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DRAFT REPORT

on a comprehensive European approach to energy storage
(2019/2189(INI))

Committee on Industry, Research and Energy

Rapporteur: Claudia Gamon

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MOTION FOR A EUROPEAN PARLIAMENT RESOLUTION

on a comprehensive European approach to energy storage (2019/2189(INI))

The European Parliament,

- having regard to the Treaty on the Functioning of the European Union, and in particular to Article 194 thereof,
- having regard to the Paris Agreement,
- having regard to the Commission communication of 11 December 2019 on the European Green Deal (COM(2019)0640),
- having regard to the Commission communication of 28 November 2018 entitled ‘A Clean Planet for all – A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy’ (COM(2018)0773),
- having regard to the Commission report of 9 April 2019 on the Implementation of the Strategic Action Plan on Batteries: Building a Strategic Battery Value Chain in Europe (COM(2019)0176),
- having regard to the Commission report of 9 April 2019 on the implementation and the impact on the environment and the functioning of the internal market of Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (COM(2019)0166),
- having regard to the European Council conclusions of 12 December 2019,
- having regard to the Council conclusions of 25 June 2019 on the future of energy systems in the Energy Union to ensure the energy transition and the achievement of energy and climate objectives towards 2030 and beyond,
- having regard to the Hydrogen Initiative launched by the Austrian Presidency of the Council in Linz on 17 and 18 September 2018,
- having regard to Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU¹,
- having regard to Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity²,
- having regard to Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources³,
- having regard to Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and

¹ OJ L 158, 14.6.2019, p. 125.

² OJ L 158, 14.6.2019, p. 54.

³ OJ L 328, 21.12.2018, p. 82.

- repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009⁴,
- having regard to Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010⁵, which is currently being revised,
 - having regard to Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity⁶,
 - having regard to Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC⁷,
 - having regard to Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy⁸,
 - having regard to Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora⁹,
 - having regard to its resolution of 15 January 2020 on the European Green Deal¹⁰,
 - having regard to its resolution of 28 November 2019 on the climate and environment emergency¹¹,
 - having regard to its resolution of 14 March 2019 on climate change – a European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy in accordance with the Paris Agreement¹²,
 - having regard to its resolution of 25 October 2018 on the deployment of infrastructure for alternative fuels in the European Union: time to act!¹³,
 - having regard to its resolution of 6 February 2018 on accelerating clean energy innovation¹⁴,
 - having regard to its resolution of 13 September 2016 on Towards a New Energy Market Design¹⁵,
 - having regard to its resolution of 13 September 2016 on an EU Strategy on Heating and Cooling¹⁶,
 - having regard to Rule 54 of its Rules of Procedure,

⁴ OJ L 115, 25.4.2013, p. 39.

⁵ OJ L 348, 20.12.2013, p. 129.

⁶ OJ L 283, 31.10.2003, p. 51.

⁷ OJ L 266, 26.9.2006, p. 1

⁸ OJ L 327, 22.12.2000, p. 1.

⁹ OJ L 206, 22.7.1992, p. 7.

¹⁰ Texts adopted, P9_TA(2020)0005.

¹¹ Texts adopted, P9_TA(2019)0078.

¹² Texts adopted, P8_TA(2019)0217.

¹³ Texts adopted, P8_TA(2018)0438.

¹⁴ OJ C 463, 21.12.2018, p. 10.

¹⁵ OJ C 204, 13.6.2018, p. 23.

¹⁶ OJ C 204, 13.6.2018, p. 35.

- having regard to the report of the Committee on Industry, Research and Energy (A9-0000/2020),
- A. whereas Parliament, the European Council and the Commission have endorsed the objective of net-zero greenhouse gas emissions in the EU by 2050, in line with the objectives of the Paris Agreement;
- B. whereas the transition to a climate-neutral economy requires an energy transition away from fossil fuels towards a renewable-based system;
- C. whereas most renewable electricity sources, such as wind and solar, are intermittent and variable; whereas the integration of variable renewable energy sources into the electricity system requires increased flexibility regarding supply and demand;
 1. Calls on the Member States to fully explore their energy storage potential;
 2. Calls on the Commission to develop a comprehensive strategy on energy storage;
 3. Calls on the Commission to establish a task force involving all relevant Directorates-General to develop this strategy, including a comprehensive analysis of the carbon footprint and life cycle of storage technologies, taking into account at least the extraction and/or production of raw materials, the manufacturing process, transport and the recycling process, where applicable;
 4. Notes that the energy transition towards a renewable-based system requires a well-developed electricity grid and advanced storage technologies, backup generation and demand management in order to secure a constant power supply;
 5. Underlines that the transition to a climate-neutral economy must not endanger security of supply; stresses that reliable power supply and the energy transition must go hand in hand;
 6. Deeply regrets that infrastructure projects which are crucial to the energy transition often face strong resistance at local level; encourages the Member States to actively encourage public support at the local level, for instance through early public participation;

