SET Plan Principles

Guidance document for Common Implementation and Investment Plans (CIIPs) and a Common Strategic Vision

16 February 2026

Rationale for this document

One of the main conclusions of the high-level Steering Group meeting of 4 November 2025 was the decision to introduce a top-down approach to the Common Strategic Vision (CSV). Accordingly, while the governance document foresees the CSV to be a compilation of all the Thematic Visions, we shall complement this approach with a top-down element.

This top-down element is proposed to be a set of guiding principles for the SET Plan, drafted in close cooperation with the SET Plan Steering Group. These principles can act as a reference point or recommendations during the drafting of the Common Implementation and Investment Plans different components, including, the Common Strategic Vision, Strategic Research and Innovation Agendas and the Thematic Visions.

We have identified the following 9 key guiding principles for the SET Plan:

1. Competitiveness
2. Decarbonisation
3. Research and Innovation
4. Circularity
5. Security and Resilience
6. Digitalisation and AI
7. Skills
8. Societal Needs
9. Technological Neutrality

1. Competitiveness

Strengthening the EU's competitiveness in a challenging global economic environment is a horizontal objective of the EU, as outlined in the Competitiveness Compass, the Clean Industrial Deal and the Net-Zero Industry Act. In line with these policies as well as the Draghi report, Europe needs to invest both in innovation and the commercialisation of high-potential clean energy technologies. Lowering energy costs and addressing affordability are priorities to alleviate energy poverty, support industrial competitiveness, and foster social cohesion. Innovation and the market uptake of new technologies are pivotal to address economic, social and environmental challenges. Enhancing the competitiveness of the EU in clean energy technologies demands a strong focus of the SET Plan on bridging the gap from innovation to market uptake, scale-up, and industrial deployment.

To address the competitiveness dimension across thematic visions, and based on the recommendations of the Task Force for Access to Market, the SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- Define an area-specific roadmap that identifies key competitiveness factors (e.g., cost, performance, reliability, sustainability) and proposes actions from research and innovation to market uptake and commercial deployment to enhance the EU's global position in the technology.
- Provide reasoned strategic prioritisation within the clean energy technology area, prioritising solutions with a high economic potential in which EU industry can realistically compete on domestic and global markets vis-à-vis international competitors.
- Consider the need for additional coordination and further alignment on priorities among policy makers, industry, research and financial experts.
- Propose actions that facilitate supply & strengthen demand for innovative clean energy technologies (e.g., standards, public procurement, creating regulatory incentives or removing bottlenecks).
- Identify opportunities for emerging value-chains in development and industrial-scale deployment across SET Plan countries as well as opportunities to strengthen existing key value chains in which the EU is currently already well placed.
- Identify priority pilot projects and large-scale demonstration initiatives needed to validate technologies, and outline potential actions by the SET Plan Community to accelerate scale-up (e.g. finance, risk mitigation) including strategies for mobilising private capital to complement public funding and de-risk investments in high-potential technologies.
- Consider the need for new regulatory sandboxes to test innovative clean energy solutions in controlled environments, providing evidence for potential future policy adjustments.
- Explore the establishment of innovation hubs that connect stakeholders across the entire value chain – technology developers, investors, policymakers, and end users.
- Propose actions by the SET Plan community to strengthen Europe's clean tech start-up pipeline and accelerate scale-up into competitive industrial players.

2. Decarbonisation

The EU has established climate targets to guide decarbonisation efforts, including the target of at least 55% greenhouse gas emissions reduction by 2030 compared to 1990 levels, a 90% reduction by 2040, and achieving climate neutrality by 2050. Since energy production and use account for more than 75% of the EU's greenhouse gas emissions, decarbonising the energy system is crucial for meeting these targets.

