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# COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

## on the revision of the Strategic Energy Technology (SET) Plan

## 1. POLICY CONTEXT: THE SET PLAN ACCELERATING THE CLEAN ENERGY TRANSITION

The EU's Strategic Energy Technology (SET) Plan[1] supports the development of clean, efficient and cost-competitive energy technologies through coordination and collaboration in clean energy research and innovation (R&I), bringing together European industry, academia and governments of the SET Plan countries[2]. The SET Plan has played a central role in implementing the research, innovation and competitiveness dimension of the Energy Union[3]. It has had a structuring effect on joint R&I actions, helping them deliver on common energy research objectives with greater speed and effectiveness.

The European Green Deal[4] and the REPowerEU Plan[5] set out strategic objectives for the clean energy transition, including the decarbonisation of energy-intensive industries and the reduction of pollution. The Green Deal Industrial Plan[6] provides further direction by calling for a more autonomous and resilient EU industry, with the Net-Zero Industry Act[7] and the Critical Raw Materials Act[8] as its building blocks:

- The Critical Raw Materials Act sets the goal to ensure a secure supply of critical raw materials by developing the EU value chain while improving the circularity and sustainability of critical raw materials production.
- The Net-Zero Industry Act aims to increase the EU's capacity to manufacture strategic 'net-zero technologies' to approach or reach a benchmark of at least 40% of the EU's annual deployment needs for the corresponding technologies by 2030, and sets a target of 50 million tonnes of annual $CO_2$ storage capacity by 2030.

In addition, the revised Renewable Energy Directive[9] asks Member States to set an indicative target for innovative renewable energy technology of at least 5% of new installed renewable energy capacity by 2030. Finally, the Communication on 'A new European Research Area for Research and Innovation'[10] and the European Research Area Policy Agenda[11] call for a better alignment of R&I investments and reforms at national and EU level to accelerate the green and digital transition.

This new policy context underlines the need for increasing the resilience, autonomy and competitiveness of the European energy system and its supply chains, using circular and human-centred solutions, within our planetary boundaries.

[1] COM(2007) 723 final of 22.11.2007, 'A European Strategic Energy Technology Plan (SET Plan) 'Towards a low carbon future''.
[2] Currently, all EU Member States plus IS, NO and TR.
[3] COM/2015/080 final, 'A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy'.
[4] COM(2019) 640 final of 11.12.2019.
[5] COM(2022) 230 final of 18.5.2022.
[6] COM(2023) 62 final of 1.2.2023.
[7] COM(2023) 161 final of 16.3.2023.
[8] COM(2023) 160 final of 16.3.2023.
[9] Texts adopted - Renewable Energy Directive ***I - Wednesday, 14 September 2022 (europa.eu)
[10] COM/2020/628 final of 30.09.2020.
[11] European Research Area Policy Agenda (europa.eu)

## 2. SET PLAN PRIORITIES, ACHIEVEMENTS AND NEW DIRECTIONS

Through its 14 implementation working groups[12] (IWGs) and related European Technology and Innovation Platforms (ETIPs), the SET Plan activities have focused on the six priorities of the Research, Innovation and Competitiveness dimension of the Energy Union. This section takes stock of the SET Plan's achievements and identifies new directions.

### Priority 1: Becoming world number one in renewables

Under this priority, the SET Plan identified two actions: integrating renewable technologies into the energy systems (action 1) and reducing the costs of these technologies (action 2). The priority has been implemented through five IWGs on specific renewable energy technologies.

The SET Plan's work on **offshore wind energy**[13] has provided a platform for R&I agenda-setting and helped to liaise the SET Plan community with the IEA Technology Collaboration Programme on wind. In the field of **solar photovoltaic** (PV)[14], the SET Plan helped align the R&I efforts of the participating countries, contributing to significant technology progress towards the world's most efficient solar cell to date. The SET Plan has strongly shaped **deep geothermal**[15] energy R&I, for example on cost reduction, through advanced drilling and well completion techniques. The SET Plan **ocean energy**[16] workstream inspired the EU offshore renewable energy strategy[17] and helped formulating guidance on setting up an insurance and guarantee fund for the deployment of large-scale demonstration projects. Moreover, the SET Plan has inspired most of the **concentrated solar thermal**[18] topics in the EU's for Research and Innovation programmes Horizon 2020[19] and Horizon Europe[20]. This has advanced the technology not only for power production, but also for innovative applications such as solar heat for industrial processes and for renewable hydrogen production.

