European Commission

SET PLAN TASK FORCE RECOMMENDATIONS

Task Force 5: Access to the Market

Cross-cutting recommendations on tools and methods to address barriers hindering the access to market of Strategic Energy Technologies

JUNE 2026

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ABBREVIATIONS

Abbreviation	Definition
ACER	European Agency for the Cooperation of Energy Regulators
AI	Artificial Intelligence
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CEER	Council of European Energy Regulators
CEF	Connecting Europe Facility
CEN	European Committee for Standardisation
CETP	Clean Energy Transition Partnership
CID	Clean Industrial Deal
CIIP	Common Implementation and Investment Plan
CINEA	European Climate, Infrastructure and Environment Executive Agency
CISAF	Clean Industrial Deal State Aid Framework
CO2	Carbon Dioxide
CSP	Concentrated Solar Power
DEEP	De-risking Energy Efficiency Platform
DG ENER	Directorate-General for Energy
DSO	Distribution System Operator
DUT	Driving Urban Transitions
EC	European Commission
ECF	European Competitiveness Fund
EED	Energy Efficiency Directive
EEFIG	Energy Efficiency Financial Institutions Group
EEN	Enterprise Europe Network
EERA	European Energy Research Alliance
EIB	European Investment Bank
EIC	European Innovation Council
EIF	European Investment Fund
EMD	Electricity Market Design
ENSREG	European Nuclear Safety Regulators Group
EPBD	Energy Performance of Buildings Directive
ERIC	European Research Infrastructure Consortium
ESCO	Energy Service Company
ETIP	European Technology and Innovation Platform
ETIP BAT	Batteries
ETIP BIO	Bioenergy

Abbreviation	Definition
ETIP GEO	Geothermal
ETIP HYDRO	Hydropower
ETIP OCEAN	Ocean Energy
ETIP PV	Solar Photovoltaics
ETIP RHC	Renewable Heating and Cooling
ETIP SNET	Smart Networks for Energy Transition
ETIP SNETP	Sustainable Nuclear Energy Technology Platform
ETIP WIND	Wind energy
ETIP ZEP	Zero Emissions Platform
EU	European Union
EV	Electric Vehicle
HVDC	High Voltage Direct Current
IAA	Industrial Accelerator Act
ID-E	Investors Dialogue on Energy
IEA	International Energy Agency
IED	Industrial Emissions Directive
IP	Implementation Plan
IPCEI	Important Projects of Common European Interest
IPR	Intellectual Property Rights
ISO	International Organisation for Standardisation
IWG	Implementation Working Group
IWG CCS-U	Carbon Capture, Storage, and Utilisation
IWG DCT	Direct Current Technologies
IWG EEB	Energy and Resource Efficiency in Buildings
IWG GEO	Geothermal Energy
IWG H2	Hydrogen
IWG ES	Energy Systems
IWG IND	Sustainable and Efficient Energy Use in Industry
IWG NS	Nuclear safety
IWG OCEAN	Ocean energy
IWG PEDs	Positive Energy Districts
IWG PV	Solar Photovoltaics
IWG RFB	Renewable fuels and bioenergy
IWG CST	Concentrated Solar Thermal
IWG WIND	Wind energy
JRC	Joint Research Centre

Abbreviation	Definition
KfW	Kreditanstalt für Wiederaufbau
KPI	Key Performance Indicator
MFF	Multiannual Financial Framework
MI	Mission Innovation
NGO	Non-Governmental Organisation
NRA	National Regulatory Authority
NZIA	Net-Zero Industry Act
OEM	Original Equipment Manufacturer
PPA	Power Purchase Agreement
PPI	Public Procurement of Innovation
PPP	Public-Private Partnership
R&D	Research and Development
R&I	Research and Innovation
RED	Renewable Energy Directive
RES	Renewable Energy Sources
SET	Strategic Energy Technologies
SETIS	Strategic Energy Technologies Information System
SME	Small and Medium Enterprise
SMR	Small Modular Reactor
SRIA	Strategic Research and Innovation Agenda
STC	Scientific and Technical Committee
STEP	Strategic Technologies for Europe Platform
TF	Task Force
TSO	Transmission System Operator
TRL	Technology Readiness Level
V2G	Vehicle-to-Grid
VC	Venture Capital

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EXECUTIVE SUMMARY

The recommendations of the Task Force (TF) on 'Access to the Market' aim to **provide effective tools and methods to address barriers hindering access to the market of Strategic Energy Technologies (SETs)**. The development of new technologies is in fact not an end goal in itself. Innovative SETs must also achieve further market uptake and, at a certain point, reach a stage of competitiveness to contribute to energy policy goals. In this context, the recommended actions are expected to contribute to and stimulate both market uptake and market competitiveness of innovative SETs, leading to more sustainable strategies and applications in a wider market.

The Task Force on 'Access to the Market' developed **five recommendations**, created by 19 Task Force members, five Independent Experts and the Task Force Lead and Facilitator. The European Commission Policy Officer had an observer role in the recommendation development process.

The recommendations specify **why** action is needed, **what** solutions could address the identified challenges, and **how** they could be implemented. These elements are synthesised below for each of the recommendations. The recommendations also identify the target audience (**who**), the proposed timing for implementation (**when**), and the **Key Performance Indicators** (**KPIs**) that could be used to track progress.

The Task Force recommendations target key SET Plan stakeholders: primarily the Implementation Working Groups (**IWGs**), and the European Technology and Innovation Platforms (**ETIPs**), but also the European Energy Research Alliance (**EERA**), and the Clean Energy Transition Partnership (**CETP**). The Task Force members, representing the IWGs, ETIPs, EERA and CETP, have expressed strong interest in implementing the recommendations. Implementation is encouraged to commence in 2026 and continue throughout 2027-2030. Progress can be monitored using the proposed KPIs.

Recommendation 1: Use and share knowledge from existing regulatory sandbox solutions for SET Plan technology innovations and develop new ones

Why: Regulatory frameworks often lag behind technological innovation, creating barriers to testing, validation and deployment of SET Plan technologies across fragmented national systems.

What: This recommendation promotes regulatory sandboxes allowing for the testing of innovative energy solutions in controlled environments, and enabling regulators to gather evidence for future policy adjustments.

How: The SET Plan community should set up an EU-level feedback loop mechanism on lessons learnt from existing regulatory sandboxes and create at least one new regulatory sandbox to address specific regulatory barriers and gaps for SET Plan technologies. This includes fostering collaboration between regulators, industry and research, enabling real-world testing environments, and creating structured knowledge-sharing platforms. In the short term, dedicated forums and internal knowledge exchange mechanisms should be set up, followed by the development of a common EU framework and new sandbox implementations by 2030, ensuring long-term regulatory learning and harmonisation.

Recommendation 2: Establish Innovation Hubs for SET Plan technologies

Why: The transition from demonstration to commercial deployment remains hindered by fragmented infrastructures, high costs and limited support at higher TRLs.

What: This recommendation calls for Innovation Hubs for SET Plan technologies, which should be established as coordinated, one-stop-shop ecosystems that connect stakeholders across the value chain to co-develop, test and validate SET Plan technology innovations. These hubs will provide shared infrastructures such as pilot plants and living labs, support co-creation across sectors, and integrate financial, technical and regulatory services.

How: Initial feasibility studies and strategic mapping should be carried out in the short term, followed by deployment and network formation of hubs by 2030, enabling long-term scaling, replication and system integration across Europe.

Recommendation 3: Design de-risking finance instruments and funding schemes

Why: Innovative energy technologies face significant financing gaps – particularly in the transition from demonstration to market uptake – due to high risks, fragmented funding schemes and limited private investment.

What: This recommendation calls for a portfolio of targeted de-risking instruments and blended finance mechanisms. Herein public and private funding, guarantees, equity instruments and innovative business models should be combined. The portfolio could encourage better alignment of EU and national funding schemes, stronger engagement of financial institutions, and improved venture capital and risk-sharing instruments.

How: In the short to medium term, Member States and stakeholders should implement tailored financing approaches, while aligning with upcoming EU strategies such as the Clean Energy Investment Strategy and Scale-up Europe Fund, ensuring long-term improvements in financing ecosystems.

Recommendation 4: Include the financial actors in the SET Plan community to address specific investment needs

Why: Limited interaction between technology developers and financial stakeholders constrains investment flows and slows down the commercialisation of SET Plan technology innovations.

What: This recommendation supports the integration of banks, institutional investors, venture capital, and other financial stakeholders, as well as project developers into the SET Plan framework. Their involvement would ensure that investment strategies align with the financial realities and risk profiles of SET Plan technology innovations. The recommendation also supports the objectives of the Clean Energy Investment Strategy by strengthening investor engagement and access to finance.

How: Structured engagement should be strengthened primarily through ETIPs by linking to existing investor networks and initiatives, including clear investment needs and plans within CIIPs, and fostering dialogue via platforms such as a newly established SET Plan Investor Council and dedicated sessions at the SET Plan Conference.

In the short to medium term, dedicated task forces or structured dialogues should be established to ensure continuous interaction with financial actors. In the longer term, this engagement should be embedded in SET Plan governance, ensuring sustained collaboration and alignment between innovation priorities and investment strategies.

Recommendation 5: Collect and share best practices for the market uptake of European SET Plan technology innovations

Why: The lack of structured knowledge on successful market uptake pathways limits the ability to replicate and scale SET Plan technology innovations across Europe.

What: This recommendation calls for the collection and sharing of best practices, covering the full innovation cycle from early-stage research to commercial deployment, including case studies, funding approaches and stakeholder collaboration models

How: The recommendation should be implemented through a collaborative, centrally coordinated approach, with the EC hosting best practices via SETIS to ensure neutrality and long-term accessibility, while ETIPs and IWGs act as primary content providers using a standardised case study framework.

In the short to medium term, coordination mechanisms and templates should be established; in the long term, this will create a robust knowledge base to support learning, replication and faster market uptake of SET Plan technologies.

1. INTRODUCTION

The TF on 'Access to the Market' worked to identify barriers to market access for SET Plan technologies and to develop recommendations for tools and methods to address them.

The TF helped to ensure that SET innovations are deployed to promote a more affordable, secure, and clean energy in the EU by:

- Supporting advancing testing environments and infrastructures for innovations, through e.g. dedicated sites, certification or regulatory sandboxes;
- Facilitating efficient decision-making for investors and producers, including through transparent tools for data sharing, an EU investor community, harmonised metrics and standards, pre-certification records, and lifecycle assessments;
- Addressing de-risking and innovative business models to help accelerate market uptake and enhance market competitiveness;
- Providing technical expertise to align technology developments and policy initiatives to EU energy goals, ensuring feasibility and addressing regulatory and funding barriers;
- Familiarising stakeholders and performing training on SET innovations (to energy consultants, utilities, Energy Service Companies (ESCOs), etc.) to stimulate market uptake and scale up.

The development of new technologies is not an end goal in itself. SET innovations must also achieve further market uptake and, at some point, reach a level of competitiveness that contributes to energy policy goals. Definitions of these key concepts are outlined in the table below. In this context, recommended actions and policies to support market access are expected to contribute to and stimulate both market uptake and the market competitiveness of SET innovations, leading to more sustainable strategies and applications across a wider market.

Table 1: Definitions of key concepts for Task Force 5 (Access to Market)

Key concept	Applied definition
Market access (Related terms: access to the market, market entry, and entry to the market)	Market access for SET Plan technologies refers to a technology company's or a country's ability to sell goods and services with minimal restrictions or barriers to market entry. Market access is thus about overcoming barriers and hurdles.
Market uptake (Related terms: market adoption, market penetration, commercial, consumer and industry acceptance)	Market uptake of SET Plan technologies refers to the extent to which a technology is adopted and used by consumers or businesses after having received access to the market. It involves the processes and factors that influence the acceptance and integration of innovations into the market.
Market competitiveness (Related terms: Dominant and high market shares)	Competitiveness of SET Plan technologies includes their capacity to compete in the market and achieve competitive levels of pricing, quality, innovation, security, and sustainability, thereby enabling sustainable productivity growth.

2. KEY EU POLICIES AND INITIATIVES

The list below provides an overview of how existing and upcoming legislation impacts market uptake, spanning six pillars:

1. Creating market demand

Key legislative acts like the **Renewable Energy Directive (RED III)**[1], the **Energy Efficiency Directive (EED)**[2], and the **Energy Performance of Buildings Directive (EPBD)**[3] establish binding targets and obligations that directly stimulate the deployment of renewable energy technologies and energy efficiency. The **Net Zero Industry Act (NZIA)**[4] also mandates the offering of 50 Mtpa (million tons per annum) of operational carbon dioxide (CO2) injection capacity to the market by designated oil and gas producers, each with a share relative to their production of oil and gas between 2020 and 2023 (article 23)[5]. These obligations are implemented within national policy frameworks, where the energy mixes defined by each Member State shape the scale, timing, and type of technologies required to meet EU targets.

These laws require Member States to increase the share of renewables, reduce emissions, incentivise near-zero-emission industrial products, reduce energy consumption, and renovate buildings to higher energy-efficiency standards, thereby creating a robust demand for SETs, such as solar PV, heat pumps, nuclear, and smart energy systems. The **Electricity Regulation**[6] **and related directives**[7] further enable fair market access and grid integration for these technologies, ensuring they can compete on equal terms.

2. Upgrading infrastructure and enabling integration

To support the integration of growing renewable capacities, the EU's **Grid Package**[8] and **Electrification Plan**[9] focus on modernising transmission and distribution networks, improving grid planning, and supporting flexibility services. These initiatives promote system-wide optimisation and pave the way for electrification in sectors like transport and industry. The 2016 **Heating and Cooling Strategy**[10] and the new strategy announced by the Commission in the Affordable Energy Action Plan, complement these efforts by facilitating the transition to clean district heating and cooling systems and boosting the deployment of renewable heat technologies. Additionally, a dedicated **Geothermal Action Plan**[11] contributes to these efforts by strengthening the role of geothermal energy in Europe's energy transition. It supports the expansion of geothermal for direct heating and cooling, enhances system flexibility through thermal storage, and helps secure access to critical raw materials such as lithium.

3. Boosting clean energy manufacturing and industrial competitiveness

Industrial policy is central to Europe's clean energy transition. The **NZIA**[12] aims to strengthen domestic manufacturing of key net-zero technologies by streamlining permitting, providing financial support, and prioritising strategic projects. It is backed by the **Clean Industrial Deal (CID)**[13], which sets out concrete measures to turn decarbonisation into a growth driver for European industry by lowering energy prices, creating quality jobs, fostering conditions for companies to thrive, supporting energy-intensive sectors to decarbonise, advancing the clean-tech sector, and promoting circularity to reduce waste and reliance on external resources. The NZIA and the CID together offer regulatory, financial, and skills-based tools to scale up clean tech industries. Meanwhile, the revised **Industrial Emissions Directive (IED)**[14] encourages industries to adopt low-emission processes and technologies; the Industrial Accelerator Act (IAA) will increase demand for low-carbon, European-made technologies and products; and the 2021 Industrial Strategy outlines a long-term vision for industrial resilience and green transformation.

1 https://eur-lex.europa.eu/eli/dir/2023/2413/oj/eng
2 https://eur-lex.europa.eu/eli/dir/2023/1791/oj/eng
3 https://eur-lex.europa.eu/eli/dir/2023/1791/oj/eng
4 https://eur-lex.europa.eu/eli/reg/2024/1735/oj/eng
5 https://eur-lex.europa.eu/eli/reg/2024/1735/oj/eng
6 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019R0943-20240716
7 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019L0944-20251012
8 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC1005&qid=1770212329024
9 https://energy.ec.europa.eu/topics/eus-energy-system/electrification_en#eu-electrification-action-plan
10 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1575551754568&uri=CELEX:52016DC0051
11 https://www.consilium.europa.eu/en/press/press-releases/2024/12/16/geothermal-energy-council-calls-for-faster-deployment/
12 https://eur-lex.europa.eu/eli/reg/2024/1735/oj/eng
13 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0085
14 https://eur-lex.europa.eu/eli/dir/2010/75/oj/eng

4. Empowering citizens and energy communities

Citizen participation is a cornerstone of the EU's clean energy agenda. Through the **Citizens' Energy Package**[15] and the **Affordable Energy Action Plan**[16] (among the other objectives of the latter), individuals and communities are recognised as active market players. These policies facilitate access to renewable energy, self-consumption, and collective initiatives like energy communities, while ensuring that vulnerable households are not left behind. By making clean energy more accessible, the EU fosters social acceptance and broader uptake.

