“Greener Together” Webinar: How Wartsila’s solution to facilitate green energy to make factory a greener power consumer

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GLOBAL LEADER

in decarbonisation of Marine and Energy markets

FOUNDED IN
1834

REVENUE (EUR)
~5BN ~50亿

ACTIVE IN
+70 countries

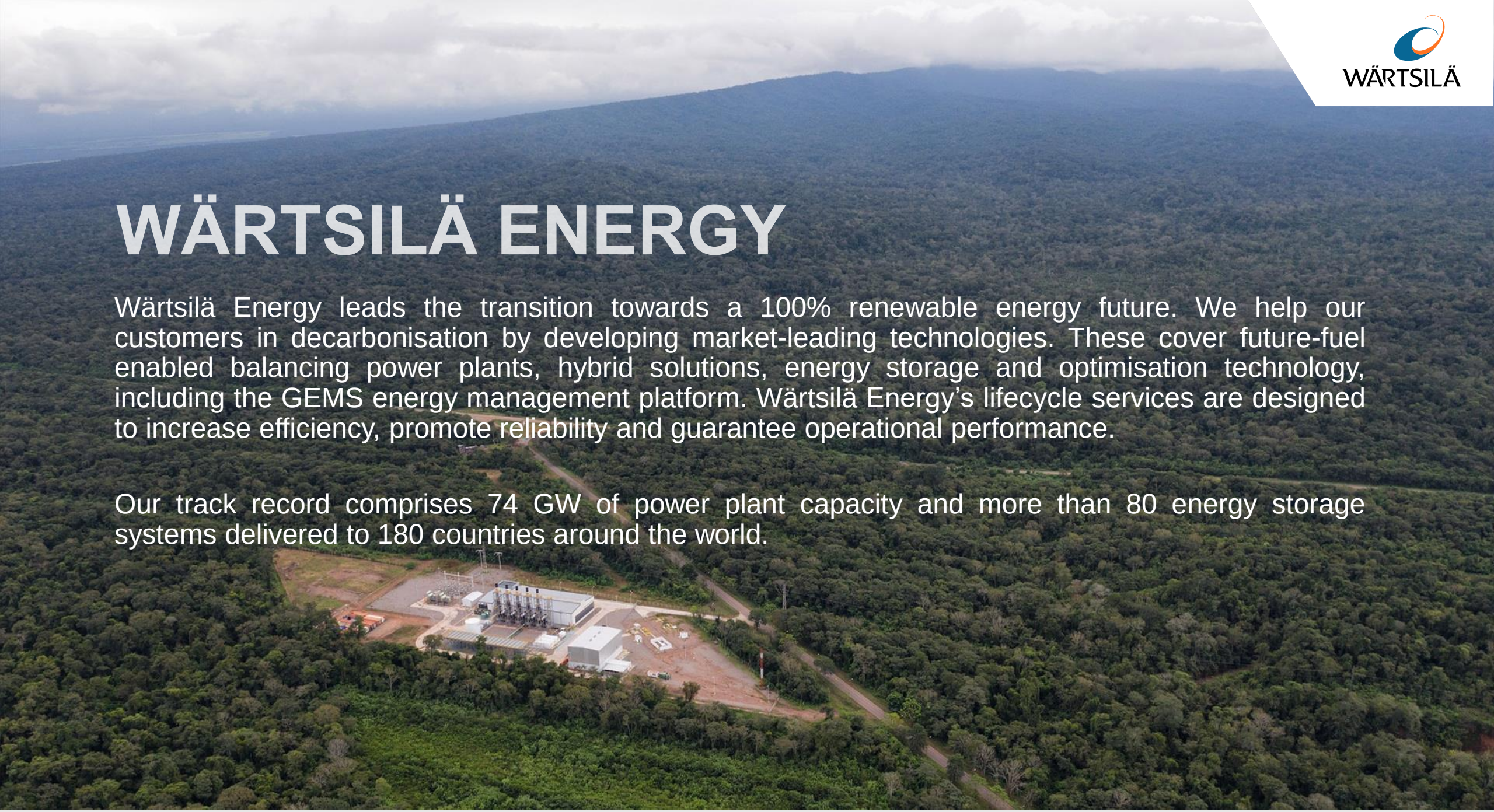
OUR PERSONNEL APPROX.
17,500

Financials are for fiscal year 2020. Location, personnel and nationalities figures are approximations based on the status in December 2020.

