



The Role of Power Reserves in Future Energy Markets

Future Energy Solutions - November 9th, 2022

1. Neoen in a few words
2. Power Reserves at Neoen
3. Roles of Power Reserves



About us



333.6 M€

Full-year revenue
in 2021

Neoen's energy sales
were up by 12% in 2021
compared to 2020



5.6 GW

In operation
or under construction

Total capacity in operation
or under construction at end
of June 2022.



16 countries

International
player


N°1 French independent
power producer of
renewable energy.


Leading independent
producer in Australia.


One of the world's leading
producers of exclusively
renewable energy.



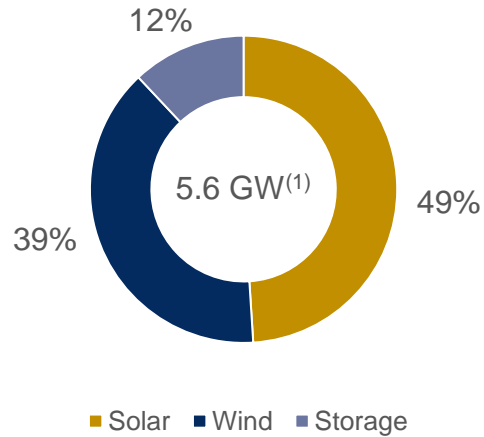
≥ 10 GW

Target
for 2025

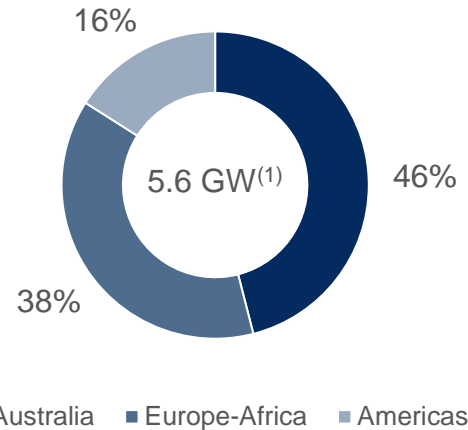
We are aiming for 10 GW
in operation or under
construction by end 2025.

Key figures

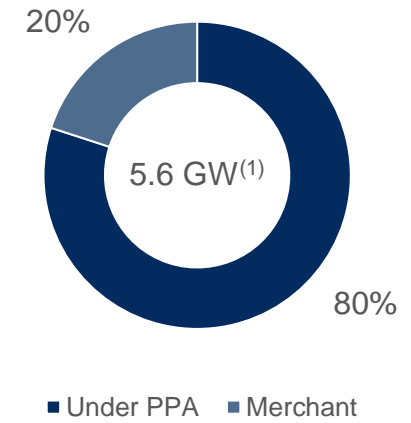
Technology breakdown⁽¹⁾



Geographic breakdown



Revenue type breakdown⁽²⁾



2,727 MWp
Solar



2,193 MW
Wind



642 MW
Storage



4 continents
16 countries



345
Employees



224 M€
Revenue
H1 2022



5,72 B€
Balance
H1 2022



175 M€
EBITDA
H1 2022

(1) Capacity in operation or under construction as of June 30, 2022

(2) Weighted average by MW for assets in operation or projects under construction as of June 30, 2022

