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5% of new capacity from "Innovative" Renewable Energy

A necessary and do-able enhancement to the Renewable Energy Directive

October 2022

Purpose

The European Parliament has adopted an amendment to the Renewable Energy Directive specifically supporting innovative renewable energy technologies. This amendment deserves the Council's and European Commission's support. It calls for 5% of new renewable energy capacity to be of "innovative renewable energy technology" (Box 1) alongside a definition of "innovative" (Box 2). Backed up by policies put in place in the Member States, it will speed up the commercialisation of new, high-quality, European-made renewable energy technology.

The signatories of this report strongly endorse these amendments, as they have stated previously, and others on demand-side flexibility and storage.

"In order to promote the production and use of renewable energy from innovative renewable energy technologies and to safeguard the Union's industrial competitiveness, each Member State shall set an indicative target of at least 5 % of new installed renewable energy capacity between … [entry into force of the directive] and 2030 as innovative renewable energy technology."

Box 1: The European Parliament's amendment to Article 3 on a 5% indicative target for innovative renewables.

[Improve] in a least one way comparable state-of-the-art renewable energy technologies or [make] exploitable a largely untapped renewable energy resource and involves a clear degree of risk, in technological, market or financial terms, which is higher than the risk generally associated with comparable non-innovative technologies or activities.

Box 2: The European Parliament's definition in Article 1 of an "innovative renewable energy technology" borrowing language from the Guidelines on State aid for climate, environmental protection and energy 2022. It combines three notions. The third of these is "risk", including "market risk" which differs from country to country and would allow a technology not considered "innovative" in one country to be considered "innovative" in another.

In the chapters below we will demonstrate i) that it is right to attend to innovative technology as part of the acceleration towards renewables precipitated by the crises in our climate and with Russia ii) the appropriateness of a target iii) the ease of implementation of the target:

1. Innovative renewable technologies are necessary for the EU and Member States individually, for the stability and security of their energy supply in the medium term and their industrial strength today.
   a. They add flexibility to the energy system,
   b. lower system costs,
   c. revive or strengthen manufacturing or other high value segments of the renewable energy business (Box 3).
2. Why the European Parliament's proposal for a target is appropriate:
   a. Indicative target: provides direction but offers flexibility
   b. Member States determine what's "innovative" for themselves
   c. 5% corresponds to a realistic quantity
3. Operationalising the target:
   a. National Energy and Climate Plans and the SET Plan to track progress and update a list of nationally relevant "innovative technologies"
   b. Examples of innovative technology suitable for the 2023-2024 NECP process
4. Measures to reach 5%

Innovation as a strategy for rebuilding or maintaining market share in the renewable energy space is not a new idea. The European Commission notes, "research and innovation is crucial to achieve the EU renewable target for 2030", while the European Innovation Agenda has similarly reinforced the message that "deep tech innovation" (aspects of which are relevant to renewable energy) will strengthen Europe's technological leadership. Yet, according to the European Commission's 2020 analysis of National Energy and Climate Plans there was, in general in EU27, "a severe lack of national objectives and funding targets [for clean energy technologies] that show concrete and relevant pathways to 2030."

Box 3: innovation is a widely accepted strategy for maintaining or building up industrial strength, yet neglected in National Energy and Climate Plans

Innovative renewable energies are part of the answer to security of energy supply and high energy prices

Ending fossil-fuel dependency requires a more flexible energy system

Member States are facing the challenge of spiralling energy costs as a consequence of Russia's war on Ukraine. To tackle climate change, fossil fuels must be completely abandoned. Renewable energy generated within the EU's borders or by nearby friendly states would restore the EU's strategic autonomy and increase its security of supply.