Decarbonisation Alignment is a principle that requires all technology pathways to demonstrably support the EU's climate-neutrality targets by reducing greenhouse-gas emissions and accelerating the deployment of clean energy solutions, reflecting that cost-effective decarbonisation depends on an integrated mix of measures and rapid clean energy technologies scale-up. This means strengthening technologies that enable deep emissions cuts while capturing co-benefits for affordability, health, competitiveness and energy security. Further, this principle promotes sector coupling in terms of integration and coordination among different sectors and industries, to optimise the use of net-zero technologies, energy and resource efficiency and reduce carbon emissions. It aims to support research and innovation and scale up of technologies that deliver significant, sustained emissions reductions across different energy sectors and industries, and enable cost-effective pathways by fostering sector integration and by combining diverse zero and low-carbon solutions (net-zero technologies, energy efficiency, storage, nuclear, CCS, CCU, hydrogen, etc.), including aspects of urban transitions, rather than relying on a single-sector where necessary.

The SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

— **Technology complementarity**. Assess how different zero and low-carbon technologies can complement each other to achieve cost-effective emissions reductions, considering sector-specific needs and timescales for deployment.

— **Sectoral decarbonisation potential**. Assess the ability of the sector with potential for significant, verifiable greenhouse gas emissions reductions, that can support achieving the 2030, 2040, and 2050 targets.

— **System integration**. Consider how technologies can integrate into evolving energy systems, provide operational flexibility, and support the expansion of fossil free electricity generation required for decarbonisation.

— **Inter-sectorial collaboration**. Encourage collaboration and knowledge-sharing among different technology developers and sectors.

3. Research and Innovation

The 2025 Nobel Prize-winning research in economics has reaffirmed that sustained productivity growth and economic resilience are fundamentally driven by R&I, especially when supported by strong institutions and well-functioning policy frameworks that guide markets towards socially desirable outcomes. Accordingly, Europe should treat R&I as both the cornerstone of its clean energy transition and as a primary enabler of strategic autonomy and competitiveness.

The competitive advantages enjoyed by the United States and China are often underpinned by market structures, scale effects, state aid practices, and levels of public intervention that are not directly transferable to the European model. Europe focuses its efforts elsewhere: in scientific excellence, industrial know-how, regulatory credibility, and coordinated action. This makes R&I not just a support function, but the primary lever through which Europe can enhance competitiveness, while remaining true to its economic, social, and environmental values.

However, as underlined in the Draghi report, Europe struggles to translate ideas into scalable, disruptive technologies. In addition, the 2025 Competitiveness Progress Report highlights the eroding leadership in clean energy technologies on the level of fundamental research. Addressing this gap requires sustained investment in R&I that supports the entire innovation cycle, from doubling down on early research and demonstration to scale-up, manufacturing, and system integration. By providing a long-term, predictable framework within which Member States, industry, and research organisations can align strategies and investments, the SET Plan is well-positioned to help close this gap.

R&I also plays a decisive role in shaping the societal foundations, supporting the development of skills, facilitating circular and resource-efficient systems, and managing environmental and social externalities. Altogether, it is a strategic asset for Europe: a means to reconcile climate neutrality with competitiveness, openness with strategic autonomy, and technological leadership with social responsibility.

The SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- **Prioritise transformative R&I.** Regulation and funding should be streamlined so that public and private investments can flow toward high-impact, high-risk technologies which drive new industries in clean tech, infrastructure, and advanced manufacturing.
- **Align & defragment funding streams.** Strengthening the coordination of funding streams would foster a single R&I market, accelerating technology diffusion, knowledge transfer and the clean energy transition.
- **Support resilient innovation ecosystems.** Ensure that skills, infrastructure, and financing are aligned to support start-ups, scale-ups, and SMEs.
- **Enable systemic solutions across the R&I value chain.** Targeting innovative technologies and their manufacturing, and innovative solutions such as energy production, storage, grids, digitalisation, and sector coupling by reducing technological and financial risk, and accelerates learning curves.

4. Circularity

Circular Economy Integration is a principle that embeds circular approaches throughout energy technology development by promoting resource-efficient design, repairability, recyclability, sustainability of raw materials, and minimisation of environmental impacts. Embedding circularity principles reduces environmental pressures, enhances resilience of clean-energy supply chains, and ensures that the scaling of net-zero technologies does not reproduce existing resource vulnerabilities. The EU has established quantified targets to measure progress toward a circular economy, such as the "Circularity rate", which measures how much of the materials we use come from recycling rather than primary extraction. Currently at approximately 12%, the target is to double the EU's circular material use rate to approximately 24% by 2030.

