



Brussels, 9.4.2019
SWD(2019) 157 final

COMMISSION STAFF WORKING DOCUMENT

Progress in Accelerating Clean Energy Innovation 2018

Table of Content

<u>Introduction</u>	2
<u>Action 1: State Aids</u>	4
<u>Action 2: Subsidies</u>	5
<u>Action 3: In-depth analysis of legislative proposals</u>	6
<u>Action 4: Standardisation</u>	9
<u>Action 5: Public Procurement</u>	11
<u>Action 6: InnovFin Energy Demonstration Projects & synergies between financial programmes</u>	14
<u>Action 7: Cleaner Transport Facility</u>	19
<u>Action 8: Exploitation of results towards investors</u>	20
<u>Action 9: European Innovation Council</u>	23
<u>Action 10: Research & Innovation Priorities in Horizon 2020 Work Programme</u>	24
<u>Action 11: Smart Specialisation</u>	25
<u>Action 12: Mission Driven Pilot</u>	28
<u>Action 13: Flagship Energy Innovation Inducement Prizes</u>	28
<u>Action 14: Mission Innovation</u>	30
<u>Action 15: Joint deployment programmes in developing countries</u>	32
<u>Action 16: SME Internationalisation</u>	35
<u>Action 17: Strategic Energy Technology (SET) Plan</u>	36
<u>Action 18: Governance of the Energy Union</u>	37
<u>Action 19: Strategic Transport R&I Agenda</u>	38
<u>Action 20: Smart, sustainable and inclusive urban demonstration projects and best practices in cities</u>	39
<u>Annex to Action 5– Example of Public Procurements</u>	45
<u>Annex to Action 8 – Examples of exploitation of results</u>	46

Introduction

The European Union is engaged in the energy transition through the Energy Union and set forth its long-term vision on climate and energy policies in the Communication *A clean planet for all*¹. Attaining the mid-term and ambitious long-term goals will necessitate a wholesale systemic transformation of Europe's economies and societies, including in the way we produce and consume energy (today accounting for over 75% of the EU's greenhouse-gas emissions).

Further scaling up research and innovation, particularly in energy, will be key. The Communication *Accelerating Clean Energy Innovation*², adopted in November 2016 as part of the Clean Energy for all Europeans package, outlined a strategy, of 20 actions, for stimulating clean-energy research and innovation between 2017 and 2020, and bringing results to the market quickly. The approach taken went beyond research financing as such, to include synergies with other EU programmes, regulatory and policy frameworks, de-risking private investment, contributions by local actors and citizens, and international engagement.

In 2018 and beginning of 2019 significant progress has been achieved in key areas of the strategy:

More EU support is provided to energy research and innovation, with further emphasis on market uptake and outreach beyond the public sector (action 6 and 10). The commitment set up in the strategy to spend over EUR 2 billion on four interconnected priorities – decarbonising the EU's building stock, strengthening EU leadership in renewables, developing affordable and integrated energy storage solutions, and electro-mobility and a more integrated urban transport system – was met and even surpassed (total funding envelope EUR 2.5 billion). The budget of the InnovFin Energy Demonstration Projects (EDP) facility supporting first-of-a-kind demonstration projects has risen exponentially, mobilising more than EUR 140 million in 2018 supporting projects amounting to more than EUR 300 million.

Mechanisms for synergies with other EU programmes are being established (action 7 and 11), such as with the European Regional Development Fund and the European Structural Investment Fund through the Seal of Excellence, the Smart Specialisation Platforms and the Connecting Europe Facility.

Activities to bring research results to the attention of industry, investors and the market have grown and deliver impacts (action 8). Results from a broad portfolio of EU-financed innovation projects (funded by Horizon 2020, FP7, LIFE, the European Structural and Investment Fund and the European Institute for Innovation and Technology Knowledge and Innovation Communities) have been disseminated through pitching sessions, networking events and publications. Target audiences included investors, potential partners and promoters of clean technologies, among them Bertrand Piccard's World Alliance for Efficient Solutions. The Alliance entered into a collaboration with the Commission, resulting in over 100 EU-

¹ A Clean Planet for all — A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, COM/2018/773 final, 28.11.2018.

² Accelerating Clean Energy Innovation, COM/2016/763 final, 30.11.2016.

funded solutions on energy and resource efficiency being shortlisted for its portfolio of efficient solutions.

Member States set out plans to implement the energy transition, increase investments and speed up the pace of innovation across key energy priorities (actions 17 and 18). All Member States have submitted their draft National Energy and Climate Plans, as per the recently approved Governance of the Energy Union regulation³, spelling out investments toward the energy transition and a research and innovation strategy. The implementation of these national plans will contribute to and at the same time benefit from synergies with the fourteen implementation plans prepared and endorsed by the Strategic Energy Technology Plan (SET-Plan) community, addressing the Energy Union's research and innovation priorities.

There are actions where further efforts will be needed to bring energy innovation and the pace of progress in the energy transition to the level required for implementing EU's long-term vision on energy production and consumption. Some of these actions relate to stimulating the demand side of clean energy innovation through public procurement (action 5), to spreading energy innovation faster through joint deployment programmes in developing countries (action 15), and to guiding innovators more effectively through the wide variety of funding and financing schemes supporting the energy transition (action 6), in particular in cities (action 20).

This Staff Working Document is the second progress report on the implementation of this strategy presenting the advances made in each of the 20 policy actions through 2018 and the first quarter of 2019.

³ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, OJL 328, 21.12.2018, p. 1-77.

Action 1: State Aids

Description of the action: *‘The Commission will examine, when reviewing the guidelines on State aid for environmental protection and energy 2014-2020 how those rules, together with the State aid rules for research & innovation investments, enable Member States to stimulate innovation in renewable energy technologies and solutions’*

Overview

In relation to two specific types of projects that have the potential to stimulate innovation across sectors, including for clean energy technologies, the Commission intends to introduce further simplifications and synergies. In this respect under certain specific conditions, research and innovation projects, independently evaluated and selected by independent experts in line with the Horizon Europe rules will not require additional evaluation or approval under EU State aid rules.

Status Update

On 6 June 2018 the Commission proposed a targeted amendment of the Enabling Regulation to accompany the next Multiannual Financial Framework. The explanatory memorandum under the heading ‘Research, development and Innovation’ summarises the purpose of the simplifications and synergies proposed. On this basis a Council Regulation⁴ was adopted on 26 November 2018.

One of the simplifications and synergies involves State aid for research and innovation projects that will also receive at least 35% co-funding from Horizon Europe. The other relates to State aid for research and innovation projects awarded with a Horizon ‘Seal of Excellence’⁵ and which are carried out by Small-and-Medium-Sized Enterprises (SMEs) up to EUR 2.5 million of aid per project.

This will provide Member States with the possibility of an even further simplified method whereby they will be able to rely on project evaluations carried out under Horizon to implement State aid that fosters investment, economic growth and job creation. The envisaged simplification will be in addition to the existing provisions that have produced impressive statistics that more than 97% of all State aid measures are already implemented by Member States without the need for prior approval by the Commission.

On 7 January 2019 the Commission launched a fitness check on several State aid rules. The fitness check includes the Guidelines on State aid for environmental protection and energy as well as the Framework for State aid for research and development and innovation. The fitness

⁴ Council Regulation (EU) 2018/1911 of 26 November 2018 amending Regulation (EU) 2015/1588 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to certain categories of horizontal State aid

⁵ The Seal of Excellence is the high-quality label awarded to projects submitted to Horizon 2020 (or future Horizon Europe) that were deemed to deserve funding but did not receive it due to budget limits.

check will evaluate how these rules enabled Member States to stimulate innovation in new technologies including in clean energy technologies and solutions in line with relevant EU policies.

French State Aid to support floating wind farm demonstration projects⁶

The European Commission approved State Aid that France intends to grant for four floating off-shore wind farm demonstrators. These highly innovative projects aim to deploy, by 2021, of four floating wind farms in the Mediterranean Sea and the Atlantic Ocean, with a minimum capacity of 5 MW per unit. The common trait of these demonstration wind-farms is that they are not fixed on the seabed but are anchored to the seabed, so they are not limited by the depth of the sea and seabed conditions, and can thus be placed at greater distances from shore, and are easier and less costly to be put in place. These projects are supported by the French Environment and Energy Management Agency (ADEME), by the European Regional Development Fund and through funds provided by the NER 300 (New Entrants' Reserve) instrument set up for the third phase of the EU emissions trading system (EU ETS). These projects will contribute to the industrial-scale development of the technologies needed to exploit floating wind farm energy and to gain additional knowledge towards commercial applications.

Action 2: Subsidies

Description of the action: *“In the Communication ‘Clean Energy for All Europeans’, the Commission sets out a range of actions to help redirect financial flows towards the clean energy transition, including measures to reinforce transparency on the issue of subsidies and their effect on innovation.”*

Overview

The Commission is reinforcing its monitoring of fossil fuel subsidies in line with the EU’s G7 commitment to eliminate inefficient fossil fuel subsidies by 2025. The study on energy costs and prices⁷ carried out in 2018 directly addresses the analysis of energy subsidies, as a first towards helping Member States achieve the related requirements under the Regulation on the Energy Union Governance and Climate Action⁸.

Status Update

The Energy Prices and Costs Report⁹ analysed subsidies on energy products (especially fossil fuels) used in the energy, transport and agricultural sectors in the EU and to evaluate the effect of these subsidies on energy prices on households and industry (particularly energy intensive industries). Overall, European energy subsidies have increased in recent years, from

⁶ http://europa.eu/rapid/press-release_IP-19-1412_en.htm

⁷ <https://ec.europa.eu/transparency/regdoc/rep/1/2019/EN/COM-2019-1-F1-EN-MAIN-PART-1.PDF>

⁸ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, OJL 328, 21.12.2018, p. 1-77.

⁹ Report on energy prices and costs in Europe, COM/2019/1 final, 9.1.2019.

EUR 148 billion in 2008 to EUR 169 billion in 2016. The increase was driven by the growth in renewable energy subsidies which reached EUR 76 billion in 2016. Over the same period, fossil fuel subsidies in the EU have not decreased and are estimated to be EUR 55 billion, remaining roughly stable across sectors and implying that EU and national policies might need to be reinforced to phase out such subsidies. Subsidies to petroleum products (mainly tax reductions) account for the largest share within fossil fuels. The report also explains that wholesale energy prices have fallen in recent years due to increasing competition on wholesale markets from greater amounts of renewable energy, improved interconnections and a more integrated internal electricity market. The report highlights how these lower supply costs, together with stable network tariffs, taxes and levies, enabled household electricity prices to fall in 2017 for the first time since 2008. The report also warns of the EU's ongoing high exposure to volatile and growing fossil fuel prices and notes that wholesale prices have started to rise again. Future electricity production costs are expected to increase for fossil fuel-generated electricity (due to import prices and the carbon price) and fall for renewables (linked to the decreasing costs of investment as technologies evolve), with the report suggesting that that electricity market prices could reduce the need for subsidising renewable energy technologies by 2030.

In line with the EU's commitments in the G7 and G20 framework, Member States are expected to report on how they plan to phase out such subsidies as part of their National Energy and Climate Plans.

Action 3: In-depth analysis of legislative proposals

Description of the action: *'Upcoming legislative proposals relevant to clean energy and climate action, amongst others the revision of the post-2020 strategies on cars/vans and on lorries, buses and coaches, will be subject to an in-depth analysis of their impact on research and innovation.'*

Overview

Innovation is instrumental for attaining the climate and energy targets and ambitions of the proposals proposed by the European Commission and adopted by the EU institutions in 2018: the new Renewable Energy directive¹⁰, the revised Energy Efficiency Directive¹¹, the revised Energy Performance of Buildings Directive¹², and the CO₂ standards for cars, vans¹³ and lorries¹⁴. The respective impact assessments underpinning the above-mentioned legislative proposals point to the key role innovation will play in view of meeting climate and energy targets and obligations. The proposed directives and regulation are expected to strengthen

¹⁰Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, OJL 328, 21.12.2018, p. 82-209.