5. Driving innovation, investment, and scale-up

Innovation support mechanisms are also essential. The **REPowerEU Plan**[17] mobilises funding for immediate infrastructure and energy supply needs while accelerating the deployment of renewables and hydrogen. The **Fit for 55 package**[18] strengthens carbon pricing and regulatory incentives, shifting markets towards cleaner solutions. Additionally, the **New European Innovation Agenda**[19] supports the growth of deep-tech start-ups, and new strategies such as the **Competitiveness Compass**[20] and the **Startup and Scaleup Strategy**[21] aim to create a fertile environment for clean energy innovators to bring solutions to market and scale across Europe. Complementing these initiatives, the **Clean Energy Investment Strategy**[22] seeks to mobilise public and private capital for clean energy technologies by improving access to finance, reducing investment risks, and strengthening the investment ecosystem across the innovation and deployment cycle.

Complementing these efforts, the **Strategy for Small Modular Reactors**[23] (SMRs) strengthens innovation and scale-up in the nuclear sector by accelerating SMR development and early deployment through coordinated industrial action, while improving financing conditions via a proposed €200 million InvestEU top-up from the Innovation Fund to de-risk first commercial projects and support a scalable European supply chain.

6. Enabling innovation and experimentation through legal provisions of EU energy legislation

The **Electricity Market Design (EMD) Directive**[24], the **RED III**[25] and the **EED**[26] embed provisions that actively promote innovation and experimentation in the clean energy transition.

In general, one of the goals of the competition stimulated by the legislative framework of the internal energy market is to encourage innovation, including its market uptake. More specifically, the EMD strengthens the framework for decentralised flexibility through measures such as expanded access for active customers and citizen energy communities to participate directly in wholesale markets, incentives for local flexibility markets, and obligations for DSOs (Distribution System Operators) to procure flexibility services where cost-effective. These provisions create opportunities for innovations such as peer-to-peer trading platforms, community-based storage, and AI-driven flexibility optimisation.

RED III accelerates innovation through mandates for pilot projects (Article 15), streamlined permitting in renewable energy acceleration areas (Articles 15 and 16), and targeted support for emerging sectors such as renewable hydrogen (Articles 22a and 25).

The EED embeds innovation by enshrining the energy-efficiency-first principle (Article 3), advancing energy management systems and audits (Article 11), and creating binding energy-savings obligations (Article 8) that incentivise the adoption of novel efficiency tools, financing schemes, and digital solutions. Together, these frameworks reduce regulatory barriers, open markets to new actors, and enable real-world experimentation in clean energy systems. This enabling role is particularly critical given that, according to the International Energy Agency (IEA), around 35% of the cumulative emissions reductions required to reach net zero by 2050 are expected to come from technologies that are not yet commercially available[27].

15 https://energy.ec.europa.eu/document/download/2d525b1f-5461-4dfe-9f8d-14f8c5259886_en
16 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0079
17 https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022DC0230#:~:text=REPowerEU%20sets%20a%20target%20of,renewable%20hydrogen%20imports%20by%202030
18 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021DC0550
19 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52022DC0332
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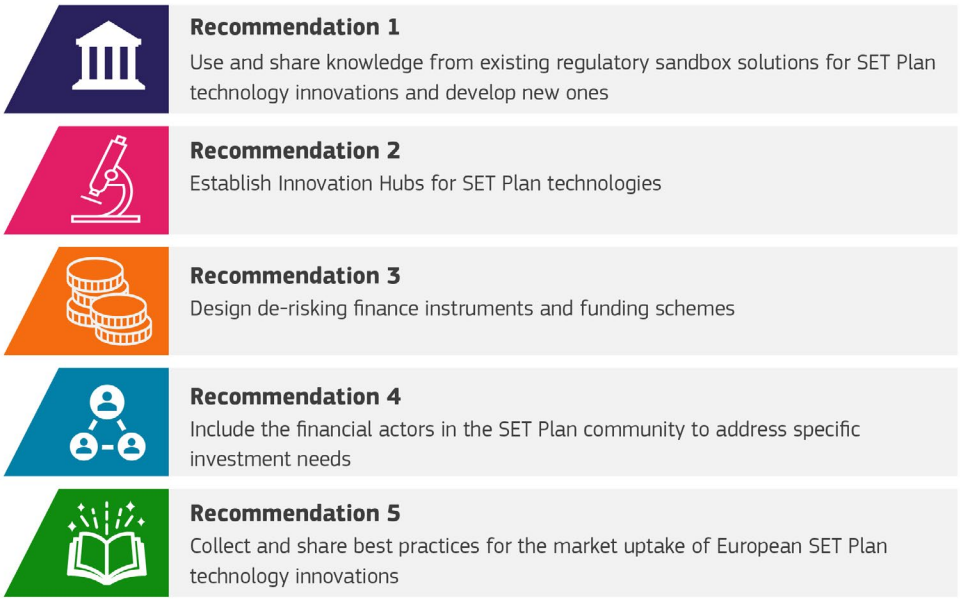
24 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019L0944-20240716
25 https://eur-lex.europa.eu/eli/dir/2023/2413/oj/eng
26 https://eur-lex.europa.eu/eli/dir/2023/1791/oj/eng
27 https://www.iea.org/reports/clean-energy-innovation-policies-in-emerging-and-developing-economies/executive-summary-and-insights-for-policy-makers

3. RECOMMENDATIONS

The Task Force 'Access to the Market' developed five recommendations.

Figure 1: The 'Access to the Market' Task Force recommendations



The Task Force recommendations target key **SET Plan stakeholders**: primarily the IWGs and the ETIPs, but also EERA and CETP.

All recommendations include the following elements:

- **Summary** of the key insights
- **Why** action is needed
- **What** solutions are out there to help resolve challenges
- **Who** is interested in implementing the recommendation
- **How** the recommendation can be implemented through various actions
- **When** it is recommended to implement the recommendation
- **Which KPIs** could help track implementation progress

The Task Force included 19 Task Force members, 5 Independent Experts, the Task Force Lead and Facilitator, and a European Commission Policy Officer (as observer) (see participants list in Annex 1). The recommendations were created based on Task Force meetings, written feedback and desk research (see methodology in Annex 2).

RECOMMENDATION 1. USE AND SHARE KNOWLEDGE FROM EXISTING REGULATORY SANDBOX SOLUTIONS FOR SET PLAN TECHNOLOGY INNOVATIONS AND DEVELOP NEW ONES

Recommendation summary:

Regulatory frameworks often lag behind technological innovation, creating barriers to testing, validation and deployment of SET Plan technologies across fragmented national systems.

This recommendation promotes regulatory sandboxes allowing for the testing of innovative energy solutions in controlled environments, and enabling regulators to gather evidence for future policy adjustments.

The SET Plan community should set up an EU-level feedback loop mechanism on lessons learnt from existing regulatory sandboxes and create at least one new regulatory sandbox to address specific regulatory barriers and gaps for SET Plan technologies. This includes fostering collaboration between regulators, industry and research, enabling real-world testing environments, and creating structured knowledge-sharing platforms. In the short term, dedicated forums and internal knowledge exchange mechanisms should be set up, followed by the development of a common EU framework and new sandbox implementations by 2030, ensuring long-term regulatory learning and harmonisation.

WHY

Challenges identified by TF members and literature review

SET Plan stakeholders have identified the following challenges affecting the access to the market of SET Plan technologies:

- Regulation lagging technological innovation, with regulatory sandboxes (and other forms of regulatory experimentation) offering opportunities for regulatory learning through first-hand experience with innovative solutions.
- Regulatory and bureaucratic barriers, including complex procedures and strict requirements that hinder testing, validation, and commercialisation for innovative technologies and business models, including Heat-as-a-Service, performance-based contracts, energy cooperatives, Public-Private Partnerships (PPPs), etc.
- Patchwork of different regulations and their implementation across Member States.
- Need to balance better market access facilitation, stakeholder involvement, and customer protection.
- Need for regulatory advocacy and experimentation to address barriers such as societal and political acceptance, which are crucial for shortening the innovation-to-deployment timeline and ensuring successful integration.
- Lack of a coherent regulatory framework for low-cost or free and fast-track testing of energy innovations and of near-zero emissions industrial products, limiting access for smaller actors and slowing down deployment.
- Lengthy permitting procedures despite legislation requiring fast-track procedures and acceleration areas.
- Inconsistent transposition of EU legislation, fragmenting the EU internal market for energy, i.e. regarding maximum permitting times as prescribed in the revision of the RED III.
- Gaps in regulatory harmonisation create additional costs for moving between national markets.
- Need for national energy regulators and possibly the European Agency for the Cooperation of Energy Regulators (ACER) to become integrated stakeholders in the EU innovation ecosystem.
- Need for further standardisation and interoperability of clean energy solutions, training and knowledge dissemination.
- Many Member States have established national regulatory sandboxes, but there is a lack of coordination. A comprehensive presentation can be found in the Joint Research Centre (JRC) report 'Making energy regulation fit for purpose. State of play of regulatory experimentation in the EU' (2023). However, these are often uncoordinated, and the lessons learned are not systematically shared across the EU.

- Lack of an EU-level feedback loop mechanism to use and share knowledge about best practices and lessons learned on existing regulatory sandboxes.
- Administrative capacity as a major barrier to implementation (of i.e. geothermal projects): even when new regulatory frameworks are introduced, permitting authorities often lack the technical and administrative capacity to process project applications efficiently.

Expected outcomes and contribution to EU priorities

This recommendation is expected to achieve the following outcomes:

- Fast-track demonstration of innovative clean energy technologies and solutions.
- Identification of regulatory gaps and barriers (including harmonisation of needs and a better balance between market access facilitation and customer protection), to be shared across Member States and SET Plan stakeholders.
- Identification of best practices, success stories and areas of improvement (in setting up regulatory experimentation instruments in the area of energy), for sharing at European level.
- Feedback on the implementation of established EU policy initiatives, such as:
  - Energy market reform and integration,
  - Facilitation of permitting for clean energy technologies and infrastructure,
  - Promotion of flexibility,
  - Energy efficiency and energy system integration,
  - Decarbonisation of energy-intensive industries,
  - Securing energy affordability.
- Development of a structured, pan-European framework to coordinate regulatory experimentation and learning efforts on innovative energy technologies and services, harmonising approaches where necessary, and ensuring that the lessons from a sandbox in one country can accelerate regulatory innovation in all Member States.

This recommendation will contribute to upcoming EU legal initiatives, including the **Citizens Energy Package**[28], the **Electrification Action Plan**[29], the **Clean Energy Investment Strategy for Europe**[30], the **European Grid Package**[31], the revision of the **Energy Taxation Directive**[32], the **revision of the Heating and Cooling Strategy**[33], the **Geothermal Action Plan**[34], the **Nuclear Illustrative Programme**[35], and the **Strategic Roadmap for digitalisation and AI for the Energy Sector**[36]. Specific contributions to the RED and NZIA are described below.

The **RED III**[37], adopted on 18 October 2023 and published on 31 October 2023, introduces several measures to accelerate the deployment of renewable energy across the EU. One of the innovative mechanisms it supports is the use of Regulatory Sandboxes (Art. 15.2a). RED III explicitly encourages Member States to establish Regulatory Sandboxes to:

- Test innovative renewable energy technologies and business models under real-world conditions.
- Facilitate experimentation with new approaches that may not fully comply with existing regulations, but are aligned with the directive's goals.
- Support the integration of renewables into the energy system, especially in areas like smart grids, energy storage, and sector coupling.

These sandboxes are meant to:

- Reduce administrative barriers for pilot projects.
- Enable faster learning and adaptation of regulatory frameworks.
- Promote collaboration between regulators, innovators, and other stakeholders.

28 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0115&qid=1773310492603
29 https://energy.ec.europa.eu/topics/eus-energy-system/electrification_en#eu-electrification-action-plan
30 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0116&qid=1773310237995
31 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC1005
32 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021PC0563
33 https://energy.ec.europa.eu/topics/energy-efficiency/heating-and-cooling_en
34 https://www.consilium.europa.eu/en/press/press-releases/2024/12/16/geothermal-energy-council-calls-for-faster-deployment/
35 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC0315&qid=1756994388566
36 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52026DC0501
37 https://eur-lex.europa.eu/eli/dir/2023/2413/oj/eng

The **Commission Notice of 2 July 2025 on innovative technologies and forms of renewable energy deployment**[38] encourages Member States to define and clarify rules for emerging renewable technologies, such as agrisolar, floating PV, and ocean energy, and to streamline permitting through designated infrastructure areas and tailored support schemes, directly aligning with SET Plan objectives on market access and regulatory clarity.

The **EMD**[39] facilitates the testing of novel approaches to flexibility, consumer participation, and system integration, laying the groundwork for structured experimentation aligned with SET Plan priorities, while Article 5(2)(a) of the Electricity Regulation (Regulation (EU) 2019/943) permits limited, temporary exemptions from imbalance obligations for approved innovative demonstration projects.

The **NZIA**[40], formally Regulation (EU) 2024/1735, adopted on 13 June 2024 and in force since 29 June 2024, includes specific provisions for Regulatory Sandboxes to support innovation in clean technologies.

- Definition and purpose: the NZIA introduces 'net-zero regulatory sandboxes' as controlled environments where companies can test innovative net-zero technologies under real-world conditions while benefiting from temporary regulatory flexibility (Art. 3.22)
- Legal basis and implementation: Member States are encouraged to provide for these sandboxes in national law, ensuring they remain compliant with EU law and national requirements for net-zero technologies (Art. 33).
- Stakeholder involvement: these sandboxes should be established in close collaboration with stakeholders, and can be initiated at the request of any company developing innovative net-zero technologies.
- Scope and conditions: the sandboxes are intended to facilitate experimentation with new manufacturing processes, business models, or deployment strategies that support the EU's net-zero goals. They are particularly relevant for strategic net-zero projects, which benefit from accelerated permitting, priority handling, and advisory support.
- Safeguards: the competent authorities developing regulatory sandboxes shall ensure that they respect the requirements of Union and national law establishing appropriate safeguards, especially against significant risk to health, safety or the environment, and exceptional risks for the health and safety of workers and of the general population (Art. 33.5).
- Strategic role: Regulatory sandboxes are part of the broader NZIA strategy to reduce administrative burdens, streamline permitting, and boost industrial competitiveness in clean tech sectors.

Relevant in this context are also:

- The **Strategy for SMRs**[41], released on 10 March 2026 (COM/2026/117), which explicitly mentions that the Commission will assist Member States in developing regulatory sandboxes for SMRs.
- The **2023 Commission Staff Working Document on 'Regulatory learning in the EU: Guidance on regulatory sandboxes, testbeds, and living labs in the EU, with a focus section on energy'**[42];
- The **2023 Better Regulation Toolbox**[43] includes regulatory sandboxes as part of 'Tool #69: Emerging methods and policy instruments'.
- The **2022 Commission's recommendation on permitting procedures and Power Purchase Agreements**[44], which encourages Member States 'to put in place regulatory sandboxes to grant targeted exemptions from the national, regional or local legislative or regulatory framework for innovative technologies, products, services or approaches, to facilitate permit-granting in support of the deployment and system integration of renewable energy, storage, and other decarbonisation technologies, in line with Union legislation' (par. 32).
- The **2020 'Council Conclusions on Regulatory sandboxes and experimentation clauses as tools for an innovation-friendly, future-proof and resilient regulatory framework that masters disruptive challenges in the digital age'**[45].