Innovative RES, often controllable, are an option for keeping energy system costs low in the medium term, storage and demand-side flexibility also

Meeting the challenge of building a cost-effective clean and secure energy system will require massive deployment of commercial renewables, especially ones that are 'variable' (with an output difficult to predict more than a day or two ahead, much less control). The increasing share of variable renewable electricity generation forces power systems to become more flexible to absorb production peaks and troughs. With fossil-fuelled units being phased down, the following flexibility options exist:

1. Demand-side flexibility: at consumer level (e.g. encouraged through retail tariffs and leveraging the potential of electric vehicles or heat pumps) or at industry-level (refrigeration, flexibility in factory output) (Box 3);

2. Storage: batteries, long duration energy storage technologies (LDES) (thermal - including batteries, hydrogen, and e-fuels, mechanical, electrochemical, and chemical-including hydrogen and e-fuels), and conventional responsive zero-carbon generation capacity: hydroelectric dams and pumped storage (Box 4);

3. Innovative renewables: Many renewable energy technologies that fit the European Parliament's definition of "innovative" are predictable or at least partially dispatchable: ocean, geothermal, concentrating solar power.

The European Parliament's vote in favour of indicative national targets for demand-side flexibility of 5% of peak electricity by 2030 (Article 3) appears to have the support of the European Commission, which has proposed a binding target to be met much sooner. The turning down of demand during peak periods can prevent issues such as grid congestion and ensure the reduction of fossil-gas electricity produced in periods of high demand and low renewable energy production. Building renovation and general energy efficiency measures will help to reach the target. It must be noted that energy storage should be carefully considered in the implementation of these targets. While behind-the-meter energy storage may simply act as demand-response, front-of-the-meter should not be prevented from supplying electricity during these periods.

Box 4: statement by Innoenergy on the importance of the proposed target for demand-side flexibility in the European Parliament's amendments to the Renewable Energy Directive

Alongside targets for innovative renewables and demand-side flexibility, the European Parliament calls for indicative national targets for energy storage technologies by 2030 in Article 3. This will facilitate the further penetration of renewable electricity into the electricity grid and buffer new grid-connected loads that will need to run 24/7 to be economical, like electrolysers. The European Parliament's position does not outline the metric for this target, i.e. whether it should be based on capacity, and whether this capacity should be measured simply in GW or in GWh also. Spain has already outlined its own energy storage strategy, setting itself a target of 20 GW of energy storage by 2030.

The amendment is the starting point for a full EU-level strategy on energy storage, with a 2030 target, subdivided into binding national targets.

Box 5: statement by EASE on the importance of the proposed target for energy storage in the European Parliament's amendments to the Renewable Energy Directive

Innovative renewable energies are new industrial sectors creating value and jobs in EU Member States

New industries create new opportunities for supply chains in the Member states

Developing innovative renewable energies is an opportunity for Member States to grow industrial sectors around the manufacture of components, construction, installation, operation and maintenance. Materials production, manufacturing, electrical infrastructure & components, onshore and offshore installation, transport & vessels, operations and maintenance are all activities which can benefit from the emergence of new industrial sectors.

The REPowerEU Communication, as well as pointing the way to faster deployment of renewables, challenges Member States to support the upstream industry (Box 6), much like the New Industrial Policy of Europe (Box 7).

> "Investments needed for scaling up the production of clean energy technology components and equipment in the EU need to be facilitated at various policy levels, which would further help achieve EU's decarbonisation, energy security, and resilience objectives."

Box 6: The European Commission's Communication REPowerEU calls for investments in "clean energy technology components and equipment" SWD(2022) 230.

> "We will need a more strategic approach to renewable energy industries, such as offshore energy, and the supply chain underpinning them. This will also help cater for a substantial increase in the amount of electricity required by the twin transitions. This should be supported by efforts to better connect Europe's electricity systems to increase security of electricity supply and integrate more renewables."

Box 7: The EC's Communication from 2020 'A New Industrial Strategy for Europe' recognised the need for a "more strategic approach" in support of renewable energy industries. So did the European Parliament's response. A similar message came from the EC in 2022.

The development of innovative renewables will create jobs and growth – more so than fossil fuels

IRENA annually publishes "Renewable Energy and Jobs" (2022 edition here), which includes data for jobs in renewables worldwide and in the EU. Another IRENA report World energy transitions outlook 2022 shows that pursuing policies consistent with limiting global heating to max. +1.5 °C creates many more jobs by 2030. More jobs are created in renewables than destroyed in conventional energy industries.