Circular economy integration is relevant as it aims to:

- Support climate neutrality by reducing emissions from material extraction, production, and waste management while keeping materials in use without hindering the market deployment of innovative solutions.
- Enhance strategic autonomy by reducing dependencies on critical raw material imports through recycling, substitution, and circular design.
- Strengthen competitiveness by creating markets for circular products and business models, reducing production costs through material efficiency
- Enable value chain approaches that optimise material flows, by-product reuse, and industrial synergies across sectors (energy, manufacturing, chemicals…).
- Foster research and innovation in areas such as ecodesign and digital enablers (AI, digital twins, etc.) that can contribute to favour the extension of product lifetimes and facilitate material recovery.

To integrate Circularity Principles integration in clean energy R&I, and using recommendations of the Task Force on circularity, the SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- **Ecodesign for energy technologies**. Consider options on how energy-related products (solar panels, wind turbines, batteries, heat pumps, electrolysers etc.) can be designed for durability, reparability, upgradability, and recyclability[4] [5].
- **Critical raw materials circularity**. Explore strategies to maximise recovery and reuse of critical materials (rare earths, lithium, cobalt, graphite etc) essential for clean energy technologies, reducing import dependencies and supply chain vulnerabilities[6].
- **Digital enablers for circularity**. Consider how digital technologies can support to track material flows, optimise resource use, enable predictive maintenance, and facilitate end-of-life material recovery.
- **System integration**. Consider opportunities for integration across different sectors where energy systems exchange materials, by-products, and waste streams to create circular ecosystems.

5. Security and Resilience

The EU's focus on security and resilience is central to its energy and digital transitions, addressing escalating risks from cyber threats, supply chain vulnerabilities, and geopolitical instability. As highlighted in the Strengthening EU Economic Security Joint Communication, a systemic, proactive approach is essential to safeguarding critical energy infrastructure, ensuring technological sovereignty, and maintaining operational continuity. Principles such as cybersecurity-by-design, real-time threat intelligence, and cross-border collaboration – echoed in reports like Clean Energy Technology Observatory (CETO) – are critical to mitigating risks across cyber, physical, and supply chain domains.

These efforts are vital to sustaining trust in digitalised energy systems, protecting against disruptions, and aligning with the EU's climate and competitiveness goals. By embedding resilience into every layer – from IoT devices to AI-driven grids – the EU aims to future-proof its energy infrastructure while preserving its strategic autonomy in an uncertain global landscape.

With respect to *Security and Resilience Principles*, the SET Plan Steering Group encourages the SET Plan community the following aspects:

Prioritise sectors with high import dependencies as a way to contribute to a more resilient and secure EU energy system: Take into account resilient and secure energy systems and clean energy value chains as essential factors for the R&I activities:

— Prioritise R&I activities that contribute to secure European clean tech value chains, especially in areas with strong dependencies on a single supplier. **Adopt an economic security approach to research and innovation in line with the EU's economic security strategy**: In addition to the prioritisation of R&I activities reducing dependencies on single suppliers, a variety of measures can enhance the security and resilience of research and innovation activities within the SET Plan community:

- Pay a particular attention to partnerships with non-EU countries; prioritise cooperation with entities established in partner countries of the EU; carefully assess who has access to public funds and sensitive information, notably key fundamental research, commercially viable intellectual property, etc.
- Identify and support startups in critical technology areas that are vulnerable to the risk of hostile foreign acquisitions, redirecting them to investment alternatives and other forms of support (e.g., advisory, capacity-building, matchmaking with investors).
- Consider the implementation of similar standards across R&I projects throughout the EU.