¹¹Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 on energy efficiency, OJL 328, 21.12.2018, p. 210-230.

¹²Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 on the energy performance of buildings, OJL 156, 19.6.2018, p. 75-91.

¹³https://ec.europa.eu/clima/policies/transport/vehicles/proposal_en#tab-0-1.

¹⁴https://ec.europa.eu/clima/policies/transport/vehicles/heavy_en.

both technology and market-driven innovation, support the creation of flexible and integrated infrastructure, and create healthy supply chains, thereby enhancing the EU technological leadership role in this sector.

Status Update

The recast Renewable Energy Directive incentivises innovation by providing a competitive framework to grant support to renewable energy, removing uncertainties for investors and setting ambitious targets for renewables deployment (at least a 32% share of renewable energy on final energy consumption at EU level and 14% share in transport by 2030). The Directive contains provisions to facilitate the development of demonstration projects, which will be exempted from some state aid rules in order to take into account their more limited capabilities as players who cannot yet compete in the market (Art. 4(3), 4(4)). A simpler notification procedure for grid connection has been established for small demonstration projects. The establishment of a specific target for renewable energy transport and a sub-target for advanced biofuels, together with certain limits on conventional technologies, will promote innovation and significant market uptake of alternative and advanced renewable fuels in the transport sector.

The revised Energy Efficiency Directive provides a number of incentives for innovation, in particular via the revised provisions on metering and billing of energy consumption for heating and cooling consumers (Art. 9-11a). Bills will be based on actual consumption and heat cost allocator readings must be included. Devices measuring heat (or cold) supplied from collective systems will, in the future, have to be readable remotely. The extension of the energy saving obligation beyond 2020 (Art. 7(1)) sends a clear signal to investors and the energy market in general which in turn would have a positive impact on the uptake of innovative technologies, techniques and services, as it will stimulate demand for improvements to energy efficiency.

The revised Energy Performance of Buildings Directive will foster innovation in the buildings and construction sectors. The Directive refers to research and innovation, requiring aggregated anonymised data on the performance of buildings to be made available for research purposes (Art. 10(6b)) and, requiring building energy performance methodologies to be transparent and “open to innovation”. In addition, the Directive introduces new provisions that will indirectly foster innovation, through increased ambition on decarbonisation, energy efficiency and smartness of buildings. Three examples are particularly illustrative: the reference to highly energy efficient and decarbonised building stocks by 2050 (Art. 2a); the establishment of a smart readiness indicator for buildings (Art. 8), and transition to Nearly-Zero Energy Buildings as of 2020 (Art. 9).

On 11 March 2019, following the entry into force of framework regulation on Energy Labelling¹⁵, the Commission adopted rescaled labels for a set of household appliances (i.e. dishwashers, washing-machines, refrigerators, lamps, and electronic displays, incl. TVs) and a new label for refrigerating appliances (i.e. supermarket freezers and vending machines).

¹⁵ Regulation (EU) 2017/1369 setting a framework for energy labelling, OJL 198, 28.7.2017, p. 1-23.

These labels include a QR code that will link to the product registration database (EPREL), where customers will be able to access further information on the appliances related to the energy consumption, water use, storing capacity, etc. As a result there is an incentive for choosing more efficient and innovative products.

For the Regulations setting CO₂ emission performance standards for cars, vans and lorries, an impact assessment analysis was made addressing the risk of EU lagging behind in terms of innovation in new technologies. Furthermore, these impact assessments include considerations, answers, and explanations related to the questions raised in the Better Regulation innovation toolkit checklist. These Regulations will provide a clear regulatory signal and predictability for industry to develop and invest in fuel-efficient technologies, which will foster innovation in car manufacturers towards fuel efficiency and clean automobile technologies.

Support for research and innovation is also a strong component of the Strategic Action Plan for Batteries.¹⁶ One year after the launch of this Plan, progress has been achieved on some of the targeted measures proposed, for example additional funding for battery-related innovation projects has been allocated under Horizon 2020 and as a result a dedicated cross-cutting call on batteries was published¹⁷ (see progress on Action 10 in this report). More achievements are presented in the Plan's implementation report¹⁸.

The Communication on *A renewed Agenda for Research and Innovation – Europe's chance to shape its future*¹⁹ ensures that whenever policy and legislation are reviewed, developed or implemented, the impact on innovation is fully assessed. For example, for new legislative initiatives their impact on innovation will be evaluated through the optional application of the revised Research and Innovation Assessment Tool in impact assessments. Also, the impact on innovation will be assessed for EU stakeholders who are offered Innovation Deals – voluntary agreements between innovators, local or regional authorities and the Commission services. The objective of such a Deal is for all parties to gain an in-depth understanding of how EU rules work to better differentiate between perceived barriers and those that may need an intervention at national level or revision of EU rules. So far, two Innovation Deals have been launched on wastewater treatment and energy battery storage²⁰.

¹⁶ Annex to Europe on the move — Sustainable Mobility for Europe: safe, connected and clean, COM/2018/293 final, 17.5.2018.

¹⁷ http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-cc-activities_en.pdf

¹⁸ Report on the implementation of the strategic action plan of batteries: building a strategic battery value chain in Europe, COM/2019/176 final, 3.4.2019.

¹⁹ A renewed Agenda for Research and Innovation- Europe's chance to shape its future – The European Commission's contribution to the Informal EU Leader's meeting on innovation in Sofia on 16 May 2018, COM/2018/306 final, 15.5.2018.

²⁰ https://ec.europa.eu/info/research-and-innovation/law-and-regulations/identifying-barriers-innovation_en

Action 4: Standardisation

Description of the action: *'Future annual Union work programmes for European standardisation will target Energy Union priorities, notably the decarbonisation of the economy and support for green public procurement.'*

Overview

Standards and ecodesign, complemented by energy labelling rules, drive investment and innovation in a sustainable manner, reinforce EU's competitiveness on low-carbon technologies, and saves money for consumers, while reducing greenhouse gas emissions and contributing to the energy and climate targets for 2020 and 2030. Over 2018, a pipeline of mandates, standards and reports have been prepared to better measure energy consumption data, increase energy efficiency and further enable the energy transition.

Status Update

The Communication *Harmonised standards: Enhancing transparency and certainty for a fully functioning Single Market*²¹ outlined four actions: (i) eliminating the remaining backlog in delivering such standards, (ii) streamlining the procedures for publishing the references to harmonized standards, (iii) elaborating guidance documents on practical aspects of the implementation the Standardisation Regulation, and (iv) reinforcing the system of consultants to support swift and robust assessment of harmonised standards.

Implementation activities have been included in the 2019 Annual Union Work Programme for Standardisation²² for the development of standards for use of alternative fuels for waterborne applications and standardisation requests related to an upcoming ecodesign regulation on batteries.

Standardisation is linked to measurements and metrology is essential to drive innovation, in particular for new technologies and applications. On this area, the Commission is funding research to directly support standardisation, including projects related to clean energy, i.e. pre-/co-normative research, under the European Metrology Programme for Innovation and Research.

²¹ Harmonised standards: Enhancing transparency and certainty for a fully functioning Single Market, COM/2018/764 final, 22.11.2018.

²² The annual Union work programme for European standardisation for 2019, COM/2018/686, 11.10.2018 – Commission Staff Working Document on the implementation of the actions foreseen in the annual Union work programme for European standardisation for 2019, SWD/2018/434, 11.10.2018.

Progress has also been achieved in a variety of clean technologies and areas through adoption of standards, dedicated studies, guides and reports:

Technology/Area	Progress Achieved in 2018
Batteries	The Strategic Action Plan on Batteries ²³ proposes actions to develop: <ul style="list-style-type: none"> - A standardised EU life cycle assessment scheme for batteries. - European standards for enabling the safe and sustainable production, (re-)use and recycling of batteries through the use of pre-normative research.
Concentrated Solar Power (CSP)	Standards were adopted on solar radiation data sets ²⁴ aiming to support a more accurate assessment of the potential of a CSP plant in a given location and the comparison of potentials across locations.
Eco-design for Air Conditioners	Group of standards recognised by the Commission ²⁵ as providing presumption of conformity ²⁶ . They support improvements in data collection, test methods and rating of air conditioners leading to a more accurate assessment of their efficiency.
Eco-design for Photovoltaics	A 2018 Commission report ²⁷ identified: <ul style="list-style-type: none"> - More than 100 standards available, which can support eco-design process for PV related to the environmental impact and energy related aspects of these products. - Areas where there are no available standards. As an intermediate step a proposal for transitional methods is being prepared²⁸, which can be used until the standard bodies develop an agreed standard at international or at EU level.

²³ Report on the implementation of the strategic action plan of batteries: building a strategic battery value chain in Europe, COM/2019/176 final, 3.4.2019.

²⁴ “Creation of annual solar radiation data set for solar thermal electric plant simulation” IEC 62862-1-2 and “Data format for meteorological data sets” IEC 62862-1-3.

²⁵ Commission Communication 2018/C 092/03

²⁶ If a manufacturer uses a harmonised standard, s(he) will have automatic presumption of conformity with the legal requirements applicable to the product in question that the standard is supporting.

²⁷ “Standards for the assessment of the environmental performance of photovoltaic modules, power conditioning components and photovoltaic systems” http://susproc.jrc.ec.europa.eu/solar_photovoltaics/docs/180611_PV_Prep_study_Standards_review_Consultation_final.pdf

²⁸ “Transitional method for PV modules, inverters, components and systems (Draft)”: http://susproc.jrc.ec.europa.eu/solar_photovoltaics/docs/Draft%20Annex_Transitional-method_PV-modules_Inverters_systems.pdf

Hydrogen	Two standards have been developed under a Commission mandate ²⁹ supporting the deployment of alternative fuels, including hydrogen, infrastructure ³⁰ .
Solar Heating and Cooling	The Global Solar Certification Network ³¹ is now operational, however, the number of manufacturers participating (six until now) is still limited.
Urban Data Platforms and Smart Lampposts	Standards have been adopted for reference architecture and design principles: <ul style="list-style-type: none"> - To enable portable urban services so that solutions can be available in other Member States and across borders avoiding vendor lock-in³². - For a smart ‘humble’ lamppost (multipurpose lampposts)³³.
Wind Energy	New standards on wind energy generation systems and support structures have been published to ensure an acceptable safety level in the design for floating offshore wind turbine concepts, prototypes and projects ³⁴ .

Standards supporting the growth and competitiveness of the floating wind industry

The demonstration and pre-commercial floating wind projects installed have, so far, been verified by existing oil & gas and offshore wind standards. Innovative concepts are unlocking the potential for harvesting offshore wind resources. To ensure the new technology is adapted safely, Det Norske Veritas and Germanischer Lloyd (DNV GL) in 2018 developed the first international holistic standard package that considers floating offshore wind technology as an integrated system and provides straightforward verification activities to ensure a safe and reliable development, design and operation of floating offshore wind technologies.

Action 5: Public Procurement

Description of the action: *‘The Commission will examine options to boost market uptake of innovative clean energy solutions through public procurement, including in the context of the revision of the Clean Vehicles Directive (Directive 2009/33/EC), and through the further development of voluntary green public procurement criteria.’*

Overview

Having the public sector as one of the first buyers or adopters of clean energy innovations provides a large enough demand to incentivise industry to invest, and increases the credibility

²⁹ Commission Implementing Decision on a standardisation request to draft European standards for alternative fuels infrastructure, C(2015) 1330 (M/533), 12.3.2015.