PV manufacturing requires skilled workers, the 2022 edition of "Renewable energy and Jobs" claims, while quoting a US DoE finding that a GW of manufacturing capacity "could generate anywhere from 1085 jobs to 2020 direct jobs across the full value chain". The 2021 edition quotes a broadly consistent finding of Fraunhofer ISE that 10 GW of PV manufacturing capacity generates up to an additional 7500 jobs in manufacturing. IRENA's findings in relation to geothermal are endorsed by EGEC, the European Geothermal Energy Council. Figures are are available for other sectors[1].

1 Jobs data or forecasts: Wind, ocean, biomass and other technologies examined by DG JRC

Member States' current technological advantage means export opportunities

Moving quickly to develop new technologies positions EU companies to export their technology. There are buyers for high-quality, high-performance renewable energy technologies. Maintaining a technological advantage is key for Member States to make the most of economic benefits.

Innovative renewables development can benefit all EU Member States

All Member states can play a part in the development of innovative renewable energy technology. They can be places where such technology is installed or where it is made. Northern Europe has hydropower and biomass resources. The Baltic states have a immense offshore wind energy potential[2] and substantial bioenergy resources. South-East Europe has been long identified as a strategic region for the development of renewable energy thanks to its large untapped potential for wind and solar energy and to a lesser extent hydropower.

The manufacture of wind turbine involves an international network of suppliers from, for example, in Austria, the Czech Republic, inland regions in Spain, France, Germany and Poland[3]. The development of a new industry in one Member State is an opportunity for industrial cooperation with other Member States. Collaboration, such as the North Seas Energy Cooperation, helps all partners advance together. In the Council Conclusions on Fostering European Cooperation in Offshore and Other Renewable Energies (Dec 2020), the Council says "demonstration support for the EU's less mature offshore renewable energy technologies, as well as supply chain development, are key for improving their competitiveness and ability to drive global innovation" and gives examples of innovative renewable energy technologies.

EU funding is already available to help Member States bring promising innovative renewables to the market

The EU is here to help. Several EU funding schemes offering high aid intensities target innovative renewables as they first appear on the market, for example:

- Innovation Fund – up to €3 billion is available to support the demonstration of innovative low-carbon technologies under the next large-scale call of the Innovation fund as of November 2022.
- Horizon Europe - €95 billion is available to support research and breakthrough innovation under the Horizon Europe Budget, approximately €15 billion of which is for non-nuclear energy.
- The Recovery and Resilience Facility has led to Italy committing €680 M to innovative renewable energy plants (including offshore) and Spain committing €200 M to offshore wind.
- The Connecting Europe Facility – Energy program - has €5.8 billion available to ensure security of supply or to support large-scale deployment of energy from renewable sources.
- Clean Energy Transition Partnership
- Driving Urban Transition Partnership

Supported actions could include market uptake of research, support companies in scaling up their ideas, as well as deploying and demonstrating deep technologies in real world environments and with end users, access to cross border infrastructure and expertise, exchange of staff, training and skills development and developing standards and regulations through sandboxes and test beds.

Box 8: Measures to advance innovation from the New European Innovation Agenda

Additionally, the EU's Renewable Energy Financing Mechanism could be designed to support innovative technology later in the decade, if it is activated.

Technical assistance can be provided by the EC, e.g. as it offers for the "development and implementation" of strategies to boost biogas or biomethane in REPowerEU[4].

2 Our Energy our future - How offshore wind will help Europe go carbon-neutral, Wind Europe 2019
3 Technology Market Report Wind Energy, JRC 2019
4 SWD(2022) 230 accompanying the REPowerEU Communication

Why the European Parliament's proposal for a target is appropriate

An indicative target to give visibility to innovative renewable energy technology and its needs

The amendment of the European Parliament strikes the right balance between providing direction and flexibility. The Parliament's choice of an "indicative" target is appropriate. The definition of "innovative renewable energy technology" is not watertight enough for a binding target but can be used to create lists of specific qualifying technologies.

Indicative targets have been an important tool to support the deployment of renewables, especially when coupled to reporting requirements. For example, Member States already have indicative targets in place for renewables in heating and cooling and must report on their efforts through their NECPs. This is described in more detail in the section below, "Operationalising the 5% 'innovative renewables' amendments".

