OPPORTUNITY 42

SCOPE TRANSITIONAL

UNCERTAINTIES

Technology, Nature

MEGATRENDS

Pushing the Boundaries on Energy

TRENDS

3D Printing
Artificial intelligence
Net Zero
Transforming Energy
New Materials

SECTORS IMPACTED

Automotive, Aerospace & Aviation
Chemicals & Petrochemicals
Communication Technologies & Systems
Consumer Goods, Services & Retail
Data Science, AI & Machine Learning
Energy, Oil, Gas & Renewables
Health & Healthcare
Immersive Technologies
Logistics, Shipping & Freight
Manufacturing
Materials & Biotechnology
Metals & Mining
Real Estate
Utilities

What if the future of batteries is internal?

PERPETUAL POWER

Innovative battery energy storage redesign using non-lithium or minimal lithium materials and advanced machine learning offers opportunities for flexibility, reliability, and sustainable applications in various sectors.

WHY IT MATTERS TODAY

Between net-zero commitments by companies[843] and nations[844] around the world, along with the global push for affordable, reliable, decarbonised electrical systems,[845] the need for energy storage solutions will continue to grow at a CAGR of 8.5%, reaching nearly $360 billion by 2028.[846] Soaring demand for electric vehicles,[847] coupled with growth in solar and wind energy installations – as well as the need to address intermittent output – will further increase demand.[848]

Batteries, especially lithium-ion (Li-ion) batteries, remain the most common energy storage method.[849] Energy storage through batteries is key to decarbonising the transport and mobility sectors and supporting off-grid energy.[850] Australia, Chile, and China are the largest producers of lithium,[851] and Li-ion battery demand is expected to grow by 27% annually to 2030 to reach 4,700GWh of energy.[852] Over 80% of this growth is driven by demands in mobility, and nearly 40% of that demand comes from China.[853] However, besides degrading over time,[854] overheating, and limited storage capacity,[855] Li-ion batteries – with nickel and cobalt – are considered rare Earth metals[856] or critical minerals[857] which require extreme forms of mining and extraction with environmental and social impacts.[858]

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OPPORTUNITY

Beyond new rare raw materials, superior, cost-effective batteries may be possible through innovative battery redesign using non-lithium, easily available materials.[859] Enabled by advanced machine intelligence,[860] batteries are redesigned internally to optimise energy generation and storage combining materials and leading to improved performance whether in decarbonised transport and electric vehicles,[861] electric aeroplanes,[862] or grid-connected or off-grid energy powering remote education, work, and health services.[863]

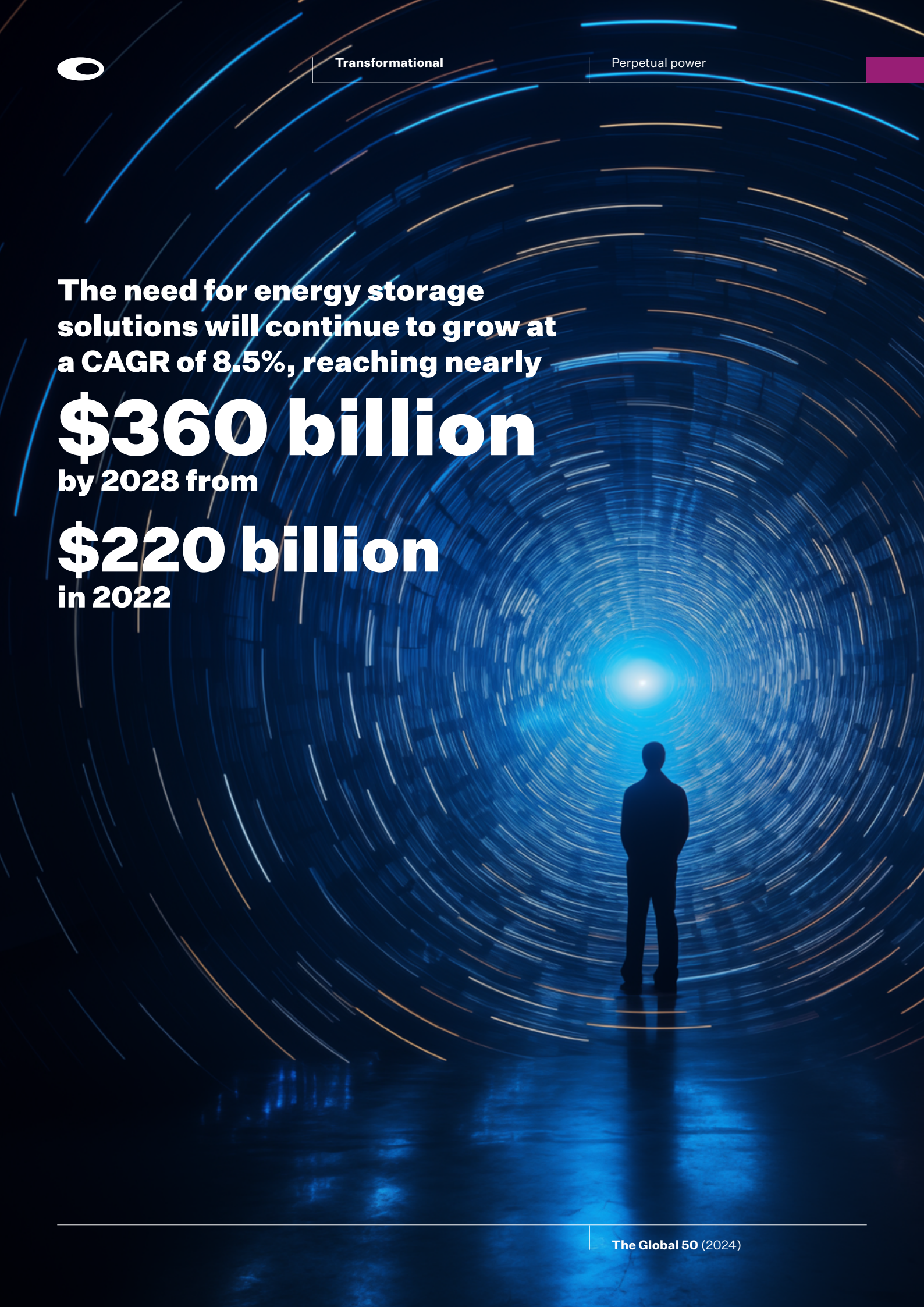
Future lithium alternatives include sodium-ion batteries and lithium–sulphur batteries,[864] along with zinc–air[865] and safer, solid-state batteries that continue to evolve through new high-conductivity materials.[866] Graphene batteries also have potential,[867] and, between solid-state and liquid-based battery technologies, magnesium-ion batteries may offer a safe, low-cost, high-energy alternative.[868]

BENEFITS

Innovative battery technologies improve eco-friendly mobility, connecting remote areas sustainably and advancing decarbonised transport, including electric aeroplanes.

RISKS

The diverse range of available battery technologies prevents any one battery innovation from scaling up, achieving cost reductions, and reaching its full potential within society. Redesigns face supply chain challenges, potential issues with new materials and increased battery waste.



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