³⁰ Directive 2014/94/EU on the deployment of alternative fuel infrastructure, OJL 307, 28.10.2014, p. 1-20.

³¹ <http://www.gscn.solar/>

³² DIN 91357

³³ DIN 91347

³⁴ DNV GL-ST-0119 and DNVGL-SE-0422

of the innovative product or service. However, lowest price tends to be the only award criterion for public contracts, indicating that public buyers might not be considering other aspects such as quality, sustainability and innovation³⁵. Furthermore, SMEs win only 45% of the value of public contracts. EU public authorities can have an important role changing these trends and mobilising public funds for innovative public procurements to support the energy transition. To support this shift the Commission has issued guidance documents and launched pilots to promote best practice and incentivise the use of public procurement of innovative solutions (PPI), pre-commercial procurement (PCP) and green public procurement (GPP).

Status Update

In 2018, the Commission created a European network of national competence centres on innovation procurement that aims to improve the capacity of public procurers around Europe to implement innovation procurements at national level³⁶. The network closely links capacity building on innovation procurement with energy efficient and green procurement. The network started with five existing and five newly created competence centres in 10 countries, and is expanding to other countries around Europe.

2018 marked also the extension of the European Assistance for Innovation procurement initiative³⁷, which provides individual assistance to public procurers around Europe that want to buy more innovative – including more energy efficient and green - solutions to modernize their public service offering.

The Commission has launched two pilots to facilitate innovation procurement in the EU. The innovation procurement broker pilot, launched in 2017, brings together and facilitates commercial links between public buyers, suppliers of innovation (with a special focus on SMEs and start-ups), investors, and researchers. The first call to support this pilot³⁸ focused on topics related to environmental sustainability and energy efficiency within the European Single Market. The second pilot aims to bring “Big Public Buyers”³⁹ together that have a clear policy vision or a declared interest and willingness for achieving broad policy goals through public procurement, or a reasonably high purchasing power. Examples of such buyers include metropolitan areas, capital cities, utilities, European regions and central purchasing bodies. The proposed initiative will start in the form of small events and training activities, all gravitating around the issue of strategic public procurement and all based on needs expressed by the participating members.

On 15 May 2018, the Commission adopted some Guidance on Innovation Procurement⁴⁰ targeted to contracting authorities in Member States. It explains what the concept of innovation procurement means, outlines how to create a conducive policy framework for innovation procurement, and how to use different available public procurement procedures while opening public markets to innovative SMEs. It contains good practice examples on

³⁵ http://ec.europa.eu/growth/single-market/public-procurement/strategy_en

³⁶ <http://procure2innovate.eu/>

³⁷ <http://eafip.eu>

³⁸ <https://ec.europa.eu/easme/en/cos-linkpp-2017-2-02-innovation-procurement-broker-creating-links-facilitation-public-procurement>

³⁹ Making Public Procurement work in and for Europe, COM/2017/572 final, 3.10.2017.

⁴⁰ http://ec.europa.eu/growth/content/commission-advises-public-buyers-how-capitalise-innovation_en

several innovation procurements that realised concrete energy efficiency improvements, reducing administrative burden, adjusting selection criteria, buying more energy efficient solutions through the use of functional specifications and a green award criteria, mobilising innovation brokers and designing a SME-friendly payment scheme to better attract innovators to public procurement.

The Clean Vehicles Directive⁴¹ addresses public procurement of clean vehicles in Member States. The co-legislator reached a trilogue agreement on the proposed revision to the Directive on 11 February 2019, which broadens the scope of the Directive, defines clean vehicles and sets binding minimum procurement targets at Member State level.

In December 2018 the Commission published revised EU Green Public Procurement (GPP) criteria for road lighting and traffic signals⁴². The use of these criteria have the potential to considerably increase energy savings from road lighting and traffic signals, by requiring: lighting equipment to have a luminaire efficacy higher than the relevant reference values (values are increased every 2 years until 2023), dimming and metering to ensure that energy consumption can be optimised and observed in real time, and durable and fit-for-use road lighting equipment that is repairable and covered by warranty or extended warranty. In addition, the Commission published, in January 2019, a revised EU GPP criteria for road transport⁴³, which covers the purchases, leases and rentals of vehicles and related mobility services. These guidelines aim to reduce CO₂ and air pollutant emissions in vehicles procured by public bodies, as well as increasing energy efficiency in electric vehicles.

In the Horizon 2020 Work Programme, there is an open call seeking the design, development and validation of wave energy convertors through Pre-Commercial Procurement⁴⁴. Previous calls for proposals on PPI have had some success project results in particular in the field of energy.

During November 2018 a public consultation opened in the context of the ongoing study SMART 2016/0040 ‘Strategic use of public procurement for innovation in the digital economy’⁴⁵ which aims to benchmark the progress made in Europe, in implementing innovation procurement across all sectors of public interest. The key output of the study is a set of country factsheets assessing national policy frameworks and investments on innovation procurement.

⁴¹ Proposal for a Directive amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles, COM/2017/0653 final, 8.11.2017.

⁴² Commission Staff Working Document on EU green public procurement criteria for road lighting and traffic signals, SWD/2018/494 final, 10.12.2018.
http://ec.europa.eu/environment/gpp/pdf/toolkit/181210_EU_GPP_criteria_road_lighting.pdf

⁴³ SWD (2019) 2 final, <http://ec.europa.eu/environment/gpp/pdf/criteria/transport.pdf>

⁴⁴ <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-sc3-ja-3-2019.html>

⁴⁵ <https://ec.europa.eu/digital-single-market/en/news/online-consultation-benchmarking-national-innovation-procurement-policy-frameworks>

Austrian framework for alternatively powered vehicles⁴⁶

Austria's Federal Procurement Agency (BBG) is the central purchasing body for Austria, and provides holistic purchasing services and innovation procurement support to public authorities in Austria. BBG has been proactively monitoring the market for alternatively-fuelled vehicles for several years, and in 2016 decided to pool the needs of the public sector and encourage greater uptake of electric and other alternatively-fuelled vehicles across Austria.

An initial needs assessment showed that 1134 cars could potentially be powered by alternative fuels. To encourage uptake, BBG offered professional consulting services, where the existing vehicle fleet and the organisational requirements were examined and the optimised drive mix (to understand any driving-range limitations) determined. The framework contract commenced in October 2017 and will be in operation for four years. The contract value is estimated at EUR 42.4 million. So far 62 battery electric vehicles and 11 plug-in hybrids/hybrid electric vehicles have been replaced.

The Digital Europe Programme 2021-2027 aims to boost the deployment of digital solutions and plans public procurement to be its main form of funding to realise this goal in the public sector domain. This will include support to public procurements of innovative digital solutions that achieve a higher energy efficiency across different domains of public sector activity.

For Horizon Europe 2021-2027 specific measures will be put in place in order to support public demand for innovative solutions, through Public Procurement for Innovative solutions and Pre-Commercial Procurement, including to facilitate SME's access to markets. A dedicated forum will be organised, involving public buyers, where public procurement of innovation will be developed and enhanced.

Action 6: InnovFin Energy Demonstration Projects & synergies between financial programmes

Description of the Action: *“The European Commission is working towards at least doubling the budget of the InnovFin Energy Demonstration Projects scheme, as well as expanding its scope, using funds channelled from different sources including Horizon 2020, the European Fund for Strategic Investment and others. Synergies with other instruments are being developed, aiming for a one-stop advisory facility to orient potential investors and developers among the different instruments available.”*

Overview

The goal of doubling the budget of the InnovFin Energy Demonstration Projects (InnovFin EDP) scheme was overachieved in 2017. Throughout 2018, the number of projects and the amount financed by InnovFin EDP has grown across the technologies financed. Further building on this success, the budget and instruments targeting clean energy projects have

⁴⁶ http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue_83_Case_Study_161_BBG.pdf

increased. Also, an Action Plan on Sustainable Finance was adopted setting ten actions to ensure the EU financial system truly supports the EU's climate and sustainable development agenda. Through the present budgetary period, (2014-2020) the EU has spent EUR 32.5 billion on tackling climate change⁴⁷ and within those expenditures and investments the European Fund for Strategic Investment (EFSI) provided loans to activities representing investments of EUR 12 billion.

Status Update

Within the InnovFin EDP facility, a financial instrument that supports first-of-a-kind projects enlarged in scope and budget last year, four new projects were signed by the European Investment Bank in 2018 amounting to loans of EUR 141.5 million (project costs of EUR 303.6 million):

- EUR 52.5 million for the manufacturing of innovative battery cells for use in transport, energy storage and industry (Northvolt, Sweden)⁴⁸;
- EUR 60 million for a floating wind farm (WindFloat Atlantic, Portugal)⁴⁹;
- EUR 17 million for a network of ultra-fast charging stations for electrical vehicles in Central and Eastern Europe (GreenWay, Slovakia)⁵⁰.
- EUR 12 million for an innovative 50MW/year automated manufacturing plant of reversible fuel cells and stack systems (Elcogen, Estonia)⁵¹

2018 also saw the confirmation of the channeling of undisbursed funds from the NER 300 (New Entrants' Reserve) programme to InnovFin EDP currently totaling EUR 531.8 million⁵².

InnovFin EDP finance to set up manufacturing plant for highly efficient fuel cells – Elcogen

Elcogen is a company operating in Estonia and Finland that has pioneered the development of Solid Oxide Fuel Cells (SOFC), electro-chemical converters that produce electricity directly by oxidising a fuel without the need for internal combustion. The SOFC are contained within a stack, which can be integrated into any clean power-generating system. Elcogen's work and developments on solid oxide cell technology have been supported by Horizon 2020's Fuel Cell & Hydrogen Joint Undertaking, and, in fact, Elcogen stacks have achieved a world record in primary energy conversion efficiency to electricity of 74% (under testing conditions). In addition, by the end of 2018 the company received a EUR 12 million loan from InnovFin EDP to set up an automated manufacturing plant for its first-of-a-kind highly efficient solid oxide cells capable of generating up to 50MW/year of electricity. This illustrates the synergies between various EU financing instruments along the technology value chain.

As an implementation action of the enhancements proposed by the EFSI 2.0 Regulation⁵³ in December 2017, the European Investment Advisory Hub Framework Partnership Agreement

⁴⁷ <http://ec.europa.eu/budget/library/biblio/documents/2019/SoE2019%20with%20covers.pdf>

⁴⁸ <https://northvolt.com/>

⁴⁹ <http://principlepowerinc.com/en/windfloat>; <https://www.edp.com/en/windfloat>

⁵⁰ <https://greenway.sk/en/>

⁵¹ <http://www.elcogen.com/>

⁵² Transfers will be done on a needs basis depending on project signatures. The total of the WindFloat operation and the renewable part of the GreenWay operation are supported through the NER300 programme funds. Funds may also be used in Clean Europe Facility (CEF) Debt Instrument projects.

was updated in April 2018 to take into account the reinforcement of some actions, including the support towards the preparation of climate action projects to help reach the climate action target as described. A pilot assignment in 2017 to provide capacity building advisory to borrowers interested in Green Bonds was further expanded in 2018, to include other borrowers (up to 10) and prepare climate action investments that can qualify for Green Bonds status in 2018. The European Investment Advisory Hub is actively supporting market development activities in the Circular Economy sector, as well as two specific project-related assignments, one involving a municipality under the URBIS initiative and the other an investment platform at Member State level. The European Investment Advisory Hub has provided support to the European Investment Bank experts contributing to relevant working groups and consultations such as for example the expert consultation for the Innovation Fund of 2017 or the expert group that was established in 2018 to assist the European Commission in the design of the Innovation Fund. Energy and investment experts of the European Investment Bank Group are dedicated to the delivery of the InnovFin EDP instrument carrying out activities such as proactive project identification, screening and initial assessment of potentially eligible operations. The advisory services will be reinforced with an additional EUR 10 million from the unspent funds of the NER300 first call, which are earmarked for technical assistance.