Member States can define their own vision of the innovative character of a renewable technology

The European Parliament's definition of an "innovative renewable energy technology" (Box 2) borrows in part from the language of the guidelines on State aid for climate and environmental protection and energy in 2022. It includes the notion of market risk, which differs from country to country, allowing a technology not considered innovative in one country still to be considered innovative in another. In doing so, the definition of innovation leaves enough flexibility for each Member State to define its own vision of an innovative technology depending on its renewable potential, industrial strengths and the focus of its R&D.

"5%" equates to a realistic quantity of new capacity

REPowerEU, based on a 45% target for renewables in final energy consumption by 2030, has indicated that 420 GW of PV must be installed in the EU to that date. Wind Europe has calculated that at least 290 GW more wind is needed by that date, according to the REPower plan.

Research commissioned since the release of REPowerEU by the Greens/EFA, separate research sponsored by the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), as well as in-house analysis by Solar Power Europe in 2021 suggest higher installations are possible. The Greens/EFA study puts forward scenarios that would lead to 56% renewables by 2030 and or even 75%. The Austrian study estimated that depending on the stringency of energy efficiency measures and the determination with which non-financial barriers to renewable energy deployment are removed, a penetration of 45.1-58.2% renewables is achievable by 2030 delivered from 545-655 GW PV, 360-445 GW wind and other sources[5]. Solar Power Europe said in 2021 that double REPower EU's ambitions for solar may be possible[6], and has since talked of TW-scale deployment[7].

The Austrian study points to new electricity capacity of about 700 GW and new heating capacity of 450 GW (averaging between their four scenarios) to 2030. 5% of these big numbers would equate to a few tens of GW of renewable energy capacity. Research commissioned by EUREC shows that for PV alone, manufacturers have plans for 40-60 GW installations using innovative technologies made on European manufacturing lines by 2030.

5 Study on 2030 Renewable Energy and Energy Efficiency Targets in the European Union (Executive summary), 26 Aug 2022, private correspondence and own calculations and approximations
6 Statements by CEO of Solar Power Europe Walburga Hemetsberger, 6 Sept 2021 (EUPVSEC)
7 RePower EU with Solar: The 1TW EU Solar Pathway for 2030, Solar Power Europe 8 Mar 2022

Additionally, 10 GW of floating offshore wind would be feasible to install by that date. Single digit GW contributions would come from other renewable energy technologies. This is detailed in the accompanying report, 'Deployment of innovative renewable energy technologies to 2030'.

A practical approach to operationalising the 5% "innovative renewables" amendments

From European to national legislation via NECPs and the SET Plan

The European Parliament has identified a role for National Energy and Climate Plans in the delivery of the "innovative renewables" target (Box 9). That could work as follows:

Each Member State's draft revised NECP to be submitted to European Commission by June 2023…

- …identifies GW of specific renewable energy technologies that it believes fit the RED III definition, choosing technologies that are innovative for its context, which could depend, for example, on its deployment potential, the country's industrial strengths and the focus of its R&D sector;
- …proposes measures to support these technologies;
- …accepts comments on its draft revised plan during the period when it is published on the European Commission website (2023-2024). As the proposed definition of "innovative" is not watertight, it is necessary to have a step where a community of experts (or wider) may consider the Member States proposals.

Each Member State shall identify in its integrated energy and climate plan, in accordance with Article 4, point (d), point (3), of Regulation (EU) 2018/1999, the measures needed to meet the targets referred to in the second and third subparagraphs of paragraph 1 of this Article.

Box 9: The European Parliament suggests in Article 3 that NECPs, which the EC recognises have a "crucial role in enhancing investor confidence and investment predictability", cover the innovative renewables and storage targets.

At some point the list of innovative renewable energy technologies notified in the NECP will be out of date. A balance must be struck between, on the one hand, the administrative burden of editing the list and adjusting the support measures and, on the other, not allowing the list to drift too far from what can reasonably be called "innovative".