The creation of the European Clean Energy Transition Partnership[21] under Horizon Europe is an example of successful EU cross-sectoral cooperation through the SET Plan. Thanks to the Partnership, EUR 500 million in national funding was pooled to support jointly agreed R&I priorities, six times more than under Horizon 2020. This shows the SET Plan's potential for leveraging public funding to support common objectives. These joint activities with Member States are complementary with the activities funded by the Horizon Europe programme in the energy domain, notably within Cluster 5 (areas of climate, energy and mobility) and Cluster 4 (areas of industry and digital).

The revised SET Plan will aim to enable the EU to become a global leader in the development of innovative renewable energy technologies and to increase the EU's manufacturing capacity for clean energy technologies in line with the ambition of the Green Deal Industrial Plan, so

[12] https://setis.ec.europa.eu/implementing-actions_en
[13] IWG Wind Energy - IP.pdf (europa.eu)
[14] SET Plan TWP PV Implementation Plan (europa.eu)
[15] Implementation plan on deep geothermal energy.pdf (europa.eu)
[16] SET Plan OCEAN ENERGY Implementation plan.pdf (europa.eu)
[17] COM (2020)741, 19.11.2020
[18] Initiative for Global Leadership in Concentrated Solar Thermal Technologies (europa.eu)
[19] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en
[20] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
[21] https://cetpartnership.eu/

that it doubles - in a resilient and competitive way - its current share of renewable energy to reach at least 42.5% by 2030, with innovative renewable energy technology representing at least 5% of new installed renewable energy capacity.

Moreover, the revised SET Plan will:

- Extend its activities to include onshore wind energy and low (less than 125 °C) and medium (125-225 °C) temperature geothermal technologies, which have substantially developed since the SET Plan was launched but still require R&I to maintain the EU's competitive advantage.
- Set up a new IWG on hydrogen to implement the strategic R&I agenda of the ERA pilot on green hydrogen[22] in line with the Clean Hydrogen Partnership and the Commission staff working document on European R&I actions to support the 'ERA pilot on green hydrogen'[23].
- Build on the work of the SET Plan IWGs on photovoltaics and concentrated solar power, to deliver on a joint solar energy strategic R&I agenda[24] encompassing photovoltaics, concentrated solar thermal and non-concentrated solar thermal.

**Priority 2: Delivering a smart, consumer-centric energy system**

Under this priority, the SET Plan identified two actions, one focused on new technologies and services for consumers (action 3) and the other on the resilience and security of energy systems (action 4). The priority has been implemented through three IWGs on energy systems[25], positive energy districts[26] and high voltage direct current[27].

The SET Plan has helped align EU and national R&I priorities on **smart and integrated energy systems** through the IWG for energy systems and the European Technology and Innovation Platform for Smart Networks for Energy Transition (ETIP SNET). The latter has supported the preparation and implementation of the EU action plan on the digitalisation of the energy system. The SET Plan has developed an integrated approach to **positive energy districts[28]** including technological, spatial, regulatory, financial, legal, environmental, social and economic perspectives. Collaboration between the Urban Europe Joint Programming Initiative, key stakeholders and the Commission has led to the Driving Urban Transition Partnership being co-funded under Horizon Europe.