International operations



Neoen in Finland



- **Hedet**

In operation: 81 MW



- **Mutkalampi**

Under construction: 404 MW



- **Björkliden**

Under construction: 41 MW



- **Storage**

In operation: 30 MW / 30 MWh



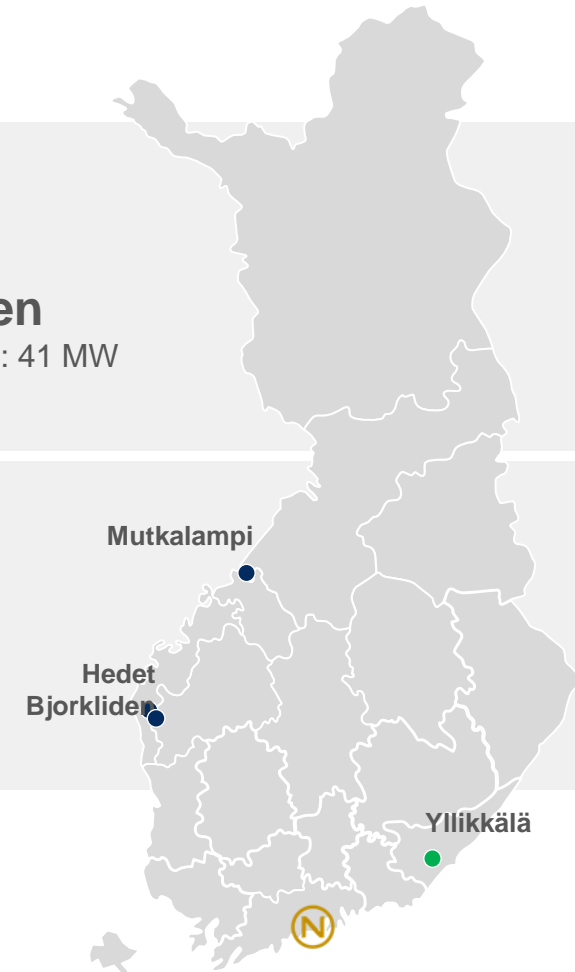
Office

Helsinki

Total Capacity⁽¹⁾

Total capacity in operation: 111 MW

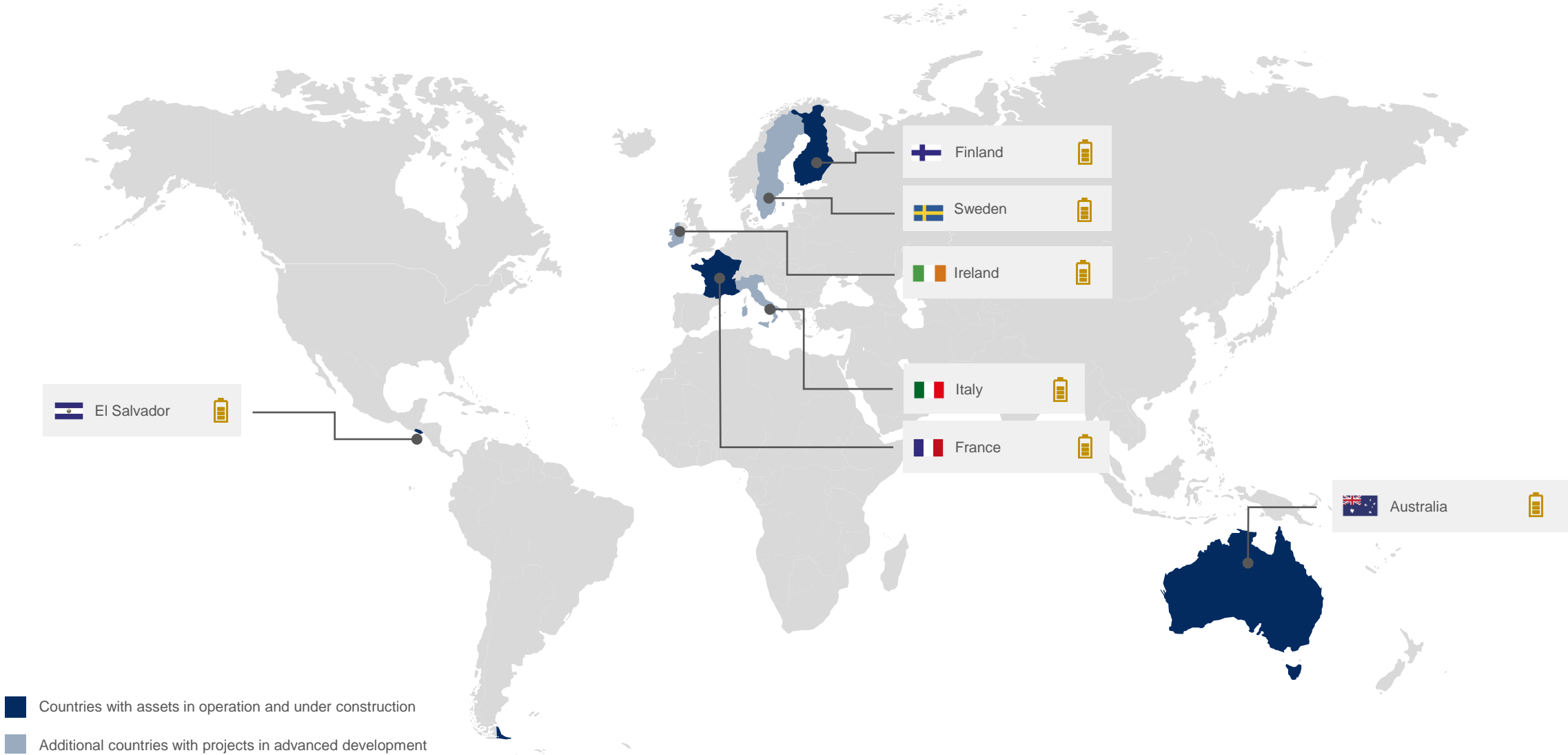
Total capacity under construction: 444 MW