Given the rapid pace of progress in the renewable energy industry, a three-year revision cycle seems the right balance, but this unfortunately does not cohere with the NECP revision cycle, which the "Governance Regulation" 2018/1999 has set at five years. Enter the Strategic Energy Technology (SET) Plan (Box 10) as an alternative means by which Member States' lists of technologies and measures may be revised in 2026-2027.

The SET Plan (Strategic Energy Technology Plan) is a framework in which energy sectors cooperate with each other and with Member States to define priority technologies to develop in given timeframes, with the European Commission facilitating the discussion in working groups of experts

Box 10: The SET Plan is under revision in 2022 and will potentially be given a new mission in 2023.

The SET Plan is familiar to specialists in energy technology innovation in Member States, companies and public research centres. Many will have been involved at some point in writing or reading a sector's 'Strategic Research and Innovation Agenda' or 'Implementation Plan' and may have participated in one of its committees like the European Technology and Innovation Platforms or Implementation Working Groups. This is summarised in the diagram below.

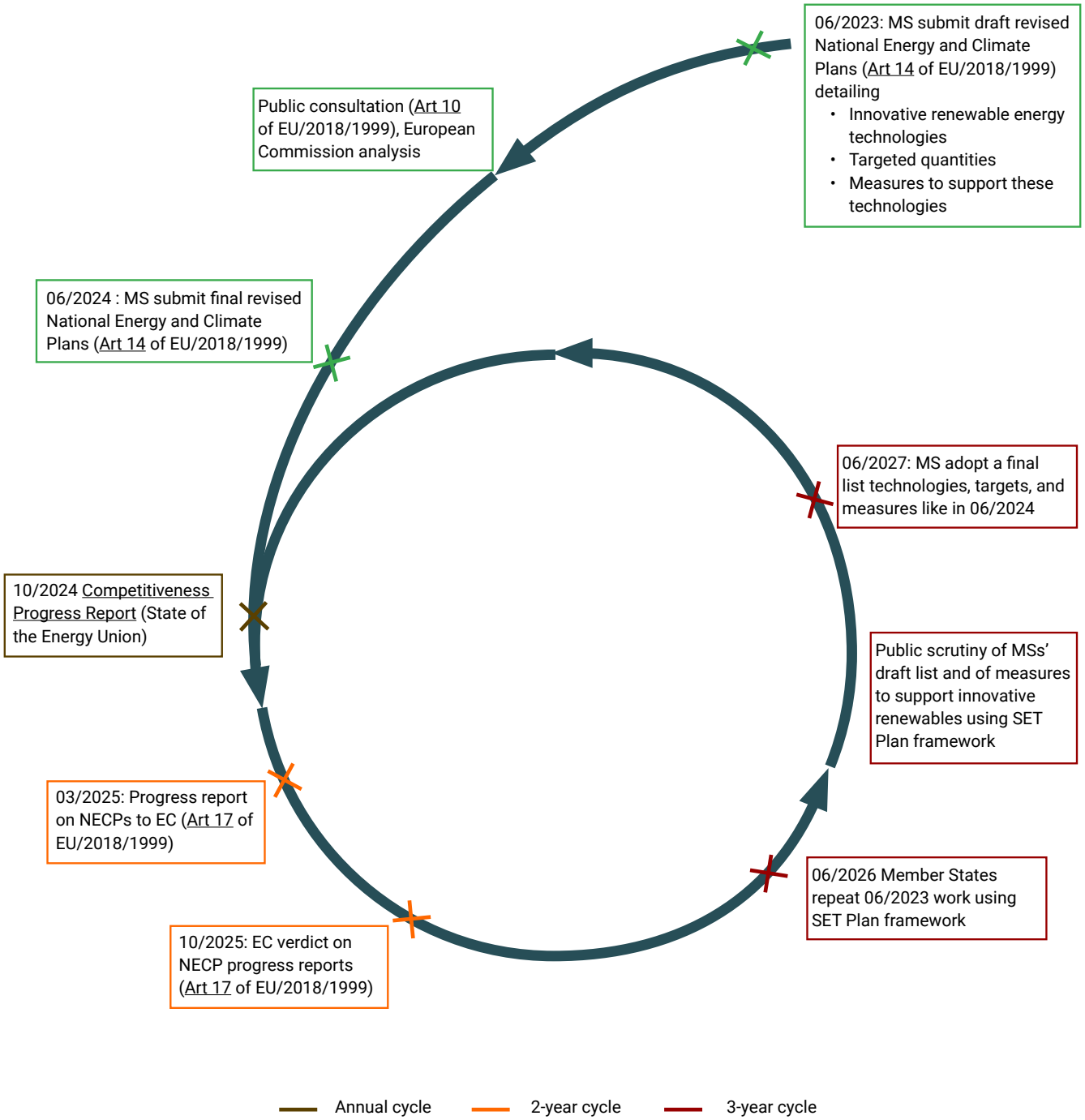

Figure 1: diagram showing how initially the NECP process 2023-2024 can be used by Member States to determine a list of renewable energy technologies meeting the European Parliament's definition of "innovative", before a process run within the SET Plan framework could take over in order to have a revision three years later. Quantities of capacity and support measures will also be specified.
There are at least two ways to track progress: the European Commission's annual Competitiveness Progress Report, fed with data from the SET Plan and the ETIPs and IWGs that constitute it, and the NECP progress reports every two years.
For clarity, the diagram shows only one instance of each activity, even though they repeat on the timescales indicated.

Measures to support innovative renewables

Tailored state aid

The Guidelines on State aid for Climate, Environmental Protection and Energy (CEEAG), adopted in January 2022, allow Member States to organise technology-specific renewable energy tenders[8] and even attach conditions that limit the tenders to innovative technology. Examples from 2022 where innovative technologies have been targeted include

- Germany: 150 MW for agri-PV and floating PV (also PV on carports), open till Dec 2022
- Spain: 220 MW for solar thermal electricity with the requirement for six hours of energy storage or hybridisation with biomass, biogas, bioliquids or (up to 10% of capacity) solar PV, opening on 25 Oct