[22] Expert groups of the agenda process (2022), Strategic Research and Innovation Agenda, Key findings and conclusions of the agenda process for the European research and innovation initiative on green hydrogen, Final version (https://www.bmbf.de/bmbf/shareddocs/downloads/files/SRIA_green_hydrogen.pdfhttps://www.bmbf.de/bmbf/shareddocs/downloads/files/SRIA_green_hydrogen.pdf).https://www.bmbf.de/bmbf/shareddocs/downloads/files/SRIA_green_hydrogen.pdf

[23] Building a European Research Area for clean hydrogen - the role of EU research and innovation investments to deliver on the EU's Hydrogen Strategy. SWD(2022) 15 final, 20.1.2022

[24] See EU Solar Energy Strategy COM/2022/221 final

[25] SET Plan ENERGY SYSTEMS Implementation plan.pdf (europa.eu)

[26] Positive energy districts (europa.eu)

[27] https://setis.ec.europa.eu/system/files/2022-02/SETPlan_HVDC_DC_Tech_ImplementationPlan_Final.pdf

[28] Positive energy districts (europa.eu)

Since 2021, the SET Plan has been giving greater importance to the development and demonstration of direct current (DC) technologies, starting with **high voltage direct current** technologies for high-power offshore and onshore connections.

The revised SET Plan will accelerate the development of innovative and flexible solutions to optimise the existing grid, in particular demand response and energy storage, whose use will be supported by the proposed electricity market design reform[29]. These solutions will help increase the share of renewable electricity production[30] integrated into the grid to reach at least 65% by 2030. The SET Plan will also accelerate the development and use of innovative technologies providing security, stability and cyber-resilience to the energy system to help it cope with the increasing likelihood of climate-driven disruption and human-driven external threats.

At local level, the new solutions stemming from the revised SET Plan will support cities in accelerating their green and digital transformation, contributing to the Climate-Neutral and Smart Cities Mission[31] objective of at least 100 climate neutral and smart cities by 2030. The revised SET Plan will also extend its scope to cover low and medium voltage direct current (LVDC and MVDC) technologies to take advantage of LVDC microgrids in buildings, industrial facilities, data centres and electric vehicle charging stations. This will reduce the number of (AC/DC and DC/AC) converters and improve material and energy efficiency in applications where most electrical equipment runs on direct current.

**Priority 3: Develop and strengthen energy-efficient systems**

Under this priority, the SET Plan's actions focused on new materials and technologies for buildings[32] (action 5) and energy efficiency for industry[33] (action 6). The priority has been implemented through two IWGs on energy efficiency in buildings and industry.

The IWG on **energy efficiency in buildings** has carried out hundreds of regional, national, and EU-wide R&I projects in the building sector in recent years. The IWG's implementation plan helped to identify the scope of the Built4People[34], Clean Energy Transition[35] and Driving Urban Transitions[36] partnerships supported by Horizon Europe. The IWG also works closely with the Processes4Planet Partnership[37].

To help increase **energy efficiency in industry** the SET Plan initially focused on two energy-intensive sectors (steel and chemicals) and two cross-cutting areas (system integration, and heating and cooling). The countries involved in this IWG agreed on common R&I priorities and targets with industry and research organisations, which were reflected in the funding

[29] COM(2023) 148 final.
[30] COM(2020) 562 final.
[31] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/climate-neutral-and-smart-cities_en
[32] https://setis.ec.europa.eu/system/files/2021-02/set_plan_buildings_implementation_plan.pdf
[33] EE-in-industry_Implementation-Plan_Rev2021_Final-Endorsed.pdf (europa.eu)
[34] Built4People (ectp.org)
[35] https://cetpartnership.eu/
[36] https://dutpartnership.eu/
[37] https://www.aspire2050.eu/p4planet/about-p4planet

priorities set out in the Horizon Europe Cluster 5 work programmes[38]. The IWG also facilitated dialogue among steel manufacturers, contributing to the creation of the Clean Steel Partnership.

In 2021, SET Plan actors adopted stricter climate and circularity targets and included two additional industrial sectors (cement, and pulp and paper) in the SET Plan activities, paving the way for greater integration between industrial sectors, renewable energy generation, and storage technologies.

The revised SET Plan will develop innovative and cost-effective ways to contribute to at least double the annual renovation rate of buildings between 2020 and 2030 and to make all new and existing buildings zero-emission by 2030 and 2050 respectively, in line with the proposed revision of the Energy Performance of Buildings Directive[39]. Its R&I priorities will also help reduce industry's greenhouse gas emissions by 25% by 2030[40] and help meet the indicative target of increasing renewable energy use in the industrial sector by 1.6% per year until 2030[41]. The SET Plan priorities on energy efficiency will be aligned and geared towards the overall reduction of primary and final energy consumption[42].