WÄRTSILÄ ENERGY

Wärtsilä Energy leads the transition towards a 100% renewable energy future. We help our customers in decarbonisation by developing market-leading technologies. These cover future-fuel enabled balancing power plants, hybrid solutions, energy storage and optimisation technology, including the GEMS energy management platform. Wärtsilä Energy's lifecycle services are designed to increase efficiency, promote reliability and guarantee operational performance.

Our track record comprises 74 GW of power plant capacity and more than 80 energy storage systems delivered to 180 countries around the world.

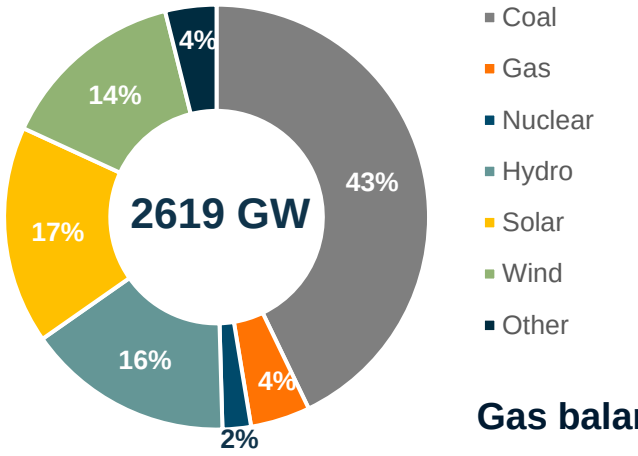


ICE Plant – Ideal for various duties

1 FAST START	2 BASELOAD	3 LOAD FOLLOWING	4 LOW-LOAD OPERATION	5 FAST STOP
VALUE • Grid stability support • Ancillary Service market	**VALUE** • Competitive life cycle generation cost • Any output, same generation cost	**VALUE** • Wind and solar balancing • Ancillary Service market	**VALUE** • ”low load” = No load • Not running when no revenue	**VALUE** • Not running when no revenue, • PV enabler
FEATURES • Power to grid in 30s • 2-5 min to full power • Start up efficiency	**FEATURES** • Highest simple cycle efficiency • Multi unit多机组 → high firm capacity • Flexicycle ™	**FEATURES** • Part load efficiency unaffected • No EOH cost for cycling	**FEATURES** • 1min shutdown • No minimum down time • Zero fuel cost • Zero emissions	**FEATURES特性** • 1min shutdown • No minimum up time • No EOH calculation

