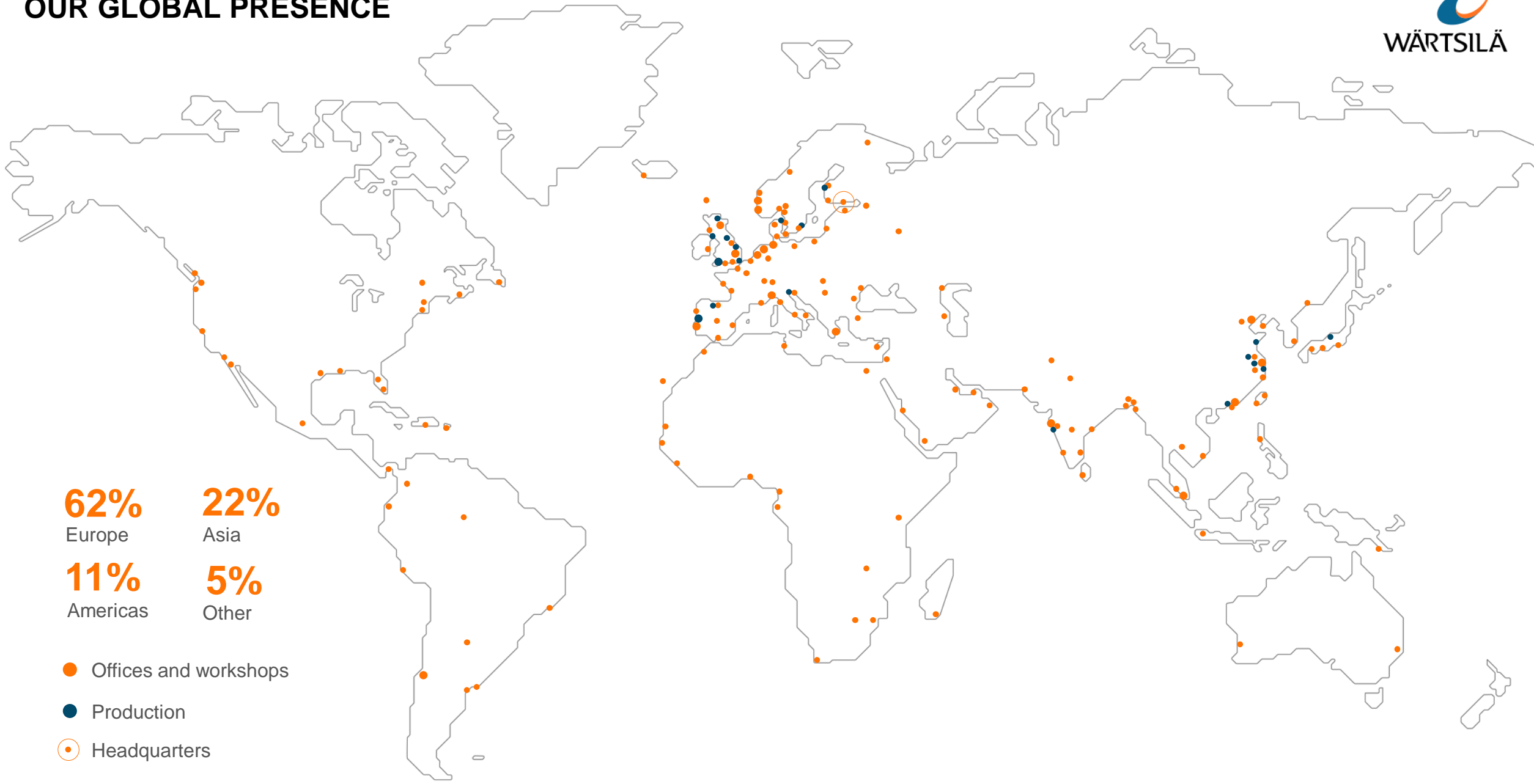
# Wärtsilä Energy role & position

# WÄRTSILÄ ENERGY

Wärtsilä Energy leads the transition **towards a decarbonised and 100% renewable energy future**. We help our customers in the transition by developing market-leading technologies, from future-fuel enabled flexible power plants and hybrid solutions to energy storage and optimisation technology, including the GEMS energy management platform. Wärtsilä Energy's lifecycle services ensure increased efficiency, reliability and guaranteed performance.