38 Gangale, F., Mengolini, A. M., Covrig, L., Chondrogiannis, S., & Shortall, R. (2023). Making energy regulation fit for purpose: State of play of regulatory experimentation in the EU (EUR 31438 EN, JRC132259). Publications Office of the European Union. https://doi.org/10.2760/32253
39 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02019L0944-20240716
40 https://eur-lex.europa.eu/eli/reg/2024/1735/oj/eng
41 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0117&qid=1773310096275
42 https://data.consilium.europa.eu/doc/document/ST-12199-2023-INIT/en/pdf
43 https://commission.europa.eu/law/law-making-process/better-regulation/better-regulation-guidelines-and-toolbox_en
44 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=intcom:C%282022%293219
45 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2020_447_R_0001

- The European Commission's staff working document on regulatory sandboxes for 'Vehicle to Grids', currently under preparation as part of the 2025 Automotive Action Plan[46]. This document is intended to accompany the Electrification Plan of 2026[47]. It will explain to Member States and interested stakeholders how the existing EU-level framework can already be used for such experiments and, if necessary, how more specific national regulations can be adapted to facilitate them.

WHAT

The use and sharing of knowledge, and the **development of Regulatory Sandboxes** should consist of:

- Develop new regulatory sandboxes with clear objectives and in close coordination with SET Plan stakeholders, national regulators, the Council of European Energy Regulators (CEER), ACER, and the European Commission, ensuring a structured and transparent approach.
- Enable real-world testing of emerging energy products, low-carbon industrial products and services, and business models in offshore areas, industrial and mixed settings, urban living labs, hydrogen valleys, and other dedicated testbeds with flexible regulatory oversight.
- Identify existing barriers that hinder the effective use of current sandbox mechanisms and address them through policy adjustments and improved guidance.
- Create free or low-cost innovation zones for priority testing, encouraging co-creation with stakeholders beyond the energy sector.
- Set up a structured feedback loop at the European level, involving all relevant stakeholders, for sharing best practices, success stories and areas of improvement from existing and future regulatory sandboxes.
- Leverage national industrial energy management schemes to provide validated datasets, improve eligibility criteria for pilots, and standardise project assessment.
- Ensure the regulatory environment is seen as enabling infrastructure that does not come before or after the technological process but evolves in parallel with it, supporting co-development and co-learning between regulators, industry and research. For the design or implementation phase, it is useful to consider expertise from other sectors where regulation and the market are developed in parallel (e.g. digital – EU AI Act[48], etc.).

WHO

The development of regulatory sandbox solutions for SET innovations and the setup of an EU-level feedback loop mechanism on lessons learned from existing regulatory sandboxes could be implemented collaboratively by a multitude of actors:

- **IWGs, ETIPs, CETP, EERA**: as the representative of SET innovators, identify and address regulatory barriers, develop sandbox proposals, and liaise with national regulators and ministries.
- **National Energy Regulators (NRAs) and Ministries (or other competent authorities):** legally develop and implement the proposed regulatory sandbox(es) with consultation from stakeholders.
- **CEER, ACER and European Nuclear Safety Regulators (ENSREG):** provide expertise to ensure pan-European relevance and consistency in the regulatory sandbox development process. Presentation of the recommendation and discussion of broader national regulators' perspectives with relevant ACER and CEER working groups.
- **Member States:** according to the NZIA, Member States may at their own initiative establish net-zero regulatory sandboxes (i.e. schemes that enable undertakings to test innovative net-zero technologies and other innovative technologies in a controlled real-world environment, under a specific plan, developed and monitored by a competent authority) in order to promote innovation and regulatory learning in the field of net-zero technologies.
- **European Commission:** support the development of harmonised regulatory experiments while respecting national specificities.

46 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0095
47 https://energy.ec.europa.eu/topics/eus-energy-system/electrification_en
48 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1689

HOW

The use and sharing of knowledge and the development of regulatory sandbox solutions for SET innovations should include the following actions:

- **IWGs, ETIPs, CETP, EERA**:
  - Gather and consolidate internal experience on addressing regulatory barriers and gaps, and develop Best Practice Guides and Training for the energy sector.
  - Facilitate dialogue between regulators, developers, and communities to address regulatory barriers while safeguarding public interests and consumer protection
  - Gather and consolidate EU-level experience on developing a regulatory sandbox (if any).
  - Identify existing barriers that hinder the effective use of current regulatory experimentation mechanisms and formulate policy recommendations.
  - Promote cooperation between ETIPs and IWGs (as an example, ETIP RHC already cooperates with IWGs for Buildings, Industry, and PEDs to promote RHC-specific actions in their Implementation Plans).
  - Advocate with National Energy Regulators and competent Ministries about the benefits of regulatory sandboxes and organise targeted dissemination and awareness-raising events to increase visibility, accessibility, and uptake of sandbox opportunities across Member States.
  - Develop draft proposal(s) for new regulatory sandbox(es). These should include applicable Member State(s), specific regulatory barriers or gaps to be addressed, target technologies (e.g. thermal storage, solar thermal, geothermal) and/or business models (e.g. aggregation, Heat-as-a-Service, performance-based contracts, energy cooperatives), as well as the pertinent area of regulatory experimentation (local, regional, national or interregional).
  - Liaise with NRAs, Ministries and other competent authorities for the implementation of the specific proposals for the development of new regulatory sandbox(es).
  - Support the development of a pan-European framework to coordinate regulatory experimentation initiatives and disseminate lessons learned
- **NRAs and competent Ministries[49]:** Develop the proposed regulatory sandbox(es) legally. Consultation with industry, local authorities and civil society, ensuring transparency, is highly recommended. Regular exchanges between National Hubs, regulators and SET Plan stakeholders to accelerate learning on permitting, sandbox design and regulatory barriers.
- **CEER, ACER and ENSREG:** Proposed to be involved in the process in order to foster pan-European relevance to the developed regulatory sandbox(es), as well as share experience and expertise, and benefit from capacity building opportunities.
- **European Commission:** Support the process (e.g. through the project funded under the call **HORIZON-CL5-2025-02-D2-12:** NZIA regulatory sandbox exchange forum support[50]). Particular focus on developing harmonised regulatory experiments while respecting national specificities.

Potential areas of application for new regulatory sandboxes (non-exhaustive list)[51]

- Local Flexibility Markets: DSOs are often not permitted or incentivised to procure flexibility services (e.g. from batteries or EVs) as an alternative to costly grid reinforcement. A sandbox could test new procurement mechanisms and network tariff structures that enable this.
- Vehicle-to-Grid (V2G) Services: There is no clear regulatory framework for how an EV can be defined and act as a grid resource. A sandbox could test the entire value chain, from grid code compliance for chargers to market participation rules and settlement processes.

49 It is noted that the current experience in the EU indicates that in certain cases regulatory sandboxes have been developed by a competent Ministry and not the NRA.

50 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/HORIZON-CL5-2025-02-D2-12?keywords=HORIZON-CL5-2025-02-D2&isExactMatch=true&status=31094501,31094502,31094503&callIdentifier=HORIZON-CL5-2025-02&order=DESC&pageNumber=1&pageSize=50&sortBy=relevance

51 For these identified areas, a useful step could be to establish guidance (as already being done for Vehicle-to-Grid) on how the existing regulatory frameworks can already be used, based on good practice of Member States and regulators.

- Dynamic Network Tariffs: Most Member States have regulations that mandate fixed, flat-rate network tariffs. A sandbox could allow a DSO to test dynamic tariffs in a specific geographical area to see how they can be used to manage grid congestion and defer infrastructure upgrades.
- Cross-Border Data Exchange for Grid Services: A pan-European sandbox could be created to test the secure exchange of operational data between a Transmission System Operator (TSO) in one country and a TSO or DSO in another, enabling more efficient management of cross-border power flows.
- Ocean Energy: Ocean energy is currently treated inconsistently in different permitting regimes. In some regimes, ocean energy devices must comply with offshore wind regulations, and in others with offshore oil and gas regulations. Dedicated, streamlined permitting processes are needed and can be best and fastest developed within a regulatory sandbox.
- Development of industrial standards and interoperability of technologies to enable access tol European and international markets in parallel rather than sequentially.
- Renewable fuels, hydrogen derivatives and biofuels: the implementation of a sandbox would provide identifiable benefits at the intersections of the energy, transport, environmental regulation, and industrial policy sectors. Many renewable fuels are still in an experimental phase and face barriers similar to those faced by fossil fuels and first-generation biofuels, including certification rules, sustainability accounting, quality standards, and access to energy networks and infrastructure. Sandboxes in this area would enable the calculation of carbon footprints, traceability of feedstocks, testing of new digital tracking systems for renewable fuels, and the definition of blending thresholds within network infrastructure. Moreover, sandboxes help reduce regulatory risk for innovation-related investments; they signal that the regulator is open to experimentation while safety and environmental outcomes are supervised.
- Multi-country / cross-border sandboxes: Many strategic energy projects increasingly span two or more Member States. A regulatory sandbox could enable the coordinated temporary derogation of relevant national rules across participating jurisdictions to facilitate the faster deployment of cross-border energy infrastructure and multi-purpose assets (e.g. High Voltage Direct Current (HVDC) cables used as interconnectors and/or for power evacuation).
- Industrial decarbonisation for low temperature (≤200 °C) process heat sectors with high electrification potential (e.g. food and beverages, textiles, wearing apparel and leather): a sandbox could address regulatory, tariff and efficiency accounting barriers for the application of technically mature technologies such as industrial heat pumps, electric boilers and resistive heating.
- Industrial decarbonisation for medium to higher temperature (>200–400 °C) process heat sectors (e.g. wood and cork, pulp, paper and paperboard, plastics, metal products, minerals, machinery and equipment): sandbox applications could consist of local biomethane based renewable micro grids, designed to enable local production and distribution of biomethane, and test adapted regulatory frameworks for network operation, tariffs, metering, responsibilities and guarantees of origin at local level. Current regulatory uncertainties and inconsistencies include the definition of a ‘renewable biomethane micro grid’ (i.e. minimum share of biomethane in a biomethane/fossil gas blend to be considered renewable), compatibility with Ecodesign requirements, and the interaction with the EED with respect to the eligibility of energy savings.

Examples of existing regulatory sandboxes in the EU and lessons learned

A comprehensive review of developed regulatory experimentation initiatives in the area of energy among the EU countries has been published by the JRC[52] further complemented by a report by European Commission's Directorate-General for Energy (DG ENER)[53] (it is noted that, thereafter, more regulatory sandboxes have been developed, for example, in Ireland.)

Regulatory sandbox initiatives have already been established in the following areas[54]:

- Flexibility and balancing services:
  - Example: in Italy in 2017, regulators opened the ancillary services and balancing markets to all actors capable of providing flexibility (from variable renewables to distributed resources, demand-side response, storage systems and even electric vehicle batteries). Aggregators were explicitly included to test how smaller resources could be pooled. The initiative functioned as a pilot, designed to gather insights and practical experience to guide a full reform of Italy's ancillary and balancing markets, making them more open, efficient and secure[55].
- Energy storage:
  - Example: in France, a project was approved specifically to ease the participation of stationary battery storage in system services. To make this possible, regulators granted derogation allowing the batteries to be hybridised with other forms of generation and dynamically aggregated. The project serves as a controlled trial to explore how battery storage can be more fully integrated into system operations and support flexibility, efficiency and security of supply[56].
- Integration of renewable and low-carbon gases (including H2) in the gas networks:
  - Example: in France, the authorities approved several experiments: one project testing the injection of gas produced from biomass and solid recovered fuels into the natural gas grid, and four projects trialling the injection of methane produced via methanation, using hydrogen generated by electrolysis. Together, these pilots explore both technical and regulatory questions regarding the integration of new green gases into the existing gas system.
- Electromobility:
  - Example: in Italy, an electromobility pilot tackles the strain that growing numbers of electric vehicles place on the power system. In 2020, ARERA (Italian Regulatory Authority for Energy, Networks and Environment) introduced a temporary regulation encouraging smart charging in non-public locations, particularly homes. The scheme lets consumers charge their cars during off-peak periods (night-time, Sundays and holidays) without having to upgrade their contracted power level, and thus without incurring extra fixed costs. The pilot tests how tariff flexibility can manage demand peaks and unlock EVs' potential as a flexible resource[57].
- Collective self-consumption and energy communities:
  - Example: The Netherlands already, in 2015 (well before the Clean Energy Package), introduced a regulatory sandbox that let citizen groups and businesses temporarily deviate from standard rules in the Electricity Act 1998. These experiments allowed communities to explore alternative arrangements for grid ownership and operation, benefit from tariff discounts, and test new approaches to metering, invoicing and data management. The initiative created room for innovative business models and helped shape the emerging framework for energy communities.
- Smart grids:
  - Example: in Portugal, a 2019 regulation required low-voltage DSOs to propose pilot projects that experiment with new ways of using smart-meter data, particularly to monitor and improve the technical quality of service. The scheme gives regulator-controlled insight into how digital technologies (smart meters, sensors, IoT and data analytics) can support more modern and responsive grid operation[58].

52 Gangale, F., Mengolini, A. M., Covrig, L., Chondrogiannis, S., & Shortall, R. (2023). Making energy regulation fit for purpose: State of play of regulatory experimentation in the EU (EUR 31438 EN, JRC132259). Publications Office of the European Union. https://doi.org/10.2760/32253

53 European Commission, Directorate-General for Energy, Fraunhofer, Trinomics, Gorenstein Dedecca, J., Ansarin, M., et al. (2023). Regulatory sandboxes in the energy sector: Final report. Publications Office of the European Union. https://doi.org/10.2833/848065

54 Gangale, F., Mengolini, A. M., Covrig, L., Chondrogiannis, S., & Shortall, R. (2023). Making energy regulation fit for purpose: State of play of regulatory experimentation in the EU (EUR 31438 EN, JRC132259). Publications Office of the European Union. https://doi.org/10.2760/32253

55 ARERA decision 300/2017/R/EEL, as amended and supplemented by subsequent decisions (e.g. ARERA decisions 422/2018, 153/2020, 70/2021).

56 More information on the project can be found in p. 5 of Decision 2021/59 of the Energy Regulation Commission (CRE) of 11 March 2021, available at https://www.cre.fr/documents/communiques-de-presse/bac-a-sable-reglementaire-la-cre-accorde-des-derogations-a-9-projets-innovants.html

57 ARERA decision 541/2020/R/eel, of 15 December 2020. Available at https://www.arera.it/it/docs/20/541-20.htm .

58 ERSE Regulation 610/2019 of 2 August 2019. Available at https://dre.pt/dre/detalhe/regulamento/610-2019-123675698

- Pan-European Grid Services Architecture
- Integration of renewable energy sources (RES):
  - Example: in line with EU efforts to remove obstacles to large-scale RES deployment, France approved projects that test new ways of optimising grid connections for renewables, including hybridised setups that combine multiple technologies. In 2021, the Ministry for the Ecological Transition granted derogations to four such projects. These trials explore how targeted regulatory flexibility can accelerate RES deployment and improve system integration[59].
- Network tariff design:
  - Example: In Sweden, a 2018 pilot regulation allowed network companies to trial new tariff structures with a limited group of customers. The goal was to encourage more efficient network use by testing designs that could stimulate local demand flexibility and support better integration of distributed energy resources[60].

Additional examples include:

- Nuclear energy:
  - Example: Since energy companies from France, Finland and the Czech Republic expressed interest in the construction of a light water SMR in the future, three national regulators, ASN (France), STUK (Finland) and SÚJB (Czech Republic) and their technical support organisations (IRSN for France and SÚRO for the Czech Republic) have conducted since 2022 a Joint Early Review (JER) of the light water SMR developed by EDF: the NUWARD SMR. The Joint Early Review was not intended to replace any future licensing review of one of the participating regulators. The regulators involved in this initiative consider that this form of collaboration can provide particular benefits to all participating parties. In fact, building on this successful innovative experience, NUWARD and an expanded group of six European nuclear safety authorities launched the second phase of the Joint Early Review in December 2023. The original group was joined by the Swedish (SSM), Polish (PAA), and Dutch (ANVS) regulators.
- CO2 infrastructure projects
- The German Federal Ministry for Economic Affairs and Energy's fund 'Living labs of the Energy Transition' as part of the 8th Energy Research Programme[61], which provides real-life testing environments where emerging energy technologies and novel business models can be trialled under near-market conditions to explore regulatory requirements and improve deployment paths. They are directly aimed at enabling technology and regulatory innovation at higher technology readiness levels, often close to commercialisation.