- The Netherlands: tender that awards points to wind projects taking particular measures to deliver an ecological benefit

France opened three calls for proposals offering 500 M EUR as a mix of reimbursable and non-reimbursable grants to projects in PV, floating wind and energy systems. As part of the same 'France 2030' strategy, 400 M EUR will be made available to "any renewable energy technology" with potential to strengthen French industry particularly ones "presenting a high degree of innovation".

France is the European country pioneering tenders for public support in which the ranking of bids is determined to 20-30% by the embodied greenhouse gas emissions of the technology (i.e. the greenhouse gas emissions associated with product's manufacture) with the product's manufacture (Box 11). It applied this approach to tenders for **PV** installations.

> The European Commission allows non-price selection criteria to count for up to 30% of the score used to rank bids submitted in response to Member States' tenders for new renewable energy capacity. Member States should use this flexibility to support renewable energy supply chains to reach the "highest environmental, technical and societal standards."

Box 11: European Commission support for non-price selection criteria in tenders

The effect is to put European-made technology at an advantage over Chinese imports, but also steers module producers wanting to sell in France to manufacture leanly and use cells with minimal use of GHG-intensive materials. At EU level, the European Commission is making proposals for an energy label to draw buyers' attention to the most productive PV systems.

Solar PV is the object of PV-IPCEI, a proposal spanning Austria, Belgium, Lithuania, Luxembourg, Poland and Spain. This designation, if awarded by the European Commission, allows state aid to be fast-tracked to projects that are "particularly important in size of scope or imply a very considerable level of technological or financial risk, or both"[9].

State aid to support innovative technologies must be flexible and time-limited to help the right technologies at the right time. Particularly short-lived and targeted state aid measures are sometimes called "regulatory sandboxes", although the term can also mean a derogation from usual rules (Box 12)[10].

> REPowerEU invites Member States to use regulatory sandboxes to "grant targeted exemptions from the national, regional or local legislative or regulatory framework for innovative technologies, products, services or approaches" and thereby speed up permitting processes. This may be particularly useful for hybrid projects where renewable energy technologies are combined to create a power plant with better dispatchability, or one or more renewable technologies is combined with a storage technology.

