Global Renewables Alliance

Global Decarbonisation Requires an Energy Storage Target

- **Meeting the 3XRenewables by 2030 and Paris Agreement goals require a six-fold increase in global energy storage capacity.**
- **Without a global energy storage target, the goals of tripling renewables by 2030 and meeting the Paris Agreement are at risk.**
- **A six-fold increase in global energy storage capacity by 2030 is key to keeping emissions reductions on track;**
- **Tripling renewable capacity by 2030 depends on 93% of growth from solar and wind, requiring greater energy system flexibility from clean sources - energy storage offers this cost-effectively;**
- **As the share of variable renewables grows, the average energy storage duration must also expand. Governments should plan for future flexibility needs, assess requirements and define storage targets for their NDCs.**

Storage is Key to Tripling Renewables and Paris Agreement Success

The urgent need to address climate change and achieve net-zero carbon emissions in line with the Paris Agreement demands the rapid deployment of clean energy resources like wind and solar PV. At COP28, the first global stocktake (GST) set a new objective to triple global renewable energy capacity to 11 TW by 2030 and transition away from fossil fuels. This goal was also specifically endorsed by more than 130 countries through the COP28 Renewables and Energy Efficiency Pledge[1], tripling today's installed capacity. However, while these commitments are necessary, they are not sufficient to achieve transformative change to a sustainable clean energy future.

The electricity sector accounts for 25% of global carbon emissions today. The International Energy Agency (IEA)[2] found a six-fold increase in storage in the electricity sector is needed by 2030 to keep the world on track for net zero by 2050. This would see 1.5 TW of electricity generating capacity from storage online in 2030. Similarly, the International Renewable Energy Agency (IRENA) recommends that 1-2 MW of electricity storage for every 10 MW of new renewable capacity added could be needed by 2030[3].

iha international hydropower association | LDES Long Duration Energy Storage Council | Global Solar Council | GWEC Global Wind Energy Council | GH2 Green Hydrogen Organisation | IGA International Geothermal Association

Furthermore, 20% of global emissions arise from the use of heat in industry. Decarbonising these emissions will require low carbon, flexible sources of heat such as renewables paired with thermal energy storage. By 2030 up to 8% of today's gas use – 3,000 TWh annually - could be decarbonised by renewable energy coupled with thermal storage

The ability to store and dispatch renewable energy when needed is an essential component of the energy transition and integral to meeting the tripling of renewables capacity by 2030 and Paris Agreement goals[4]. Energy storage targets must be set to ensure these vital enabling technologies are deployed on time and at scale.

By 2030 we need a six-fold increase in storage, with 1.5 TW required to keep the world on track for net zero. Beyond 2030, the need for storage will continue to accelerate, with a wide diversity of technologies and durations required to decarbonise global electricity systems and energy-intensive industrial processes.

Moreover, storage duration[5] needs to increase as clean energy resources scale and the energy transition progresses. As the world increasingly depends on variable renewable electricity, the duration of storage will need to increase relative to the generating capacity. Crucially, as the penetration of solar and wind grows in line with requirements to meet the Paris Agreement goals, the length (duration) of energy storage increases in order to continue emissions reductions at least cost.