With regard to creating synergies across financial instruments, European Investment Advisory Hub was involved in advising project proposals to the Connecting Europe Facility (CEF) Blending call⁵⁴, which had a large envelope for alternative fuel actions. It is also supporting the market study for the proposed CEF Blending Facility expected to be operational by mid-2019. It has one assignment linked to establishing a financing structure for hydrogen buses, which are also subject to support from the Hydrogen and Fuel Cells Joint Undertaking. Most of the work on investment platforms involves establishing synergies or blending of various financial resources, including EFSI, European Structural and Investment Funds (ESIF), European Investment Bank and National Public Banks contributions.

GreenWay – Integrating financing sources to achieve access to e-mobility

GreenWay is private company based in Slovakia building the ecosystem for electric mobility in Central Europe since its founding in 2011. As both charging point operator and e-mobility provider, GreenWay is the largest charging network and the most recognized e-mobility brand in Poland and Slovakia with intention to expand to other European markets. So far the co-financing (EUR 31.4 million) is secured from the Connecting Europe Facility programme of European Commission, InnovFin EDP and Slovak Investment Holding.

Through the present budgetary period (2014-2020) the EU has spent EUR 32.5 billion on tackling climate change (hence nearly 20% of the overall EU budget). In addition, since its launch in mid-2015, the European Fund for Strategic Investment (EFSI) has approved an

⁵³ Regulation (EU) 2017/2396 as regards the extension of the duration of the European Fund for Strategic Investments as well as the introduction of technical enhancements for that Fund and the European Investment Advisory Hub, OJL 345, 27.12.2017.

⁵⁴ <https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/apply-funding/2017-cef-transport-blending-map-call>.

estimated EUR 12 billion to support activities contributing to the energy transition. For the upcoming Multiannual Financial Framework (2021-2027) the Commission proposes to set a more ambitious goal for climate mainstreaming across all EU programs, with a target of 25% of EU expenditure contributing to climate objectives. Furthermore, the future InvestEU Programme, which will bring together under one roof the multitude of EU financial instruments supporting investment in the EU, is expected, as indicated in the Commission proposal, to dedicate 50% of its sustainable infrastructure financing to climate and environment objectives ensuring that investments flow into activities that protect the environment and mitigate climate change.

In December 2018, the European Bank for Reconstruction and Development, one of the world's leading development banks, has agreed to adopt a “no coal, no caveats” financing policy and slash lending to oil exploration and production projects as a move to foster the energy transition and combat climate change. In addition, the European Investment Bank has announced a revision of its energy lending criteria in 2019 to align it with the 2030 climate and energy framework⁵⁵, and the future EU long-term strategy.⁵⁶

The Innovation Fund is a funding instrument set up for the revised EU Emission Trading System⁵⁷ will amount to about EUR 10 billion pooling together resources from the revenues of the auctioning of 450 million allowances from 2020 to 2030⁵⁸, as well as any unspent funds from the NER300 programme. The Fund will support highly innovative technologies and big flagship projects with European value added that can bring on significant emission reductions in all eligible sectors (energy intensive industries, renewable energy, energy storage, CCS and CCU). The first call for proposals will be published in January 2020.

In March 2018, the Commission adopted the Action Plan on Sustainable Finance⁵⁹, one of the key steps towards implementing the historic Paris Agreement and the EU's agenda for sustainable development. The action plan aims to re-orient capital flows towards sustainable investments; manage financial risks stemming from environmental and social issues; and foster transparency and long-termism. The Action Plan includes ten actions, among them, establishing an EU taxonomy, a classification system for green economic activities, providing clarity on what investments count as “environmentally sustainable”. The aim is to provide a common language for financial market participants offering “green” products.

When it comes to area specific financing, on 6 February 2018 the European Investment Bank approved the creation of the Smart Finance for Smart Buildings (SFSB) instrument⁶⁰. This new instrument, together with other EU policy initiatives for smart buildings, aims to unlock a

⁵⁵ https://ec.europa.eu/clima/policies/strategies/2030_en.

⁵⁶ <https://www.eib.org/en/about/partners/cso/consultations/item/public-consultation-energy-lending-policy.htm>.

⁵⁷ Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814.

⁵⁸ The revenues of these sales depend on the carbon price.

⁵⁹ Action Plan: Financing Sustainable Growth, COM/2018/97 final, 8.3.2018.

⁶⁰ https://ec.europa.eu/info/news/smart-finance-smart-buildings-investing-energy-efficiency-buildings-2018-feb-07_en.

total of EUR 10 billion in public and private funds between now and 2020 for energy efficiency projects addressing social aspects of the energy transition. It is estimated that up to 3.2 million European families could be taken out of energy poverty through this instrument.

On 17 October 2018 the Commission signed a Memorandum of Understanding with Breakthrough Energy a group of organisations committed to building new tools to address climate change spearheaded by Bill Gates⁶¹. Under this partnership, the European Investment Bank will set up a pilot joint investment vehicle, Breakthrough Energy Europe, which will provide patient equity investments to European ground-breaking technologies and companies in the sector of clean energy innovation. Breakthrough Energy Europe will be initially co-funded with a EUR 100 million budget (EUR 50 million will be committed by Breakthrough Energy; and EUR 50 million by the European Commission through Horizon 2020). The vehicle is expected to be launched in May 2019.

Under the partial political agreement reached on 7 March 2019, the Connecting Europe Facility (CEF) for 2021-2027 includes a new window for cross-border cooperation in the field of renewables⁶². It will be aimed at cost-effective deployment of renewables in Europe by making use of the best potentials and the strategic uptake of renewables technologies through regional cooperation. If certain conditions are met, such projects can benefit up to 20% of the CEF–Energy budget. All renewable technologies across electricity, heating & cooling and transport are potentially eligible, including their integration solutions.

Action 7: Cleaner Transport Facility

Description of the Action: *“The Commission and the European Investment Bank will set up a Cleaner Transport Facility to support the deployment of alternative energy transport solutions. To build a project pipeline, targeted collaboration initiatives, such as the new deployment initiative for clean (alternatively fuelled) buses, will be promoted.”*

Overview

There has been continued investment in the deployment of alternative fuel infrastructure through loans from the European Investment Bank as well as the results of the Connecting Europe Facility 2017 Blending Call published in 2018. This has seen an investment in alternative fuel solutions in the areas of public transport, inland waterways, short sea shipping and freight haulage.

Status Update

The Cleaner Transport Facility supports the accelerated deployment of cleaner transport vehicles and the associated infrastructure through the full range of European Investment Bank and European Commission financial products and available advisory services.

⁶¹ http://europa.eu/rapid/press-release_IP-18-6125_en.htm.

⁶² <https://www.consilium.europa.eu/en/press/press-releases/2019/03/13/connecting-europe-facility-coreper-confirms-common-understanding-with-the-parliament-on-extending-the-programme/>

Since the launch of the Cleaner Transport Facility, the European Investment Bank has approved loans towards more than a dozen projects mobilising over EU 1 billion for alternative fuel vehicles and infrastructure. This will see over 850 buses using a range of cleaner alternative fuels such as hydrogen, Liquefied Natural Gas (LNG), Compressed Natural Gas (CNG) and hybrids start offering public transport services, support for the expansion of charging stations for electric vehicles and the building of greener shipping.

The 2017 Connecting Europe Facility Blending Call was open to all EU Member States and had an original budget of EUR 1 billion. In November 2017, via way of corrigendum, the budget for ‘Innovation and New Technologies’ was increased from EUR 140 million to EUR 490 million, bringing the total value of the call to EUR 1.35 billion, and the second cut-off date for the submission of proposals was extended to 12 April 2018.

A number of new innovative features were included within this blending call one of which required applicants to demonstrate the concept of financial readiness, whereby full financial close with a private sector investor, the European Investment Bank or a National Promotional Bank had to be reached 12 months from the date of signature of the grant agreement.

Following completion of the external and internal evaluation of the submissions from applicants, the Commission adopted on the 5 January 2018 the list of 39 proposals under the first cut-off date for an amount of EUR 1.02 billion. In September 2018 a further 35 proposals under the second cut-off date were recommended to receive funding of EUR 405 million. Thirty-two projects will receive support under the area of ‘Innovation and New Technologies’ (see annex to Action 7 for projects funded in this area since 2016). This will see the funding of a range of alternative energy transport solutions deployed across Europe, including hydrogen fuel cell buses, Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG) infrastructure in road, inland waterways and shipping, and electric vehicle charging points.

Action 8: Exploitation of results towards investors

Description of the Action: *‘The Commission, through the European Investment Project Portal and other channels, will bring a pipeline of innovative projects to the attention of investors of the relevant Public Private Partnerships supported under Horizon 2020 and the Knowledge and Innovation Communities InnoEnergy and Climate of the European Institute of Innovation & Technology’*

Overview

Dissemination and exploitation activities bringing project results to the attention of investors and other interested stakeholders have increased considerably in 2018. A wide range of publications were prepared that focused on the results and innovations coming from EU funding programmes. Also, pitching and matchmaking events took place throughout the year bringing EU funded innovations in front of potential investors, partners and clients. Some public and private investors took financing decisions on EU-funded innovations thanks to the

information brought to them. A Commission-wide initiative was developed, through the collaboration between the European Commission and Bertrand Piccard's World Alliance for Efficient Solutions⁶³, to collect and disseminate project results from across EU funding instruments that help combat climate change and which are financially sound.

Status Update

Publications collecting results of projects funded under EU instruments were prepared throughout 2018, among them: Call for Investors: Clean Energy – Connecting innovative EU-funded energy solutions with the investors⁶⁴; Batteries – a major opportunity for a sustainable society⁶⁵; Pathways to sustainable industries – Energy efficiency and CO₂ utilisation⁶⁶; From European research to innovative solutions and business opportunities⁶⁷; Deep Renovation – New approaches to transform the renovation market⁶⁸; and New skills for the construction sector to achieve European energy targets⁶⁹. The objective of these publications was to present the results of EU-funded projects and their potential to go into the market or influence policy, rather than the processes, reviews and deliverables of the projects themselves. These publications have a more market-oriented focus and support innovation in the field of clean energy. They catch the attention of partners or investors that can help them reach commercialisation or of policy makers who can then include the results and recommendations in policy frameworks or approaches.