CHINA POWER MARKET OVERVIEW

China Installed Capacity in 2022

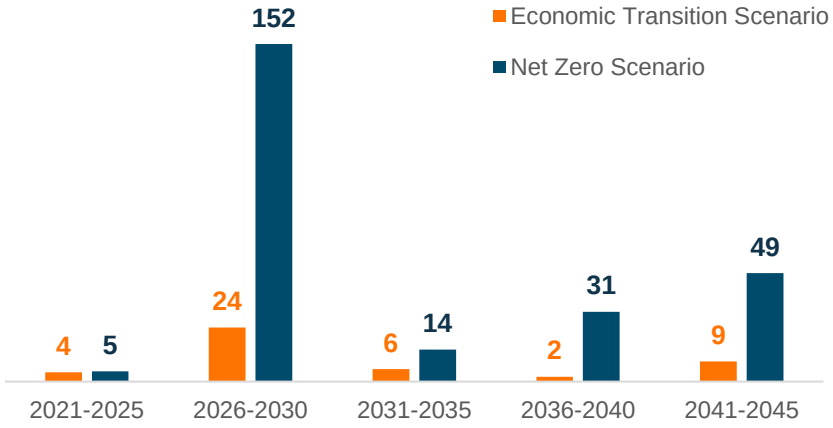


Capacity additions from 2022 to 2030

Gas	144 GW	+ 121%
Solar	979 GW	+ 226%
Wind	839 GW	+ 225%
BESS	126 GW	+ 1575%

The growth of renewables in China is set to continue with 80% of the capacity addition coming from solar and wind

Gas balancer capacity addition in China (GW)



China is the world's third-largest country by gas power capacity. BNEF estimates that 30 GW of gas balancer will be added this decade

- total power demand of China in 2022 reached 8537 TWh (+3.6%)
- total installed capacity reached 2564 GW (+7.8%)
- in which wind power reached 370GW (+11.2%), solar PV reached 390GW (+28.1%)
- yearly investment in the power generation sector reached 721 billion CNY (+22.8%, about 98 billion euro).

Sources: BNEF NEO 2022 – Economic Transition Scenario (ETS)

The Way Forward and Challenges

- Build and integrate considerably more renewable energy
- Reduce its reliance on coal-fired power production
- Unpredictable nature of weather dependent sola and wind power requires a highly flexible power system