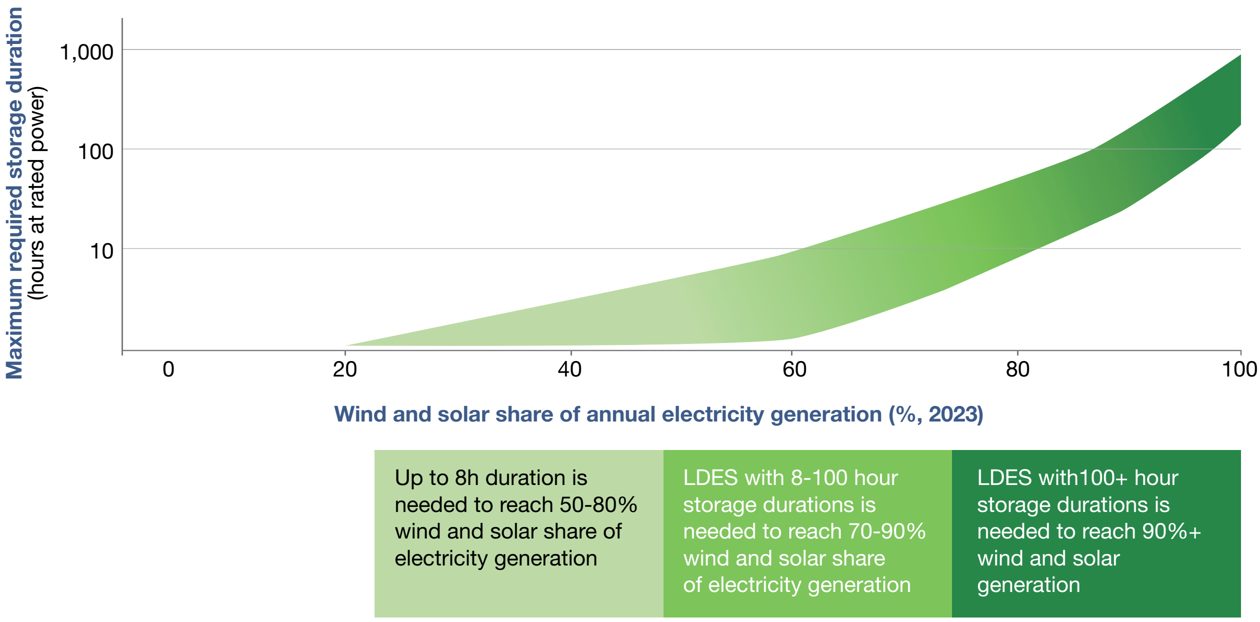

Figure 1 Storage duration needs grow as variable clean energy resources scale
Source: Long Duration Energy Storage Council

Why is Energy Storage Essential?

As we move towards net zero, wind and solar are expected to deliver most of the world's electricity, accounting for 93% of the capacity additions in the tripling renewables goal to 2030. Because the sun does not always shine and the wind does not always blow, energy grids need to store surplus energy during times of high renewable generation and lower demand, and then release that energy during times of high demand and when renewable energy generation is low. This energy may be released in the form of electricity or as heat supplied through thermal energy storage.

The need for storage can be over shorter durations – minutes to hours to provide grid stability – or long durations - across days, weeks, and even seasons, depending on the specific characteristics of each electricity grid, such as the specific mix of wind and solar, the level of interconnections with other grids or energy systems.

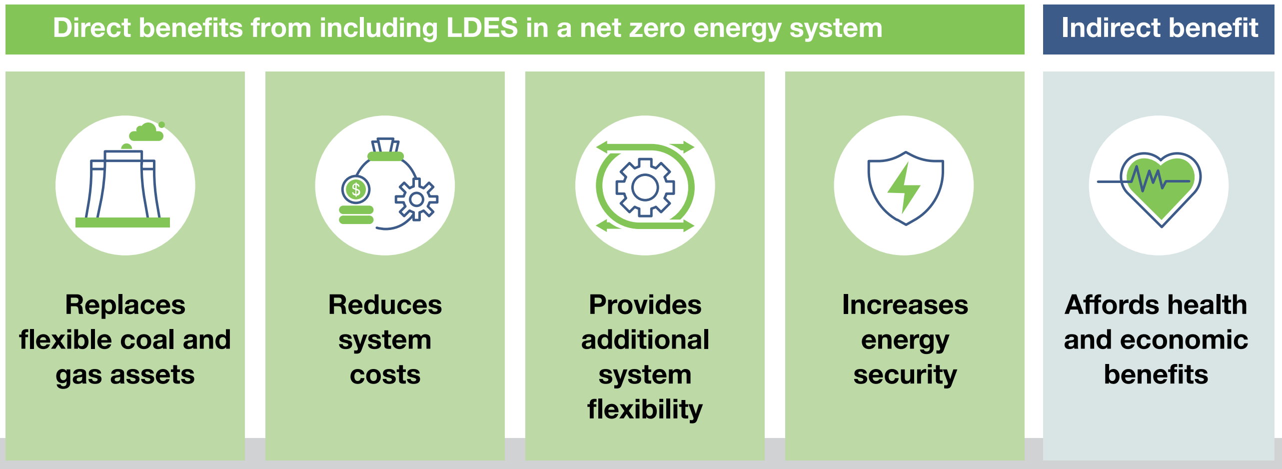

Figure 2 Direct and indirect benefits from including storage in a net zero energy system.
Source: Long Duration Energy Storage Council Annual Report 2024 (Forthcoming)

In addition to capturing excess renewable generation and storing it for later use, storage provides extensive further benefits. Longer-duration storage technologies can reduce the need for additional renewables buildout. Similarly, longer durations of energy storage can defer the need for transmission infrastructure upgrades, strengthen grid resilience and reliability, reduce pressure on land use, and bolster energy security across geographies.

Why Set a Storage Target?