A series of matchmaking and pitching events also took place in partnership with different clean energy stakeholders at key events throughout the year, such as: the European Utility Week in Vienna⁷⁰, the European Sustainable Energy Week in Brussels, Cleantech Capital Day in Malmö⁷¹, the European Innovation Council Summit, the Hannover Venture Summit⁷², The Business Boosters organised by European Institute of Innovation & Technology (EIT) InnoEnergy⁷³, Raw Materials, and Circular Economy (BE-MAT) co-organised by EIT RawMaterials in Capri⁷⁴, the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) Stakeholder Forum⁷⁵ in Brussels, and the series of meetings organised by EIT Climate KIC. Around 100 EU entrepreneurs, whose clean energy businesses and ideas received EU funding, presented their innovations and solutions to potential investors and partners, during these

⁶³ <https://solarimpulse.com/network/EUFunded>

⁶⁴ <https://publications.europa.eu/en/publication-detail/-/publication/91a18e8c-e282-11e8-b690-01aa75ed71a1/language-en/format-PDF/source-79133007>

⁶⁵ <https://publications.europa.eu/en/publication-detail/-/publication/d9f3bd80-cb49-11e7-a5d5-01aa75ed71a1/language-en/format-PDF/source-69927140>

⁶⁶ <https://publications.europa.eu/en/publication-detail/-/publication/72d482c6-1850-11e8-ac73-01aa75ed71a1/language-en/format-PDF/source-69927092>

⁶⁷ https://www.cem9-mi3.eu/sites/default/files/inline-files/EC-RTD-Booklet%20for%20Malmö_18052018_FINAL.pdf

⁶⁸ <https://publications.europa.eu/en/publication-detail/-/publication/7726dd32-f6b1-11e8-9982-01aa75ed71a1/language-en/format-PDF/>

⁶⁹ <https://publications.europa.eu/en/publication-detail/-/publication/11ec9f62-6222-11e8-ab9c-01aa75ed71a1/language-en/format-PDF/source-71672294>

⁷⁰ <https://www.european-utility-week.com/event-updates#/>

⁷¹ <http://ccd.cleantechscandinavia.com/>

⁷² <https://ec.europa.eu/easme/en/hannover-messe>

⁷³ <https://tbb.innoenergy.com/about/>

⁷⁴ <https://bemat2018.b2match.io/>

⁷⁵ www.fch.europa.eu

events, with the aim of securing further support for the deployment into the market of their technologies, services or products. Entrepreneurs had a dedicated time and space to pitch their business and their innovation, and to meet with potential investors. For some events, there was also the opportunity to receive pitching training and learn how to transfer a project result into a business idea to ensure EU funded innovators were well prepared to meet with investors and were able to present a sound business plan. All events had a strong participation from investors and key industry players.

While it is difficult to fully trace the impact of events such as pitching and matchmaking events there have been some cases where there is a clear traceability, such is the case of the companies: Northvolt and Principle Power⁷⁶ participated in the targeted pitching event organised by EIT InnoEnergy with the European Investment Bank and both secured loans of EUR 52.5 million and EUR 60 million, respectively through the Bank's InnovFin Energy Demonstration Projects instrument (more successful examples of projects securing investments in the annex to Action 8).

With the goal of guiding projects into adopting a more entrepreneurial mind-set the Innovation Radar⁷⁷ was piloted across energy related projects, 34 projects have now been introduced to the innovation radar database, and from next year the Innovation Radar will be used across Horizon 2020. Thirty-two research projects of Horizon 2020 benefitted from the exploitation support scheme⁷⁸ offered to energy projects. Coached by experts the beneficiaries elaborated strategies and dedicated roadmaps (business and action plans) for the exploitation of key results; they were also trained to pitch their results and solutions.

In 2018, the Commission launched a collaboration with Bertrand Piccard's Efficient Solutions initiative by directing solutions funded by EU programmes into this initiative. The collaboration started with project results from the clean energy portfolio (Sustainable Development Goal (SDG) 7 'affordable clean energy'), which paved the ground to spreading the collaboration to all other areas covered by the initiative: 'clean water and sanitation' (SDG 6), 'industry innovation and infrastructure' (SDG 9), 'sustainable cities and communities' (SDG 11) and 'responsible consumption and production' (SDG 12). To date 120 project results have been shortlisted to be part of the Efficient Solutions portfolio, 62 in the clean energy domain, 9 solutions have been certified and are officially part of the portfolio, 7 of which are solutions in the field of clean energy (see annex to Action 8 for the list of solutions certified).

The European Investment Project Portal (EIPP)⁷⁹ has around 500 projects published, a figure which has doubled since March 2018, and 80% of project promoters have been contacted by investors. One of the three successful projects selected to receive more visibility relates to

⁷⁶ <https://northvolt.com/>; <http://principlepowerinc.com/en/windfloat>. Both companies have been supported by EIT InnoEnergy

⁷⁷ <https://www.innoradar.eu/>

⁷⁸ <http://sserr.meta-group.com/SitePages/default.aspx>

⁷⁹ <https://ec.europa.eu/eipp/desktop/en/index.html>

clean energy innovation, Ecoduna⁸⁰. This project has developed an innovative process to cultivate microalgae at an industrial scale to produce biomass for energy and other uses. In order to complement the online Portal, the EIPP organised physical matchmaking events, putting project promoters and investors at the same table, at large events and conferences such as the Trans-European Transport Network (TEN-T) Days in Ljubljana; the European Business Angels Network (EBAN) Annual Congress in Sofia; the Small and medium-sized enterprises (SME) Assembly 2018 in Graz; and the Innovative Enterprise event in Vienna.

Web platforms to showcase project results and link innovator to investor have been launched or are undergoing upgrades to improve their impact. The EIT Climate-KIC launched an investor marketplace⁸¹ in September 2018 to facilitate access to finance for early-stage cleantech start-ups. There are over a 100 start-ups listed on the platform and around 100 single page views a day, so far. Start-ups are supported to create their profiles, which are reviewed and rejected if incomplete, inaccurate or unsatisfactory, and only updated start-up profiles are visible. For its part, EIT InnoEnergy has put together the most influential European Venture Capitalists in the cleantech sector in its so called “VC Community” that examines regularly the most promising innovations and start-ups of its portfolio. The Transport Research and Innovation Monitoring and Information System (TRIMIS)⁸², in the last quarter of 2018, started a gradual upgrade process to present better project results and their impact through new dynamic and interactive features, maps, web sections and a further enhanced user-friendly interface.

Action 9: European Innovation Council

Description of the Action: *“The Commission will look at ways to strengthen existing bottom-up approaches to innovation under Horizon 2020 and explore other mechanisms, including a potential European Innovation Council. This will help to better support potentially disruptive technologies, innovations, and business models, including breakthrough innovations for the low-carbon economy which are not foreseen in strategic, mission-driven funding.”*

Overview

The implementation of the European Innovation Council (EIC) pilot for 2018-2020 made a difference in supporting potentially disruptive technologies, innovations, and business models. Subsequently, following the call from the European Council, the Commission launched an enhanced pilot for the European Innovation Council as of mid-2019 for the remaining period of Horizon 2020 which also paves the way for the European Innovation Council under the Horizon Europe framework programme. The European Innovation Council's bottom-up approach is expected to significantly contribute to clean energy innovation.

⁸⁰ <https://ec.europa.eu/avservices/video/player.cfm?ref=I156008&lg=EN&sublg=EN>

⁸¹ <https://www.climate-kic.org/marketplace/>

⁸² <https://trimis.ec.europa.eu/>

Status Update

The European Innovation Council for breakthrough, market-creating innovation launched in October 2017 has evolved into a three-strand approach. Firstly, the European Innovation Council Pilot 2018 has, through the use of a bottom-up call and mentoring and coaching opportunities, provided considerable support to innovative businesses and innovators through a range of existing Horizon 2020 instruments⁸³.

Now, the European Innovation Council Enhanced Pilot 2019-2020 will open for calls in 2019 and will adopt three novel approaches: reformed and simplified funding instruments within Horizon 2020 rules; management with a more flexible and pro-active approach; and governance through an EIC Advisory Board. The *'Pathfinder'* financial instrument will focus on innovations from early technology stage to early commercial through the provision of grants to high-risk cutting-edge projects. The *'Accelerator'* financial instrument will cover early commercial and market deployment of innovations in view of their scaling-up through a blending of grant and private financing to support projects. As of summer 2019 a Special Purpose Vehicle shall provide equity participations in the supported projects.

Finally, the co-legislators have agreed on the European Commission's proposal to firmly establish the European Innovation Council in the next Multiannual Financial Framework under Horizon Europe largely following the structure of the Enhanced Pilot operating in 2019.

The bottom-up approach of the European Innovation Council aiming to nurture and launch market creating innovation is expected to allow the breakthrough and the acceleration of clean energy innovation. Yet, the results and impacts of such approach will have to be assessed at a later stage, once the projects will have delivered their results.

Action 10: Research & Innovation Priorities in Horizon 2020 Work Programme

Description of the Action: *“The Commission intends to deploy more than EUR 2 billion from the Horizon 2020 work programme for 2018-2020 to support research and innovation projects in four priority areas: (1) Decarbonising the EU building stock by 2050: from nearly-zero energy buildings to energy-plus districts; (2) Strengthening EU leadership on renewables (RES); (3) Developing affordable and integrated energy storage solutions; and (4) Electro-mobility and a more integrated urban transport system.”*

Overview

Following confirmation of the budget allocation for 2020, the Horizon 2020 Work Programme 2018-2020 now includes EUR 2.482 billion for programmable actions addressing the four research and innovation priorities flagged in the Communication.

⁸³https://ec.europa.eu/info/news/eic-pilot-eu1734-million-top-class-innovators-bring-their-innovations-faster-market-2018-dec-20_en&pk_campaign=rtd_news

Status Update

Over EUR 2 billion will be dedicated through programmable activities across Horizon 2020 to the four Research and Innovation priorities of the Communication. The related calls for proposals will be flagged on the Participant Portal⁸⁴.

	Buildings EUR million	Renewables EUR million	Storage EUR million	Mobility EUR million	Total EUR million
LEIT-NMBP	157	51	153		361
LEIT-ICT	30				30
SC2 (Bioeconomy)		56			56
SC3 (Energy)	326	799	282		1407
SC4 (Transport)			45	285	330
SC5 (Climate, environment, resource efficiency and raw materials)	30			30	60
FCH-JU			110	110	220
Research and Innovation Infrastructures		18			18
Total	543	924	590	425	2 482

Table 1: *summary of the contributions from Horizon 2020 programme to the four Research and Innovation priorities*

Through 2018, EUR 601.7 million of this budget has been allocated to 100 projects across the four Research and Innovation priorities.

	Buildings		Renewables		Storage		Mobility		Ttotal	
	EUR million	projects	EUR million	projects	EUR million	projects	EUR million	projects	EUR million	projects
LEIT-NMBP	40.9	6			52.3	6			93.2	12
SC3 (Energy)	5	1	201.5	35	108.6	14			315.1	50
SC4 (Transport)							57.8	13	57.8	13
SC5 (Climate, environment, resource efficiency and raw materials)	24.8	3					24.8	3	49.6	6
FCH JU					27.9	8	39.0	9	66.9	17
R&I infrastructures			19.1	2					19.1	2
Total	70.7	10	220.6	37	188.9	28	121.6	25	601.7	100

Table 2: *EU contribution (in EUR million) and number of projects addressing the four Research and Innovation priorities. Data refer to committed (signed or in preparation) grants under the 2018 calls (as of January 2019).*

⁸⁴

<http://ec.europa.eu/research/participants/portal/desktop/en/home.html>

Through the bottom up approach from the European Institute for Innovation and Technology (EIT) Innoenergy, Raw Materials and Climate KIC, co-funded by Horizon 2020, it is estimated that an investment of around EUR 150 million in the four Research and Innovation priorities could be added over the period 2018-2020.

Action 11: Smart Specialisation

Description of the Action: *“The Commission will reinforce the support provided from ESIF through the thematic Smart Specialisation Platforms, notably the ones on energy and industrial modernisation, as a springboard for regional innovation and industrial clusters to work on concrete investment projects in areas such as digital and key enabling technologies and energy efficiency. The four priority areas will be further targeted, mobilising public and private stakeholders in synergy with other EU instruments and funding schemes.”*

Overview

The cohesion policy has and will continue to have in the future an important role to play in assisting regions in the development of their plans towards transitioning to a low carbon economy⁸⁵. Cohesion policy funds for the 2014-2020 programming period are also supporting energy research and innovation, based on smart specialisation, with at least EUR 2.5 billion of EU funding available to research and innovation in low-carbon technologies of out which about EUR 1.2 billion has been selected for projects on the ground at the end-2018⁸⁶. Two out of the three smart specialisation platforms are in areas contributing to the energy transition supporting interregional work and exchange of best practices.