The revised SET Plan will also:

- broaden the scope of the IWG on energy efficiency in buildings to give heat pumps more prominence, thereby helping expand the EU's innovation and manufacturing capacity for these technologies, of which the roll-out must double in the building sector to reach a cumulative 10 million units over the next 5 years.
- broaden the scope of the IWG on energy efficiency in industry and accelerate the development, integration, testing, and validation of key technologies for competitive, climate neutral and zero pollution energy-intensive industries before 2030, building on the ERA industrial technology roadmap for low-carbon technologies in energy-intensive industries and the mapping of industrial demonstrators.

**Priority 4: Diversify and strengthen energy options for sustainable transport**

Under this priority, the SET Plan's actions focused on enhancing EU competitiveness in the global battery sector for e-mobility and stationary storage[43] (action 7) and renewable fuels and bioenergy[44] (action 8), with IWGs on batteries and renewable fuels and bioenergy.

The SET Plan has created Batteries Europe[45], bringing together more than 700 stakeholders in the European batteries R&I ecosystem to develop a sustainable and competitive **battery value chain** in Europe. This paved the way for the BATT4EU co-programmed partnership under Horizon Europe[46]. SET Plan activities have provided a deeper insight into the value chain approach for **renewable fuels and bioenergy**, which is of particular importance in this field.

[38] For instance, on industrial heat and cold management.
[39] COM(2021) 802 final.
[40] Compared to 2015 - COM(2020) 562 final.
[41] COM(2021) 557 final
[42] Directive 2023/1791 of 13 September 2023 on energy efficiency and amending Regulation 2023/955 (recast)
[43] https://setis.ec.europa.eu/system/files/2021-05/set_plan_batteries_implementation_plan.pdf
[44] https://setis.ec.europa.eu/system/files/2021-07/setplan_bioenergy_implementationplan.pdf
[45] Batteries Europe is the technology and innovation platform part of the European Battery Alliance
[46] https://bepassociation.eu/

The revised SET Plan will:

- facilitate the development and uptake of 100% renewable, efficient, and interconnected energy and transport systems to achieve the 2030 and 2050 renewable energy targets and the respective emission reduction targets under the EU Climate Law as well as under RefuelEU aviation[47] and FuelEU maritime[48] regulations.
- strengthen the European battery manufacturing value chain, including the domestic sourcing of raw materials and advanced materials as well as reusability and recyclability, to achieve self-sufficiency by 2030.
- further work with Batteries Europe to support the monitoring of the batteries value chain.
- address innovative storage technologies beyond electrochemical batteries.

**Priority 5: Driving ambition in carbon capture, utilisation and storage**

Under this priority, the SET Plan's action 9 focused on carbon capture and storage (CCS) and on carbon capture and utilisation (CCU)[49].

The SET Plan has been highly successful in mobilising more countries and stakeholders to work on CCUS. The resulting knowledge sharing and increased efficiency has benefited demonstration and full-scale projects, for example in the cement industry[50]. The results achieved under this action serve as a reference for the further rapid deployment of CCS and CCU as put forward in the Net-Zero Industry Act.

The revised SET Plan will align targets and activities with the new energy and climate policy landscape, in particular the Net-Zero Industry Act and the industrial pillar of the Sustainable Carbon Cycles Communication as well as the upcoming EU strategy for carbon capture, utilisation and storage (CCUS). To maximise its impact, the revised SET Plan must support coordinated public-private action aimed at developing business cases and cooperation models for the emerging carbon capture, storage or use value chains (including the pre-competitive evaluation of storage options at regional and national scale), in support for economic operation of at least 50 million tonnes of annual $CO_2$ injection capacity by 2030, both in saline aquifers and in depleted hydrocarbon fields in the EU.

**Priority 6: Maintain and strengthen safety in the use of nuclear energy**

Under this priority, the SET Plan's actions focused on nuclear safety during operation and decommissioning (action 10) with a related workstream[51].