Box 12: Recent European Commission support for regulatory sandboxes

8 Admired by European Renewable Energy Federation in its report Final Report of Study on 2030 Renewable Energy and Energy Efficiency Targets in the European Union, Sept 2022 (p37)

9 C(2021) 8481 Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest

10 An example from Belgium is the demonstration of an energy community set up in Ganshoren. The European Commission is involved in some regulatory sandboxes calling them "Innovation Deals".

The form that State aid takes matters. Interviews of the solar thermal community made in connection with this study have revealed a particular need for "access to capital" for large investment projects because they are seen as more complex and riskier than correspondingly mature electricity applications[11].

Offshore renewable energy

Offshore wind developers felt governments could help by building **infrastructure** for floating wind turbines. Interviewees felt offshore transmission capacity was lacking for plants > 100 km from shore and that support should be available to use HVDC technology for these, which is potentially better than the AC technology used today.

The **supply of materials** to the floating wind industry must be sustained: governments should turn their attention to ensuring the availability of steel or mooring chain materials to prepare for deployment at the scale of 10s of GW. They should also **stimulate R&D** work by turbine manufacturers and cable manufacturers to develop products specifically adapted for the floating turbine market.

Large offshore projects where floating PV is installed next to offshore wind might appear before the end of the decade. The technologies might not merely be co-located but even integrated in the same plant. **Marine spatial planning rules** must anticipate such projects, as well as offshore projects including seawater desalination or aquaculture. Germany, Belgium and the Netherlands are already developing MSP policy for the coming era.

Heat from renewable energy sources

Policies to promote **solar thermal** are set out in Solar Heat Europe's Solar Thermal Roadmap for Europe. The ones more relevant to innovative solar thermal, such as solar thermal used in industry, call for "dedicated investment vehicles for renewable heat solutions, such as solar thermal" and incentives to sign Heat Purchase Agreements, which would offer similar contractual terms to the Power Purchase Agreements already prevalent today for renewable power. The sector calls for "thermal energy storage to be included in building requirements, namely promoting common thermal energy storages in multi-family building". Factories needing heat at the temperatures that solar thermal can provide must be "solar thermal ready", likely including thermal storage as part of their design.

The **heat pumps** sector eyes refundable subsidies as a possible measure to help heavy-duty, large heat pumps for industrial applications. To win over potential customers and investors for such lesser-known heat pump systems, they would be offered a performance guarantee underwritten by the public. The supplier would offer the system at low cost to the customer, with the public covering, say, 75% of the costs to install it. The customer would repay that money progressively as it reaches performance milestones. For the largest potential customers (and if practical), the scheme could also include an in-situ demonstration of the feasibility of the heat pump by the supplier before the customer commits to the definitive installation.

The European Geothermal Energy Council identifies "geological risk [as] an element with a significant impact on the overall cost of the project". A **European Insurance and Guarantee Fund** of the kind proposed by Ocean Energy Europe could help, or equivalent national measures.

Soft measures

Industrial "Alliances" in PV, batteries and hydrogen[12] or "Accelerators" for heat pumps or hydrogen[13] will complement the beefier measures proposed above by giving these industries the chance to craft a comprehensive and very visible EU strategy. Furthermore, the European Commission's re-launched Clean Energy Industrial Forum now has a 'Working group on offshore renewable energy' to elevate ideas for reaching deployment targets for 2030 and 2050 for offshore wind and ocean energy.

In its New European Innovation Agenda (published in July), the European Commission suggests creating "regional innovation ecosystems" to strengthen and better connect innovation players throughout Europe, including in regions lagging behind.

11 CAPEX grants have been found to be most common form of support for national and transnational R&D programmes in solar process heat – source: IEA SHC TASK 64/IEA SolarPACES Task IV. Deliverable Report D.E1 Subtask E, Collection of available solar process heat related national and trans-national research and funding programs, April 2021

12 Including the Solar Photovoltaic Industry Alliance, European Battery Alliance, European Clean Hydrogen Alliance

13 The hydrogen industry will have one; The heat pump industry has called for one.