Status Update

Three thematic Smart Specialisation Platforms have been established to assist Member States and regions to connect those with similar smart specialisation priorities. Two of these platforms are in the area of clean energy innovation, namely on Energy and Industrial Modernisation. Under the Energy Platform⁸⁷, five interregional partnerships are being supported (on Bioenergy, Marine Renewable Energy, Smart Grids, Solar Energy, and Sustainable Buildings). In addition, a series of presentations on the work of the platform have been made at a number of events including the EU Sustainable Energy Week, the European Territorial Cooperation (ETC - better known as Interreg) Policy event and the European Week of the Regions and Cities during 2018. The platform has produced two reports Good Practices for Smart Specialisation in Energy⁸⁸ and Smart specialisation and social innovation: from

⁸⁵ <https://cohesiondata.ec.europa.eu/>

⁸⁶ <http://s3platform.jrc.ec.europa.eu/esif-energy>

⁸⁷ <http://s3platform.jrc.ec.europa.eu/s3p-energy>

⁸⁸

http://publications.jrc.ec.europa.eu/repository/bitstream/JRC112812/jrc112812_jrc112812_good_practices_s3penergy.vf.pdf

policy relations to opportunities and challenges⁸⁹. The Industrial Modernisation Platform⁹⁰ supports several partnerships related to the low-carbon economy and in September 2018 this included a partnership called Advanced Materials for batteries and electro mobility and energy storage.

Given the needs for more reinforced support for the smart specialisation partnerships to work on investment projects along the value chains, the specific needs of the regions for industrial transition, and building on the Smart Specialisation Platforms, the Commission launched a pilot action for ‘Interregional partnerships for innovative projects’⁹¹ supported with EUR 1 million of funding from the European Regional Development Fund. Following the call for expressions of interest in December 2017, eight interregional partnerships were selected (four under the platform for Industrial Modernisation and two under the platform for Energy). The partnerships with an energy theme selected are Marine Renewable Energy and Sustainable Buildings. Under the pilot, the partnerships have received support to focus on commercialisation and scaling up of the projects and are currently developing Action and Business Plans to enable the progression to capitalisation in 2019.

A second pilot action, supported with EUR 6 million of funding through the European Regional Development Fund, was launched to boost innovation capacity in ‘regions in industrial transition’⁹². It aims to boost innovation capacity in industrial transition regions with the objective to develop or redesign strategies for regional economic transformation based on the smart specialisation priorities, and addressing the main challenges of industrial transition, including the transition to a low-carbon economy and a circular economy. After two calls in late 2017 and early 2018, ten regions and two Member States⁹³ were selected to participate in the pilot actions. The work on these pilots is ongoing along with a series of peer review and foresight workshops organized in 2018 with the Organisation for Economic Co-operation and Development (OECD) on the challenges of industrial transition.

The pilot eco-district of Îlot Allar, in Marseille, France, is testing an **innovative thermal smart grid** – powered by 75 % renewable energy – to deliver both heat and air-conditioning to buildings in the area. This innovative EU-funded smart grid captures energy from the sea surrounding the port of Marseille. The total investment (from national public, EU and private sources) for the project amounts to EUR 9 660 950 with the EU’s European Regional Development Fund contributing EUR 941 938.⁹⁴

89

http://s3platform.jrc.ec.europa.eu/documents/20182/201464/Jrc111371_Smart+Specialisation+and+Soc+Innovation/cdece44d-f557-4449-a8d2-ca4ec0dbebd6

⁹⁰ <http://s3platform.jrc.ec.europa.eu/industrial-modernisation>

⁹¹ http://europa.eu/rapid/press-release_IP-17-5108_en.htm

⁹² https://ec.europa.eu/regional_policy/en/information/publications/factsheets/2018/pilot-action-regions-in-industrial-transition

⁹³ Hauts-de-France (FR), Norra Mellansverige (Sweden), Piemonte (Italy), Saxony (Germany), Wallonia (Belgium), Cantabria (Spain), Centre Val de Loire (France), East-North Finland, Grand-Est (France), Greater Manchester (United Kingdom), Lithuania and Slovenia.

⁹⁴ https://ec.europa.eu/regional_policy/en/projects/france/sea-water-powered-heating-system-sets-sustainable-example-in-marseille-france

Holders of Seals of Excellence⁹⁵ under Horizon 2020 applied for funding through the ERDF under the General Block Exemption Rule for State Aid described under Action 1. In 2018, agreement has also been reached to streamline and eliminate duplication in the application assessment processes for the future Horizon Europe and European Rural Development Fund programmes, which will simplify the process whereby Member States may select Seal of Excellence recipients to receive funding.

For the post-2020 period, innovation and the low-carbon economy features prominently in the Commission proposals for Cohesion policy (including by proposing an instrument for interregional innovation investments with an envelope of about EUR 1 billion). Further, the Commission has also proposed for the next Multiannual Financial Framework period the inclusion of a more strategic approach to synergies and complementarities, including simplification of the Seal of Excellence.

Nova Innovation Ltd⁹⁶ has received support through Horizon 2020 of EUR 13.9 million towards the development of its tidal energy technology. The company has also secured funding in the region of EUR 306.000 from the Scottish Governments Low Carbon Infrastructure Programme, supported by the European Regional Development Fund, towards the integration and deployment of battery storage with the tidal energy technology.

Action 12: Mission Driven Pilot

Description of the Action: *‘In the context of the existing Horizon 2020 funding instruments and rules, the Commission has set up a pilot scheme combining a directive, mission-driven approach in identifying and selecting projects with high potential impact. With direct involvement in the management of the project and various forms of targeted, tailor-made assistance, it will also use existing powers to restructure or terminate funding if agreed milestones are not reached. The scheme emphasizes impact if market relevance reached.’*

Overview

The topic of the mission driven pilot introduced in the Work Programme 2018-2020 of the Energy Societal Challenge of Horizon 2020 was entitled 'disruptive innovation in clean energy technologies' with a budget of EUR 12 million. Two specific fields were identified that lend themselves to disruptive innovation: Photovoltaic windows (“transparent” solar cells) and the “bionic leaf” technology.

Status Update

The call for proposals ran from the 5 December 2017 to 19 April 2018 and following its closure, the applications were evaluated against the award criteria by an independent panel of external experts with this process completed on 31 May 2018. The successful proposals (two

⁹⁵ https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/seal-excellence_en . The Seal of Excellence is currently awarded to applicants under the Horizon 2020 programme that despite scoring highly in the evaluation process were unsuccessful in securing Horizon 2020 Funding.

⁹⁶ <https://www.novainnovation.com/>

in photovoltaics and one in bionic leaf technology) were granted agreements by December 2018 with all three of the projects starting in January 2019.

The projects successful under this pilot will follow a stage-gate approach based on milestones and reviews. The first review is due to be carried out by the Commission, with the assistance of independent experts, after six months and will be based on an assessment of the feasibility and innovation potential of the proposed solution or application. This pilot action is carried out with the support of EIT InnoEnergy.

Action 13: Flagship Energy Innovation Inducement Prizes

Description of the Action: *“The Commission intends to launch a flagship Energy Innovation inducement Prize for EUR 5 to EUR 10 million to reward a breakthrough innovation, for example in one of the following areas: (1) Artificial photosynthesis; (2) Low cost, nearly-zero energy building (NZEB) design and construction; (3) Community-based energy trading scheme; or (4) Social innovation in energy and/or transport at city level”.*

Overview

Two prizes addressing clean energy innovation, with the goal of inducing breakthroughs in artificial photosynthesis and batteries for e-vehicles, were launched in November 2017 and February 2018 respectively. In addition, a recognition prize to reward innovative local renewable energy production in a decentralized energy grid in islands will open in the first quarter of 2019.

Status Update

The Horizon Work Programme 2018-2020 includes three prizes contributing to accelerate clean energy innovation:

1. The Fuel from the Sun: Artificial Photosynthesis prize (EUR 5 million)⁹⁷ – launched on 12 December 2017, will reward the development of an innovative prototype, using photosynthesis, that can produce useable synthetic fuel. The prize contributes to the Mission Innovation challenge on converting sunlight⁹⁸.
2. The Innovative Batteries for eVehicles prize (EUR 10 million)⁹⁹ – launched on 23rd February 2018 – will reward the development of a safe and sustainable battery through the use of new materials and chemistries making use of abundant, sustainable low cost materials, which are easily available in Europe.
3. The RESponsible Island prize (EUR 1.7 million for two prizes)¹⁰⁰ – to be launched in 2019, will reward innovative local renewable energy production in a decentralized electricity grid. The prize is in line with the objectives of the Political Declaration on

⁹⁷ https://ec.europa.eu/research/eic/index.cfm?pg=prizes_sunfuel

⁹⁸ <http://mission-innovation.net/our-work/innovation-challenges/converting-sunlight-challenge/>

⁹⁹ https://ec.europa.eu/research/eic/index.cfm?pg=prizes_batteries

¹⁰⁰ https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/responsible-island-prize_en

Clean Energy on EU Islands and the Smart Islands Initiative, and will contribute to the Mission Innovation challenge “Off Grid Access to Electricity Innovation Challenge”).

In addition, two innovation prizes, from the 2014-2017 Horizon Work Programme, supporting breakthrough clean energy innovations are still open for applications. These prizes are:

1. The CO₂ Reuse prize (EUR 1.5 million)¹⁰¹ will reward innovative products utilising CO₂ that could significantly reduce the atmospheric emissions of CO₂ when deployed on a commercial scale.
2. The Low Carbon Hospital prize (EUR 1 million)¹⁰² will reward a hospital that has an innovative and perfectly integrated combined heat and power installation within its premises.

The Horizon prize for a historic district that had integrated a photovoltaic system for at least 50% of its consumption, “Photovoltaics for historic urban districts (EUR 0.75 million)¹⁰³, closed in September 2018 and was not disbursed as applications for it did not meet the required criteria.

Action 14: Mission Innovation

Description of the Action: *“The Commission will work with Member States such that the European Union plays a leading role within the global Mission Innovation initiative. It will lead the Converting Sunlight Innovation Challenge to create storable solar fuels and the Affordable Heating and Cooling of Buildings Innovation Challenge, and take an active part in the remaining innovation challenges. The Commission will focus on realizing synergies with the private sector including the Breakthrough Energy Coalition.”*

Overview

Following the Third Mission Innovation Ministerial meeting co-hosted by the European Union with the Nordic Council in Malmö in May 2018, the Commission passed the chairmanship of the Mission Innovation Steering Committee to Canada, who will host the next Mission in Vancouver in May 2019. The European Commission co-leads three innovation challenges, and leads the Mission Innovation Champions programme. The European Union is well on track to meet its commitment to double its overall investment in clean energy innovation over the period 2015-2020. Calls for proposals designed for addressing Mission Innovation Challenges related activities introduced in the Work Programme 2018-2020 of Horizon 2020 represent a EUR 396 million investment. With regard to private sector engagement, Breakthrough Energy and the European Commission are developing a partnership announced in this context.

Status Update

The European Commission co-hosted with Denmark, Finland, Norway, Sweden and the Nordic Council of Ministers the 3rd Mission Innovation Ministerial conference in Malmö, on

¹⁰¹ <https://ec.europa.eu/research/horizonprize/index.cfm?prize=co2reuse>

¹⁰² <https://ec.europa.eu/research/horizonprize/index.cfm?prize=lowcarbon>

¹⁰³ <https://ec.europa.eu/research/horizonprize/index.cfm?prize=photovoltaics>

22-23 May 2018, under the heading of “Energy Integration and Transition: towards a competitive and innovative low-carbon economy”. Reinforcing the political momentum of EU Member States in Mission Innovation, Austria officially joined Mission Innovation at the 3rd Ministerial becoming the 24th MI member and the 9th EU Member State to join and commit to doubling its clean energy innovation funding.