Power Reserves at Neoen



We operate Power Reserves in 4 different countries



Over 500 MW of storage operating across 3 continents (1)



DeGrussa 2015
Hybrid solar + storage power plant



6 MW / 1.4 MWh

SAMSUNG



Hornsdale Power Reserve 2017
Extended to 150 MW / 193.5 MWh in 2020 - The world's first big battery



150 MW / 193.5 MWh

TESLA



Victorian Big Battery 2021
One of the world's largest batteries



300 MW / 450 MWh

TESLA



Bulgana 2021
Hybrid wind farm+ storage power plant



20 MW / 34 MWh

TESLA

Over 500 MW of storage operating across 3 continents (2)



Azur storage 2018
Grid battery storage facility



Nidec



6 MW / 6 MWh

LG Chem



Albireo Power Reserve 2020
First storage power plant in Central America



Nidec



3 MW / 2 MWh

LG Chem



Antugnac storage 2022
Grid battery storage facility



saft



8 MW / 8 MWh



Pod-Tredan storage 2022
Grid battery storage facility



Entech
smart energies



8 MW / 8 MWh

Over 500 MW of storage operating across 3 continents (3)



Yllikkälä Power Reserve 2020
The Nordics' largest battery storage unit



Nidec



30 MW / 30 MWh

LG Chem

Roles of Power Reserves

Output
50.

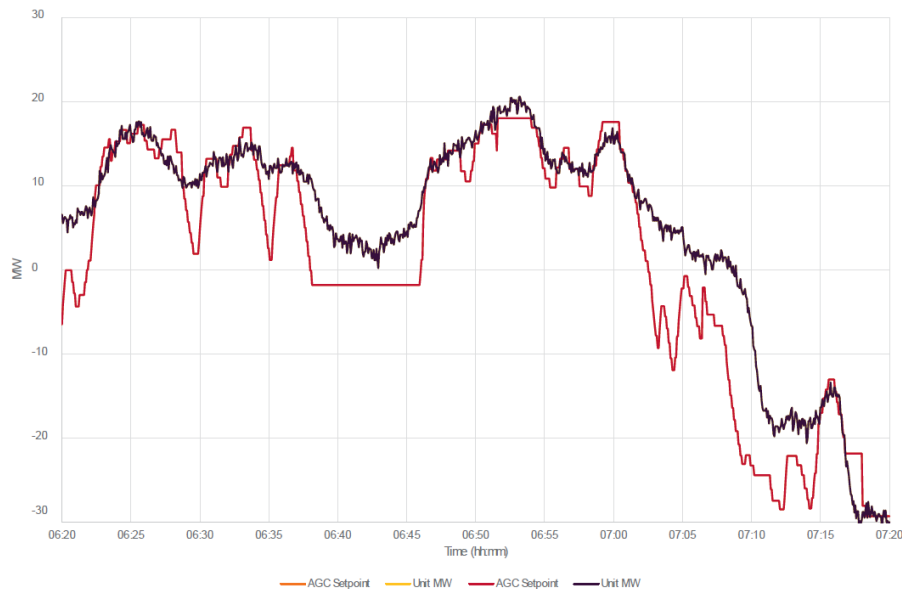
Target
50.