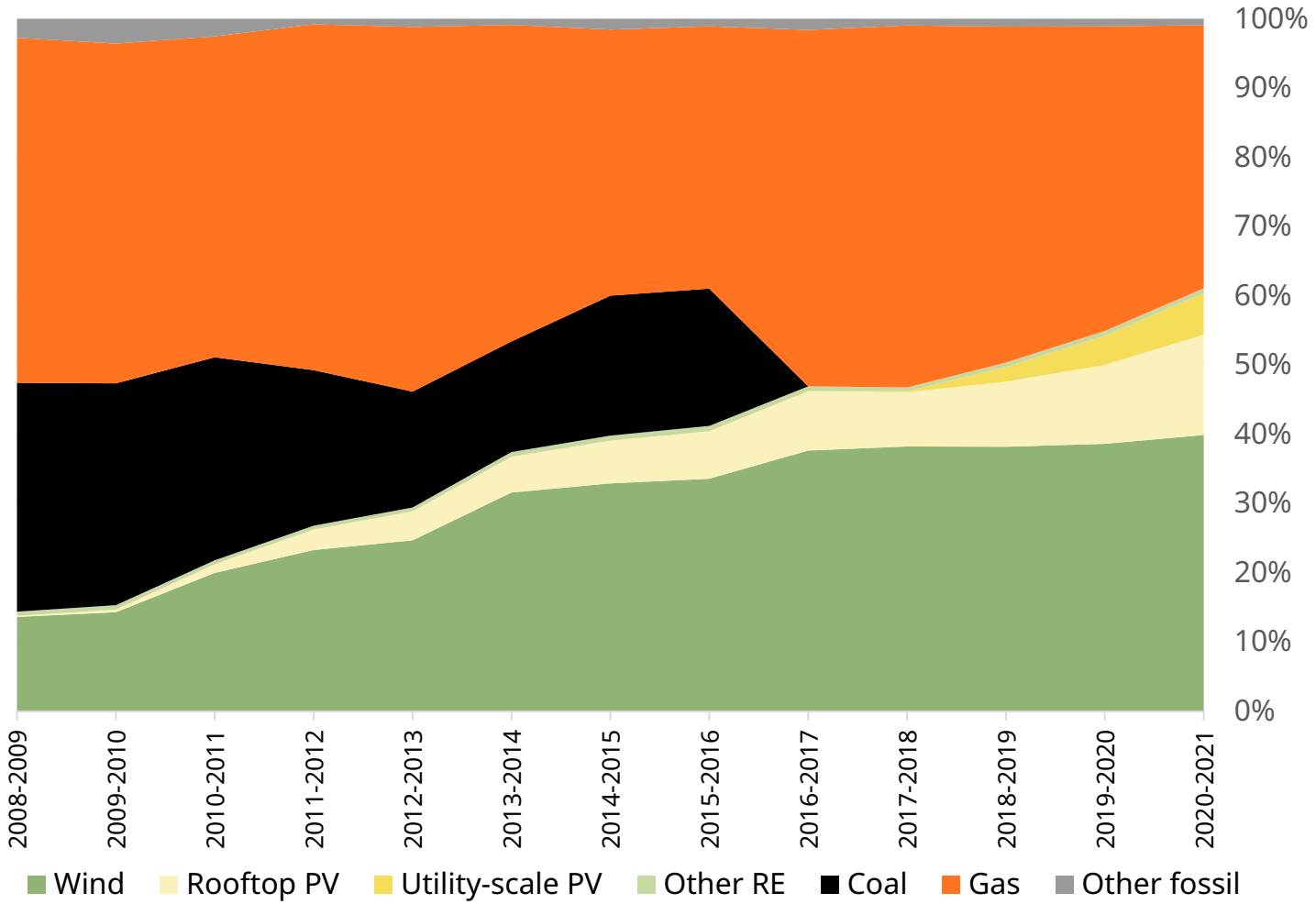
China Carbon Neutrality Target

In September 2020, China announced that it would aim to reach a peak in its carbon dioxide (CO2) emissions before 2030 and achieve carbon neutrality by 2060

South Australia’s enegry transition

From 0% to 60% renewable generation in 14 years

South Australia’s generation mix



Last coal plant shutdown
May 2016

South Australia’s first thermal balancer, Barker Inlet Power Station, delivered
December 2019

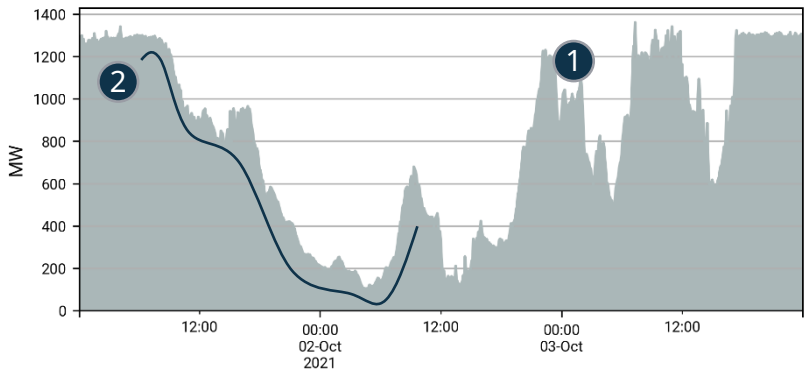
Renewable energy generation reached 100% demand nearly every day
October 2021

