



Input Paper for the 14th SET Plan Conference 2020

"Making the SET Plan fit for the EU Green Recovery"

The SET Plan contribution to the Renovation Wave

Setting the scene

The 14th Conference of the Strategic Energy Technology Plan (SET Plan) will take place on 23 - 24 November 2020. Since 2008, this EU energy research and innovation initiative is key in further shaping and implementing energy technology policy across Europe. In 2015, the launch of the Energy Union saw the SET Plan incorporated as the Energy Union's fifth pillar on 'Research, Innovation and Competitiveness' and, through the Communication "Towards an Integrated Strategic Energy Technology (SET) Plan", the Integrated SET Plan set ambitious R&I targets in each of its 10 priorities, to address the objectives of the Energy Union.

Today, the European Green Deal, with the 2050 decarbonisation strategy as well as the recovery plan for Europe set a new scene, requiring the SET Plan to quickly adapt to the new political objectives and challenges. National and European green R&I policies need to follow the pace in order to lower the cost of low-carbon energy and to contribute to the implementation of the new energy system. The role of the European Commission is to support Member States and Associated Countries in better aligning their clean energy R&I approaches and funding programmes to the European policies and goals. Therefore, this year conference will focus, among others, on three main European energy policy initiatives under the European Green Deal for 2020, namely the Energy System Integration Strategy (next to the Hydrogen Strategy), the Offshore Renewables Energy Strategy and the Renovation Wave.

All SET Plan Implementation Working Groups (IWG) have been asked to contribute on a voluntary basis to any of these policy papers, answering the following question:

"How is your work within the IWG contributing to the development and implementation of the three strategies, taking into consideration the #NextGenerationEU package?"

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IWG contributions to the Renovation Wave

- IWG Photovoltaics
- IWG Deep Geothermal
- IWG Positive Energy Districts
- IWG Buildings
- IWG Batteries
- IWG Industry
- IWG Bioenergy and Renewable Fuels

The [Renovation Wave](#) tackles the building sector, a key area for the European Green Deal, as it is responsible for more than one third of the EU's emissions. This area is a priority on the last as "currently, roughly 75% of the building stock is energy inefficient, yet almost 80% of today's buildings will still be in use in 2050"¹. The aim of this strategy is to create a refurbished and improved building stock in the EU in order to reach a clean energy system through energy efficiency.

This strategy builds on the work done in the last years on energy efficiency for buildings, including through the efforts undertaken by the Positive Energy Districts approach as delivered under SET Plan Action 3.2, the H2020 Smart Cities & Communities Lighthouse Projects and Smart Cities Marketplace's Action Cluster on Sustainable Districts & Built Environment.

The **Photovoltaics IWG** contributes to the Renovation Wave being PV one of the technologies of choice for use in buildings, cities and neighborhoods. It is inherently modular and silent and offers excellent possibilities for attractive, citizen-centered, value-oriented and sustainable use. Building Integrated PV (BIPV) as well as Building Added PV (BAPV) have convincingly shown their potential and are logical and indispensable for deep (energy) renovation, but they need to be developed further to allow for rapid, affordable application in the wide variety of buildings in the existing stock. This requires further improvements concerning flexibility of use, cost reduction (reducing the difference with standard applications), performance enhancement, manufacturing technologies and supply-chain integration, adapted building codes, and local energy system integration to realize their full potential.

An example of ongoing research project implementing this strategy is the "Standard-BIPV-System - Standardised BIPV construction elements with integrated BOS" project (funded by the German BMWi,

¹ https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en



carried out by 7 partners from Industry and research, total budget of EUR 2.8 million, and a duration 3 years). The projects will develop standardised BIPV construction elements with integrated bulk of system (BOS), on the basis of the Plug&Power technology. To achieve a widespread use of BIPV in the building stock it is crucial to develop solar active building elements which can be easily integrated into existing planning procedures and which are cost-effective regarding the additional costs per square meter compared to conventional passive components.

The **Deep Geothermal IWG** is part of the Renovation Wave Strategy as to contribute to a European building stock that is efficiently heated, cooled and powered by renewable energy sources, such as geothermal. To allow innovative heating and cooling grids to be deployed at a large scale in the future, the innovation focus should lie on advanced, low-temperature systems running on 100% renewables and unavoidable waste heat in combination with building renovation and energy system integration. In order to displace fossil fuels in buildings, geothermal heat pumps combined with geothermal heat grids are an affordable solution of renewable energy in constant supply. Regarding the IWG principal R&I activities, the focus is on geothermal heat in urban areas as well as increasing awareness and risk mitigation.