Output
45.

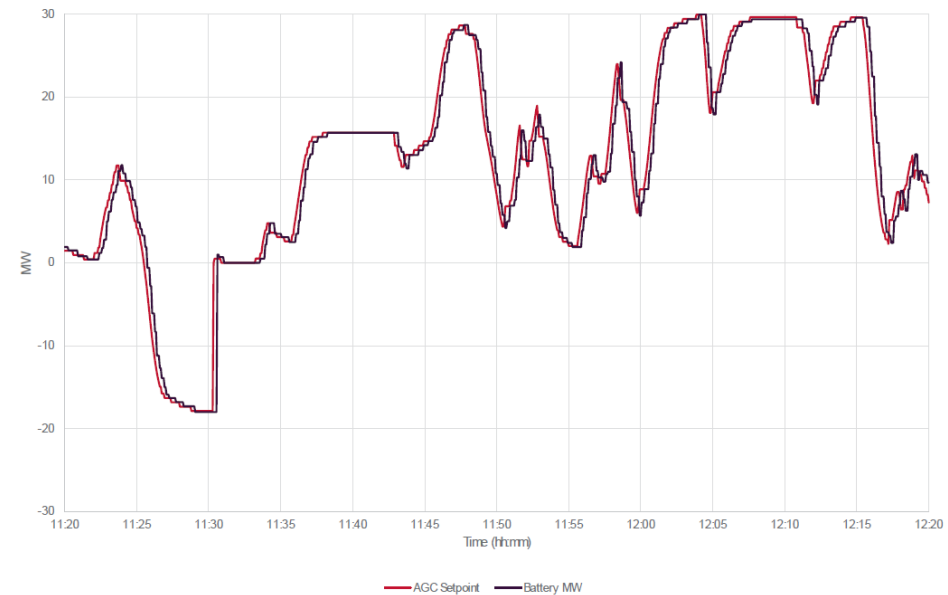
Reliable Multi-Service Providers in Today's Markets

- Power Reserves are **key contributors to Grid Stability**

- Battery Energy Storage Systems can react almost instantaneously and very accurately to grid frequency deviations
- Very performant and very competitive technology to deliver Frequency Regulation Services
- Already widely deployed in many Power Systems across the globe today