Wind and solar output vary across all timescales

1 Seconds and minutes

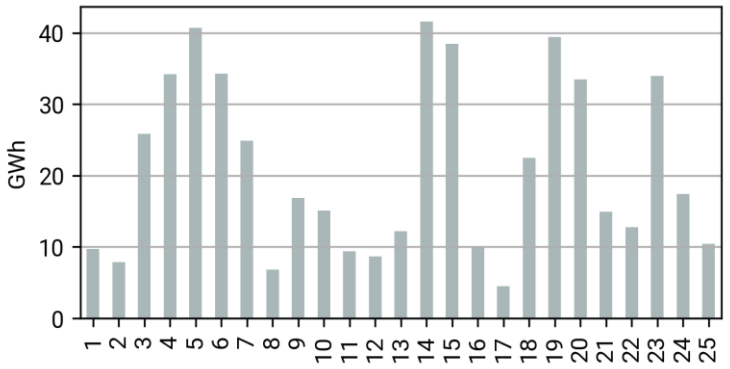
2 Intraday

VRE output, MW



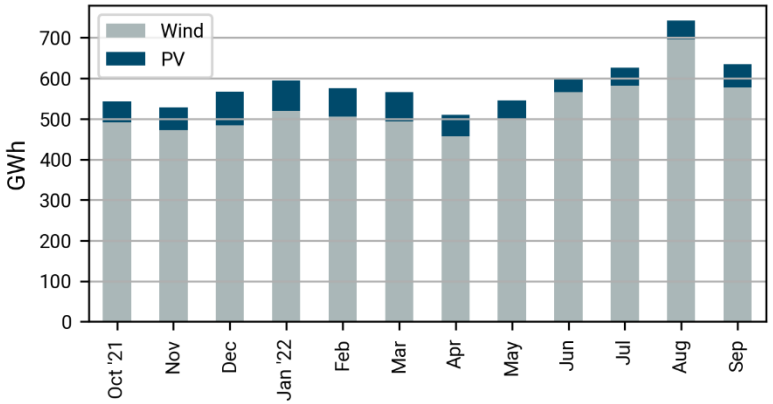
3 Day-to-day

VRE daily output, June 2022



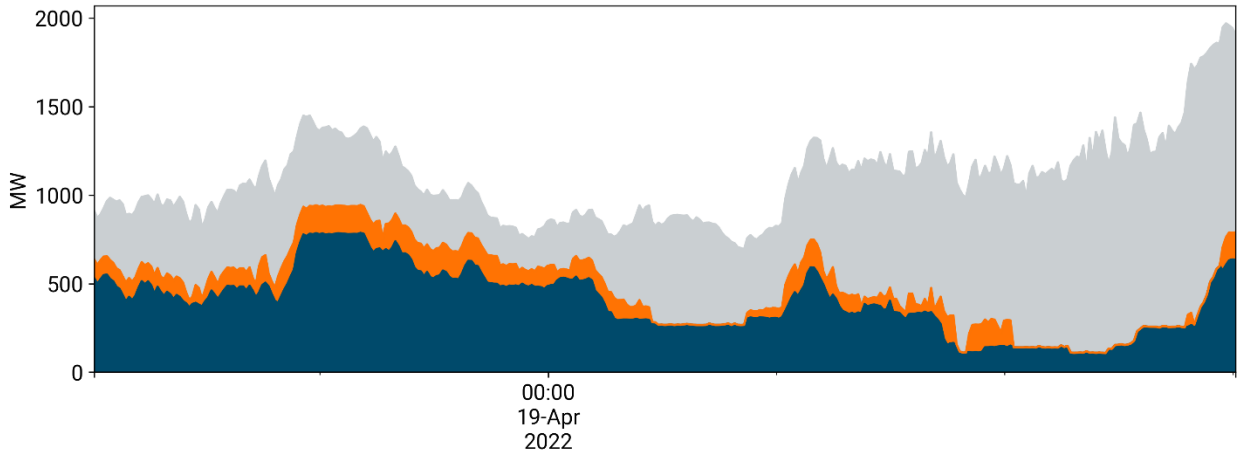
4 Seasonal

VRE monthly output



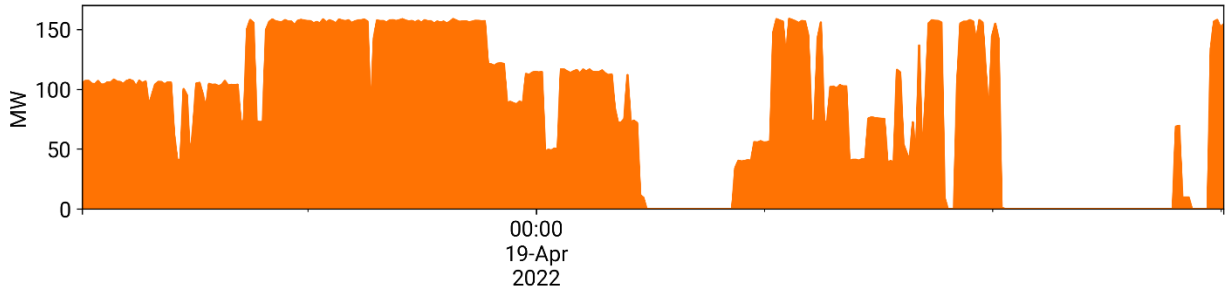
Some **dispatchable assets needed** to be flexible and able to **balance up to the minute-level**, as well as to operate at lower capacity factors (20-50%), alternating high-low production to **cover days of low VRE.**