In addition to bringing high-level officials and technical specialists together, the two official side events of the conference, the Solutions Summit¹⁰⁴ and Cleantech Capital Day¹⁰⁵, gathered industry, investors, innovators and entrepreneurs with the goal of discussing progress and global efforts on new initiatives and solutions in clean energy. A total of 30 innovative start-ups, 23 of them funded by EU programmes¹⁰⁶, pitched their clean energy innovations to a panel of international investors – including asset managers from Bill Gates’ Breakthrough Energy Ventures, the European Investment Bank and venture capital firms – with the aim of securing further financing to continue developing their businesses and reach the market. The Solutions Summit showcased cutting-edge solutions, breakthroughs, ideas and innovations supported by R&D investments by MI members.

On the technical side, the Commission is co-leading a new challenge 'Hydrogen' (Innovation Challenge 8), and continues to co-lead the ones on 'Converting sunlight into storable solar fuels' (Innovation Challenge 5), and 'Affordable Heating and Cooling' (Innovation Challenge 7).

SUNRISE Solar Energy for a Circular Economy – contributing to Innovation Challenge 5¹⁰⁷

The SUNRISE project aims to enable the production of renewable chemicals and fuels on mass scale using abundant molecules as feedstocks (e.g. H₂O, CO₂, N₂, O₂) and sunlight as the sole energy source. This will be essential to facilitating the transition from a linear to a circular economy, with huge benefits for the European economy, and the ongoing efforts to mitigate climate change.

The production of alternative fuels and platform chemicals from renewable energy, water, and atmospheric sources is a real game changer and one of today's greatest challenges. While electricity is currently the main renewable energy carrier, it represents less than 20% of end-use energy consumption, with the rest being used in the form of fuels. SUNRISE seeks to address these scientific, technological, and societal challenges through the photorecycling of atmospheric CO₂ into a variety of products, the combination of nitrogen with solar hydrogen to produce ammonia for fertilizers, and, more generally, the direct production of fuels and platform chemicals.

The total funding dedicated to clean energy innovation¹⁰⁸ from EU and other Mission Innovation Members having joined Mission Innovation has increased by over USD 3 billion in the second year of the Mission Innovation cycle. Calls for proposals related to Mission Innovation Challenges have been introduced in the Work Programme 2018-2020 of Horizon 2020 for a total amount of around EUR 396 million. Complementary calls for international

¹⁰⁴ <https://www.cem9-mi3.eu/programme/mi3-side-events>

¹⁰⁵ cd.cleantechscandinavia.com/

¹⁰⁶ https://www.cem9-mi3.eu/sites/default/files/inline-files/EC-RTD-Booklet%20for%20Malmo_18052018_FINAL.pdf

¹⁰⁷ <https://www.sunriseaction.com/>

¹⁰⁸ Funding for so-called “MI focus areas” included by MI members in their MI baselines.

research proposals have been launched by other Mission Innovation countries, among them: India, France, Canada and Mexico. Several Horizon 2020 European Research Area Network (ERA-Nets) on topics related to innovation challenges also include other non-EU MI countries in their calls, such is the case for the Carbon Capture and Storage one, which includes the US.

As part of the initiatives to achieve greater engagement from innovators, the European Commission leads the Mission Innovation Champions Programme¹⁰⁹ to recognise and support researchers and innovators who are developing novel ways of making energy cleaner, cheaper, and more reliable and using it more efficiently. The first cohort of the Champions will be officially presented at the 4th Ministerial conference in Vancouver.

Mission Innovation is strengthening the Private Sector Engagement through collaborations with the World Economic Forum (WEF), Breakthrough Energy and the European Institute for Innovation and Technology (EIT) Climate Knowledge and Innovation Community (KIC). In December 2017, at the One Planet Summit in Paris, organised by President Macron to accelerate the implementation of the Paris Agreement, Breakthrough Energy announced its intention to launch pilot public-private collaborations with five Mission Innovation members including the Commission (for more details on this collaboration refer to Action 6).

The European Institute for Innovation and Technology (EIT) Climate-KIC joined forces with Mission Innovation, and the Research Institutes of Sweden to develop an ‘avoided emissions’ investor framework¹¹⁰ that aims to rapidly identify emissions-saving solutions needed to limit global warming to below 1.5° C and to scale them up by directing public and private capital into those solutions. Nominations opened in November 2018 for ‘framework explorers’. In addition, one hundred ‘1.5° C compatible’ low carbon solutions¹¹¹ are being sought through an open nomination process, as well as through nominations from organisations supporting low-carbon solutions including EIT Climate-KIC, the Clean Energy International Incubation Centre, World Wildlife Fund (WWF) Climate Solvers, Breakthrough Energy and World Alliance for Efficient Solutions. They will be evaluated using the recently launched Mission Innovation framework for avoided emissions to estimate potential greenhouse gas emissions reductions¹¹².

Action 15: Joint deployment programmes in developing countries

Description of the Action: *The Commission will work with Member States to launch one or two joint deployment programmes in developing countries in the areas of energy efficiency and renewable, with a focus on Africa as a privileged partner in view of the EU-Africa summit in 2017. Such programmes will couple research and innovation with capacity building in the host country as both components are indispensable elements for reaching success on the ground. The EU financial contribution will consist of contributions originating from*

¹⁰⁹ <https://www.michampions.net/>

¹¹⁰ <https://www.climate-kic.org/opinion/investor-framework-launched-for-1-5c-compatible-investments/>

¹¹¹ Solutions with the potential to reduce CO2 emissions by 10 million CO2-e or more by 2030

¹¹² <https://www.misolutionframework.net/>

Horizon 2020 and/or Development cooperation programmes as appropriate. The initiative will be complemented by technical assistance where needed.'

Overview

Activities preparing the ground for relevant Research and Innovation cooperation in Africa have taken place, and synergies between Research and Innovation and technical assistance programmes have been strengthened. A Support Action was introduced, in the context of African Union (AU) – European Union (EU) Research and Innovation Partnership on Climate Change and Sustainable Energy (CCSE) launched in November 2017, to pave the way for a Research and Innovation Action on renewable energy in the Horizon Work Programme 2018-2020. In addition, the identification and documentation of African and European affordable building designs, construction techniques and other aspects of energy efficiency have been included in a 2019 call topic in the Horizon in the Horizon Work Programme 2018-2020.

Status Update

The African Union and European Union are working together, in the context of the High Level Policy Dialogue on Science, Technology and Innovation, towards implementation of the Climate Change and Sustainable Energy partnership, capitalising on the impetus given by President Juncker's proposal for a new Alliance for Sustainable Investment and Jobs between Europe and Africa¹¹³. Following this proposal both sides decided to work further together in strategic areas. In this context, a dedicated energy Task Force with representatives of the sustainable energy sector from Africa and Europe was launched in November 2018¹¹⁴.

The External Investment Plan (EIP) started to receive applications in early 2018, to leverage more public and private sustainable investment in Africa and neighborhood regions. Sustainable Energy and connectivity, and Sustainable Cities are among the topics of new guarantee instruments established under the European Fund for Sustainable Development (EFSD - the financial arm of the EIP together with the blending programmes). So far, EUR 1.54 billion have been allocated to support 28 guarantee instruments,¹¹⁵ and EUR 2.2 billion have been mobilised by the European Union for blending projects in Africa, which will unlock EUR 19.6 billion in overall investment. Eight out of the 28 approved guarantees (six of them focusing on Africa) are under the Sustainable Energy and connectivity window,¹¹⁶ accounting to a total of EUR 603.5 million.

Taking stock of the feedback from the African Union (AU) – European Union (EU) Summit and other related activities, a framework for an EU Africa Joint Research and Innovation co-funded initiative on renewables started to be developed in 2018. Under the leadership of

¹¹³ Communication on a new Africa-Europe Alliance for Sustainable Investment and Jobs: Taking our partnership for investment and jobs to the next level, COM/2018/643 final, 12.9.2018.

¹¹⁴ http://europa.eu/rapid/press-release_IP-18-6804_en.htm

¹¹⁵ <https://ec.europa.eu/europeaid/sites/devco/files/181213-eip-28-guarantees-brochure-final.pdf>

¹¹⁶ Guarantees under the Sustainable Energy and connectivity window: European Guarantee for Renewable Energy, Africa GreenCo, Room2Run, DESCOs Financing Programme, Renewable Energy Support Programme for Mainly Rural Areas in Sub-Saharan Africa, Framework to Scale-up Renewable Energy Investments (Boosting investment in renewable energy), Sustainable Logistics and Interconnectivity Guarantee (SLIG) and Energy Efficiency and Sustainable Cities in EU Neighbourhood.

France, a consortium of European and African partners, including funding organisations and top research performers in the field, has completed the mapping and clustering of collaborative AU-EU research and innovation activities oriented to the penetration of renewable energy in the African continent. Based on this meta-analysis, the consortium has identified gaps and opportunities for further impactful research, grouped around a number of themes. These are the basis for the definition of Research and Innovation Pathways, which, aggregated, will constitute the Research Agenda that will guide the overall joint Research and Innovation initiative. The pathways are expected to be finalised in 2019 and their implementation is expected to start in 2020.

Following the African Union (AU) – European Union (EU) Summit, EUR 1 million has been earmarked for a call for proposals under Horizon 2020¹¹⁷. The call, launched on 12 March 2019, will include exchange activities between African and European policy-makers to foster low-cost, high performance, locally adapted bioclimatic construction approaches for the development of building policies, standards, regulations, certificates and other relevant instruments in Africa.

Development Cooperation with Africa on sustainable energy has continued to focus on exploiting the benefits of digitalisation as an enabler, in line with the Digital for Development Initiative¹¹⁸, on building the nexus between access to energy, digital services and digital technologies. In line with its commitment to promote renewable energy in partner countries and to deliver on the Digitalisation Agenda, the European Commission is working together with the French Agency for Development (AFD)¹¹⁹ towards the establishment of a Digital Energy Facility for the promotion of energy transition and energy access. The facility, to which the EU will contribute EUR 23 million, is expected to support: (i) 8 to 10 utilities to develop comprehensive roadmaps and investment plans for performance improvements through the integration of smart grids and new digital solutions and (ii) 40 to 45 energy access Small and medium-sized enterprises (SMEs) and start-ups to prepare the financing of significant portfolios of innovative projects with scalability and replicability potential. The facility is due to be operational in the second half of 2019 and synergies with EU programmes, such as Horizon 2020 and the previous Framework Programmes, will be established. Several innovative solutions supported by these programmes have proved an increased level of technology readiness and replicability potential.

In addition to the Research and Innovation partnership, the Commission is also promoting clean energy innovation with Africa through other mechanisms. Capacity building in developing countries is undertaken via a specific pool of experts in the field of sustainable energy policies and regulations. Relevant missions/assignments performed during 2018 include:

- Support to the West African Power Pool (WAPP) in the operationalization of the Improving the Energy Governance in West Africa program (Energy Governance –

¹¹⁷ Call: building a low-carbon, climate resilient future: secure, clean and efficient energy, lc-sc3-ee-18-2019

¹¹⁸ Digital4Development: mainstreaming digital technologies and services into EU Development Policy: https://ec.europa.eu/europeaid/sites/devco/files/swd-digital4development_part1_v3.pdf CSW (2017)157

¹¹⁹ <https://www.afd.fr/fr>

Amelioration De la Gouvernance du Secteur de L'energie en Afrique de L'ouest – AGoSE);

- Support to the organization and implementation of institutional reforms in the electricity sector in Mauritania;
- Support for the development of a rural Electrification web-hosted geographical information system (GIS) planning tool in Burkina Faso;
- Development of Minimum Energy Performance Standards and labelling guidelines, both for on grid and off-grid energy systems in Africa.
- Support the transfer of research into the market through technical and vocational trainings within the Africa-EU Renewable Energy Cooperation Programme and the EU funded programme GET.invest¹²⁰.
- Accelerate the transfer of technologies, including an incubator programme, for climate change mitigation and adaptation, including energy efficiency and renewable energy, through the EU contribution to the Climate Technology Centre and Network (CTCN).