The **Positive Energy District IWG** is directly contributing to the Renovation Wave through the strengthening of national innovation policies by coordinating, pooling and increasing of R&I funding for developing 100 Positive Energy Districts (PEDs) in Europe by 2025. Its objective is to facilitate technology, innovation and demonstration for PEDs and provide framework conditions for faster market diffusion, jobs in construction and renovation and upscaling and replication of PEDs in Europe. The PED IWG is specifically contributing through the development of a joint transnational call for PED Labs and PED Demos and other additional activities (e.g. capacity building, knowledge exchange etc.) for PED Renovation. A first call for PED Labs and PED Demos within the ERA-NET Positive Energy Districts is planned for 2021 with 15 European countries involved and a call budget of about EUR 17 Million. Additional annual calls on PEDs development as such, but also PED renovation will follow as the mission of the SET Plan Action to develop 100 PEDs in Europe by 2025 will become a priority area in the planned Driving Urban Transitions Partnership in Horizon Europe. The Positive Energy District IWG expects 20 out of 100 PEDs to be PED Renovations. The PED renovations will be triggered by annual joint transnational calls for research and innovation (about EUR 20 million call budget). In the majority of participating countries national public research funding, especially innovation funds, need to be matched by contributions of the beneficiaries. On average, approximately at least 30% (EUR 150 million out of EUR 500 million) of public funding will be given by the beneficiaries (depending on the national funding rules). Additionally, public R&I funding is expected to have a leverage effect, leading

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to investments for the deployment and operation of PEDs, infrastructure, construction and refurbishment by cities, public housing organisations, real estate developers etc. The investments on the ground for 20 PED renovations can be estimated at a minimum of EUR 20 billion.

The objective of the Positive Energy District IWG is also to facilitate coordination and synergies between national R&I Programmes as well as to activate measures/budgets in the national recovery plans, in order to accelerate PED renovation and maximise impact with respect to economic recovery, emission reduction and implementation of carbon neutral cities.

In September, the Positive Energy Districts IWG established a Task Force on National Recovery Plans. The ambition of this Task Force is to identify national recovery plans related to the COVID 19 crisis that may serve as an opportunity to boost support for climate neutrality in cities. Transnational cooperation regarding national programmes supporting implementation for climate neutrality in cities that go beyond R&I funding is a chance to strengthen of ambitions towards the EU Mission on Climate neutral Cities and create a strong implementation level for the planned Driving Urban Transitions Partnership. So far, four countries have presented their national recovery plans related to climate neutral cities (AT, DE, NL, SE), but the process is ongoing.

The **Energy Systems IWG** contributes to the Renovation Wave when it comes to the energy communities' objective. Indeed, the IWG4 is active in the analysis towards the removal of barriers to building renovation identified by the Energy Efficiency Financial Institutions Group (EEFIG) and highlighted into the Renovation Wave Roadmap, with special reference to:

- Barrier n.5 (“A combination of factors making it difficult to aggregate projects and/or carry out more efficient district approaches”) and
- Barrier n.6 (“Regulatory barriers such as complex permit procedures at national or local level, EU rules limiting the effectiveness and feasibility of some of the possible solutions”).

In this respect, a Taskforce “Energy Communities” operated as part of the Horizon 2020 BRIDGE Initiative and “Taskforce Local Energy Communities” of ERA-Net Smart Energy Systems cooperate closely to better understand legal and regulatory frameworks and derive research and innovation needs on member state and EU level.

The input from the **Buildings IWG** is key in implementing the Renovation Wave. Indeed, the refurbishment of existing buildings has a high potential for reducing CO2 emissions due to their large number and systemically relevant energy demand. The renovation of buildings includes not only the

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building envelope, heating and cooling systems, management and monitoring tools, but also non-technological issues such as financial and legal aspects, education and training of actors, architectural issues, urban planning and synergies with the transport sector.

The objective is to remove fossil fuels in all types of buildings as an umbrella function through three key actions:

- The establishment of a management committee (or Renovation Waves Forum) which meets annually to mark progress in each Member State of targeted buildings and that should provide the needed political impetus to deliver the necessary changes.
- The creation of a Communication Wave in order to build awareness and a pipeline of investments.
- To desegregate the building sector challenge into a series of manageable tasks/a series of Renovation Waves in order to tackle more efficiently unique sectors of buildings.

The Renovation Wave affects all key Research and Innovation activities of the Buildings IWG:

- Innovative materials such as biomaterials or phase change materials, technical solutions such as smart windows and innovative thermal insulation with higher thermal performance and without any materials from fossil sources are important research topics for the refurbishment of existing buildings.
- Heating and cooling offers enormous potential for reducing energy consumption at the building level. The development of cost-effective, intelligent and flexible heat pumps (including thermally driven ones) and heat pumps for high temperatures, as well as cost-effective and energy-efficient hybrid technologies aiming at integrating micro CHP/CCHP with other renewable energy based processes have great potential to contribute to this objective.
- Thermal energy storage systems are crucial for the success of the Renovation Wave. On a district or city scale, large thermal energy storages enable a more flexible and fully renewable provision of heat to the renovated buildings through district heating systems. The development needs for these large thermal storage systems are in materials improvement, in optimising storage concepts and storage construction processes and in the system integration. On individual building or building block level, compact thermal energy storages are crucial. They also enable the short- or medium-term storage of available renewable electricity in power to heat configurations or of solar thermal energy for seasonal thermal storage with minimal space requirements in the building.