Continuous balancing of renewables

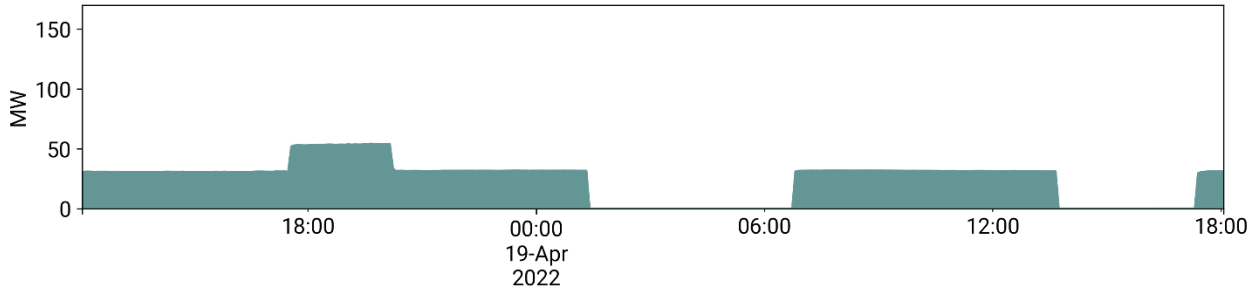


Renewables
Dispatchable fleet
Barker Inlet
Hallett

Barker Inlet
engines



Hallett
Aeroderivative gas turbine



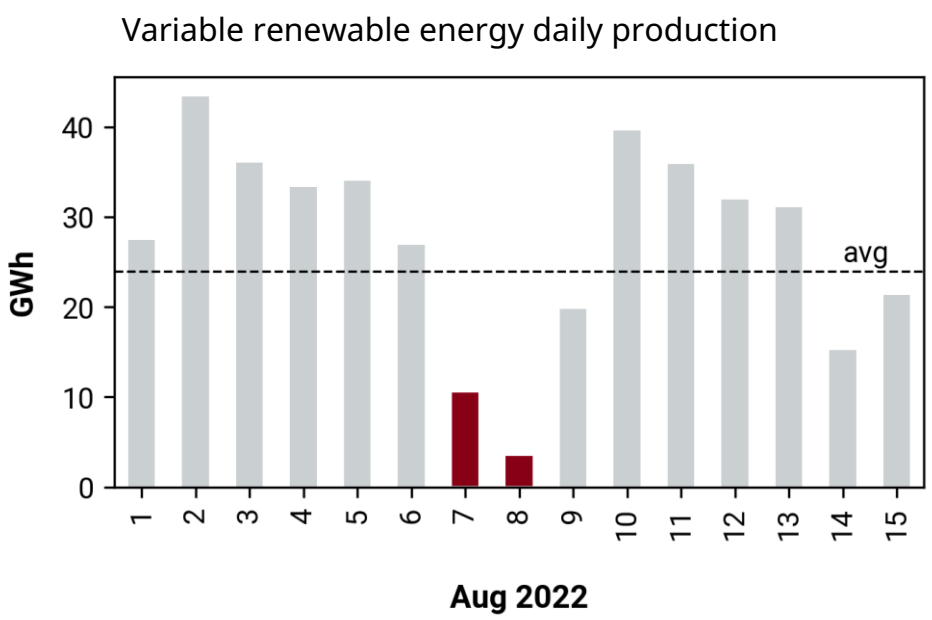
Continuous ramping

Made possible by modular units that can start and stop multiple times per day.