The SET Plan has provided a dialogue platform for Member States using or willing to use nuclear technologies in their energy mix or in other applications (for e.g. nuclear medicine[52]).

[47] https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A52021PC0561

[48] https://data.consilium.europa.eu/doc/document/PE-26-2023-INIT/en/pdf

[49] https://setis.ec.europa.eu/system/files/2021-04/set_plan_ccus_implementation_plan.pdf

[50] https://www.leilac.com/project-leilac-2/

[51] https://setis.ec.europa.eu/implementing-actions/nuclear-safety_en#documents

[52] SAMIRA Action Plan (europa.eu)

SET Plan cooperation also led to the EERA Joint Programme on Nuclear Materials[53], which aims to improve plant safety and efficiency, as well as qualification for advanced nuclear fission and fusion systems. The SET Plan also supported ongoing and planned European co-funded partnerships[54].

The revised SET Plan will help maintain and strengthen the safety of nuclear energy, taking also into account the declared ambition of 14 Member States[55] (Nuclear Alliance[56]) to provide up to 150 GW of electricity capacity by 2050 in the EU (from roughly 100 GW today). This is expected to entail at least 30-45 new build large reactors and small modular reactors (SMRs).

The revised SET Plan will put increased emphasis on the safety of SMRs, the diversification of the supply chain, on industrial hubs, and on fostering the development of centres of excellence, competencies, and the availability of world class research infrastructures.

## 3. MAKING THE SET PLAN FIT FOR THE NEW ENERGY AND CLIMATE AMBITION: ADDRESSING CROSS-CUTTING ISSUES

The revised SET Plan priorities, actions and IWGs should be accompanied by new priorities on cross-cutting issues to accelerate the development and deployment of clean and efficient energy technologies[57]. The revised SET Plan will take a task force approach to address the following cross-cutting issues:

**Digitalisation** is key to the energy transition as it can improve the performance of many parts of the energy system and reduce the costs of research and experiments through virtualisation[58]. Ensuring that smarter assets can communicate easily and offer flexibility will be important in balancing supply and demand of our energy system, thus facilitating the integration of decentralised renewable energy sources and reducing their curtailment. Digitalisation will be key to supporting the flexibility that energy-intensive industries need to respond to challenges such as electrification or volatile energy supply. Digital solutions can also enhance market integration and empower consumers in the energy transition.

The revised SET Plan will support closer cooperation between digital and energy areas across the entire strategic technology value chains in EU and national R&I programmes. As announced in the EU action plan for the digitalisation of the energy system, the Commission will create the 'Gathering Energy and Digital Innovators from across the EU' (GEDI EU) platform for cooperation between the SET Plan stakeholders and the European Digital Innovation Hubs and

[53] http://www.eera-jpnm.eu/

[54] Radioactive waste management, geological disposal, and decommissioning (EURAD); Nuclear materials to improve plant safety and efficiency, and qualification for advanced nuclear fission and fusion systems; Radiation protection (PIANOFORTE) also supporting the implementation of the Strategic Agenda for Medical Ionising Radiation Applications; Fusion research with EUROfusion.

[55] Belgium, Bulgaria, Croatia, the Czech Republic, Estonia, Finland, France, Hungary, the Netherlands, Poland, Romania, Slovenia, Slovakia, Sweden.

[56] https://www.ecologie.gouv.fr/sites/default/files/nuclear%20alliance%20statement_VEN.pdf

[57] European Commission, Directorate-General for Research and Innovation, SET plan interim evaluation final report, Publications Office of the European Union, 2022 https://data.europa.eu/doi/10.2777/939719https://data.europa.eu/doi/10.2777/939719. https://data.europa.eu/doi/10.2777/939719

[58] COM(2022) 552 final - 'Digitalising the energy system – EU Action Plan'.

the Artificial Intelligence Testing and Experimentation Facilities (AI TEFs) set up under the Digital Europe Programme that focus on energy.

Furthermore, the SET Plan community will assist the Commission in preparing policy initiatives on the digital and sustainable transformation of the EU's energy system.

