Joint **EPPSA – EUGINE – EUTurbines** input on:

SET-Plan ISSUES PAPER No.4: *Energy systems*

(Increase the resilience, security, smartness of the energy system)

The sector of flexible thermal power generation technology in Europe, represented by **EPPSA** (European Power Plant Suppliers Association), **EUGINE** (European Engine Power Plants Association) and **EUTurbines** (European Association of Gas and Steam Turbine Manufacturers) welcome the European Commission's initiative to refocus and prioritise the actions and activities within the updated SET-Plan.

EPPSA, EUGINE and EUTurbines appreciate the opportunity to participate in the dedicated stakeholder's consultation on the "issues paper No.4 on Energy Systems" where we would like to stress the importance of flexible thermal backup generation contributing to the resilience and security of the energy system, enabling more RES onto the power system in a secure manner. Our sector therefore jointly submits this input paper in order to help shape research and innovation activities in this area.

Our contribution follows the questions outlined in the "Implementation process and expected outcomes" document. Please, note that, while we are also providing input on other areas, our comments are mainly focused on one of the flexibility options mentioned in the issues paper, namely "flexible backup and generation".

Target

Our three organisations welcome and support the proposed overall target, which recognises the importance of flexibility and the robustness it provides to the energy system. While the role of cost-effectiveness needs to be acknowledged, we believe that R&I activities should also work towards decreasing the environmental impact of these flexibility options. For this reason, we would propose to slightly modify the proposed target as follows:

> *As an overarching target, the SET-Plan R&I will aim at developing, maturing and demonstrating (up to TRL7 to 9) technologies, systems and services which have the potential of being cost effective and reduce the environmental impact, so that the EU electricity system is capable of hosting 45% of variable renewables by 2030 and operate in a safe, stable and secure way.*

In the same way, we propose the following modifications to the paragraphs introducing the **flexibility options** in that same section, which aim at enhancing the descriptions and emphasising the R&I needs of these options/technologies. Changes are proposed for both "storage" and "flexible backup and generation":

> ***Storage:*** *Energy storage, related to the electricity system, is the act of deferring an amount of the final energy that was generated to the moment of use, either as final energy or converted into another energy carrier[1], for which a wide range of options are available. An ensemble of cost-competitive storage solutions must be developed at different levels (generation, transmission, distribution, consumers) and different timescales (from real-time to seasonal balancing). As these technologies shall be applied at generation, transmission, distribution or*

[1] Following the definition supported by the energy storage sector.

consumption level, R&I activities should be closely connected to these different levels, in order to ensure an efficient integration. Storage solutions shall include not only the storage technology itself, but should look at the entire process, from transformation to re-transformation and use.

Flexible backup and generation: *To achieve the overarching target, thermal power plants in the future will need to be optimised for maximum flexibility to ensure the smooth functioning of the system. These flexibility improvements have to incorporate the overarching target of maximising efficiency as well. In the context of the SET-plan, integration of flexible backup and generation solutions will be privileged that can at the same time provide a maximum of flexibility services and significantly decrease GHG emissions. Solutions should aim to economically provide the services required for balance and stability of the power system and exploit the potential capabilities of both thermal and renewable power generation. In addition, the further development of hybrid plants combining variable power generation from renewables with the reliability of dispatchable energy sources should be further supported for power generation, as well as solutions for an efficient conversion of existing power plants, to contribute to a cost-effective and low-emission backup.*

Monitoring of the Target

EPPSA, EUGINE and **EUTurbines** agree with the Commission that to achieve this target, *"all flexibility options should be combined in an optimum way*", which may be different in different geographical areas. We also believe in a market-driven approach, in which flexibility solutions should compete.

In addition, we agree that fixing shares and targets for each of the flexibility options based on the overarching target would not be feasible. Instead, we suggest that for monitoring R&I efforts and technology progress, specific **performance targets** relative to today's state of the art shall be defined for the different identified flexibility options described in the document. These will ensure that R&I efforts stay focused. In this sense, information available in the currently existing Integrated Roadmap and other similar or related documents could be used as basis, which would, in turn, guarantee continuity of the work done in the past.

For instance, the deliverables mentioned in the INDUSTRIAL RESEARCH AND DEMONSTRATION PROGRAMME for Challenge 4: Flexible /Back-up Energy Generation in Actions 3 (Efficient and Responsive Thermal Power Plants) and 4 (Flexible and Efficient Gas and Steam Turbines) [2] would be a good start to define such performance targets. More time to develop and agree on such performance targets is however needed, and this would require the involvement of all relevant stakeholders.