Wärtsilä has delivered 74 GW of flexible power plant capacity and more than 80 energy storage systems in 180 countries around the world.

# OUR GLOBAL PRESENCE



**62%**  
Europe

**22%**  
Asia

**11%**  
Americas

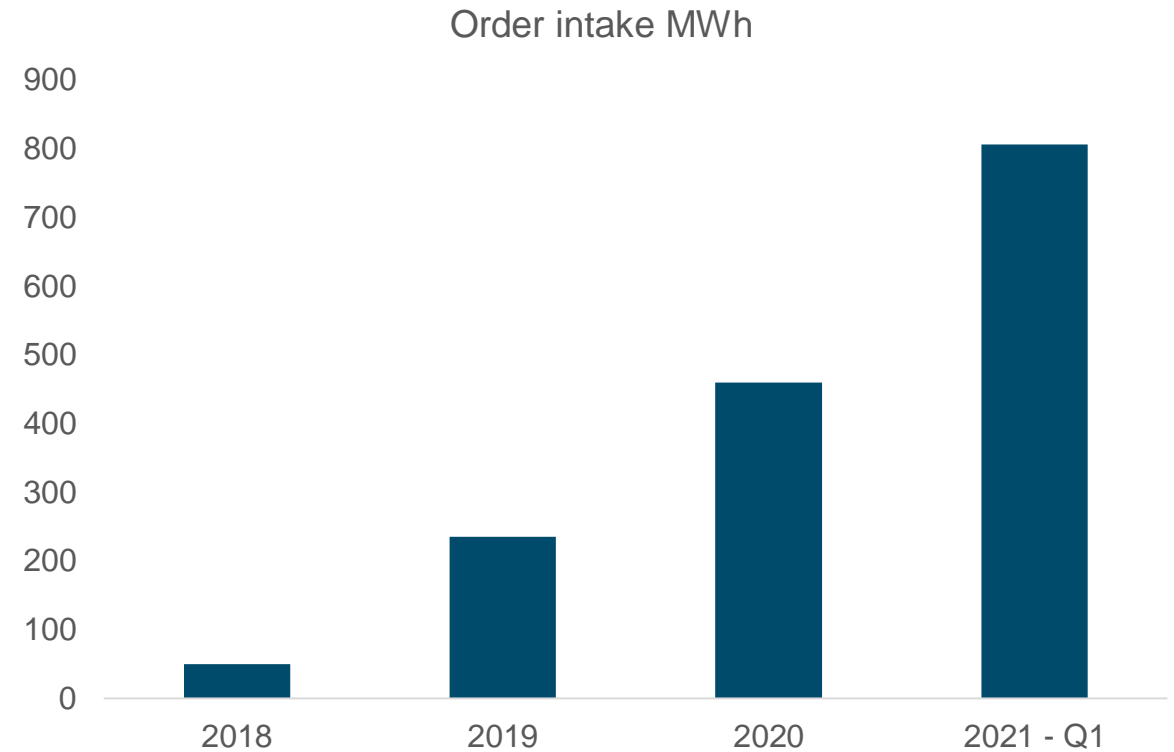
**5%**  
Other

- Offices and workshops
- Production
- Headquarters

# Major breakthrough in energy storage market in 2019 - geared up for future growth

## Energy storage market is growing fast and Wärtsilä is well-positioned in the market

- 10+ years of grid-scale energy storage leadership
- Leading energy management software (GEMS Solutions Suite)
- Global sales, delivery, and services footprint
- Strong client base