Regulatory barriers

7. Points out that most Member States require operators of storage facilities to pay network charges or energy taxes twice; is convinced that the abolishment of this burden would lead to more energy storage projects being deployed; calls on the Commission to prohibit the double taxation related to energy storage projects in its upcoming proposal for a revised Energy Taxation Directive; calls on the Member States to abolish any kind of double taxation or charges related to energy storage projects;
8. Urgently calls for a revision of the TEN-E Regulation¹⁷ before the adoption of the next list of projects of common interest (PCI); calls for the criteria for granting PCI status to be aligned with the EU's climate and sustainability goals;
9. Notes with concern that approval procedures at national level take considerably longer than the maximum periods for PCI projects provided for by the TEN-E Regulation; calls

¹⁷ Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009 (OJ L 115, 25.4.2013, p. 39).

on the Commission to address this issue in its upcoming review through an effective enforcement mechanism;

10. Regrets the lack of market deployment of research projects under Horizon 2020, and welcomes the planned greater focus on close-to-market activities under Horizon Europe, in particular through the creation of the European Innovation Council; calls for greater use of pre-commercial procurement;
11. Notes that there is only an indirect reference to energy storage projects in the Guidelines on State aid for environmental protection and energy 2014-2020; notes, furthermore, that astonishingly few State aid measures for storage projects have been notified in the past;
12. Calls on the Commission to take into account the important role of storage in the energy transition when reviewing the State aid guidelines; calls on the Commission to make sure that the new guidelines take into account the efficiency and the contribution to grid stability of different storage technologies, so that inefficient funding is avoided;

Power to gas

13. Acknowledges the high potential of green hydrogen for energy storage and as feedstock for energy-intensive industries;
14. Notes that there are varying standards in the Member States as regards the blending of hydrogen with natural gas; calls, therefore, on the Commission to develop minimum blending standards for hydrogen both for the gas grid and end uses;
15. Calls on the Commission to conduct a comprehensive analysis of the cost of retrofitting gas infrastructure for the use of green hydrogen;

Batteries

16. Is convinced that batteries will play a crucial role in ensuring a stable electricity supply;
17. Is concerned that the EU has a very low battery manufacturing capacity; welcomes, therefore, the European Battery Alliance and the Strategic Action Plan on Batteries; calls for continuous support for them and for the implementation of the Strategic Action Plan on Batteries to be strengthened; welcomes, in this respect, the Commission's announcement that it will propose legislation on batteries in support of the Strategic Action Plan and the circular economy; calls, in this regard, for life cycle analysis of batteries;
18. Is concerned about the EU's heavy dependence on imports of raw materials for battery production; is convinced that enhanced recycling schemes for batteries could deliver a significant share of the raw materials required for battery production within the EU;
19. Acknowledges the potential for used electric vehicle batteries to be reused for energy storage in private homes or in larger battery units; is concerned that the classification of used batteries as waste in the Batteries Directive, independent of reuse, can act as a barrier to such reuse;
20. Calls on the Commission to consider a recycling target for lithium-ion batteries when revising the Batteries Directive;

Pumped storage

21. Notes that pumped storage plays a crucial role in energy storage; is concerned that the EU is not exploiting the full potential of this carbon-neutral and highly efficient way of storing energy;
22. Considers that the Member States should seek further ways to enhance pumped storage capacity; calls on the Member States to remove any administrative obstacles that are delaying these projects and to provide regulatory support for innovative approaches in this field; calls on the Commission to prioritise the necessary energy transition, to conduct a comprehensive review of the relevant legislation and to propose changes where necessary;
23. Points out that in order to strengthen environmental protection, updates of existing facilities and higher capacity projects should be prioritised;

Thermal storage

24. Considers district heating to be a very efficient tool for energy storage and residential heating in densely populated areas; calls on the Commission and the Member States to support and develop district heating networks;
25. Welcomes the fact that district heating and cooling networks will be eligible for funding under the revised CEF Regulation and calls for their inclusion as potential PCIs under the TEN-E Regulation;

The role of consumers

26. Believes that home batteries, domestic heat storage, vehicle-to-grid technology and demand response help to cut consumption peaks, provide flexibility and are playing an increasingly important role in ensuring that the energy grid is efficient and integrated;
27. Instructs its President to forward this resolution to the Council and the Commission.