6. Digitalisation and AI

The EU's ambitious climate and digital agendas demand a rapid, integrated transformation of the energy sector. By 2030, the European Green Deal targets a 55% reduction in greenhouse gas emissions and a fully digitalised, resilient energy system. Digitalisation is a critical enabler, accelerating the integration of renewables, enhancing grid flexibility, and empowering consumers through data-driven innovation. Common data infrastructures, interoperability standards, and cyber-resilient frameworks are essential to unlocking cross-sectoral synergies, ensuring energy security, and fostering competitive, sustainable markets. These priorities align with the need for seamless data exchange, advanced analytics, and AI-driven solutions, all of which underpin the EU's vision for a decarbonised, consumer-centric, and technologically sovereign energy future.

Therefore, the SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- Build on Task Force recommendations to deliver cross-cutting solutions for better digital solutions integration.
- Factor in digitalisation and AI-powered solutions as essential drivers that help to manage effectively the energy system transformation towards full decarbonisation, decentralisation of generation and integration across energy carriers.
- Build on the hardware-software interactions to develop smart energy solutions in an open and interoperable manner. Ensure suitable options for the long-term maintenance of the software solutions, which require systematic updates along all their lifetime.
- Unlock the full value of data in energy and build innovative data-driven solutions and platforms (including AI-powered solutions) that aim to strengthen the European strategic sovereignty regarding the data access, management and use at EU level. Create interoperable data infrastructures that are conducive to establishing an EU federated Common Energy Data Space that would ensure seamless data exchanges along the energy value chain. Establish clear rules of accessing and managing data and put in place appropriate governance to oversee data ownership and data exchanges.
- Observe the principle of ensuring cybersecurity by design and consider open-source solutions from the outset.
- Use digital and AI- driven solutions to accelerate R&D activities for clean energy technologies, building on the AI in Science Strategy that proposes an ambitious approach to advance AI in science, notably through RAISE, the Resource for AI Science in Europe. The SET Plan Community is encouraged to tap into RAISE, the virtual institute that will bring together essential resources for developing AI and applying it to drive transformative scientific breakthroughs. AI resources will include computational power, data, talent and research funding across the EU Member States and the private sector, to drive AI-enabled scientific progress.
- Make best use of European initiatives that are publicly funded and opened to the participation of energy stakeholders with a view to establish ecosystems that foster innovation, collaboration, and development of solutions. Examples include (but are not restricted to): AI Gigafactories, Testing and Experimentation Facilities for energy, Large-scale Partnership on the Digitalisation of the Energy System under the Pact for Skills.

7. Skills

The Strategic Energy Technology (SET) Plan should embed skills development as a foundational principle in all research and innovation (R&I) activities related to clean energy technologies. There is an urgent need for a workforce equipped with advanced, interdisciplinary, and future-proof skills to ensure the successful clean and competitive transition of the European economy. The SET Plan is ideally positioned to deliver on this priority.

The Task Force on Skills, underscores that the success of the SET Plan's R&I actions hinges on the availability of a skilled workforce capable of designing, deploying, and maintaining innovative clean energy technologies. This requires a systemic integration of skills priorities into every stage of R&I – from project design and funding allocation to implementation and dissemination. The SET Plan should therefore integrate a skills-by-design approach, ensuring that its initiatives foster the development of the human capital required to sustain technological innovation. This means actively supporting the upskilling and reskilling of the current workforce, and the harmonisation of certification and qualification frameworks across Member States.

In addition, digital literacy, system-level thinking, and collaboration between industry, academia, and policymakers are becoming essential to deliver competent workforce. By embedding these principles into its R&I framework, the SET Plan can ensure that research & innovation are socially and economically inclusive, attracting diverse talent and enabling a just transition.

The SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- Align R&I priorities with skills foresight, using the insights and recommendations from the Task Force to anticipate and address emerging skills gaps.
- Promote collaboration between research institutions, industry, and education providers to co-create training programmes and curricula that reflect real-world needs, in particular through the network of the Net Zero Industry Act Academies and the different Large-scale Partnerships under the Pact for Skills.
- Contribute, as appropriate and in support of competent authorities, to the ongoing development of EU-wide standards and frameworks for skills recognition and certification, thereby facilitating labour mobility and portability of skills across borders.