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- Ventilated façades offer a great opportunity to host in a modular way active and passive heating and cooling and storage technologies in order to decarbonize the building sector.

The development and demonstration of digital planning and operational optimization instruments is of great importance here. BIM-based, automated fault detection and diagnostic is suitable to identify, and even predict, technical faults in the building based on on-board measurement data. These methods can significantly reduce cost and effort of renovation and maintenance while improving the energy efficiency of buildings.

An integrated approach is needed to address these issues properly. In order to intensify the transfer of research and innovation into building practice through a broader application and demonstration of outstanding concepts for new and existing buildings and neighbourhoods, the Building IWG proposes a European competition format, a Living Labs European Competition (LLEC). This systemic competitive approach addresses the energy system and end-use technologies in buildings. Energy management, monitoring systems and intelligent technologies, synergies between different energy sectors and infrastructures will be topic of a new format to achieve optimal solutions both for local or regional energy systems and for the European energy system as a whole. The activity aims to promote the transition from the current habits to a permanent living lab for climate-neutral urban living spaces in a sustainable way, taking societal issues and the economy as serious factors for transformation.

The **Batteries IWG** is also part of the IWGs delivering the Renovation Wave. Indeed, this group aims at accelerating the installation of charging points in buildings, which is key in the strategy. It also contributes through the deployment of stationary storage, which shows growing demand and need further implementation. This IWG seeks a holistic approach to supporting R&I across the Battery Value Chain as battery research and development requires a continuous stepwise progression from concept to commercial product maturity and utilisation.

The **Industry IWG** perceive the Renovation Wave as an enabler to advanced district heating and cooling. Furthermore, the strategy will also look at how to foster deeper renovation such as heating and cooling solutions. The IWG6 contributes to the Renovation Wave on aspects related to district heating and cooling. Heat and cold recovery technologies are crucial to enable cascade use of heat (or cold) between cross-sectoral plants in industrial parks, and with district heating and cooling networks. The activities related this matter will contribute to increase the integration of residual sources of heat and cold between industrial sites and district and cooling networks. The action 6 fosters also the adoption of an industrial symbiosis approach opened also outside industrial plant perimeters such as buildings and district heating and cooling networks to contribute to the overarching Renovation Wave.

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IWG Bioenergy and Renewable Fuels: Biomass heating is applied at large scale for heating in buildings. Bioenergy offers promising options of small-scale electricity and heat production from biomass with very low emissions and high efficiency performances, in small and medium size applications. Bioenergy hybrid systems (combining bioenergy and solar thermal, bioenergy and shallow geothermal, heat pumps or waste heat recovery) are available in the heating sector, particularly for small scale in residential sector and in the district heating network at larger scale. District heating with biomass is an option especially in several Member States where the district heating networks are developed. Bioenergy hybrids with heating, ventilation and air conditioning (HVAC) provides energy security and flexibility in renovated buildings. Integrated and hybrid system solution in combination with digitalization can contribute to affordable solutions with large impact and at the same time create new green jobs.

Next Steps / Recommendation

- In the context of the Renovation Wave, different IWGs could cooperate to identify challenges in terms of financing clean technologies for the building renovation and seek for innovative financial frameworks.
- IWGs to work closely to establish appropriate mechanisms to analyse the interdisciplinary aspects addressed by the two partnerships, the Clean Energy Transition and the Driving Urban Transition (relevant to the Renovation Wave).
- IWGs to work closely and look for synergies with the Smart Cities Marketplace, the Covenant of Mayors as well as in the context of other relevant European and international initiatives, such as the upcoming Mission on Cities under Horizon Europe.

Questions for discussion

- Buildings and their renovation are one of the most difficult innovation challenges of the climate crisis. How can you, as stakeholder and/or member of the SET Plan, best contribute to the European companies leading and delivering on innovation of energy saving and renewables-related goods and services? What are the main bottlenecks, and which are the most relevant pull factors?
- Innovation for cost-reduction, mass scale production, installation-time reduction, and industrialisation of innovative solutions can make the difference. What are the conditions needed to make this happen? What is the role of finance, and through which tools, mechanisms and instruments?

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- Zooming into industrial processes and building materials, how best to make them more sustainable, smarter and reduce their emissions? How to spur demand for deeper renovation and falling costs for more sustainable building products?
- If done without extra support from research and innovation, the Renovation Wave risks to create a lock-in in energy-intensive and non-sustainable technologies. How can innovation play a role in preparing for the investments mobilized by the Renovation Wave?
- Showcasing an integrated approach to building renovation and a sustainable built environment, and the role of the public sector: how can local actors, cities, public authorities, municipalities, consolidate their leading role and have biggest impact? What are the main ingredients for making this happen? Are best practices sufficiently shared, learned from and replicated?