EXPLANATORY STATEMENT

With the European Green Deal the EU has committed to decarbonise the European economy and become carbon neutral by 2050. This requires an accelerated transition from fossil fuels as a primary energy source to renewable energy sources (RES). A higher share of RES will lead to a further decentralised energy generation. It is expected in all scenarios that decarbonisation will mainly be reached through electrification of the biggest sectors (energy, transport, heating and cooling), which will lead to a massive increase in electricity demand: according to the Commission, the electricity demand by 2050 will more than double (+55%). As it is our commitment to decarbonise the energy sector, the share of electricity generated by RES will increase. The Commission expects a 55% share of renewables by 2030, more than 80% by 2050. A higher share of RES inevitably leads to a higher volatility in the electricity grid. **Hence, due to the commitment to become carbon neutral by 2050, a massive increase of storage capacity is needed to guarantee the security of energy supply.**

It must be our priority to secure a constant electricity supply at all times. Furthermore, energy must stay affordable for the EU Citizens. Energy storage will be crucial to help reduce extreme electricity prices by equalising the peaks and lows in demand and supply. A broad range of storage technologies covering all characteristics regarding power, capacity and response time will need to be brought to the market to serve for the stability of the grid, voltage control, as operating reserve, dispatch and re-dispatch as well as for the retail energy shift. There will not only be a need for short-term storage but also seasonal storage over months. Storage can be a service to a Distribution System Operator (DSO), e.g. for congestion management, or the Transmission System Operator (TSO) for balancing.

The EU needs to act now. This report aims to analyse the current storage possibilities and make recommendations to the Commission and the Member States to fully explore the storage potential in the EU. If storage is considered only within the electricity sector in isolation, flexibilities are limited and very costly. Through the smart integration of different sectors, for example power-to-gas or power-to-heat, more storage technologies become available, such as thermal storage. A comprehensive approach is needed to align different aspects like efficiency, environmental impacts, competences and permitting. A careful and extensive analysis of each type of storage technologies must be conducted, especially when it comes to the environmental impacts. The high environmental standards in the EU must not be weakened. Some storage technologies, such as batteries, may come with a large carbon footprint, which depends significantly on the energy mix used for their manufacturing and extraction method for raw materials. This is why the rapporteur suggests that the Commission should create a task force across all relevant Directorates-General to develop a comprehensive strategy for energy storage. An analysis of the life cycle of all available storage alternatives with a focus on their carbon footprint should be conducted in this context.

Regulatory barriers

Regarding the regulatory side, the EU must remove all possible barriers that interfere with a swift exploitation of the potential. Significant progress has already been made in some sectors to make the regulatory requirements more consistent. For example, the Electricity Market Directive lays out clear rules for the internal market for electricity. A swift implementation of such provisions is pivotal for a paradigm shift for energy storage. However, some issues remain

to be addressed, such as double taxation and double grid fees for storage operators being a major obstacle to access this new market.

With a view of the upcoming revision of the Energy Taxation Directive, the rapporteur welcomes the Commission's evaluation report acknowledging the need for a revision, since the Directive is outdated and allows for double taxation of storage providers. The rapporteur believes that providing storage to the grid has a societal benefit, which is why she calls for an abolition of the double taxation. It will be necessary to differentiate between ordinary consumption of energy and storage or conversion for storage.

The TEN-E Regulation must urgently be revised before the adoption of the next list of projects of common interests (PCI). The criteria to determine these projects do not reflect the Union's commitment to decarbonise the energy sector. The criteria therefore need to be aligned with the Union's Climate and Sustainability goals. Storage facilities can be relevant for grid planning and sectoral integration requires investments into new grids such as pipelines fit to carry green hydrogen or heat networks. Therefore such projects should become eligible for inclusion in the PCI lists. Also, administrative approval procedures in the Member States massively exceed the maximum periods for PCI provided by the TEN-E Regulation. The Commission should review the enforcement mechanisms in this respect.

As to research funding, the past has shown that research projects funded by the EU often have difficulties to access the market. The rapporteur welcomes the creation of the European Innovation Council. Furthermore she welcomes that the new Horizon Europe Programme will provide for funding of close-to market activities.

State Aid will be necessary especially for storage projects that have not been proven to be market ready yet. Storage projects are currently insufficiently addressed in the Guidelines for State Aid for Environmental Protection and Energy 2014-2020 (EEAG), which rather focus on renewable energy projects. This might be one reason why currently only few state aid measures for storage projects have been notified. The rapporteur deems it necessary to take into account the role of storage in the energy transition when reviewing the EEAG.

As one major objective of the energy transition is the affordability of electricity, it is reasonable to focus on technologies that are either already in the market or close to be operational. This is why the report focuses on a selection of technologies.