Identified lessons learned[62] include:

- The national legal framework must provide the NRA with the powers to engage in regulatory experimentation (e.g. granting derogations and setting temporary rules), and possibly the incentive to do so (contribution to energy system innovation).
- A regulatory experiment can include a variety of stakeholders beyond NRAs and national governments: Market players who will deploy the technology/business case (e.g. energy producers and suppliers), network operators, end customers (e.g. energy communities, energy-intensive industries), energy service providers, and ICT and software providers. Early mapping of all relevant stakeholders in the design phase is important.
- Regulatory expertise is necessary for navigating the existing regulatory landscape and identifying the exact barriers and/or gaps.
- Regulatory advisory/feedback services (such as 'one-stop shops') have been proven very helpful. Still, these are subject to the competent authorities' decisions and may require a significant commitment of resources.
- A structured process for regulatory learning should be established early on (monitoring, evaluation, dissemination of lessons learned and, finally, introduction of regulatory changes if deemed beneficial).

59 CRE decision n. 2022/295 of Available 17 November at: https://www.cre.fr/documents/deliberations/avancement-des-projets-beneficiant-de-derogations-accordees-dans-le-cadre-du-dispositif-d-experimentation-reglementaire.html

60 Chapter 4, Sections 4 a - 4 b of the Electricity Act (1997:857). Available at: https://lagen.nu/1997:857

61 https://www.energieforschung.de/en/home/current-research-topics/living-labs-of-the-energy-transition

62 Gangale, F., Mengolini, A. M., Covrig, L., Chondrogiannis, S., & Shortall, R. (2023). Making energy regulation fit for purpose: State of play of regulatory experimentation in the EU (EUR 31438 EN, JRC132259). Publications Office of the European Union. https://doi.org/10.2760/32253 and European Commission, Directorate-General for Energy, Fraunhofer, Trinomics, Gorenstein Dedecca, J., Ansarin, M., et al. (2023). Regulatory sandboxes in the energy sector: Final report. Publications Office of the European Union. https://doi.org/10.2833/848065

- Setting clear and objective eligibility criteria, transparent evaluation and selection processes, along with specific knowledge sharing obligations, are important for alleviating concerns about disrupting competition.
- Similarly, consumer protection risk analysis must be conducted early on, and necessary measures must be incorporated in the design of the regulatory experiment.
- Regulatory sandboxes generally do not involve funding. However, economic support can be provided through alternative means, such as the revenue-setting process or derogations from the ordinary network tariff system.
- A significant concern of NRAs has been the possibility that the regulatory sandbox derogations or temporary rules could violate EU legislation.

The above-listed examples and lessons learned could serve as the starting point for an EU-level feedback loop mechanism on best practices and lessons learned from existing regulatory sandboxes.

WHEN

Short-term (2026-2027):

- IWGs, ETIPs, CETP, EERA set up permanent internal knowledge-sharing platforms (or improve existing ones) on regulatory issues.
- Organisation of a European Regulatory Sandbox Forum and/or dedicated information exchange sessions for sharing experiences, lessons learned and areas of improvement. The SET Plan could facilitate the organisation of this forums/ exchange sessions, co-chaired by the European Commission (DG ENER), ACER, ENSREG and CEER. The IWGs and ETIPs would be among the primary actors bringing forward new proposals for experimentation.

Medium-term (2027-2030):

- ETIPs enhance cooperation with IWGs on addressing regulatory barriers.
- IWGs, ETIPs, CETP, EERA, with other EU stakeholders (industry and consumer associations, think-tanks, Non-Governmental Organisations (NGOs), etc.), develop structured advocacy campaigns on regulatory barriers and gaps for their areas of innovation
- IWGs, ETIPs, CETP, EERA move from technology-specific regulatory analysis towards the inclusion of business model analysis, incorporating more than one technology
- IWGs, ETIPs, CETP, EERA strengthen their internal coordination on regulatory issues towards harmonisation of their regulatory campaigns
- Launch of developed regulatory sandbox solution(s) for SET innovations
- Development of a Common Framework: a common EU framework for designing, monitoring, and evaluating regulatory sandboxes should be developed. This would include common eligibility criteria, risk assessment methodologies, and knowledge-sharing protocols.
- Creation of a knowledge-sharing platform: this public platform would serve as a central repository for all regulatory sandbox projects across the EU. This platform would share methodologies, results, and lessons learned to accelerate regulatory innovation in all Member States.

Long-term (beyond 2030):

- IWGs, ETIPs, CETP, EERA develop permanent regulatory in-house expertise available for their members
- IWGs, ETIPs, CETP, EERA integrate specific regulation-related actions in their Common Implementation and Investment Plans (CIIPs)
- SET Plan community becomes an important and integral part, at national and EU level, of the debate on the required regulatory and policy reforms to further promote the energy transition, presenting a coherent cross-technological vision
- Launch of further regulatory sandbox solutions for SET innovations
- Permanent, structured and efficient knowledge sharing from regulatory sandboxes experience at the European level. Use this feedback as an integral part of developing new regulatory sandboxes (if deemed necessary).

KEY PERFORMANCE INDICATORS (KPIS)

- Number of participants in the European Regulatory Sandbox Forum
- Number of regulatory barriers identified by each IWG/ETIP
- Number of regulatory gaps identified by each IWG/ETIP
- Knowledge-sharing platform on regulatory issues set up by IWGs/ETIPs (sub-KPIs can include the number of IWGs/ETIPs involved, the number of meetings, etc.)
- Number of campaign materials (official statements, position papers, etc.) on specific regulatory issues by IWGs/ETIPs
- Number of regulatory experimentation initiatives developed in each Member State with the active contribution of IWGs/ETIPs
- Number of permanent regulatory reforms as a result of the aforementioned regulatory sandbox initiatives
- Number of regulation-related actions and activities incorporated in CIIPs

RECOMMENDATION 2. ESTABLISH INNOVATION HUBS FOR SET PLAN TECHNOLOGIES

Recommendation summary:

The transition from demonstration to commercial deployment remains hindered by fragmented infrastructures, high costs and limited support at higher TRLs.

This recommendation calls for Innovation Hubs for SET Plan technologies, which should be established as coordinated, one-stop-shop ecosystems that connect stakeholders across the value chain to co-develop, test and validate SET Plan technology innovations. These hubs will provide shared infrastructures such as pilot plants and living labs, support co-creation across sectors, and integrate financial, technical and regulatory services.

Initial feasibility studies and strategic mapping should be carried out in the short term, followed by deployment and network formation of hubs by 2030, enabling long-term scaling, replication and system integration across Europe.

WHY

Challenges identified by TF members and literature review

SET Innovation Hubs respond directly to the Task Force's priority of de-risking innovation at higher TRLs through shared, well-equipped, and policy-aligned environments. The recommendation addresses critical barriers hindering the scale-up and commercialisation of clean energy technologies in the EU, including:

- Insufficient support for Research and Innovation (R&I) at higher Technology Readiness Levels TRLs (TRL 6–9): Despite strong early-stage innovation, many promising clean energy technologies struggle to transition from prototypes to first-of-a-kind plants and subsequently replication for commercial deployment and volume production.
- Fragmented R&I energy infrastructure and lack of shared validation environments: There is (geographically) limited availability of facilities where companies can collaboratively test and validate technologies under real-world conditions. More European Research Infrastructure Consortia (ERICs) should be created to improve collaboration between R&I energy infrastructures.
- High perceived risk and cost of demonstration: Without dedicated spaces for demonstration of single technologies as well as integrated SET systems, companies face high financial and operational risks when bringing technologies closer to market readiness. There is a need for a framework to enable rapid, low-cost testing of innovations.
- Funding gap for demonstration in relevant environment or beyond (end TRL 6-9): Scarcity of funding at the demonstration prototype and first commercialisation stages. Funding and infrastructure support beyond TRL 5 are crucial for accelerating market uptake.
- Lack of a testing ground for key requirements beyond the technical: namely, new cooperative business models, involvement of investors for suitable project opportunities, adaptive legal frameworks and governance, as well as societal acceptance for technology integration.
- Unmanageable testing processes, which delay time to market: Currently, the regulatory framework is rather strict and therefore, testing processes are burdensome.

Expected outcomes and contribution to EU priorities

The following outcomes are expected from this recommendation:

- **Newly created SET Innovation Hubs**, which will form a network to support pre-competitive collaboration between companies.
- Coordinated landscape **of research infrastructures, pilot plant parks and living labs** to facilitate pre-commercial testing and validation of single clean energy technologies and clean energy systems consisting of integrated energy technologies.
- Enhanced **industry-academia-government collaboration** in real-world conditions, fostering innovation ecosystems across the EU in a programmatic and bottom-up approach, driven by research, industry needs and regional ecosystems.
- Acceleration of **technology de-risking and shortening time-to-market** for climate-neutral solutions.
- Improved **alignment of R&I with market, regulatory, and societal needs**, enhancing acceptability and scalability of solutions.
- **Increase in private funding** and **improved efficiency of funding** through shared infrastructure, cooperation between companies and between business and academia, and involvement of investors and financiers.
- **Reduced investment risks and increased burden-sharing** through PPPs for funding of innovation, while improving coordination across EU and national initiatives, aligning investments, and minimising duplication.
- **Enhanced sector coupling between industries** to foster systemic innovation and enable the creation of new cross-sectoral markets and integrated systems of SET.
- Enablement of strategic planning that spans from early-stage research (low TRL) to full deployment (TRL 9), ensuring coherence and continuity across research programmes.

This recommendation aligns with and supports the objectives of the following key EU policies and initiatives:

- **CID[63], NZIA[64], Competitiveness Compass[65], Clean Industrial Deal State Aid Framework (CISAF)[66]:** strengthens the competitiveness of industries by enabling the commercialisation of climate-neutral technologies.
- **EU Startup and Scaleup Strategy[67]:** fostering an innovation-friendly environment, supporting market uptake and expansion.
- **European Charter for Access to Research Infrastructures[68]:** fostering access of industrial users to research and innovation infrastructures.
- **InvestEU[69] and Horizon Europe[70]:** leverage EU funding mechanisms to scale breakthrough innovations.
- **SET Plan Implementation Framework:** directly supports SET Plan goals by enhancing the innovation chain from research to deployment, particularly for TRL 6 and above.
- **RepowerEU[71], Affordable Energy Action Plan[72]:** facilitates the deployment of economically viable energy technologies utilising renewable domestic sources.
- **EU Regional Innovation Valleys[73]:** provide a strategic tool for bridging innovation divides, scaling local solutions, interconnecting innovation ecosystems, and leveraging smart specialisation strategies.

63 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0085
64 https://eur-lex.europa.eu/eli/reg/2024/1735/oj/eng
65 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0030
66 https://eur-lex.europa.eu/eli/C/2025/3602/oj/eng
67 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0270
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69 https://investeu.europa.eu/index_en
70 https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
71 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52022DC0230
72 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC0079&qid=1741780110418
73 https://research-and-innovation.ec.europa.eu/strategy/support-policy-making/shaping-eu-research-and-innovation-policy/new-european-innovation-agenda/roadmap/flagship-3-accelerating-and-strengthening-innovation-european-innovation-ecosystems-across-eu-and/regional-innovation-valleys_en

- **The 2023 Commission Staff Working Document on 'Regulatory learning in the EU: Guidance on regulatory sandboxes, testbeds, and living labs in the EU, with a focus section on energy'[74]:** sets out available experimentation tools and showcases existing examples from Europe and beyond on how the European Union and national governments can support and engage innovators in the regulatory process.

By supporting collaborative, real-world experimentation, the new SET Innovation Hubs foster an integrated innovation landscape, ensuring Europe's position at the forefront of the global clean tech transition.

WHAT

Set up new SET Innovation Hubs that build on existing innovation support structures (see examples listed in the how section) and are backed by regional innovation valleys and clean tech clusters. The SET Innovation Hubs will form a coordinated European network to boost Europe's competitiveness. SET Innovation Hubs will be composed of, but not restricted to, the following shared infrastructures for co-creation:

- Pilot Plant Parks: shared facilities equipped for testing interoperability and integration of multiple clean technologies in a 'system-of-systems context', validating and scaling at TRL 5–8.
- Living Labs: real-life testing environments integrating end-users, regulators, business angels, and societal stakeholders to assess technological, regulatory, and social impacts of innovative energy technologies and integrated systems of energy technologies.

The new SET Innovation Hubs will:

- Offer pre-competitive spaces for multiple companies and research actors at limited cost, covering the full TRL spectrum.
- Provide access to shared infrastructure, testing protocols, digital tools, and expert support.
- Enable experimentation under real-world conditions across key energy system sectors (e.g. hydrogen, renewables, energy storage, carbon capture and storage, electrification).
- Encourage co-creation among key actors, including among various industries (e.g. energy, transport, agriculture), to foster systemic innovation and enable the creation of new cross-sectoral markets and technologies.
- Facilitate interactive learning among stakeholders, using a quadruple-helix model involving industry, research institutions, policymakers and civil society (notion of a 'transition lab').
- Offer shared communication to promote activities and inform stakeholders, including citizens and the media.
- Include skills development, training and knowledge transfer programmes to support industrial uptake.

They will offer a multi-dimensional support mechanism for the entire value chain:

- Technological
- Financial (public and private)
- Business incl. Intellectual Property Rights (IPR) management and legal assistance.
- Governance/regulatory

Innovation Hubs should be given particular emphasis in coal and mining regions across Member States.

WHO

A multitude of key actors should implement the establishment of new SET Innovation Hubs:

- **SET Plan IWGs, ETIPs and EERA:** strategic coordination and funding alignment under the guidance of the European Commission.
- **National governments and regional authorities:** coherence and coordination among Member States (e.g. Concentrated Solar Power (CSP) ERANET), co-financing, site selection, regulatory alignment, and alignment with social partners.

74 https://data.consilium.europa.eu/doc/document/ST-12199-2023-INIT/en/pdf

- **National Energy Efficiency Hubs:** support sandbox participation, provide technical assistance for Innovation Hubs, help companies access de-risking instruments, and supply case studies to the EU Observatory.
- **Higher Education Institutions and Research Organisations:** host and operate pilot facilities.
- **Industry consortia and start-ups:** co-design and use of infrastructure.
- **Clean Tech Valley Clusters:** provide clean tech challenges and ensure swift market uptake (e.g. Small and Medium Enterprises – SMEs).
- **EU funding agencies** (e.g. European Climate, Infrastructure and Environment Executive Agency – CINEA, European Investment Bank – EIB, European Innovation Council – EIC): financial support mechanisms.
- **Venture capital and angel investors:** firms or funds that provide private equity financing to start-up, early-stage, and emerging companies, mentorship and guidance.
- **Standardisation bodies and regulatory agencies:** integration of standards and enabling regulation (e.g. ACER, European Committee for Standardisation – CEN, International Organisation for Standardisation – ISO).
- **Consumer organisations:** providing consumers with information about innovative technologies in order to help overcome resistance to market access of unknown technologies.