Given the different nature of the four identified flexibility options, and in order to guarantee a technology-neutral approach, we strongly believe that **implementation plans** for each of these options need to be developed in a coherent and coordinated way while keeping in mind the specificities and the stage of technology development of each option.

Identifying gaps/barriers to meet the target

In the issues paper, the Commission outlines a number of areas for which indicators could be developed. Identifying gaps/barriers to meet the target in terms of data availability, quality and comparability will be necessary to ensure a reliable and fair measurement of progresses as well as to assess the level of ambition of the proposed target. Such indicators would also need to be developed

[2] See Annex I part II to the document "Towards an Integrated Roadmap: Research Innovation Challenges and Needs of the EU Energy System", p.99-100.

in consultation with all relevant stakeholders. In the same way, the above mentioned performance targets relative to the state of the art of the different technologies would also contribute to the progress assessment.

R&I priorities

EPPSA, EUGINE and **EUTurbines** hereby highlight a number of R&I areas that need to be prioritised in the future, in order to improve the flexibility and efficiency of thermal power plants. These may vary, depending on the nature of the thermal power plant:

Efficient and Flexible Thermal Power Generation – Operational flexibility: For thermal power generation, the shift from base-load to flexible back-up generation poses a number of challenges to the current technology, which need to be addressed and optimised – especially in the area of operational flexibility. Improvements in the following areas will contribute to increasing the flexibility, efficiency and response capability of thermal power plants – **these areas built on the existing Horizon2020 LCE17-2014 and LCE28-2017 calls** (Highly flexible and efficient fossil fuel power plants):

- **Start-up/shut-down ability:** further improving the ability of the thermal power generating facility to move within a specified time from a defined idle state to synchronous operation with a defined power output. The same applies to the ability of a facility to return to a defined idle state within a given timeframe.
- **Load following capability:** further increasing the rate at which a power generating facility can increase or decrease its output. This flexibility increase must apply to existing and new power plants' components.
- **Minimum load:** further reducing the minimum load at which a power generating facility can reliably operate. It needs to be kept in mind that running a thermal power plant in partial load decreases its efficiency.
- **Efficiency:** further improving the conversion rate of energy from different forms into electricity, which defines the efficiency of a thermal power plant. Aspects in the operational flexibility of the thermal power plant will also have an impact on its overall efficiency, hence the need to increase part load efficiency.

Fuel flexibility: Thermal power plants of the future need to increasingly be able to flexibly use different fuel sources and be capable of switching among them – including biofuels, biomass, etc.

Energy storage at thermal power plants: Thermal power plants can improve their efficiency and flexibility by storing excess energy on site in case of demand variations and using this at times of peak demand. Similarly also excess energy from variable renewables could be stored at thermal power plants or transformed into a syngas, chemical products etc., as support and/or possible alternative to fossil fuels.

Hybrid plants: Better integration of RES will be achieved via hybrid plants, for example to enable rapid switches between RES and thermal power generation, such as thermal solar plants, or to allow the use of CO_2 neutral biomass or hydrogen to increase electricity supply stability while reducing plants' carbon emissions.

Decentralised power generation: optimising the connection, control and management of decentralised power generation units, including those coordinated as "virtual power plants", and providing flexibility to the power system, which will help address and minimise the challenges in transport between the points of energy generation and consumption.

Combined heat and power generation (CHP): Increase of efficiency in CHP units, optimisation of decoupled use of heat and power (by buffers, by storage of heat, power-to-heat or power-to-gas) and better integration of existing industrial CHP plants into the grid.

Improvement of robustness: Improved robustness of thermal power plants, allowing even with increased cycling, to minimise wear & tear effects. The number of starts through the lifetime of the power plant will, thus, also have an impact – the goal is to be able to increase those as well.

Optimisation of costs: Investments costs should be optimised to be in a position to recover costs with a reduced number of operating hours per year.

Emission reduction: The increased cycling of flexible thermal power plants creates challenges regarding the emissions performance of these power plants. The optimisation of the emissions performance under these conditions is a new technical challenge that needs to be addressed.

Actors for implementation

EPPSA, **EUGINE** and **EUTurbines** believe that only the involvement and cooperation of all relevant stakeholders, including industry, researchers and Member States/EU, will allow the EU to achieve its objectives in a transparent, fair and balanced manner.

We look forward to being involved in the upcoming discussions of the SET-Plan Steering Committee and remain available to provide additional information on the abovementioned points. We look forward to also contributing to the preparation of the implementation plan as part of the second stage of the process as outlined in the "Implementation process and expected outcomes" document.

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