

Response to Long Duration Electricity Storage Consultation

12 March 2024

<https://www.gov.uk/government/consultations/long-duration-electricity-storage-proposals-to-enable-investment>

Response Authors:

This response is on behalf of the 'Future Electric Vehicle Energy networks supporting Renewables (FEVER)' project team (www.fever-ev.ac.uk/contact), funded by the Engineering and Physical Sciences Research Council (EPSRC) Programme Grant, grant reference EP/W005883/1.

Executive Summary and Recommendations:

- Off-grid solutions for LDES should be included in the proposed new policy framework to enable investment.
- The definition of Stream 2 should be revised to accommodate novel LDES technologies, specifying criteria such as a Technology Readiness Level (TRL) of 6/7 and a supply duration of at least 10 hours at a minimum capacity of 100 kW.
- Caps and floors for storage durations must be set to encourage a variety of long duration storage solutions, with appropriate cost levels.
- An annual review mechanism must be implemented to reassess the arrangement to adjust support regulation as necessary.
- A minimum duration for LDES should be agreed upon based on discussions about storage definitions, considering adopting the approach favoured by the National Renewable Energy Laboratory (NREL) in the USA, which defines long duration storage as between 10 – 100 hours.
- Wider system benefits, including off-grid LDES use, should be fully considered when assessing projects, and the term 'system' should be removed in relevant questions to encompass these benefits.

The response provides evidence and policy recommendations in relation to the following questions:

Q.1- Do you agree with the policy objectives that have been identified? Please explain your reasoning.

Q.2- Are there other factors we should consider in our policy objectives?

Q.3- Will these policy objectives help to bring forward LDES projects to help the electricity system reach net zero in the most effective way? If so, why?

Q.4- Do you agree with our assessment that a cap and floor is the most appropriate policy option to enable investment and bring forward the required LDES? Please explain your reasoning.

Q.5- Do you agree with our approach to not set an overall scheme capacity?

Q.7- Do you agree that only those technologies that meet the electricity storage definition should be eligible for an LDES scheme?

Q.8- Do you agree that it is appropriate to exclude technologies that can already be funded under existing market arrangements and/or those that would be eligible for multiple business model support?

Q.9- Do you agree with our proposal for a minimum duration of 6 hours? If not please provide a rationale.

Q.11- Do you agree with the proposed approach to splitting the streams by TRL level? Please provide your reasoning. If not, please suggest an alternative approach.

Q.13- Do you agree that the identified wider system benefits should be considered when assessing a project?

Q.14- Would an approach similar to that of the interconnector scheme be appropriate? if not what alternative would you suggest?

Q.15- Are there any wider economic and societal benefits that have not been identified that LDES projects could provide that we should include in the criteria?

Responses:

1. Do you agree with the policy objectives that have been identified? Please explain your reasoning.

Yes, we agree with the policy objectives identified HOWEVER we also believe there are significant benefits to be achieved from LDES for **off-grid systems** that must be included within the proposed new policy framework to enable investment. Off-grid systems, such as the provision of reliable, carbon free, low cost electric vehicle (EV) charging infrastructure which is the focus of the FEVER research project, can both:

- a) Offer a significant reduction in grid load demand by delivering stand-alone off-grid solutions employing local renewable energy and storage, and LDES has a part to play in delivering daily, weekly and seasonal storage to achieve such systems. The reduction in grid demand (and annual demand of some 65-100 TWh of EV charging and 60 TWh of heat pump load by 2050, see data later in response to Q1) will alleviate the significant grid connection pressures (there is a queue of some 200GW of projects waiting to achieve a grid connection¹) and costs to achieving increased renewable energy generation AND load demand reduction.
- b) Offer increased energy security by decoupling off-grid loads from the electricity market (and sensitivity to hydrocarbon price volatility and geo-political factors), and will stimulate new entrants including local communities.

In the general case, offering revenue mechanisms for off-grid generation would bring forward investment and construction of new capacity that would have otherwise been waiting for grid connections.

Ofgem recently suggested some 65-100 TWh of annual EV (including cars and vans) charging demand on the grid by 2050², and the UK Government has a target of some 600,000 heat pumps installations

¹ <https://www.theguardian.com/business/2023/may/08/uk-green-energy-projects-in-limbo-as-grid-struggles-to-keep-pace>

² Ofgem, "Enabling the transition to electric vehicles", Sept 2021

each year by 2028³, and National Grid Future Energy Scenarios predict that by 2050 some 15 million UK homes will be heated by Air Source Heat Pumps (ASHP) adding (assuming an average 9 kW heat pump rating⁴ and ~4,000 kWh annual consumption⁵) some 135 GW and 60 TWh load⁶, compared to a total UK annual electricity demand of 320.7 TWh in 2022⁷.

2. Are there other factors we should consider in our policy objectives?

The proposed definition of 'Stream 2' needs to be reconsidered. In a manner similar to the Renewables Obligation Order 2009⁸, Schedule 2, Part 2, which defined a banded structure to the award of Renewable Obligation Certificates (ROCs) to provide more support to nascent (versus more developed) renewable technologies, we feel that there requires to be a similar mechanism defined for LDES and would propose Stream 2 is defined as: "Novel technologies with a TRL of 6/7, a supply duration of at least 10 hours at a minimum capacity of 100 kW" (giving 100 kW * 10 hrs = 1 MWh minimum capacity). This will offer ready investment support for new technologies and avoid a significant hurdle of achieving 50 MW rating before being able to access such support.