HOW

A feasibility study and an initial business plan will be the first key steps in establishing SET Innovation Hubs. The financing and implementation of the feasibility study are open for discussion. The actions outlined below would then follow:

- **Strategic Mapping (Year 1):**
  - Site selection: Identify regions based on SET Plan priorities and ensure geographical balance.
  - Specialisation: Identify specific systemic challenges that hubs could address.
  - Integration: Ensure integration with existing innovation clusters (see examples below).
- **Framework Development (Year 1-2):**
  - Develop governance models (public-private partnerships, joint ventures).
  - Define access rules, IP-sharing frameworks, and regulatory sandboxes.
- **Infrastructure Deployment (Year 2-5):**
  - Build or upgrade physical and digital infrastructure.
  - Mobilise public funding from Horizon Europe, InvestEU, national, and regional innovation funds. The EIB's venture debt product, advisory solutions and traditional loan services[75] might be particularly relevant in this context.
  - Mobilise private funding.
- **Operationalisation and Scaling (Year 3 onward):**
  - Launch calls for industry participation.
  - Facilitate cross-sector collaboration and joint testing programs.
  - Link structures into a coordinated European network.
- **Evaluation and Expansion (Year 5+):**
  - Assess performance, replicate successful models, and integrate feedback.
- **Sustainability (Year 5+):**
  - Deliver tangible results to ensure long-term sustainability.

Potential Areas of Application for SET Innovation Hubs:

CIIPs of the Implementation Working Groups (IWGs) and the European Technology and Innovation Platforms (ETIPs) are linked to this recommendation, as they address industrialisation, scale-up, and the competitiveness of clean technologies.

75 Additional information on the EIB's products available here: https://www.eib.org/en/publications/20240233-eib-group-product-catalogue

- Example: ETIP PV Strategic Research and Innovation Agenda (SRIA): 'European industry success in the global competition relies upon high market ambitions, rapid innovation and a future-ready sustainable value chain'[76]. The ETIP PV IP considers clean technologies and materials for energy harvesting and storage, as well as clean-tech manufacturing technologies[77].
- Example: ETIP Bioenergy SRIA: key challenges include improving conversion efficiencies, reducing cost, and de-risking of value chains. There may be a need for new infrastructures for platform chemicals and dedicated fuels[78] (ref. Re-Fuel EU).
- Example: ETIP Geothermal SRIA: 'The technologies can be widely applied in energy infrastructures supplying sustainable and low carbon heat to industry, agriculture and district heating grids' (p. 68)[79].
- Example: ETIP SNET: Full-scale local flexibility market simulating a real city district; 'System of systems' V2G platform testing interoperability of EVs; Cross-sector data exchange platform testing exchange of data between electricity, gas, district heating systems and EV providers; Cybersecurity Centre where operators can simulate cyber-attacks and test coordinated response and recovery strategies in a safe environment.
- Example: Several EERA Joint Programmes (e.g. in wind energy) are working towards deeper collaboration with ETIPs and industry associations, bringing together stakeholders across the value chain to co-develop, test, and validate new solutions, while monitoring technological progress and addressing the key points outlined in the section 'Expected Outcomes and Contribution to EU priorities' above. In parallel, EERA is developing a proposal further to define the scope and objectives of such Innovation Hubs. This work builds on the expertise and structure of its Joint Programmes and is aligned with the scope of this recommendation.
- Example: Industrial decarbonisation use cases: testing frameworks for low-, medium- and high-temperature industrial heat technologies.

Examples of existing infrastructures:

- Bio-Base Europe Pilot Plant[80]: co-creating the next generation platform of pilot and demo infrastructures, unlocking faster innovation and EU bioeconomy growth
- Horizon Europe-funded S2H4C project - From Industrial Symbiosis to Hubs for Circularity
- NetZeroCities[81] living labs in 100+ cities
- ECCEL ERIC[82]: distributed European Research Infrastructure for CO2 capture, utilisation, transport and storage; encompassing interlinked transnational scientific facilities and national nodes
- IPCEI Batteries[83], IPCEI PV
- Clean Hydrogen Valleys[84]
- Green Tech Valley Styria[85]: Circular Economy Innovation Hub
- Silicon Alps Cluster[86]
- EnergyVille[87]
- North Sea Wind Power Hub[88]
- The European Industrial Alliance on Small Modular Reactors (SMRs)[89]

76 ETIP PV, 'Strategic Research and Innovation Agenda on Photovoltaics', 2024 (https://media.etip-pv.eu/filer_public/f5/8b/f58b06d7-60fa-457a-8562-80eb71fa667c/etip_pv_-_sria_report_update-_august24.pdf).
77 ETIP PV Implementation Plan (https://etip-pv.eu/set-plan/pv-implementation-plan/).
78 ETIP Bioenergy, 'Strategic Research and Innovation Agenda 2023', 2023 (https://new.etipbioenergy.eu/wp-content/uploads/2024/07/ETIP_SRIA_2023.pdf).
79 ETIP Geothermal, 'Strategic Research and Innovation Agenda', 2023 (https://etip-geothermal.eu/front/wp-content/uploads/SRIA_2023_Final_ForWeb_compressed.pdf).
80 https://cordis.europa.eu/project/id/101157279
81 https://netzerocities.eu/mission-cities/
82 https://eccsel.eu/
83 https://www.ipcei-batteries.eu/
84 https://www.clean-hydrogen.europa.eu/get-involved/hydrogen-valleys_en
85 https://www.greentech.at/ueber-das-valley/
86 https://www.silicon-alps.at/
87 https://energyville.be/en/
88 https://northseawindpowerhub.eu/
89 https://single-market-economy.ec.europa.eu/industry/industrial-alliances/european-industrial-alliance-small-modular-reactors_en

- NUGENIA[90] is dedicated to R&D&I of nuclear fission technologies, with a focus on safe and efficient operation of Gen II and III nuclear plants. This pillar initiates and supports international R&D projects and programmes.
- ESNII[91] (the European Sustainable Nuclear Industrial Initiative) focuses on industrial initiatives that aim to demonstrate Gen IV technologies with closed fuel cycles to exploit the full potential of nuclear energy, ensuring the best use of uranium resources and minimising waste.
- Research Infrastructure Services for Renewable Energy (RISEnergy)[92] integrates Europe's energy research infrastructures, creating a more interconnected and accessible network of facilities, laboratories, and testing sites. It also aims to standardise and harmonise technical protocols, data sharing, and operational practices. RISEnergy provides a unique entry point to 86 research infrastructures (RI) services across 10 energy domains, to deliver 2,500 days of access to more than 250 users.
- NC2I[93] (European Nuclear Cogeneration Industrial Initiative) aims to demonstrate innovative and competitive energy solutions for the low-carbon cogeneration of heat and electricity and hydrogen production based on nuclear energy.
- Living Lab project on energy hybridisation at CEDER-CIEMAT: the network is already allowing researchers and companies to test and validate new technologies and devices to drastically reduce energy transport losses, facilitate the grid connection of all types of renewable energies, and support the massive connection of electric or hybrid vehicles.
- 8th Energy Research Programme of the German Federal Ministry for Economic Affairs and Climate Action: it supports mission-oriented research and innovation for energy technologies, including networking, platform building, and collaborations between industry, research institutions and public sector stakeholders. It also helps finance collaborative consortia and research networks that function as national innovation hubs in specific SETs.
- Innovation Platforms and Networks: Bodies such as the de:hub[94] initiated by BMWi (German Federal Ministry for Economic Affairs and Climate Action) and BMDS (German Federal Ministry for Digitalisation and Government Modernisation), which provide strategic dialogue and networking across stakeholders (digital start-ups/ SMEs, science, public administration) to coordinate innovation priorities and help build hub-like structures in the field of digital R&D.
- Startup and Innovation Funds Programmes such as the ERP-EIF Facility[95] and GFF-EIF Growth Facility[96] (co-financed with the European Investment Fund), which strengthen venture capital and funding ecosystems for energy and deep-tech innovation in Germany, effectively enable innovation hubs and ecosystem financing.

Examples of existing support mechanisms

- EIC Accelerator[97]: develop and scale up innovations with the potential to create or disrupt markets.
- KIC InnoEnergy[98] – De-risking Cleantech Innovation for Global Impact
- Climate KIC ClimAccelerator[99] – Catalysing Global Climate Start-Ups
- Climate KIC Climate Launchpad[100] – Turning Green Ideas into Climate Ventures
- European Research Infrastructure Consortium (ERIC)[101] - A specific legal form that facilitates the establishment and operation of Research Infrastructures.
- European Industrial Alliance on SMRs[102] – it aims to facilitate and accelerate the development, demonstration, and deployment of SMRs in Europe by the early 2030s.

90 https://snetp.eu/nugenia/
91 https://snetp.eu/esnii/
92 https://risenergy-project.eu/
93 https://snetp.eu/nc2i/
94 https://www.de-hub.de/en/
95 https://www.eif.org/equity-products/all/erp-eif-facility
96 https://www.eif.org/press/all/germany-gff-eif-financing-startups-growth-stage
97 https://eic.ec.europa.eu/eic-funding-opportunities/eic-accelerator_en
98 https://www.eit.europa.eu/sites/default/files/KIC_InnoEnergy_a_new_approach_to_education_web_HD.pdf
99 https://climateaccelerator.climate-kic.org/
100 https://www.climate-kic.org/open-call/climatelaunchpad-2025/
101 https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/our-digital-future/european-research-infrastructures/eric_en
102 https://single-market-economy.ec.europa.eu/industry/industrial-alliances/european-industrial-alliance-small-modular-reactors_en

- Austrian COMET Competence Centres[103]: the COMET program is an Austrian success story. It brings together scientific expertise and technological know-how across three funding lines. Within COMET, companies and research partners collaborate on clearly defined topics, enabling the direct transfer of new knowledge into innovative prototypes. The ultimate goal is to create market-ready solutions.

WHEN

Short-term (2026-2027): **Immediate preparatory actions**

As a first step, a **feasibility study and initial business plan** for new SET Innovation Hubs would need to be commissioned in order to perform a strategic mapping exercise of relevant existing structures in the Member States, and issue a recommendation for specialisation and site selection for new SET Innovation Hubs, as well as initiate a governance and legal framework for their establishment.

Medium term (2027-2030): **Full roll-out** (aligned with Multiannual Financial Framework)

In the medium-term, the SET Plan Innovation Hubs will provide a coordinated landscape of pilot plant parks and living labs to facilitate pre-commercial testing and validation of technologies. They will deploy the necessary infrastructure, and the SET Innovation Hubs will be fully operational. To scale the operation and enhance competitiveness, the SET Innovation Hubs will form a European network of hubs.

Long-term (beyond 2030): **Supporting climate neutrality goals**

In the long term, based on strategic performance assessments- using regular performance monitoring data- successful models will be highlighted, and SET Innovation Hubs will integrate their feedback. Eventually, this process will lead to adjustments in the SET Innovation Hubs system.

KEY PERFORMANCE INDICATORS (KPIS)

- Number of SET Innovation Hubs established
- Number of technologies supported at TRL 7-9
- Number of industry research collaborations initiated
- Time-to-market reduction for participating technologies
- Investment leveraged (public + private)
- Number of cross-border pilots conducted

103 https://www.ffg.at/en/comet

RECOMMENDATION 3. DESIGN DE-RISKING FINANCE INSTRUMENTS AND FUNDING SCHEMES

Recommendation summary:

Innovative energy technologies face significant financing gaps – particularly in the transition from demonstration to market uptake – due to high risks, fragmented funding schemes and limited private investment.

This recommendation calls for a portfolio of targeted de-risking instruments and blended finance mechanisms. Herein public and private funding, guarantees, equity instruments and innovative business models should be combined. The portfolio could encourage better alignment of EU and national funding schemes, stronger engagement of financial institutions, and improved venture capital and risk-sharing instruments.

In the short to medium term, Member States and stakeholders should implement tailored financing approaches, while aligning with upcoming EU strategies such as the Clean Energy Investment Strategy and Scale-up Europe Fund, ensuring long-term improvements in financing ecosystems.

WHY

Challenges identified by TF members and literature review

SET Plan stakeholders have identified the following challenges affecting the access to the market of SET Plan technologies:

- Lack of financial instruments to bridge the second 'valley of death' (TRL 6-9) and support market penetration and scale-up
- Inadequate EU-wide financial mechanisms and de-risking instruments
- Poor mix and design of public and private funding schemes
- Insufficient engagement of private capital and venture investment
- Limited support mechanisms for industrial actors and near-zero materials
- Weak public-private collaboration and cross-border investment models
- Regulatory uncertainty is hindering the development of public-private partnerships

Additionally, SET Plan stakeholders expressed concerns about the limited collaboration between public and private sectors on investments, not only in the early stages of the SET innovation lifecycle, but also in the later stages of development and scaling. In many cases, it remains unclear which matching financing instruments are available for a specific technology.

Expected outcomes and contribution to EU priorities

The establishment of dedicated financial/funding schemes for de-risking SET innovations and leveraging industry contribution and Venture Capital is expected to contribute to the following EU policies and priorities:

- **Contributions to Competitiveness Compass for the EU**[104], Section 1.1 and 2.3: Closing the innovation gap (lack of commercialisation activity) and improving financing competitiveness, and a Savings and Investments Union
- **Contributions to Affordable Energy Action Plan**[105] **pillar I:** Lowering energy costs by lowering the bill requires addressing its three cost components: network and system costs, taxation, and supply costs
- **Contributions to CID**[106]**, Section 3:** Lead markets: boosting clean supply and demand by building a business case for decarbonised products also requires concrete measures on the demand side.

Overall improvements in the financing conditions for innovative SETs will not only stimulate the real economy but also increase the diversity and resilience of the financial system itself.

104 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0030
105 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC0079&qid=1741780110418
106 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0085

Recent and upcoming European policies and strategies will, in turn, improve financing conditions for SET innovations. Such policies include:

- The **Clean Energy Investment Strategy**[107], which will help bridge the gap between the private capital currently available and the investments needed, and will help de-risk projects and mobilise private finance for grids, innovative clean energy technologies and energy efficiency.
- The **EU Startup and Scaleup Strategy**[108] and the **Scaleup Europe Fund**[109], which will operate as a market-based, privately managed and privately co-financed growth fund to lead major European investment rounds.

Additionally, this recommendation complements the efforts of several existing EU initiatives that, in various ways, help create better market access for Strategic Energy Technologies. They support the development of enabling regulatory frameworks, SME support networks, trade facilitation, and technology-specific partnerships. Such initiatives address regulatory, financial, knowledge, and technology-specific barriers. Investment-focused schemes such as **DEEP (De-risking Energy Efficiency Platform)**[110], the **Investors Dialogue on Energy (ID-E)**[111], the **Energy Efficiency Financing Coalition (EEFIG)**[112], and **IPCEIs**[113] (Important Projects of Common European Interest, e.g. Hy2Tech, Hy2Move, nuclear IPCEI) and nuclear IPCEIs mobilise funding, enhance investor confidence, and de-risk projects. Knowledge-sharing platforms such as Access2Markets and the Enterprise Europe Network (EEN) equip businesses—particularly SMEs—with trade intelligence, market-entry strategies, and innovation support. Advisory and expert groups, including the Net-Zero Technologies and Supply Chains Expert Group, the Innovation Fund Expert Group, the **Clean Energy Industrial Forum**[114], and the Internal Energy Market Expert Group, shape policies and provide targeted guidance to remove market barriers. Technology-specific initiatives, such as **ENNOH (European Network of Network Operators for Hydrogen)**[115], the **Clean Hydrogen Partnership**[116]**,** the Industrial Carbon Management Forum[117], the DUT (Driving Urban Transition) Partnership on Positive Energy Districts (PED) transition pathways, the EU Cities Mission Platform, the Euratom Scientific and Technical Committee (STC), and European Partnerships like **Batt4EU**[118], address sector-specific challenges by aligning R&I with market needs, developing infrastructure, and fostering stakeholder collaboration.