8. Societal Needs

Addressing societal needs is fundamental to delivering a clean energy transition that is not only technologically and economically viable but also fair, widely supported and thus politically sustainable. In the SET Plan, societal needs are currently addressed by the Societal Needs Task Force and 'societal readiness' piloted in Cluster 5 work programmes. Both share the same rationale and objective: to make sure that the differential impacts of R&I are addressed, thereby increasing the potential for societal uptake of clean energy innovations and facilitating the necessary societal adaptation.

The barriers to societal uptake and adaptation are commonly identified as, but are not limited to, energy literacy, energy affordability, privacy concerns, high upfront costs, lengthy permitting processes, fragmented policy landscape and the disproportionate impacts on the environment, economy and society.

The Task Force identified the following core elements in societal needs that should address these barriers and guide clean energy R&I: 1) stakeholder engagement, 2) accessibility and affordability 3) fair distribution of costs and benefits, and 4) co-benefits and multi-use of space. The experts drew on principles of energy justice as well as relevant EU policies which aim at mitigating the potential negative impacts of the energy transition.

The societal readiness pilots do not offer a definitional understanding of societal needs, but require researchers and innovators to reflect on a set of guiding questions - who are the key stakeholders, how are they included, who benefits and might face burdens etc. – thus embedding societal needs considerations at the beginning of the clean energy R&I process. It is a key complement to the traditional TRL approach which fails to pay sufficient attention to the lived experiences of technological uptake and the broader effects of R&I outcomes on society.

The successful integration of both inputs in the work of the SET Plan will be central to the success of working groups, as smooth manufacturing, deployment and scalability of their output greatly depends on their acceptance, affordability and legitimacy. Therefore, the SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- **Strengthen public trust and legitimacy.** Technologies often require changes in behaviour, infrastructure or land use. Transparent processes, early engagement, and inclusive decision-making help build legitimacy, reduce opposition and support long-term social acceptance.
- **Enhance the relevance and quality of innovation.** Understanding societal needs helps direct R&I efforts toward solutions that respond to real-world challenges and user requirements as opposed to technology development driven by specific political or market priorities.
- **Anticipate and mitigate risks early.** Societal concerns – whether about environmental impacts, local acceptance, data privacy, or equitable cost distribution – are easier and cheaper to address at the design stage than during deployment.

9. Technological Neutrality

Technological neutrality assurance is a broad principle that ensures energy technology development pathways remain open, flexible, and responsive to innovation while avoiding premature lock-in to specific technical solutions. The energy transition involves a diverse portfolio of solutions (solar, wind, hydrogen, bioenergy, storage systems, energy efficiency solutions, and advanced nuclear etc.) each facing different challenges and enablers such as permitting delays, supply-chain constraints, cost differentials, and varying levels of technological maturity. Incorporating neutrality to the SET Plan therefore ensures that no technology area is prematurely excluded, enabling Member States to deploy the most effective options for their specific system needs while strengthening EU competitiveness. This will also contribute to diversifying the low-carbon technology portfolio and avoid over-relying on a single technology or specific solutions within a technology.

Technological neutrality assurance is relevant as it aims to:

- prevent premature exclusion of potentially breakthrough technologies.
- promote fair competition and cost-efficiency in achieving decarbonisation targets.
- enable diverse pathways that respect regional specificities and industrial strengths across Europe.
- reduce the risk of technological dependencies and supply chain vulnerabilities.
- maintain policy adaptability as scientific understanding and technological capabilities evolve.

The SET Plan may support activities from fundamental research (Technology Readiness Levels (TRL) 1) to demonstration and deployment (TRL 9), by providing level playing field, including on access to funding and support.

The SET Plan Steering Group encourages the SET Plan community to consider the following aspects:

- **Technology portfolio approach**. Cover different technological options, acknowledging that optimal solutions may vary by technology and commercial maturity level, application context, geography, and timeframe.
- **Outcome-based targets**. Explore defining priorities and strategic targets in terms of performance outcomes (e.g., emissions reductions, energy efficiency and resource efficiency gains, costs reduction, system integration capacity, export opportunities).
- **Flexibility**. Consider structuring activities and objectives with sufficient flexibility to incorporate emerging technologies and respond to scientific breakthroughs, market developments, or changes in the policy landscape.

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