Please also see rationale for defining a duration of at least 10 hours presented in Q9.

Further, the cap and floor arranged should also consider a range of storage durations, with the longest duration storage mechanisms, with appropriate storage efficiency, having increased cap and floor cost levels to those with the 'longest' duration capacity, to stimulate and encourage a range of long duration storage solutions.

3. Will these policy objectives help to bring forward LDES projects to help the electricity system reach net zero in the most effective way? If so, why?

Yes, we believe these policy objectives set out a transparent and integrated set of measures that will deliver the necessary investment to stimulate this sector HOWEVER, as per Q1, we believe these measures should also be available for qualifying **off-grid** energy storage systems, for the reasons defined in the response to Q1, namely off-grid systems lower the stress on the grid capacity and grid connection request process and will, if supplied from renewable energy or net-zero energy sources, play a vital, secure route to the UK's net-zero ambitions.

4. Do you agree with our assessment that a cap and floor is the most appropriate policy option to enable investment and bring forward the required LDES? Please explain your reasoning.

Yes, the cap and floor policy option is an appropriate mechanism, is well understood by all parties and, with suitable cap and floor cost levels set, will enable a robust market for LDES.

5. Do you agree with our approach to not set an overall scheme capacity?

³ <https://www.gov.uk/government/publications/heat-pump-net-zero-investment-roadmap>

⁴ <https://www.ovoenergy.com/guides/air-source-heat-pump-size-guide>

⁵ <https://www.viessmann.co.uk/en/heating-advice/heat-pumps/do-heat-pumps-use-a-lot-of-electricity.html>

⁶ NationalGrid ESO, Future Energy Scenarios, July 2022.

⁷ <https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>

⁸ <https://www.legislation.gov.uk/uksi/2009/785/contents/made>

Yes, we agree to not setting an overall scheme capacity, however would recognise that at least annual review of this arrangement would need to be instigated to allow ultimate support regulation (i.e. reduction and/or withdrawal of LDES financial support) if/when necessary.

7. Do you agree that only those technologies that meet the electricity storage definition should be eligible for an LDES scheme?

Yes, we agree with the definition stated.

8. Do you agree that it is appropriate to exclude technologies that can already be funded under existing market arrangements and/or those that would be eligible for multiple business model support?

Yes, we agree it is appropriate to exclude technologies that can already be funded. However, where we consider long duration of storage, as opposed to duration of delivery, it is likely to be necessary to provide support to existing technologies. This will be needed to offset revenue generation achievable in shorter-term markets to promote long durations of stored energy such as that required for seasonal storage.

9. Do you agree with our proposal for a minimum duration of 6 hours? If not please provide a rationale.

The definition of storage must first be discussed. The duration of LDES can mean both:

- 1) the duration of the discharge of the energy store at maximum power e.g. 1MW for 6 hours duration defines 6 MWh of storage capacity;
- 2) the duration of how long the energy can be stored for, and still ultimately deliver the duration of discharge as per point Q9 1) above. For example a hydrogen storage system, comprising electrically powered electrolyser to produce hydrogen gas, where the gas can be stored for long periods (>weeks) and then reconverted to electricity via a fuel cell.

Within this context we believe adopting the approach favoured by the National Renewable Energy Laboratory (NREL) in the USA would be appropriate, whereby they define long duration storage as between 10 – 100 hours⁹.

11. Do you agree with the proposed approach to splitting the streams by TRL level? Please provide your reasoning. If not, please suggest an alternative approach.

See response given to Q2 above.

13. Do you agree that the identified wider system benefits should be considered when assessing a project?

Yes, we agree the wider benefits of the use of LDES should be considered, including **off-grid** LDES use, hence we recommend the removal of the word 'system' in Q13.

⁹ Denholm, Paul, Wesley Cole, A. Will Frazier, Kara Podkaminer, and Nate Blair. 2021. The Challenge of Defining Long-Duration Energy Storage. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A40-80583, <https://www.nrel.gov/docs/fy22osti/80583.pdf>

14. Would an approach similar to that of the interconnector scheme be appropriate? if not what alternative would you suggest?

Yes, we would support that an independent assessment of each project be undertaken however that this also applies to **off-grid** LDES schemes.

15. Are there any wider economic and societal benefits that have not been identified that LDES projects could provide that we should include in the criteria?

Yes, the potential grid load reduction (whether existing or planned new load) offered by **off-grid** solutions employing LDES has not been currently recognised in this consultation or previous analysis. As stated in the response to Q1, there is scope to develop off-grid solutions for EV charging infrastructure and to supply the forecast heat pump load, which would benefit the electricity grid to avoid the reinforcement and upgrades required. Further, off-grid solutions will provide a more secure and diverse energy supply, free of external cost sensitivity to energy markets or geopolitical impacts, and stimulating more local or community energy ownership and operation.