WHAT

Dedicated de-risking funding/financing schemes should act as high-risk patient capital if possible, and can apply (some of) the following solutions:

- Continue and strengthen grant support for innovative energy technologies, also at high TRL (TRL 6-9), in order to balance high capital cost on the market.
- Improve alignment between existing funding schemes (e.g. EIC, Innovation Funds, LIFE, etc.), also a core objective in the MFF (Multiannual Financial Framework) 2028-2034 proposal by the EC
- Engage regional and national investment funds as well as local government funds
- Enable more risk-carrying financial instruments (equity)
- Increase mutual understanding of technology developers and private finance (both need to change their criteria for attracting finance and their expectations (return, time horizon, etc.)
- Introduce loan guarantees (including export credits for innovative SETs), insurance schemes, and co-investment funds, as well as more PPPs to reduce financial risk and support commercialisation, e.g. increase budget and reduce the investment threshold for co-investments with EIB[119]. Render such guarantees and insurance schemes eligible for funding under all European programmes.

107 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0116&qid=1773310237995
108 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0270
109 https://eic.ec.europa.eu/eic-fund/scaleup-europe-fund_en
110 https://deep.ec.europa.eu/
111 https://energy.ec.europa.eu/topics/funding-and-financing/investors-dialogue-energy_en
112 https://energy.ec.europa.eu/topics/energy-efficiency/financing/european-energy-efficiency-financing-coalition_en
113 https://competition-policy.ec.europa.eu/state-aid/ipcei_en
114 https://energy.ec.europa.eu/topics/renewable-energy/clean-energy-industrial-forum_en
115 https://ennoh.eu/
116 https://www.clean-hydrogen.europa.eu/index_en
117 https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/industrial-carbon-management/icm-forum-and-working-groups_en
118 https://bepassociation.eu/
119 Addressing Section 1.1 of 'A Competitiveness Compass for the EU' related to 'Closing the innovation gap' and section 2.3 related to 'Financing competitiveness and a Savings and Investments Union'

- Strengthen National (Green) Investment Banks, such as KfW (Kreditanstalt für Wiederaufbau) in Germany, Bpifrance in France, ICO (Instituto de Crédito Oficial) in Spain[120].
- Lead market development through Power-Purchase Agreements (PPAs)[121]. Heat Purchase Agreement (article 23 RED), Heat-as-a-service, and performance-based contracts: more widely introduce ringfenced contracts for differences for each innovative technology[122].
- Through the CIIPs, promote private funding for the market uptake of new energy technologies in the context of the upcoming (status as of December 2025) Clean Energy Investment Plan.
- Encourage the use of venture capital by start-up and scale-up companies, in particular from the developing Scaleup Europe Fund.
- Leverage national industrial energy management schemes to provide validated datasets, improve eligibility criteria for pilots, and standardise project assessment.
- Empower industry and the research community to lead in identifying critical gaps and real needs, directing resources efficiently, reducing technical risk, and guiding policymakers towards effective, long-term strategies.

WHO

- **IWGs** are the main targets of this recommendation because they focus on implementation and represent Member States (fostering coherence of solutions between Member States). They are encouraged to take on board elements from this recommendation in their future CIIPs.
- **National governments** are the main point for interventions in the real economy and national financial markets.
- **Financial institutions**, such as institutional investors, banks (including the **EIB**) and other financiers that supply the lion's share of finance for clean technologies.
- **Corporate actors** such as grid operators and original equipment manufacturers (OEMs), as well as venture capital funding divisions (or equivalent) of large energy corporates.

HOW

Generally, we advocate for a portfolio of initiatives, tailored to different TRLs and risk profiles. Initiatives aimed at de-risking SET innovations, as well as leveraging industry contributions and risk-carrying, can be undertaken by the following SET Plan stakeholders. We provide recommendations for Member States and market actors, as well as specific ETIPs (examples of best practices). We highlight the mechanisms through which particular interventions work in italics. These need to be further discussed and refined with the consultation of the SET Plan stakeholders:

- **Member States:** blended finance and de-risking
  - Make use of the leverage aspect of public funding and include non-price criteria
  - Set technology-specific deployment targets to show political commitment and attract private investors
  - Establish national investment banks (example: KfW in Germany) and, if not done so already, enable collaboration between national strategic investment funds and EIB
  - Set up revenue-supporting measures (e.g. Contracts for Difference/CfD) to support blended finance (mainly private part), especially for more systemic technologies (e.g. smart grids)
  - Encourage Public Procurement of Innovation (PPI): Encouraging public bodies (e.g. a municipality for its vehicle fleet, or a DSO for its own grid management) to act as the lead customer
  - Provide support for better teams and management in energy-related start-ups due to the extra challenges they face (asset-heavy, slow scaling, etc.) through dedicated education programs

120 Addressing Section 2.3 of 'A Competitiveness Compass for the EU' related to 'Financing competitiveness and a Savings and Investments Union'.
121 Addressing paragraph 3 of the 'Clean Industrial Deal' related to 'Lead markets: boosting clean supply and demand' and Pillar III of the 'Action plan for affordable energy' related to 'Attracting investments and ensuring delivery'.
122 Addressing Pillar III of the 'Action plan for affordable energy' related to 'Attracting investments and ensuring delivery'.

  - Improve standardisation: While not a direct financial instrument, its role as a powerful de-risking mechanism is critical. A clear, widely adopted standard reduces technical risk for investors, increases the potential market size, and avoids vendor lock-in

- **Market actors:** reducing information asymmetries and uncertainty
  - Financiers: Acquire more technological knowledge about the SET Plan technologies, and more proactively study the IWGs' and ETIPs' CIIPs.
  - Corporate actors: articulate needs for de-risking and other financial needs (e.g. investments in complementary assets such as grid infrastructure, unclear government commitment to specific policy)
  - Reinforcement of capacity building for industry and financial actors: training for project developers, ESCOs and financiers to be foreseen as a cross-cutting action to improve uptake of de-risking tools and participation in demonstrations.
- **EIB:** financial instruments[123]
  - Equity (funds), through the European Investment Fund (EIF)
  - Direct equity and venture debt
  - Risk-capacity instruments (guarantees and securitisation)
  - Direct guarantees
  - Bond purchases (green and hybrid bonds)
  - Liquidity instruments (intermediated loans)
  - Direct loans (including project finance and public-private partnerships)
  - Advisory services and technical assistance
  - EIB's 'Green Checker[124]' to assess the financing eligibility of emerging energy technologies.
  - New financing: the EIB will increase support to private investments in innovative clean energy technologies (e.g. long-duration energy storage, etc.) and will put in place EUR 500 million of financing to accelerate the offer and uptake of 'energy efficiency as a service' models.
- **European Commission:** policies and public funding
  - Horizon Europe[125], Innovation Fund[126] and European Innovation Council[127]
  - InvestEU top-up from the Innovation Fund until 2028 (EUR 200 million) to support the deployment of innovative nuclear technologies (SMR) via de-risking guarantees[128].
  - Strategic Infrastructure Investment Fund to act as an Equity Platform facilitating targeted co-investment alongside infrastructure funds (EUR 500 million[129]).
  - Scaleup Europe Fund and EU Startup and Scaleup Strategy[130] to support new clean energy technologies and address the gap in large-scale equity financing for technology scale-up.
  - Clean Energy Investment Strategy[131] to address the significant increase in investment needed in the European energy sector.
- **ETIP Geothermal:** Central mechanism – de-risking
  - Risk insurance for geothermal projects (public insurer of last resort) and public-private collaborations to undertake operational risks not covered or overpriced by commercial insurers
  - Guarantees for upfront risks for geothermal drilling (Member States)[132];

123 Additional information on EIB's financial instruments: https://www.eib.org/en/publications/20240233-eib-group-product-catalogue
124 https://greenchecker.eib-group.org/eib-green
125 https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
126 https://cinea.ec.europa.eu/programmes/innovation-fund_en
127 https://eic.ec.europa.eu/index_en
128 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0117&qid=1773310096275
129 https://energy.ec.europa.eu/topics/funding-and-financing/clean-energy-investment_en
130 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0270
131 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0116&qid=1773310237995
132 Risk insurance funds exist for example in France, Germany, Iceland, The Netherlands, Denmark and Switzerland.

    - Examples: The GEORISK project developed insurance schemes as a blueprint and best practice. Munich Re, a reinsurance company, offers risk mitigation solutions for geothermal projects, including well output insurance and exploration risk insurance[133]

- **ETIP ZEP:** risk-sharing fund
    - Cross-chain risks between CO2 capture, transport and storage are a key show-stopper of projects, but these have been overcome and led to significant investments such as Northern Endurance Partnership and Hynet in the UK[134].
        - Example: The UK Revenue Support Agreement has proven successful in leading to the financial close of two major CO2 clusters. While a significant allocation of public resources covers these risks, export credit agencies (ECAs) could provide a means to underwrite significant risks arising from the operation of Carbon Capture and Storage (CCS) projects.
- **ETIP Wind:** blended finance
    - The Danish investment fund Copenhagen Infrastructure Partners (CIP) is a prominent example of a fund that takes more risks than a usual public-private fund (i.e. the North Sea wind park project[135]).
- **ETIP Batteries:** reducing information asymmetries and uncertainty
    - TF members reported that the funding agency supports high TRL projects and requests in funding calls preliminary thoughts on business model as best practice.
- **ETIP Ocean:** blended finance
    - TF members highlighted grant funding for blended finance for tidal energy backed by the EU Innovation Fund as best practice.
    - TF members highlighted the need for ringfenced revenue support to bridge the gap in project finance.
- **ETIP HYDRO:** reducing information asymmetries and uncertainty
    - TF members reported Innovation Hubs/valleys as best practice (see Hydrogen Valleys)[136].
- **ETIP SNET & PED[137]:** blended finance and de-risking
    - Address the challenge of systemic value: smart grid innovations (e.g. enhanced grid resilience) are a public good. De-risking schemes must be designed to recognise and reward this systemic value.
    - Act as a key forum for bridging the gap between innovators and financiers, signalling trust, validating potential business models, technical standards, etc. Collective technical and market expertise can inform due diligence and validation processes, helping to make smart grid projects bankable.
- **ETIP SNETP:** ensure technology neutrality and political de-risking
    - Reduce the risk of a political stop to further development of nuclear.
- **Cross-cutting:** strengthen stakeholder engagement
    - Expand schemes that provide technical assistance for innovative project development at national and European level (through e.g. EIB)
    - Develop and provide training and tools for capacity building that will facilitate fast adoption of new/innovative SETs. Target stakeholder groups may include: ESCOs, energy consultants, project developers, EPCs, and project investors/financiers.
- **ETIP RHC:** different dimensions of de-risking
    - Financial obstacles to the development of solar thermal projects in Europe exist and must be solved by early public backing of solar thermal development. To ensure the security of large solar thermal investments, it is also necessary to build a favourable framework. In brief, the main financing priorities are risk-mitigation measures to reduce the cost

133 https://www.georisk-project.eu/ https://www.munichre.com/content/dam/munichre/contentlounge/website-pieces/documents/MunichRe-Geothermal-Factsheet.pdf/_jcr_content/renditions/original/MunichRe-Geothermal-Factsheet.pdf
134 https://www.catf.us/resource/risk-allocation-regulation-co2-infrastructure/
135 https://www.energyconnects.com/news/renewables/2025/march/danish-investor-raises-12-billion-for-renewable-energy-fund/
136 https://www.clean-hydrogen.europa.eu/get-involved/hydrogen-valleys_en
137 https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en

of capital and other risk-related costs (e.g. warranties), and direct financial support to reduce upfront investments and make these projects competitive within shorter economic lifetimes.

  - Other crucial financial mechanisms address barriers by reducing non-financial risks, which in turn de-risk a project financially, referred to as 'Standardisation and Interoperability' and 'Training and Knowledge Dissemination' in the ETIP RHC SRIA.

- **IWG RFB:** Hydrogen Bank and support to high-TRL
  - Renewable fuels suffer from investment uncertainty, requiring additional experimental investment efforts for innovative process solutions (an effective example is the production of biohydrogen through gasification processes). Furthermore, in many cases, the final product is not competitive with fossil alternatives, both in terms of levelized cost and storage infrastructure (this is true for hydrogen and its derivatives such as e-methane or e-kerosene). Initiatives such as the Hydrogen Bank and support programs for high-TRL research and development – aimed at enabling market entry for developed technologies (including the Italian Mission Innovation 2.0 case) – are essential for the sustainable market deployment of renewable fuels, hydrogen derivatives, and innovative biofuels.
- **The German example:** mobilisation of private capital and de-risking
  - Deutschlandfonds / Strategic Investment Fund (KfW): Germany launched a €30 billion 'Deutschlandfonds' or strategic investment initiative aimed at mobilising private capital for strategic technology deployment, including the energy transition. It uses guarantees, loans, and equity instruments to lower investment risk for private investors in energy technologies and related innovation sectors.
  - ERP-EIF and Growth Facilities: federal co-investments via ERP-EIF and GFF-EIF enhance early and growth-stage equity financing, reducing the equity gap for innovative energy technology firms and mobilising private capital.
  - Climate and Transformation Fund & Special Fund for Infrastructure and Climate Neutrality: these cross-ministerial funds provide significant public finance for infrastructure and climate goals, indirectly helping de-risk investments in SETs by anchoring long-term public commitment to climate and energy goals.

WHEN

Short term (2026-2027):

- Across technologies: Strengthen the CETP and enable its co-funding potential (other regional research and innovation funding), shift focus towards scaling phase ('second valley of death'); Streamlining funding bureaucracy serves as another crucial lever, enabling simpler, faster processes and further reducing risks within the funding sector.
- Concrete actions for specific ETIPs:
  - ETIP Geothermal: Make the insurance schemes already developed known to establish new ones and analyse gaps (e.g. limits to the amount covered), and promote pan-European risk-sharing frameworks
  - ETIP Wind: Include grid operators in the SET Plan community as key players (relationship with governments, acting as investors, etc.)
  - ETIP RHC: Introduce new or expand existing schemes providing dedicated technical support, as well as funding and financing to project developers and technology providers, aiming at market scale-up of RHC applications
  - ETIP SNET: Blended finance vehicle Connecting Europe Facility (CEF) for initial infrastructure cost, reducing the amount of private capital at risk.
  - ETIP RHC: Expand existing schemes to provide dedicated technical support, as well as funding and financing to project developers and technology providers aiming at market scale-up of innovative SET applications.

Medium-term (2027-2030):

- Across technologies:
  - Inclusion of investors and developers in particular energy technology projects (better respond to market/investor demand and reduce uncertainties) in each IWG/ETIP

- Creation of an inventory of blended finance schemes for different technologies identified per Member State by each IWG/ETIP
- Establishment of a 'SET Plan Investment Platform', e.g. co-led by the European Commission and the EIB to manage a portfolio of de-risking instruments and act as a one-stop shop for innovators, e.g. by developing standardised 'Investment Readiness' templates.

- Concrete actions for specific ETIPs:
  - ETIP Geothermal: Co-develop an EU insurance fund with insurance companies and state-investment banks (see example of KfW and Munich RE), incorporate geothermal de-risking funds into the SET Plan funding toolbox
  - ETIP Wind: Roll out more blended finance schemes for offshore wind; match long-term project duration with financing scheme
  - ETIP SNET & PED: The SET Plan should advocate for a specific portion of the Innovation Fund to be earmarked for system-enabling technologies (like smart grids and flexibility platforms)
  - ETIP RHC: Develop and deploy insurance products for de-risking the scaling-up of renewable heating and cooling technologies (e.g. by facilitating multiple MW-scale demonstrations)

Long-term (beyond 2030):

- Mature energy technologies:
  - Phase out public support for mature technologies ('Re-risking') to shift market risk back to private parties
- Concrete actions for specific ETIPs:
  - ETIP Geothermal: More private insurance and guarantee schemes in mature markets to enable a fully functional market for risk insurance for geothermal projects
  - ETIP Wind: Market integration for wind energy, possibility to trade wind energy from one Exclusive Economic Zone (EEZ) to another, which would stabilise prices and increase energy security

KEY PERFORMANCE INDICATORS (KPIS)

- Across technologies:
  - Increase in public and private investment in particular technologies (TRL 7+) identified per Member State by each IWG/ETIP
  - Number and volume of blended finance investments approved/ongoing/completed per Member State by each IWG/ETIP
  - Number of projects and capacity in different technologies, and whether this is in line with EU targets, etc., by each IWG/ETIP
  - Diversity of funding sources available for companies, projects and infrastructure identified per Member State by each IWG/ETIP
- Specific technology recommendations (so far)
  - ETIP Geothermal: Increase in the number of countries offering risk insurance, increase the number of private geothermal insurance products
  - ETIP Wind: Capacity in offshore wind (in line with the EU targets); Reduced price for offshore wind energy
  - ETIP SNET & PED: Development of common standards under the SET Plan to reduce integration risks.
  - ETIP RHC: Increase in the number of insurers that offer risk insurance at the European and Member State level; Financing (e.g. low-interest debt) provided to innovative RHC projects.

