Grid-scale energy storage paramaribo

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Grid-scale storage plays an important role in the Net Zero Emissions by 2050 Scenario, providing important system services that range from short-term balancing and operating reserves, ancillary services for grid stability and deferment of investment in new transmission and distribution lines, to long-term energy storage and restoring grid operations following a blackout.

pumped-storage hydropower is the most widely used storage technology and it has significant additional potential in several regions. Batteries are the most scalable type of grid-scale storage and the market has seen strong growth in recent years. Other storage technologies include compressed air and gravity storage, but they play a comparatively small role in current power systems. Additionally, hydrogen - which is detailed separately - is an emerging technology that has potential for the seasonal storage of renewable energy.

While progress is being made, projected growth in grid-scale storage capacity is not currently on track with the Net Zero Scenario and requires greater efforts.

The total installed capacity of pumped-storage hydropower stood at around 160 GW in 2021. Global capability was around 8 500 GWh in 2020, accounting for over 90% of total global electricity storage. The world"s largest capacity is found in the United States. The majority of plants in operation today are used to provide daily balancing.

The grid-scale battery technology mix in 2022 remained largely unchanged from 2021. Lithium-ion battery storage continued to be the most widely used, making up the majority of all new capacity installed.

The rapid scaling up of energy storage systems will be critical to address the hour-to-hour variability of wind and solar PV electricity generation on the grid, especially as their share of generation increases rapidly in the Net Zero Scenario. Meeting rising flexibility needs while decarbonising electricity generation is a central challenge for the power sector, so all sources of flexibility need to be tapped, including grid reinforcements, demand-side response, grid-scale batteries and pumped-storage hydropower.

Grid-scale battery storage in particular needs to grow significantly. In the Net Zero Scenario, installed grid-scale battery storage capacity expands 35-fold between 2022 and 2030 to nearly 970 GW. Around 170 GW of capacity is added in 2030 alone, up from 11 GW in 2022. To get on track with the Net Zero Scenario, annual additions must pick up significantly, to an average of close to 120 GW per year over the 2023-2030 period.

Based on cost and energy density considerations, lithium iron phosphate batteries, a subset of lithium-ion batteries, are still the preferred choice for grid-scale storage. More energy-dense chemistries for lithium-ion batteries, such as nickel cobalt aluminium (NCA) and nickel manganese cobalt (NMC), are popular for home

energy storage and other applications where space is limited.

Besides lithium-ion batteries, flow batteries could emerge as a breakthrough technology for stationary storage as they do not show performance degradation for 25-30 years and are capable of being sized according to energy storage needs with limited investment. In July 2022 the world"s largest vanadium redox flow battery was commissioned in China, with a capacity of 100 MW and a storage volume of 400 MWh.

Moreover, the impacts of Russia"s invasion of Ukraine are also apparent in the battery metals market. Both cathode (nickel and cobalt) and anode (graphite) materials are affected. Russia is the largest producer of battery-grade Class 1 nickel, accounting for 20% of the world"s mined supply. It is also the second and fourth largest producer of cobalt and graphite respectively.

Ranging from mined spodumene to high-purity lithium carbonate and hydroxide, the price of every component of the lithium value chain has been surging since the start of 2021. 2022 saw the first increase in the price of lithium-ion batteries since 2010, with prices rising by 7% compared to 2021. Some relief was observed only in the first quarter of 2023.

Global investment in battery energy storage exceeded USD 20 billion in 2022, predominantly in grid-scale deployment, which represented more than 65% of total spending in 2022. After solid growth in 2022, battery energy storage investment is expected to hit another record high and exceed USD 35 billion in 2023, based on the existing pipeline of projects and new capacity targets set by governments.

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