



## LDES: technology ready, market not yet

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### LDES: the need is there. So is the technology. But where is the market?

Renewable energy makes our electricity system more sustainable, but also less predictable. How do you store energy when there is a surplus of solar or wind power? And not just for a short while, but for hours or even days? Because producing something is one thing, but keeping it available until the right moment is another matter entirely.

During the Sirris event **Unlocking the Industrial Potential of Long-Duration Energy Storage**, it became clear that **flexibility is the next challenge in the energy transition**. **Long-duration energy storage (LDES)** has a key role to play here by storing energy and load shifting over longer periods.

The experts are clear: **the technology is there, but the market is lagging behind**. Large-scale implementation is not expected for the time being. Not because it isn't possible, but because the policy and the network infrastructure aren't ready for it yet.



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## Ready for use

**Lithium-ion batteries** have long been the benchmark for **rapid, short-term energy storage**. However, due to the **growing need for long-term storage**, they are no longer sufficient on their own. LDES addresses this by ensuring that energy is available not only quickly, but above all over long periods. 'Many solutions are at an advanced stage of development and are already close to market launch', says Pieter Jan Jordaens of Sirris. 'The applications range from 8 to over 40 hours of storage.'

**The technological landscape is remarkably vast:**

- Redox flow batteries
- Zinc-bromide systems
- CO<sub>2</sub>-based storage
- Other innovative concepts

Various technologies, **each with their own strengths**. 'This diversity isn't a disadvantage, but rather an asset', says Dennis Renson of PerPetum Energy. 'There is no one-size-fits-all solution, but rather a growing ecosystem of solutions. The right choice always depends on the application.'

The event provided a comprehensive overview of LDES from various perspectives. I understood that LDES is a crucial solution to many energy problems and will form an essential backbone to the electricity grid, including the containerized solutions we're engineering.

Jef Dijckmans, Business Development Manager, Smulders

## A new approach to energy storage

LDES is transforming not just the technology, but the way we think. We assess **conventional batteries** based on **efficiency and speed**, while with **LDES** the focus is on **reliability and availability**. 'It's less about round-trip efficiency and more about reliable capacity', explains Dennis Renson. 'As long as you're above a certain minimum, the main consideration is availability when it's needed.'

LDES is therefore also about **duration**: the ability to conserve energy over a longer period of time. A subtle but fundamental shift **from short-term optimisation to value creation at system level**.



## Added value that goes beyond cost

Nevertheless, lithium-ion batteries are still often preferred due to their lower cost and proven track record. LDES technologies often perform better in **areas that are still under-emphasised in traditional business cases**:

- Improved fire safety
- Longer service life
- Better recyclability
- Greater independence from critical raw materials (thanks to strong local supply chains)

For **industrial sites**, where **space is limited** and **safety is crucial**, these features can be **decisive**. 'Our technology allows battery systems to be stacked, which is a major advantage', says Alessio Mariani of EOS Energy. 'What's more, unlike lithium, they don't pose a fire hazard.'

In this way, LDES encourages businesses to look beyond the initial investment cost and consider the long-term value too.

What impressed me most was the market readiness of solutions like the EOS Zinc- isn't



## Why hasn't the market followed suit yet?

All the technology needed to implement LDES on a large scale is in place, but its roll-out has not yet taken place. The biggest obstacle lies in **the environment in which it has to operate, which is not yet economically or systemically geared to its strengths**. 'Energy markets primarily reward the rapid and short-term flexibility of short-duration energy storage (SDES), such as lithium-ion batteries', explains Dennis Renson. 'Since LDES generates value over longer periods, it doesn't really fit with that logic.'

In this context, LDES today often means:

- **Higher investment costs**
- **Limited and uncertain revenue streams**
- **Projects that are difficult to finance**

**Investors, banks and insurers** also find it difficult to assess how these projects will **pay for themselves in the long term**. 'It's the classic chicken-and-egg story', says Dr Sebastian Husein of the University of Twente and the Dutch consortium Sustainable Long Duration Batteries. 'Without liquidity, parties won't make investment decisions. And without investment, there's no market.'

Even so, **interest is growing rapidly**, and connection applications have already been submitted for **dozens of gigawatts of LDES projects**. A clear sign that the technology is ready but waiting for the right market conditions.



## The pressure on the electricity grid calls for flexibility

This reluctance stands in stark contrast to the **growing need on the ground**. Industrial sites are increasingly facing **grid constraints, fluctuating energy prices and the growing electrification of their processes**. At the same time, **renewable energy** is still **shut down** all too often, because the grid can't cope with the peaks. 'This is putting the system under increasing pressure', says Frie Gybels of Elia. 'Flexibility is no longer just a nice-to-have, but a necessity.'

This is precisely where the strength of **LDES** lies: storing energy when it is abundant and using it when it becomes scarce. In this way, it helps to **absorb peaks, bridge shortages and reduce the strain on the grid**. 'Battery storage is no longer a future opportunity, it's critical infrastructure', Dr Sebastian Husein adds.

However, new developments such as **data centres and AI** are also driving additional demand for **flexible and long-term energy storage**. As a result, LDES is evolving from an optimisation tool into an essential component of a stable and future-proof energy system.

The transition to Net Zero is no longer only about sustainability, it's about energy security, resilience, and affordability. The solutions at this event oriented toward that: practical, scalable technologies to modernize our power grid.  
Dr. Sebastian Husein, University of Twente

## How policy can make a difference

For LDES to really take off, a suitable framework is needed. Policy and market mechanisms play a crucial role in this. Companies **still tend to evaluate storage projects on the basis of cost reduction**. Above all, though, LDES creates value at system level: **reducing grid congestion, increasing flexibility and enhancing energy security**. That is not yet being adequately translated into revenue.

How can this bring about the transition from an interesting technology to an investable project? By focusing on:

- **Long-term security**
- **Stable contract types**
- **Predictable revenue streams**
- **Paying for capacity rather than just energy**

International examples in the United Kingdom and elsewhere show that this approach works and makes investment considerably more attractive.



## The future is hybrid

All the experts agree: LDES will not replace existing technologies but will complement them.

**Hybrid systems** will form the basis of a **robust and flexible energy infrastructure**. Short-term storage for rapid response and grid stability; long-term storage to shift larger energy flows over time. Not a choice, but a carefully considered combination, tailored to use.

## First test, then invest

What this means is that the next step for businesses is not necessarily to wait and see, but to explore. **Pilot projects** in **realistic demonstration environments** and **concrete business cases** help to:

- Build up **knowledge**
- Analyse the impact on **energy consumption**
- Understand **costs** better
- Substantiate **strategic choices**

Those who gain all this experience today will be in a stronger position as the market continues to develop.

## Do you want to keep up with the latest developments?

Sirris is actively involved in a wide range of events and initiatives that bring together technology and practical applications. Keep an eye on our [upcoming initiatives](#) and find out how you can explore LDES within your own context today.

[Explore upcoming initiatives](#)

## Taking the next step together

It's clear that the breakthrough of LDES is no longer a technological challenge, but a matter of **collaboration**. This is where **Sirris** comes in: **bringing companies together**, sharing insights and focusing on **test infrastructure and demonstration projects**. In order to translate technology into a concrete reality.

Contact us

## Authors



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