RECOMMENDATION 4. INCLUDE THE FINANCIAL ACTORS IN THE SET PLAN COMMUNITY TO ADDRESS SPECIFIC INVESTMENT NEEDS

Recommendation summary:

Limited interaction between technology developers and financial stakeholders constrains investment flows and slows down the commercialisation of SET Plan technology innovations.

This recommendation supports the integration of banks, institutional investors, venture capital, and other financial stakeholders, as well as project developers into the SET Plan framework. Their involvement would ensure that investment strategies align with the financial realities and risk profiles of SET Plan technology innovations. The recommendation also supports the objectives of the Clean Energy Investment Strategy by strengthening investor engagement and access to finance.

Structured engagement should be strengthened primarily through ETIPs by linking to existing investor networks and initiatives, including clear investment needs and plans within CIIPs, and fostering dialogue via platforms such as a newly established SET Plan Investor Council and dedicated sessions at the SET Plan Conference.

In the short to medium term, dedicated task forces or structured dialogues should be established to ensure continuous interaction with financial actors. In the longer term, this engagement should be embedded in SET Plan governance, ensuring sustained collaboration and alignment between innovation priorities and investment strategies.

WHY

Challenges identified by TF members and literature review

SET Plan stakeholders have identified the following challenges affecting the access to the market of SET Plan technologies:

- Absence of a coordinated EU investor community
- Lack of investor awareness and communication gaps
- Bridging of the 'Knowledge Gap' between innovators and investors. Innovators need to understand what makes a project bankable. Investors must deepen their expertise to understand the risks and opportunities of new energy technologies
- Fragmented access to funding opportunities
- Inadequate collaboration with financial and industrial actors
- Limited engagement and risk aversion of private capital, resulting in an insufficient level of investment in SET plan technologies
- Lack of strategic differentiation and support across TRL stages
- Limited support for higher TRL technologies in public R&I budgets

Expected outcomes and contribution to EU priorities

By contributing to the market uptake of SET innovations in Europe through greater investor involvement in the SET Plan community and by mapping investment needs, this recommendation will help achieve the NZIA targets[138] and the objectives of the Clean Energy Investment Strategy[139]. The recommendation to involve financial actors in the SET Plan community aligns in fact with NZIA priorities by boosting investment in strategic energy technologies (supporting the financing needs of the green transition), by further expanding private sector participation in energy projects, complementing public funding, and by strengthening the EU's competitive edge in clean technology by ensuring adequate funding and financing for scaling up strategic solutions. It also supports the objectives of the Clean Energy Investment Strategy by improving access to private and institutional capital, reducing investment risks, and strengthening the investment ecosystem needed to accelerate the commercial deployment of clean energy technologies.

138 https://eur-lex.europa.eu/eli/reg/2024/1735/oj/eng
139 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0116&qid=1773310237995

The **NZIA** aims to help scale up EU manufacturing capacity for net-zero technologies and increase the competitiveness of EU industries. The legislation seeks to meet at least 40% of the EU's annual deployment needs for the technologies required to achieve the 2030 climate and energy targets, and to account for 15% of global production of these technologies by 2040. The Clean Energy Investment Strategy complements these objectives by promoting measures to mobilise public and private investment, improve de-risking mechanisms, and strengthen the financing framework for clean energy technologies throughout their innovation and deployment cycle.

Additionally, while EU venture capital investments are significant and help to achieve these targets (e.g. in 2023, the EU accounted for 28% of global venture capital investment in clean energy technologies, ranking between the US (30%) and China (24%)[140], Europe lags in several areas (e.g. hydrogen and fuel cells, smart grid technologies, and carbon technologies). Clearly, there is a need to speed up investment (both Venture Capital (VC) and other private investments) in these areas if the NZIA's domestic contribution targets are to be achieved.

WHAT

Better inclusion of the financial sector in the SET Plan can involve the following:

- Focus on investment needs for system integration: The priority should not just be on financing individual technologies, but on funding the complex, integrated systems (e.g. smart grids, sector coupling infrastructure) that are essential for the transition but often have more complex risk profiles.
- More active communication and information exchange with the financing community and more alignment across Member States (as detailed in the how section below)
- Improved promotion of innovative results of EU-funded projects towards industry and the financing community
- Involvement of more market actors from industry and finance in the SET Plan community
- Industrial participation in EU projects and improve promotion of their results to industry stakeholders
- Encouraged investment in energy systems portfolios rather than isolated projects
- Leverage of the work of the ID-E[141], embracing all economically available zero-carbon technologies
- Development of a decision tree tool to guide innovators toward suitable financing schemes linked to TRL stages
- Match of technologies and innovation levels with appropriate financing schemes
- Use of recognised technology development pathways to engage investors and innovators
- Education, training and support for innovators on (Venture Capital) investments
- Incorporated investment-readiness assessments in CIIPs
- Focus on risk mitigation
- Creation of Joint Task Forces within ETIPs and other bodies to help the financial sector better understand the risks, opportunities, and investment potential of SET innovations.
- Organisation of specific awareness-creation workshops, webinars or forums that bring together SET Plan stakeholders, project developers and representatives from the financing sector to translate technical and innovation needs into investment-ready proposals.

140 Report from the Commission to the European Parliament and the Council, 2025, 'Progress on competitiveness of clean energy technologies' (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0074).

141 https://energy.ec.europa.eu/topics/funding-and-financing/investors-dialogue-energy_en

WHO

- **ETIPs:** Update CIIPs with dedicated activities to include representatives from the financing sector in the SET Plan community. Include more detailed assessments of investment needs in CIIPs, taking into account not only public sources of financing, but also the required contribution of private capital. Map formal commitments by private sector actors (industry pledges) to invest in, develop, or scale up clean energy technologies, infrastructure, or related innovations, and remaining gaps. Elaborate KPIs to support the implementation of the CIIPs, which include indicators of these public and private financing needs, to help investors match their portfolios in terms of budget and supported TRL level.
- **SET Plan Secretariat:** Ensure participation of private investors, lenders and insurers in the annual SET Plan Conference
- **Financing Community** (e.g. investors, venture capitalists, insurance, financiers and business angels): Engage in activities (e.g. Task Forces, investor events, SET Plan Conference) of the SET Plan community. Provide feedback on the investment planning outlined in CIIPs and identify potential information gaps. Stakeholders of the financing sector may include associations such as Invest Europe and the European Venture Capital Association. A segmented approach to financial actors must be pursued to engage different types of financial actors in the SET Plan:
  - Venture Capital (i.e. European Tech Champions Initiative – ETCI[142]): For high-risk, early-stage (TRL 4-6) technology start-ups.
  - Private Equity & Infrastructure Funds: For scaling up proven technologies and first-of-a-kind commercial projects (TRL 7-9).
  - Commercial Banks & Institutional Investors: For providing debt finance for mature, large-scale infrastructure deployment.
  - EIB: involvement of EIB sector specialists in SET Plan initiatives related to their area of expertise.
- **Energy corporates** and other potential interested investors in innovative clean energy (including the venture capital funding divisions, or equivalent, of large energy corporates): invited by the European Commission to join the existing Trusted Investors Network of EIC[143].
- **Organisations and networks that facilitate connections** (i.e. Cleantech for Europe[144]).

HOW

Actions that the SET Plan stakeholders can take include:

- Increasing efforts to include representatives from investors, venture capitalists and financiers in the SET Plan community: integration of activities on dedicated collaboration with investors, venture capitalists and financiers in the CIIPs.
- Establishing a Permanent 'SET Plan Investor Council': This high-level council, composed of representatives from the EIB, Invest Europe, and major European infrastructure funds, should provide strategic advice directly to the SET Plan Steering Group on investment trends, financial barriers, and the design of funding instruments.
- Mandating an 'Investment and Market Uptake' Chapter in all CIIPs: All IWGs and ETIPs must be required to include a detailed chapter in their strategic documents that maps the investment needs for their technology across the TRL scale. This chapter must be developed in consultation with financial experts.
- Developing more detailed investment plans for the planned actions based on CIIPs, covering: the investment needs of the planned actions (at various TRL), divided into public (EU and national) and private funding, with a detailed timeline, and existing formal commitments by private sector actors. The targeted private/public support ratio for 2030 and beyond[145], with an increasing share of private contribution, for the various technology groups, shall be based on international benchmarks[146].

142 https://www.eif.org/flagship-initiatives/european-tech-champions-initiative/overview
143 https://eic.ec.europa.eu/eic-fund/trusted-investor-network_en
144 https://www.cleantechforeurope.com/
145 The private/public support ratio refers to the proportion of funding provided by private sector actors (companies, investors) versus public sector actors (EU institutions, national governments). It ensures a balanced funding approach, with private investment increasing over time as technologies mature and become commercially viable, while public funding supports early-stage development. For 2030 and beyond, the ratio aims to shift towards a higher share of private sector funding.
146 E.g.:
- European Green Deal: For projects aligned with the EU's Green Deal, the public/private investment ratio is targeted at about 1:3, with public funding covering the initial stages (e.g., R&D) and private funding contributing more as technologies move towards commercialisation.

- Establishing dedicated Task Forces within ETIPs regularly addressing collaboration aspects with investors, venture capitalists and financiers. Active collaboration with the ID-E[147].
- Encouraging regular participation of SET Plan stakeholders at investors' events, such as EIB's Investment Forum[148], EU Sustainable Energy Investment Summit, World Future Energy Summit (WFES)[149], Clean Energy Ministerial (CEM) Investor Summit, etc.
- Setting up a dedicated event format offering a structured mechanism for investors to engage directly with the detailed planning of SET Plan actions, presenting concrete project opportunities to investors and providing insights into product development and market creation. Private investors could provide feedback on the investment planning presented in the ETIPs' CIIPs, ensuring timely input from investors.
- Including separate sessions dedicated to private investors at the annual SET Plan conference. Make the SET Plan Conference a Premier 'Deal-Flow' Event: The annual conference should be restructured to include a dedicated, high-profile investor track with curated pitching sessions for the most promising SET Plan innovations.

On-going initiatives

- European Commission's High-Level Investment Forum
- ID-E: a multi-level stakeholder platform bringing together experts from the energy and finance sectors in all EU countries to assess and upgrade financing schemes to mobilise financing in the context of the REPowerEU Plan and the European Green Deal. Its five Working Groups cover different segments of the energy value chain, namely energy production, transmission and distribution, energy storage, heating and cooling, and services and prosumers.

Examples

The present recommendation is a cornerstone of the Capital Markets Union, as it aims to channel private capital more effectively towards the green transition. It is also a critical enabler for InvestEU and the Innovation Fund, as it will help to create a pipeline of high-quality, investment-ready projects.

- ETIP ZEP have in 2025 established a Finance Working Group designed to cater specifically to the financial sector in discussing innovative business and financing models for CCS and Carbon Capture Utlisation (CCU) projects. IWGs and ETIPs could also seek to develop such initiatives.
- The 2024 SRIA of ETIP Ocean provides detailed budget requirements for planned actions (public and private)[150].
- IWG DCT is discussing potential funding schemes (e.g. CEF) for High Voltage Direct Current (HVDC) projects, such as testing of full-scale High Voltage DC Circuit Breaker (HV DCCB) projects.
- Consulted SET Plan stakeholders are encouraged to provide additional examples of investment needs specified in their SRIAs and IPs (former CIIPs).
- The EU Cities mission implementation[151] provides additional good practices, including the efforts to engage financial institutions, the creation of climate investment plans, and the support provided to mission cities on financing.
- The Mission Innovation (MI)[152] initiative has already put much effort into connecting with the global financial community on clean energy innovation specifically. Learning from and leveraging existing networks, such as those created by MI, should be incorporated into implementing this recommendation, with more intensive involvement of the MI steering committee and secretariat in SET plan activities.

- US Department of Energy's Loan Programs: In the United States, public funding often covers up to 50% of a project's early-stage costs, particularly for technologies at lower TRLs, with private investors expected to contribute the remaining funding as the technology matures.

147 https://energy.ec.europa.eu/topics/funding-and-financing/investors-dialogue-energy_en
148 https://www.eib.org/en/events/eib-group-forum
149 https://www.worldfutureenergysummit.com/
150 ETIP Ocean, „2024 Strategic Research and Innovation Agenda', 2024 (https://www.etipocean.eu/knowledge_hub/1738/)
151 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
152 https://www.mission-innovation.net/

WHEN

Short term (2026-2027):

- Establish dedicated Task Forces within ETIPs where researchers, policy-makers and investors have an institutionalised dialogue and analyse investment needs for each SET technology.
- Enhance awareness of financiers and project developers in relation to new/innovative SETs.
- Ensure that private investors' associations have sufficient representation at the annual SET Plan conferences.
- Integrate activities on dedicated collaboration with investors, venture capitalists and financiers in the CIIPs of IWGs and ETIPs.
- Expand CIIPs by creating more detailed investment plans and incorporating feedback from the investor community.
- Map industry pledges and remaining gaps.
- Set the necessary KPIs for investment needs and progress achievements.

Medium Term (2027-2030):

- Ensure continued participation of representatives of the financing sector (investors, venture capitalists and financiers) in the SET Plan community.
- Monitor activities on dedicated collaboration with the financing sector as laid down in the CIIPs of IWGs and ETIPs.
- Update mapping of investment needs and industry pledges if needed.

Long Term (post 2030):

- Ensure continued participation of representatives of the financing sector (investors, venture capitalists and financiers) in the SET Plan community.
- Monitor activities on dedicated collaboration with the financing sector as laid down in the CIIPs of IWGs and ETIPs.
- Update mapping of investment needs and industry pledges if needed.

KEY PERFORMANCE INDICATORS (KPIS)

- Number of activities on dedicated collaboration with the financing sector incorporated in the CIIPs of IWGs and ETIPs.
- Number of dedicated Task Forces established within ETIPs.
- Number of CIIPs expanded with detailed investment plans with feedback from investor advisory groups.
- Additional financing and funding (bn €) provided thanks to the activities on dedicated collaboration with the financing sector.

RECOMMENDATION 5. COLLECT AND SHARE BEST PRACTICES FOR THE MARKET UPTAKE OF SET PLAN TECHNOLOGY INNOVATIONS

Recommendation summary:

The lack of structured knowledge on successful market uptake pathways limits the ability to replicate and scale SET Plan technology innovations across Europe.

This recommendation calls for the collection and sharing of best practices, covering the full innovation cycle from early-stage research to commercial deployment, including case studies, funding approaches and stakeholder collaboration models.

The recommendation should be implemented through a collaborative, centrally coordinated approach, with the EC hosting best practices via SETIS to ensure neutrality and long-term accessibility, while ETIPs and IWGs act as primary content providers using a standardised case study framework.

In the short to medium term, coordination mechanisms and templates should be established; in the long term, this will create a robust knowledge base to support learning, replication and faster market uptake of SET Plan technologies.