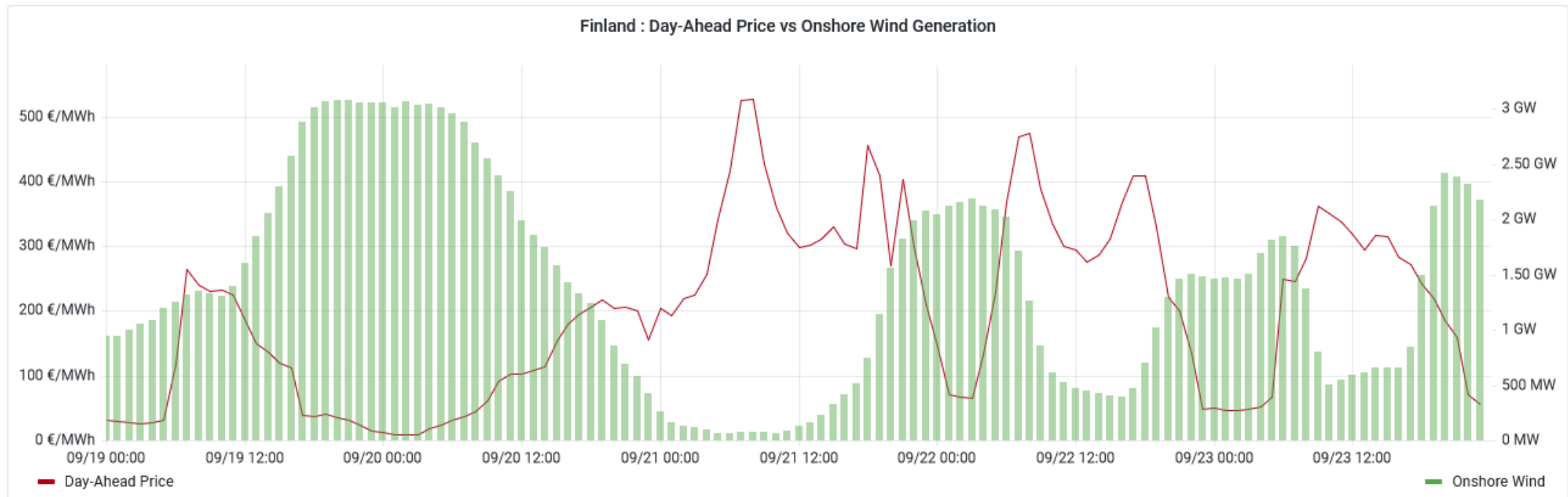
Accuracy and speed of Frequency Regulation response – large conventional steam turbine



Accuracy and speed of Frequency Regulation response – Hornsdale Power Reserve

Reliable Multi-Service Providers in Today's Markets

- Power Reserves enable **further renewable penetration**
 - **Arbitrage in Wholesale Markets** (Day-Ahead, Intraday) to shift power from high-renewable-generation hours to low-renewable-generation hours
 - Storage Capacity can also be **offered to Grid Operators in Balancing and Regulating markets** to balance the system, providing close to real-time flexibility to absorb renewable intermittency and forecast errors



Tailored Services for Futures Energy Markets

- **Network Support**

- BESS can bring critical support in times of exceptional events affecting grid integrity
- Capacity is reserved at all time to **deliver warp-speed response if specific event happens:**
 - Major default on a HV line
 - Outage of a large generation unit

- ➔ Our Victorian Big Battery will provide a **250 MW/125 MWh guarantee to the Australian Grid Operator over the next 10 years**
- ➔ Our Yllikkäla Power Reserve is **actively participating to the OL3 System Protection Scheme** during its commissioning phase



Tailored Services for Futures Energy Markets

- **Synthetic Inertia**

- More and more non-synchronous generators (wind, solar) penetrate power systems, driving inertia of power systems down at times of high renewable generation
- BESS can be operated to replicate mechanical inertia by responding to Rate of Change of Frequency (RoCoF)
- ➔ Developed, trialed and implemented at our Hornsdale Power Reserve in Australia

- **Virtual Battery**

- Provides flexibility benefits of Power Reserves to customers who don't own BESS
- Customers send virtual dispatch orders (charge/discharge)
- Virtual orders are financially settled against an actual market settlement index (typically, regulating price)
- Aggregated virtual orders are backed by a physical BESS
- ➔ Neoen is delivering a 70 MW virtual battery to AGL in Australia

- **Baseload PPAs**

- By pooling storage and renewable assets, **firm baseload profiles can be delivered to offtakers** over the long-term
- ➔ Neoen is delivering a 70 MW baseload PPA to BHP by combining wind, storage and energy management expertise

➔ **Leverage Power Reserve flexibility to deliver tailored, customer-specific services**

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A close-up, low-angle shot of a white wind turbine against a clear, vibrant blue sky. The turbine's three blades are visible, with one blade extending towards the top right corner of the frame. The tower of the turbine is visible on the right side.

Thank you for your attention

NEOEN

ARGENTINA AUSTRALIA CANADA CROATIA ECUADOR EL SALVADOR FINLAND FRANCE IRELAND ITALY JAMAICA MEXICO MOZAMBIQUE PORTUGAL SWEDEN ZAMBIA