Power-to-gas

Europe needs to become a leader in the green hydrogen sector. Green hydrogen, produced from water with electricity coming from RES, can provide significant flexibility to the electricity system. Modern electrolysers already exist in multi-megawatt sizes. Green hydrogen allows for great geographical flexibility: it can be produced directly at the electricity source (e.g. wind park), and either be used directly, be stored - in extremely high quantities (e.g. in natural caverns) - or be transported over long distances without significant losses. It can then be used for various purposes, for example to decarbonise industrial processes in energy-intensive industries by replacing a part of the 15 Mt hydrogen used worldwide in refineries; to replace natural gas for heating; as a fuel for cars; or be re-transformed into electricity. Currently there is no harmonised framework defining standards or requirements for power-to-gas. Blending standards vary between 5% and 20% among the Member States.

To stimulate investments in the production of green hydrogen and thus to create a market, a solid infrastructure and harmonised technical standards are essential. The possibility to make use of existing grid pipelines should be considered before contemplating the construction of a separate grid to transport hydrogen. In order to avoid market distortion, clear rules are needed to determine the roles of different actors in the market, similar to the revised electricity market design provisions.

Batteries

Batteries can primarily serve short-term uses to secure the power quality in the grid, such as frequency control, balancing of demand peaks or buffering fluctuations thanks to their relatively fast response times. Some scenarios project a demand for lithium-ion batteries of up to 4000 GWh by 2040 compared to 78 GWh today. Lithium-ion batteries are the current state of art used in electric vehicles or private homes. They range between 1-10 KW systems up to 1-50 MW systems. 85% of battery cells are manufactured in the Asia-Pacific region. Furthermore, the five essential raw materials (lithium, nickel, cobalt, manganese and graphite) must be imported. It is therefore essential to promote battery development and innovation in the EU to reduce dependency on third countries. This is why the rapporteur welcomes the European Battery Alliance (EBA) and the Strategic Action Plan on Batteries which shall be further supported. The Strategic Action Plan on Batteries focussing on raw materials, extraction, sourcing, refining, cell production and recycling must be strengthened further. Lithium-ion batteries have significantly benefitted from research. In addition, the Commission should adopt measures that help build a value chain for batteries in Europe.

To further reduce the dependency on imports of raw materials we urgently need an improved EU framework for the recycling of used batteries, including specific provisions, such as for lithium-ion batteries, which are currently missing. Such provisions could help to create a market for the recycling of lithium-ion batteries. In this respect, the rapporteur welcomes the forthcoming review of the Batteries Directive and underlines the importance of removing barriers for reuse and recycling. A specific recycling target for lithium-ion batteries should be considered in the context of the revision.

Pumped Storage

Pumped storage is one of the oldest and most mature ways to store energy. With an efficiency degree of 75-80%, it accounts for 97% of the EU's current energy storage facilities. It is a well proven and efficient way of storing energy at competitive costs.

Although some Member States have already explored their pumped hydro storage potential to a great extent, there is still a great potential to be further explored in the EU, such as through retrofitting and refurbishing, which is a balanced approach bringing together environmental protection and an increase of storage potential and its efficiency. According to a study by the Joint Research Centre¹, in certain scenarios, there is an EU potential for 28 TWh and more, focussing on natural reservoirs only. As current research projects show, pumped storage is not

¹ Marcos Gimeno-Gutiérrez, Roberto Lacal-Aránzategui 'Assessment of the European potential for pumped hydropower energy storage - A GIS-based assessment of pumped hydropower storage potential' (JRC Scientific and Policy Reports 2013)

limited to natural reservoirs. There are research projects to use former open pit mines for pumped storage.

Thermal Storage

Thermal storage, such as in district heating, is currently used in combination with CHP (combined heat and power) to heat densely populated residential areas; the heating grid is used for transport and as a storage unit at the same time. As this is another technology that already has been proven to be very efficient, the rapporteur believes that the potential should be further explored. Especially residential areas in the vicinity of an industrial conurbation are ideal to use waste heat from industrial processes which can be stored and distributed for heating. Other forms of thermal storage, underground or in isolated tanks, can provide seasonal energy storage.

The rapporteur recommends therefore to further develop district heating grids, upgrade and refurbish obsolescent ones and make them eligible for funding. Therefore she welcomes the inclusion of cross-border district heating networks under the revised CEF Regulation.

The role of consumers

The role of decentralised energy storage by consumers will increase. Private households can store the energy that they produce, for example from photovoltaic panels, in home batteries for their own later use. They can also become storage units in the grid by offering the storage capacities of their e-vehicle batteries to the grid ('vehicle-to-grid'). Cars are parked 96 % of the time, and the battery capacity of parked e-vehicles can be used for balancing the grid. Innovative smart charging already exist and should widely be made available to make offering such flexibility services attractive to consumers.

**ANNEX: LIST OF ENTITIES OR PERSONS
FROM WHOM THE RAPPORTEUR HAS RECEIVED INPUT**

The following list is drawn up on a purely voluntary basis under the exclusive responsibility of the rapporteur. The rapporteur has received input from the following entities or persons in the preparation of the draft report:

Entity and/or person
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