Planetary boundaries must be respected by improving the **circularity** (recyclability and reusability) and efficiency of clean energy **materials** and other low-carbon technologies and infrastructures through a lifecycle approach (e.g. development of advanced sustainable materials, and material/water consumption reduction in production processes) and by investing more in research on materials substitution to secure the resilience of the European clean energy supply chains. The circular economy action plan proposes to strengthen the role of circular economy objectives in future revisions of the national energy and climate plans, while pointing to support possibilities under State aid rules for clean energy technology development and deployment and, where appropriate, in other climate policies.

The revised SET Plan will support the circularity principles by mainstreaming the recovery, recycling and substitution of critical raw materials into the research, development, and manufacturing of clean energy technologies.

**Societal needs** must be respected to ensure a just, fair and socially acceptable transition for all as a means of facilitating the development and implementation of low-carbon energy technologies and infrastructures (e.g. through better understanding of the public's concerns such as energy poverty or emerging health and safety related issues for workers in 'green' jobs, and their increased engagement and participation).

The revised SET Plan will pursue a user-centred approach by mainstreaming issues such as health, gender, safety, security, accessibility, affordability, as well as the needs of aging or disabled consumers into all actions.

The **upskilling and reskilling** of the workforce is of paramount importance to meet the labour needs of a new energy and societal model. So far, 14 Member States[59] are including investments and reforms in the area of green skills and jobs in their national Recovery and Resilience Plans that, together, amount to around EUR 1.5 billion[60]. Other resources to support green skills and jobs are earmarked by the European Social Fund Plus (ESF+, EUR 5.8 billion) and the Just Transition Mechanism (EUR 3 billion). The European Regional Development Fund (ERDF) complements ESF+ with investments in skills, education and training, including infrastructure (EUR 1.8 billion). Horizon Europe provides targeted support to a European Hydrogen Academy, bringing together a large alliance of universities and institutions. The Single Market Programme includes support to a Solar Academy. Furthermore, the European

[59] Greece, Spain, France, Croatia, Portugal, Slovenia, Ireland, Estonia, Lithuania, Romania, the Netherlands, Cyprus, Finland and Denmark.

[60] Figures as of 18 August 2023. They are based on the pillar tagging methodology for the Recovery and Resilience Scoreboard and correspond to the measures allocated to the policy area 'Green skills and jobs' as primary or secondary policy area.

Institute of Innovation and Technology (EIT) and its Knowledge and Innovation Communities (KICs) which operate in various fields, such as energy, raw materials and climate, offer a wide array of education and training programmes with a strong entrepreneurship and innovation component. Most of these programmes are already available at the EIT Campus[61] and contribute to deep tech talent[62] development.

Notwithstanding these funds available at European level, investment in skills needs to be mainly financed by other public and private investments, and current funding is insufficient to meet the needs.

The Commission strongly encourages SET Plan countries to engage in the new EU large-scale skills partnership for onshore renewable energy under the Pact for Skills and to consider the possibilities for funding from the ESF+, ERDF and the Just Transition Fund programmes, if relevant and in line with the programmes' objectives.

The revised SET Plan will support the European Net-Zero Industry Academies announced in the Net-Zero Industry Act[63], by building on the experience of the European Batteries Academy[64]. Each academy will aim to train 100 000 people within their first 3 years.

To support Europe's recovery and increase its competitiveness and global leadership in technology, SET Plan activities must **accelerate the market uptake** of R&I results. This means embedding industrial processes, manufacturing needs, and their costs in technology development. To accelerate market uptake, innovators and technology developers should be able to test their product's manufacturability efficiently and quickly in a professional and accessible technology infrastructure and receive a pre-certification record and a lifecycle assessment. This will help potential investors to make informed decisions based on the manufacturing potential and compliance with existing regulations. Once set up, the regulatory sandboxes proposed in the Net-Zero Industry Act will be a major support for innovators, developers and investors alike. The Recovery and Resilience Facility has also been an enabling tool in this area, where measures amounting to EUR 15 billion have been included in national Recovery and Resilience Plans addressing research and innovation towards climate change mitigation, adaptation, and the circular economy.