WHY

Challenges identified by TF members and literature review

This recommendation responds to the following challenges identified by the Task Force members and SET Plan stakeholders:

- Persisted underperformance of Europe in bringing innovative SETs into the market, and mainly in scaling them up.
- Low awareness among the SET community and financiers on best practices for stimulating market access, market uptake and scale-up.
- Fragmented funding landscape across EU, national, and regional levels makes it difficult for innovators to navigate and access suitable support.
- Mismatch between financing tools and TRL stages, leading to gaps—especially in the 'valley of death' between R&D and market entry.
- Low awareness among the SET Plan stakeholders and financiers on best practices for stimulating market access and market uptake – scale-up.
- Lack of replication of successful schemes, with proven national or regional models rarely scaled or adapted EU-wide.
- Low visibility and accessibility of funding opportunities for SMEs, start-ups, and project developers.
- Limited investor engagement due to perceived risks, long returns, and a lack of successful de-risking examples.
- Regional disparities in funding availability and support for technology deployment across Member States.
- Need to align public and private funding practices with the actual market uptake needs of SET innovations.
- Fragmentation of the knowledge generated by EU-funded projects (notwithstanding the dissemination and exploitation requirements) across projects and programmes.

Expected outcomes and contribution to EU priorities

The key recommendation to focus on identifying best practices for the market uptake of SET innovations will address challenges that hinder the effective deployment and commercialisation of clean energy technologies in the EU. Namely, this recommendation is expected to have an impact on the following EU policies:

- **EU Green Deal**[153] and **Innovation policies:** the identification of best practices will help ensure that successful practices and funding mechanisms are shared across Member States, enabling greater coordination of national and EU resources.
- **Fit for 55** and **Net-Zero target by 2050**[154]**:** by addressing financing gaps and learning from best practices across the EU, this recommendation accelerates the commercial deployment of technologies that contribute to achieving the EU's climate targets, including reducing emissions by 55% by 2030 and achieving carbon neutrality by 2050.
- **Horizon Europe**[155]**, Innovation Fund**[156] **and the future European Competitiveness Fund**[157]**:** the EU's Horizon Europe program and the Innovation Fund are key mechanisms for advancing sustainable energy technology. Still, their effectiveness depends on ensuring that funding matches the TRL of innovations. The European Competitiveness Fund (ECF) aims to streamline and simplify European innovation funding into a single instrument.
- **European Innovation Agenda**[158]**:** contributing to more efficient diffusion of innovation.
- **Cohesion Policy**[159]**:** a critical tool to provide less-developed regions with the blueprints to replicate successful innovation models.
- **Clean Energy Investment Strategy**[160]**:** establishes the Energy Transition Investment Council, composed of high-level Member State representatives and financial stakeholders. The Council will also serve as a platform for strategic feedback, ensure that its activities proceed without overlap, and encompass an innovation and market uptake dimension in coordination with the SET Plan.

WHAT

The challenges outlined above can be addressed by the following solutions, proposed by the Task Force members and SET Plan stakeholders:

- Collect and share best practices in funding and financing for SETs, as well as in de-risking and in the development and establishment of regulatory sandboxes and innovation hubs.
- Facilitate structured knowledge exchange between Member States to replicate successful practices.
- Support regional replication of effective financing models in less-developed areas.
- Enhance post-project visibility of EU-funded innovations to attract private follow-on investment.

153 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640
154 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021DC0550
155 https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en
156 https://cinea.ec.europa.eu/programmes/innovation-fund_en
157 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025PC0555R%2801%29&qid=1754057198136
158 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52022DC0332
159 https://ec.europa.eu/regional_policy/policy/what/investment-policy_en
160 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52026DC0116&qid=1773310237995

WHO

The recommendation applies to all **IWGs and ETIPs.**

Some IWGs and ETIPs are working with more mature technologies, such as wind, solar photovoltaic, nuclear and hydropower. Other IWGs and ETIPs are working across a wider range of TRLs, such as geothermal energy, and some are addressing lower-level TRLs, such as ocean energy, CCS and CCU, hydrogen, advanced biofuels, or new materials for batteries. The sharing of best practices, funding arrangements and successful approaches will be especially important for these technologies to bridge the 'valley of death' and to ensure successful market uptake. Collaboration among a wide range of stakeholders, including industry, academia, governments, and financial institutions, is essential to ensure market uptake of sustainable energy technologies, particularly those that are less mature.

Coordination with similar initiatives, such as the Strategic Technologies for Europe Platform (STEP)[161] and the European Innovation Centre for Industrial Transformation and Emissions (INCITE)[162], can help enable synergies.

HOW

Actions that can be taken by IWGs and ETIPs include:

- Collection and sharing of best practices in funding and successful approaches for sustainable energy technologies: replicable success stories should be shared, including successful funding combinations, regulatory framework, business models and stakeholder collaboration. Where appropriate, this should build on the dissemination and exploitation obligations of EU-funded projects (e.g. Horizon Europe), ensuring that project results, lessons learned and market uptake pathways are systematically captured, synthesised and made reusable beyond individual projects. This involves creating a centralised, accessible database of case studies from the EU and internationally, enabling structured knowledge exchange among Member States to replicate successful funding schemes and approaches for SET innovations. The collected best practices shall be made publicly available via Strategic Energy Technologies Information System (SETIS)[163]. Relevant data from the IEA's Technology Collaboration Programmes (IEA TCPs)[164] and already existing best practices provided by IEA (i.e. IEA's innovation database[165]), as well as from the JRC's Clean Energy Technology Observatory (CETO)[166], shall be used as a data source. Regular updates and quality control are required to keep the collection up to date and of high quality.
- Support for regional replication of effective financing models and best practices for areas that have lower uptake of sustainable energy technologies: this solution addresses the issue of regional disparities, ensuring that Member States with lower technology uptake have the tools and resources to adopt proven, successful financing models, policies and collaborative approaches for SET technologies. This would help create a more equitable energy transition across Europe. E.g. there are large differences in the uptake of nuclear, wind, and solar energy in the EU, not only because of differences in geographic and technical potentials, but also because of policy and financing differences. Regional replication will be encouraged through the launch of dedicated communication campaigns and the organisation of events.

Practical implementation:

The SET Plan should implement this through a collaborative, distributed model of content creation and central coordination.

1. Collection of best practices hosted by the European Commission via SETIS: The European Commission should host the collection of best practices on the SETIS website. This ensures neutrality, longevity and integration with other EU knowledge platforms.

2. ETIPs and IWGs as Primary Content Providers: The SET Plan must formally mandate all ETIPs and IWGs to be the primary content providers. Each platform should be responsible for identifying, analysing, and submitting a regular stream of high-quality best-practice case studies from its respective sector.

161 https://strategic-technologies.europa.eu/index_en
162 https://innovation-centre-for-industrial-transformation.ec.europa.eu/
163 https://setis.ec.europa.eu/index_en
164 https://www.iea.org/programmes/technology-collaboration-programme?__cf_chl_f_tk=ZeMenIMYvUFQ8VAZuko5QhmO6758m8Du4qCIgb0ArWM-1783073713-1.0.1.1-tTJHZMh2PY6iO3GsbmZKWkoUhQ6ilUD_KwWgqRX5hZc
165 https://www.iea.org/reports/the-state-of-energy-innovation-2025
166 https://setis.ec.europa.eu/publications-and-documents/clean-energy-technology-observatory_en

3. A Standardised Case Study Framework: The SET Plan should develop a common, rigorous template for case studies. This will ensure that all submissions are comparable and capture the necessary details on the technical, financial, regulatory and societal dimensions of the innovation.

WHEN

Short term (2026-2027):

- Collect best practices for SET innovations.

Medium term (2027-2030):

- Upload best practices on the SETIS website in the form of a digital database.
- Carry out regional replication campaigns.

Long term (beyond 2030):

- Continue sharing best practices through SETIS.

KEY PERFORMANCE INDICATORS (KPIS)

- Integration of recommendations into the core documents of the SET Plan stakeholders.
- Upload of best practices on the SETIS website.
- Number of best practices collected and promoted.
- Number of adoptions/replications across the EU of the collected best practices.
- Averaged reduced time it takes for technologies developed under the SET Plan to progress from the research phase (TRL <5) to full market deployment (TRL 9).
- Averaged increased numbers of new technologies that successfully transition from early TRLs (<5) to higher TRLs (e.g. 7-9) within the SET Plan framework.
- Increased number of technologies being funded due to the SET Plan and funding schemes like Horizon Europe.

ANNEXES

ANNEX 1: PARTICIPANTS OF THE TASK FORCE

The table below lists those who participated in the Task Force and contributed to the development of recommendations.

Table 2: Participants of the Task Force 5 (Access to Market)

Name (Role/Organisation)
Support Office (including Independent Experts)
• Rainer Janssen (Task Force Lead, Support Office) • Benedetta Di Costanzo (Task Force Facilitator, Support Office) • Brigitte Hasewend (Lead Expert) • Stamatios Chondrogiannis (Support Expert) • Friedemann Polzin (Support Expert) • László Szabó (Support Expert) • Frauke Urban (Support Expert) • Clara van den Berg (Support Office)
TF members
• Annita Westenbroek (IWG IND) • Dimitris Papageorgiou (ETIP RHC) • Eadbhard Pernot (ETIP ZEP) • Emina Pasic (IWG PED) • Emmanuel Bouyge (ETIP HYDRO) • Ester Halldórsdóttir (IWG GEO) • Ivan Matejak (EERA) • John Moore (IWG DCT) • Jozef Sobolewski (IWG NS) • Lotta Pirttimaa and Henning Schuler (ETIP OCEAN) • Luca Xodo (IWG GEO) • Marion Perrin (ETIP PV) • Natalie Samovich (ETIP SNET) • Nuno Souza e Silva (ETIP SNET) • Philippe Dumas (ETIP GEO) • Piergiovanni Domenighini (IWG RFB) • Simona De Iuliis (IWG CST) • Stefan Wolf (ETIP BAT) • Thorsten Fingerle (ETIP WIND)
European Commission (Observer)
• Anna Sobczak (Lead Policy Officer, DG ENER)

ANNEX 2: METHODOLOGY OF THE TASK FORCE

The sections below describe the main elements of the approach for developing recommendations within a Task Force:

1. Nomination of Task Force members
2. Task Force Meetings (3x)
3. Literature review
4. Consultation with wider SET Plan community (2x)
5. Written comments from Task Force members (3-4x)

1. Nomination of Task Force members

The following 'stakeholder groups' of the SET Plan were invited to nominate representatives to participate in the Task Forces:

- Implementation Working Groups (IWGs);
- European Technology and Innovation Platforms (ETIPs);
- European Energy Research Alliance (EERA);
- Clean Energy Transition (CET) Partnership;
- Driving Urban Transition (DUT) Partnership.

Each SET Plan stakeholder group (i.e. a specific ETIP or IWG) was able to nominate one primary representative for each cross-cutting Task Force. A call for expressions of interest was launched in Q3 2024 to gather nominations and establish the members of each Task Force.

There were specific roles within the Task Force that facilitated the co-creation of recommendations. These are described in the table below.

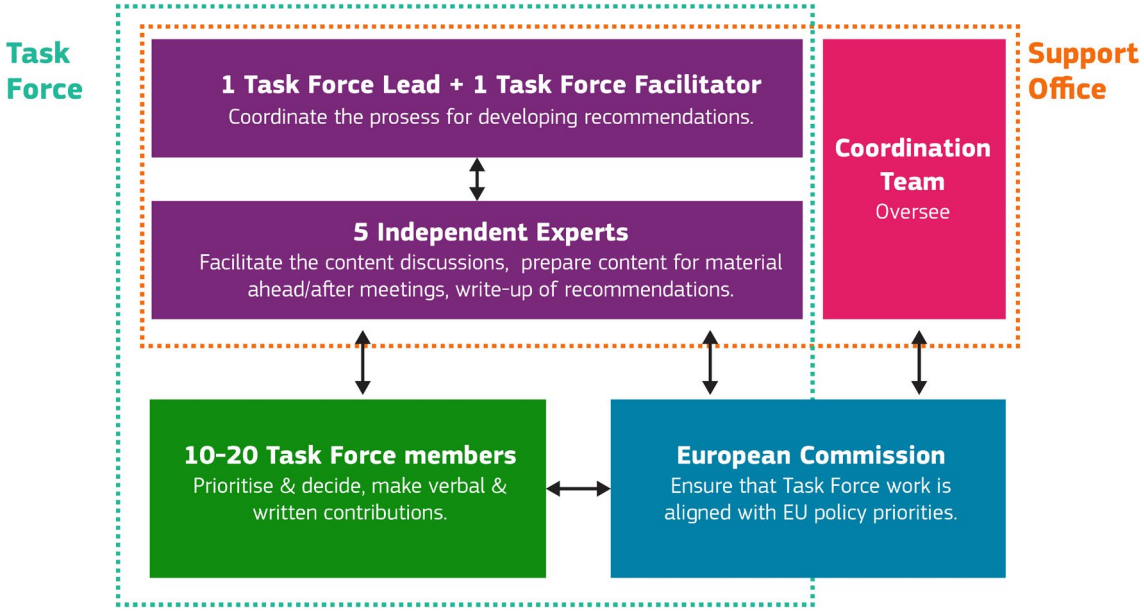
Table 3: Overview of roles for each Task Force

Role	Description
Support Office (7+)	The Support Office operated the Task Forces and was made up of: • Coordination team overseeing the operation of the five Task Forces. • 1 Task Force Lead and 1 Task Force Facilitator to coordinate the meetings (incl. logistics and minutes) and outputs of the Task Forces. • 5 Independent Experts who provide knowledge and guidance in their specialised fields and write up (specific aspects of) the recommendations. They are 'independent' in the sense that they were not previously involved in the SET Plan.
Members of the Task Forces (10 – 20)	Representatives were nominated by the SET Plan stakeholder groups (ETIPs, IWGs, etc.). Specific responsibilities for Task Force members included: • Attend all meetings of the Task Force (3 online meetings took place in 2025 and 2026); • In between meetings: Gather feedback from the SET Plan stakeholder group they represent and provide written inputs; • During meetings: Make verbal contributions (e.g. rank and decide on priorities and solutions).

European Commission (1+)	• European Commission Policy Officers had an observer role in the recommendation development process.
	• 'Lead' Policy Officers: Ensured that the work of the Task Force was aligned with the policy priorities of the Commission.
	  • They reviewed and approved recommendations from the Task Force.
	  • They did not directly influence the process of the recommendations.
	• Other' Policy Officers: Provided oral and written inputs on an as-needed basis (e.g. for a specific policy area).

Overall, the Support Office served as a facilitator, drawing on the knowledge of the SET Plan stakeholder groups. With the help of the Independent Experts, the Support Office structured discussions and helped identify gaps and challenges for Task Force members.

Figure 5: Roles of the Task Force and Support Office



2. Task Force meetings and workshop

The following meetings were held to facilitate the development of the recommendations:

- 1st Task Force meeting (March 2025): The top priorities and related barriers/gaps were discussed and refined. Within the TF, priorities for future work were agreed upon.
- 2nd Task Force meeting (June 2025): Preliminary concepts for recommendations were discussed.
- 3rd Task Force meeting (March 2026): Finalisation of the recommendations.
- Several meetings with the Task Force Lead, Facilitator, and Independent Experts took place to discuss input, develop the recommendations and support preparation for Task Force meetings.

Initially also a Cluster Workshop took place (in November 2024), which brought together the Secretariats of the Implementation Working Groups (IWGs) and the European Technology & Innovation Platforms (ETIPs) of the SET Plan. The objective of the workshop was to identify their priorities across five cross-cutting topics to inform the future work of the respective Task Forces.

3. Literature review

Between October 2024 and April 2026, literature was reviewed by the Support Office and the Independent Experts. The literature review serves as a supporting evidence.

4. Consultation with the wider SET Plan community

Following the development of the draft recommendations, a consultation was launched to collect feedback from the IWG and ETIP Secretariats and (Co-)Chairs; European Commission members; and Steering Group members. The consultation took place between the 25th of August and the 12th of September 2025. A second consultation round took place between the 9th of February and the beginning of March. Feedback from the consultation was included in the finalisation of the recommendations on cross-cutting topics to be addressed by/within the SET Plan.

5. Written comments

On several occasions, Task Force members, European Commission and Independent Experts were able to include input comments on the Recommendations and update their expressions of Interest accordingly. These also informed the finalisation of the recommendations.