The commitments made by governments to accelerate the energy transition and rapidly develop renewable energy resources must be matched by efforts to deploy and scale energy storage technologies. The global tripling and Paris Agreement goals will not be met if storage does not expand faster than current trends to 2030. Setting specific targets for energy storage deployment will provide clarity, direction, and accountability for policymakers, industry, investors, and stakeholders. A quantifiable target can be tracked, and progress measured. Storage targets provide context for the necessary enabling policy measures and send a clear signal for investment across the supply chain.

Setting a 2030 target for storage is an important signal, and it is also necessary to consider longer-term objectives to meet decarbonisation goals. Many longer-duration storage technologies need clarity over a longer horizon, either because projects have long lead times or they need time to scale and drive down costs when they are needed.

At COP29, countries should commit to setting storage targets for 2035 and 2040 at later COPs and agree on a process to define what level the targets should be set at and what mix of durations is appropriate. These storage targets relate to the growing variable wind and solar into the power mix, and it may be useful to develop a 'rule of thumb' metric, for instance, for every 3GW of variable renewables, 1 GW of storage is required to allow countries a rough approximation of needs ahead of detailed investigation.

Alongside setting targets, it is important to establish policies that are fit-for purpose to achieve them. Prime among these is the need for long-term stable revenue mechanisms, which allows attraction of low-cost capital into this vital part of the decarbonisation transition.

Lastly, a global target raises awareness among stakeholders of the need for these technologies to enable and accelerate deep and durable decarbonisation.

Diversity in Duration and Technologies

Several storage technologies, such as pumped storage hydropower—with over 90% of storage capacity on grids today—lithium-ion batteries and molten salt, are already widely deployed today. Shorter duration options will continue to play an essential and growing role as the energy transition gathers pace.

However, there is a wide range of other storage technologies that will also play a significant role. In addition to pumped storage hydropower, other forms of mechanical storage include compressed air and liquid CO2. Chemical storage technologies like green hydrogen-based fuels store energy in chemical bonds. Thermal energy storage stores energy in the form of heat6. Electrochemical batteries come in a wide range of chemistries with different usage profiles to complement lithium-ion. The diversity of technologies on offer provides resilience in respect of global supply chains and fulfils different needs in energy systems.

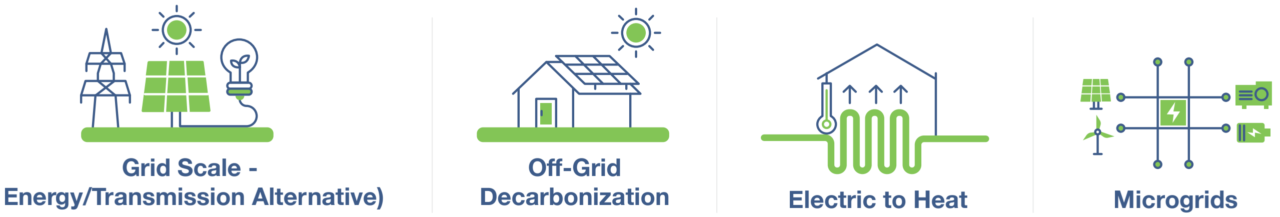

Figure 3 Storage Applications
Source: Long Duration Energy Storage Council Annual Report 2024 (Forthcoming)

A Call to Action

- **The 3XRenewables by 2030 and wider Paris Agreement goals will not be met if storage does not expand faster than current trends to 2030.**
- **We call on national governments to agree to a global target of 1.5TW of energy storage by 2030 at COP29.**
- **Beyond 2030 there will be an increasing need for longer duration and larger capacities. Additional targets should be set at later COPs for further in the future, with a process to set them agreed at COP29.**
- **Governments should start planning for their flexibility needs now, assessing what will be required to deliver their commitments under the Paris Agreement, setting their individual targets, and implementing enabling policy to meet those targets. In particular, they should set storage targets within their new Nationally Determined Contributions, due to be submitted by February 2025.**

1 Global Renewables and Energy Efficiency Pledge
2 IE A (2024), Batteries and Secure Energy Transitions, IEA, Paris
3 (IRENA (2024), Tripling Renewable Power by 2030: The Role of the G7 in Turning Targets into Action, IRENA, Abu Dhabi)
4 COP28 Presidency, IRENA, GRA (2023), Tripling renewable power and doubling energy efficiency by 2030: Crucial steps towards 1.5°C
5 The energy stored – or duration – is a crucial consideration. A 10MW battery with 20MWh energy stored can provide 10MW of power for two hours. A 10MW battery with 100MWh can provide 10MW of power for 10 hours.