The revised SET Plan will share best practices on regulatory issues, liaising with the Net-Zero Europe Platform where it should be represented. It will identify the needs for and feasibility of technology infrastructures in the EU, with a link to the European approach for technology infrastructures under the European Research Area Policy Agenda.

The revised SET Plan will develop strong links between the ETIPs and industrial alliances (the European Battery Alliance, the European Clean Hydrogen Alliance and the Solar PV Industry Alliance), to promote the development of viable investment projects and manufacturing capacity in clean energy technologies in the EU, and to address market, regulatory, infrastructure and technological barriers to their large-scale deployment.

[61] https://eit-campus.eu/
[62] https://www.eitdeeptechtalent.eu/
[63] E.g. solar photovoltaic and solar thermal technologies, renewable hydrogen technologies and raw materials
[64] The European Batteries Academy is run by InnoEnergy, a Knowledge and Innovation Community (KIC) of the European Institute of Innovation and Technology (EIT).

The revised SET Plan should **improve access to funding, in particular to scale up innovations**. In 2021, the EU spent EUR 328 billion on R&I, representing 2.26% of GDP[65]. This ratio was well below both that of Japan (3.26%) and that of the US (3.45%). Clearly, efforts still need to be intensified to reach the EU public and private expenditure target of 3% of GDP[66]. Although most Member States have increased their public R&I investments in the Energy Union priorities, as a proportion of GDP these investments were in 2021 below the levels prior to 2016. As for private investments, they were proportionally lower than major competing economies such as China, Japan, and South Korea. With 19% of global Venture Capital investments in clean energy technology firms, the EU ranked third in 2022, behind the US and China[67].

This underlines the need to use the full range of EU public financial instruments (such as grants, loans and quasi-equity), including the new Strategic Technologies for Europe Platform[68] (STEP), to leverage private capital (e.g. from investment funds, banks and pension funds) for the SET Plan priorities in order to maximise the amount, quality and impact of investment in R&I and accelerate deployment. Best use should be made of instruments that bridge the gap between public and private sector investment, such as the Green Transition Product and the Joint Equity Product under InvestEU[69] and the Breakthrough Energy Catalyst[70]. The SET Plan ETIPs are well-positioned to identify potential barriers and recommend possible solutions to leverage such private and public investments.

The scope and activities of the SET Plan is highly congruent with that of the Innovation Fund, which is the key EU funding instrument for the deployment of low-carbon technologies in the areas of renewable energy generation, energy storage, CCUS (carbon capture, utilisation and storage), energy-intensive industries, net-zero mobility and buildings. Synergies and complementarities should be sought between the activities of the SET Plan and the Innovation Fund. In this context, coordination actions funded by Horizon Europe Clusters 4 and 5 in the main areas of the Innovation Fund will be launched early 2024.

The Clean Energy Transition Partnership will be instrumental to the extended scope of the revised SET Plan, as it will support links between funding instruments and improve access to the clean energy technology market. The European Energy Research Alliance will complement the work of the Partnership by organising joint programmes between research institutes and academia.

The actors involved in the revised SET Plan should aim to secure increased financial support for the Clean Energy Transition Partnership co-funded under Horizon Europe, to support the stronger ambitions, including increased collaboration between ETIPs under the ETIPs Forum[71]. Synergies and complementarities should be sought between the activities of the SET Plan and the Innovation Fund.

[65] Source: Eurostat

[66] European Council conclusions of 23 March 2023, pdf (europa.eu)

[67] Source: Competitiveness Progress Report 2022

[68] https://commission.europa.eu/system/files/2023-06/COM_2023_335_1_EN_ACT_part1_v11.pdf

[69] InvestEU Fund (europa.eu)

[70] https://breakthroughenergy.org/our-work/catalyst/

[71] The ETIPs Forum develops and maintains regular, continuous and structured dialogue between the 11 ETIPs.

The Commission calls upon SET Plan countries to increase efforts to spend 3% of their GDP on R&I and to foster the scale-up of innovations.