# Over 1.5+ GW in operation, deployed or contracted

Highlighted experience in: **grid-scale energy storage**





# Wärtsilä energy storage

# Wärtsilä's **energy storage** expertise:



## Full EPC Capability

- Storage an integral part of emerging infrastructure in high renewables penetration case
- Hybrid Power Plant market



## GEMS Software

- Leading energy management software
- Future-proofing for flexibility and no stranded assets
- Optimisation of technology/asset mix and modelling for best ROI



## Operation & Maintenance based in region

- Global offices



## Optimisation of technology mix for best TCO

(Total cost of ownership = CAPEX + OPEX)

- Technology neutral



## Proven global energy industry expertise

- Clean safety record
- Cyber security

# Wärtsilä Gridsolv Quantum

Flexible design, speed of delivery, optimised energy



Flexible design



Speed of delivery



Ease of deployment



Optimised for use-case



High availability

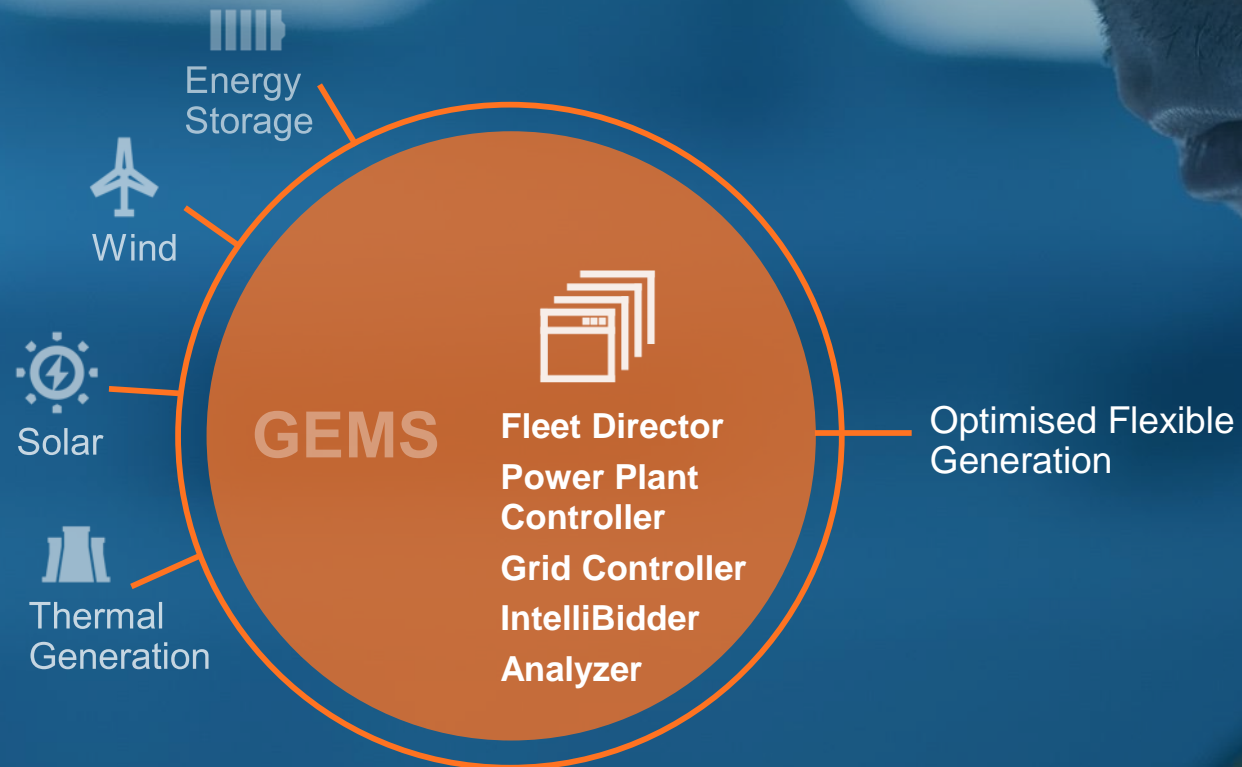


Safety

# 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

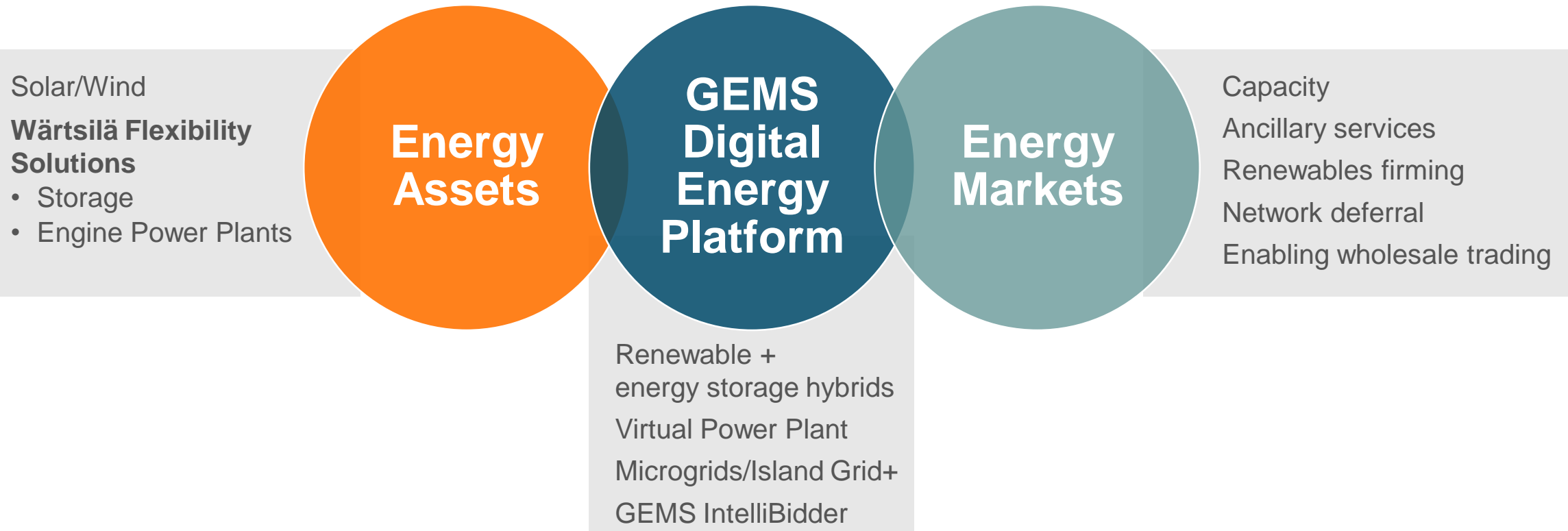
Secure, flexible, scalable

Deployed in **70+** projects globally

# Energy storage market positioning

## Connecting energy assets to energy markets

Energy storage is central to renewable energy transition by providing **flexibility solutions** and **GEMS digital energy platform** which connect energy assets to **energy markets** in technically and economically optimised manner



# Energy storage projects

## Performance optimisation and increased value streams in CAISO

GEMS integrates existing wind while simultaneously optimising multiple generation assets

The system provides **ancillary services** and facilitates **energy arbitrage**; purchasing electricity from the market when prices are low and selling stored energy back into the market when short-term costs rise



**70 MW energy storage and GEMS energy management system** includes full equipment delivery to a renewable developer in the California Independent System Operator (CAISO) energy market



Storage system is **co-located with wind** at an existing wind farm in California; Wärtsilä's largest energy storage deployment tied to a renewable resource in the western U.S.

## Grid control, integration and optimisation

Boosts **renewable energy consumption**

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

Delivers both **economic and environmental benefits**

**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





## Microgrid control at a remote off-grid African mine

**GEMS** to optimise 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

## 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 will reach COD in summer 2021.



Cowley, Oxford



Kemsley, Kent



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



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



# Enabling a **100% renewable** energy future

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



[storage.wartsila.com](https://storage.wartsila.com)