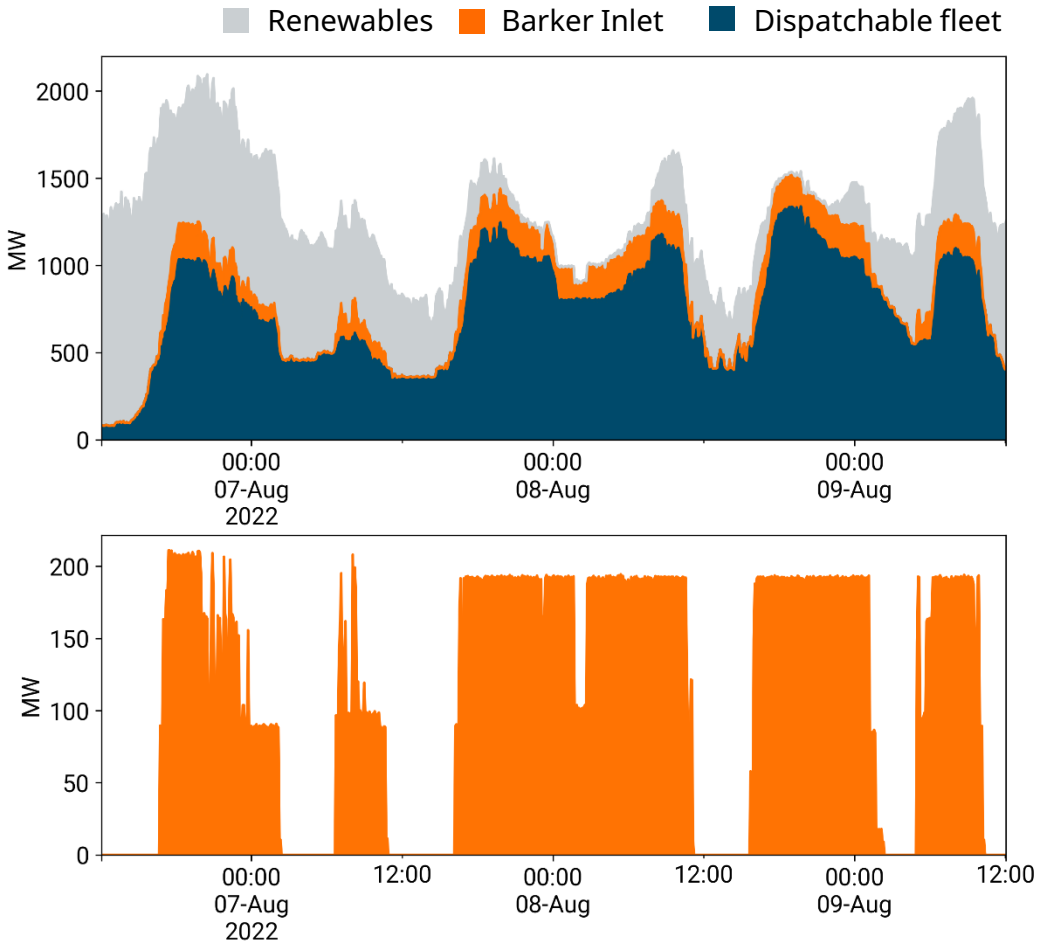
ON/OFF pattern

Preference to operate each turbine at full load.

Long continuous operation needed to cover days of low renewable output



Low VRE output can even span a few days, a gap that is more economically filled by a thermal balancer rather than storage.



ICE SOLUTION TO FACILITATE GREEN ENERGY TO MAKE FACTORY A GREENER POWER CONSUMER

- Improve and ensure grid stability
- Allow grid to connect more renewable energy
- As consequence, the factory as power consumer will utilize more green energy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