## 4. GOVERNANCE, MONITORING AND REPORTING

The SET Plan will need to renew its governance model to deliver on the goals of the European Green Deal, REPowerEU and the Green Deal Industrial Plan. To this end, the Commission proposes to increase the legitimacy of the SET Plan Steering Group by upgrading it to the status of expert group, possibly as a subgroup under the European Research Area and extending its mandate to providing strategic directions for the development and implementation of the SET Plan. It also proposes to set up dedicated, time bound task forces to integrate cross-cutting issues into SET Plan work and to strengthen cross-sectoral cooperation between the SET Plan IWGs. The Commission will foster the engagement of all SET Plan countries in this expert group and their activities should be coordinated with the Horizon Europe representatives of the EU Member States and Associated Countries.

Through the SET Plan information system (SETIS), the Commission will systematically monitor and report on the progress and achievements of the revised SET Plan and map developments in the European R&I landscape through key performance indicators. This information will feed into the annual reporting on the Energy Union and will be disseminated at the SET Plan annual conferences. This information will also support Member States in deploying innovative renewable technologies under the revised Renewable Energy Directive[72].

The SET Plan is essential for delivering on the fifth dimension of the Energy Union (research, innovation and competitiveness)[73]. Member States should therefore include national objectives stemming from the SET Plan, as well as R&I activities, in their national energy and climate plans (NECPs), including exploring synergies between other relevant national funds and activities[74]. NECPs should also assess the adequacy of national funding for R&I activities. The Commission's assessment of this part of the NECPs, including of progress reports and their updates, will feed into its overall assessment of the SET Plan achievements. In addition, the Commission calls on Member States to reinforce the collaboration at national level between their SET Plan community and those actors in charge of NECPs.

At European level, the new SET Plan will be given a greater role in feeding into the annual progress reports on the competitiveness of clean energy technologies - another tool of the Energy Union. These annual reports from the Commission to the European Parliament and the Council, are therefore an important way to share information about the implementation of the SET Plan.

[72] 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 sources (recast), (*OJ L 328, 21.12.2018, p. 82).*

[73] Regulation (EU) 2018/1999. Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council, *(OJ L 328, 21.12.2018, p. 1).*

[74] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022XC1229(02)

The SET Plan should also become the main tool for advancing clean energy research in the European Research Area, especially on cross-cutting issues like skills, circularity, access to market, digitalisation and social requirements. The Commission will ensure an annual exchange between the SET Plan and the ERA Forum to assess mutual achievements and alignment of activities. In parallel, the Commission will also reinforce the exchanges between the SET Plan Steering Group and the Energy Union government representatives.

The SET Plan should play a prominent role in informing the development and implementation of relevant EU energy and research strategies and legislation, in particular the Net-Zero Industry Act. The SET Plan should regularly report on its achievements to the relevant Committees of the European Parliament and Council working parties. A higher level of political support and commitment to the SET Plan will ensure better consistency between various national actions, and mobilise and leverage more investments for research into, and development and deployment of clean energy technologies, by both the public and private sector.

## 5. CONCLUSIONS

The Commission recognises the SET Plan's contribution to the EU's climate and energy goals, as well as its potential to contribute to stronger industrial competitiveness and to more resilient European supply chains, by enhancing collaboration between the involved countries, industry and research institutes.

However, the SET Plan's objectives, governance structure and IWGs need to be revised if it is to make an even greater contribution to the European Green Deal, REPowerEU and Green Deal Industrial Plan goals, thereby accelerating the clean energy transition and increasing the EU's competitiveness.

To this end, the Commission will work closely with the SET Plan countries, the SET Plan Steering Group and other relevant stakeholders, including new actors and task forces as necessary, to develop and deliver on the new actions and targets.

The Commission calls on all involved countries to strengthen their participation and to increase their efforts in supporting research and innovation in, and the development and deployment of, innovative clean energy solutions, and to further contribute to the financing and implementation of the SET Plan initiatives through a joint programming approach.

The Commission calls on the Council and Parliament to agree to the strengthening of the SET Plan as set out in this Communication.