Action 16: SME Internationalisation

Description of the Action: *“The Enterprise Europe Network will be extended to additional third-country markets to facilitate business co-operation, technology transfer, knowledge transfer, and research project cooperation for Small and Medium Enterprises, with the environment, renewable energy and sustainable construction as the most important sectors.”*

Overview

SME internationalisation continued to be promoted through the Enterprise Europe Network (EEN)¹²¹ through the the European Strategic Cluster Partnerships (ESCP)¹²² and the Low Carbon Business Action (LCBA)¹²³. Additionally a network of European research and innovation centres has been established under the banners of European Network of Research and Innovation of Centres and Hubs (ENRICH) China¹²⁴ and ENRICH-Brazil¹²⁵. All of these initiatives have expanded the number of partnerships in third country markets now established with EU businesses.

Status Update

The Enterprise Europe Network (EEN) provides advice to Small and medium-sized enterprises (SMEs) in all sectors. On clean energy, the three sector groups ” Intelligent Energy”, “Environment” and “Sustainable Construction” have approved an additional 79 partnership agreements taking the total to 180.

¹²⁰ <https://www.get-invest.eu/>

¹²¹ <https://een.ec.europa.eu/>

¹²² <https://www.clustercollaboration.eu/eu-cluster-partnerships>

¹²³ <https://www.clustercollaboration.eu/international-cooperation/low-carbon-business-actions>

¹²⁴ <http://china.enrichcentres.eu/>

¹²⁵ <http://brazil.enrichcentres.eu/>

Through the European Strategic Cluster Partnerships (ESCP) for Internationalisation two partnerships became operational this year. One in the field of geo-energy regrouped 8 clusters in different COSME¹²⁶ participating countries to develop an internationalisation strategy targeting Canada, the Middle East and Australia. The second ESCP partnership is in the area of eco-, bio-, renewable energy and regroups 5 clusters from five Member States to target Vietnam, Malaysia, Singapore, Indonesia, Jordan, Qatar, and the United Arab Emirates. An action plan has been adopted which targets the establishment of partnership agreements facilitating the expansion of SMEs into these markets.

The Low Carbon Business Action (LCBA) focuses on the transfer of technology from EU SMEs assisted through the Partnership Instrument¹²⁷ of the EU Foreign Policy Instrument in a series of sectors including energy. This year the LCBA in Mexico evaluated the original 93 formal cooperation partnerships made between EU and Mexican companies and selected 47 of these to receive technical assistance support through the instrument to progress. The LCBA in Brazil established 640 business partnerships between EU and Brazilian companies and following evaluating their concept notes has selected 90 to receive further assistance via technical assistance through this financial instrument.

A network of centres under the banner of ENRICH Brazil was established by the Centre for Europe-Brazil Business and Innovation Co-operation (CEBRABIC) during 2018. The centres services include the provision of advice, training activities, workspace, and business incubation or networking services to SME's.

Under its banner of ENRICH China, the European Research and Innovation Centre of Excellence in China (ERICENA) held a 'match making' tour during November 2018 involving participants from Estonia, Lithuania, Sweden, Bulgaria, Austria, Finland and Latvia. Following on from the conclusion of the tour ENRICH China provided thematic activities to a delegation from the Lithuanian Agency for Science, Technology and Innovation.

Action 17: Strategic Energy Technology (SET) Plan

Description of the Action: *“The Commission will work with Member States through the Energy Union governance structures, and in particular, through the SET plan, to align member State investments under the four priority areas mentioned in [Action 10] of the ACEI communication and to explore possibilities for developing relevant Important Projects of Common European Interest.”*

Overview

Through 2018 the Strategic Energy Technology Plan has finalised and endorsed all fourteen Implementation Plans¹²⁸ addressing the Energy Union research and innovation priorities¹²⁹.

¹²⁶ COSME is the EU Programme for the Competitiveness of Small and Medium-Sized Enterprises.

¹²⁷ https://ec.europa.eu/fpi/what-we-do/partnership-instrument-advancing-eus-core-interests_en

¹²⁸ <https://setis.ec.europa.eu/actions-towards-implementing-integrated-set-plan/implementation-plans>

The execution of these Implementation Plans will represent the main contributions to the respective Strategic Energy Technology (SET) Plan actions and will serve also the four Research and Innovation priorities set forth in the Communication ‘Accelerating Clean Energy Innovation’ for the period 2018-2020.

Status Update

In June 2018, the Strategic Energy Technology (SET) Plan Steering Group presented the main priorities and policy orientations for the SET Plan in the next five years and facilitates the delivery of the actions described in the various Implementation Plans.

European governments, industry, research organisations and the European Commission are expected to continue working together to reshape Europe’s energy future and accelerate the transformation of European Energy System through innovation. The priority is now to step up public and private investments in the Research & Innovation priorities identified in these Implementation Plans under the umbrella of the SET Plan that will maximise National and European investments.

More information on the different Implementation Plans endorsed, is provided in the SET Plan brochure 2018¹³⁰ presented at the annual SET Plan conference held in Vienna in November 2018.

In addition, the European Battery Alliance is examining the potential for battery cell manufacturing facilities to access public funding that could be compatible with EU state aid rules under the Important Projects of Common Interest (IPCEI) framework. Several EU Member States have launched processes to identify consortia with the aim of seeking approval by the Commission for their investment plans in 2019.

Action 18: Governance of the Energy Union

Description of the Action: *“The Governance of the Energy Union will ensure that the national objectives and measures regarding research, innovation and competitiveness, are set out in national integrated energy and climate plans and that objectives, policies and measures are coherent with the EU’s objectives. In addition, biennial integrated progress reports and the State of the Energy Union reports will ensure the necessary follow-up and monitoring.”*

Overview

The new governance framework will help to implement and develop further the Energy Union¹³¹. Research, innovation and competitiveness is one of the five dimensions of the Energy Union, and is to be covered in the National Energy and Climate Plans (NECPs). This

¹²⁹ <https://setis.ec.europa.eu/>

¹³⁰ <https://publications.europa.eu/en/publication-detail/-/publication/a3b22c5b-ed41-11e8-b690-01aa75ed71a1/language-en/format-PDF>

¹³¹ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, OJL 328, 21.12.2018, p. 1-77.

should provide increased visibility, predictability and stability for stakeholders and investors when it comes to national objectives and policies and measures by 2030.

Status Update

Research and Innovation and competitiveness is a key horizontal dimension that brings together all areas covered by the NECP and provides a longer term horizon by including not only 2030 objectives, but also, where available, 2050 objectives related to the promotion and deployment of clean energy technologies.

NECPs provide the opportunity to drive forward common EU R&I efforts, coordinate and avoid duplication of activities across Member States or at the EU-level. The plans also provide a useful framework for countries to develop their own long-term low-carbon R&I strategies, allowing industry and investors to align their own plans and projects in the mid to long-term. The regulation makes a strong connection between the integrated national energy and climate plans and the long-term low emission strategies. The plans and strategies are to be aligned and consistent with each other.

To the same extent that other parts of the NECP refer back to the targets set in the new legislation on renewables or energy efficiency, the work that is ongoing on R&I at EU level should also be reflected in the national plans. Such is the case for the SET Plan, the main EU instrument for ensuring coherence between Member States spending and action on energy technology R&I. Member States shall indicate how the SET Plan objectives are being translated to a national context.

All Member States have submitted their draft NECP to the European Commission, which will provide possible recommendations by June 2019. The deadline for submission of the final plans taking into account Commission recommendations is 31 December 2019.

Action 19: Strategic Transport R&I Agenda

Description of the Action: *“The Commission has set up a specific governance structure with Member States on Strategic Transport Research and Innovation Agenda (STRIA), to align strategic plans for long-term transport research and innovation actions and to better link them to the energy sector and digital technologies.”*

Overview

The STRIA Governance group, gathering Member States representatives responsible for Transport and R&I policy and other transport stakeholders (Associated countries, European Technology Platforms) is now set up and operational. Its mandate is to oversee the implementation of the seven STRIA roadmaps and to support the deployment of innovative and sustainable transport solutions.

The Transport and Research and Innovation Monitoring and Information System (TRIMIS)¹⁰² has been developed to provide information and monitoring of the STRIA governance process by mapping and analysing technology trends and R&I capacities in the transport sector providing open-access information on projects, funding programmes and country profiles. Several Science for policy reports are available and relevant Key Performance Indicators have been developed.

Status Update

The STRIA Governance group has identified three areas where an update of the present roadmaps due to the fast technological development as well as definition of concrete actions is necessary. In the areas of Connected and Automated Transport (CAT), Smart Mobility in Urban Areas and Transport Infrastructure, Working Groups gathering Member States representatives, transport stakeholders and experts have been established.

At its meeting held on 11 December 2018 the STRIA Governance Group received updates on progress to date from these three Working Groups. The Working Groups for CAT and Smart Mobility in Urban Areas will publish their reports in early 2019 setting out the action plans on updating the respective roadmaps.

Action 20: Smart, sustainable and inclusive urban demonstration projects and best practices in cities

Description of the action: *'The Commission will stimulate sharing and upscaling of best practices and smart, sustainable and inclusive urban demonstration projects, including those supported under the European Innovation Partnership on Smart Cities and Communities and under Urban Innovative Actions. This will also draw on data and products from the European Commission's Copernicus programme for Earth observation.'*

Overview

Cities across the EU lead the way on reducing emissions and on making ambitious energy and climate commitments. To date 1529 EU cities have committed to reducing their CO₂ emission by at least 40% by 2030¹³², and over 25 cities have an even higher ambition, some aiming for carbon neutrality by 2050¹³³. Cities are excellent hubs for innovation and best practices on climate mitigation and across the EU there are numerous initiatives that work on sharing best practice, connecting different city projects and facilitating upscaling of such projects. Throughout 2018 portfolios have grown in budget and projects, as well as in results in particular for Lighthouse city projects, Energy-Efficiency Building contractual Public-Private Partnership (EeB cPPP) and for the Horizon 2020 large scale demonstration projects. New platforms have been set up to foster the sharing and upscaling of best practices in cities when it comes to securing financing and further growing results into mainstreamed city solutions.

¹³² EU cities signatories to the Covenant of Mayors for Climate and Energy.

¹³³ Examples of these cities can be seen in: http://www.energy-cities.eu/IMG/pdf/local_energy_climate_roadmaps_final.pdf

Status Update

New platforms and initiatives have been launched throughout 2018 to bridge the gap of access to finance for smart city projects and ensure such projects continue to develop¹³⁴. The European Innovation Partnership on Smart Cities and Communities (EIP-SCC) Matchmaking Platform¹³⁵ was launched in May 2018. The objective of the platform is to match partners from city administration, businesses and the financing sectors in order to ensure replication and implementation of projects. To date the platform team has organised 89 meetings with project promoters, international financial institutions and private investors. In addition, three large matchmaking events have taken place in the context of the platform – at the EU Sustainable Energy Week 2018 in Brussels¹³⁶, in Sofia end of June 2018, and at the Smart City Expo World Congress 2018 in Barcelona¹³⁷. When it comes to Matchmaking, EIT Climate KIC has such an initiative, supported by the LoCaL Flagship, which identified over 1000 green projects from 362 cities in 2017, representing more than USD 50 billion of investment opportunities for cities and investors.

URBIS¹³⁸, a new dedicated urban investment advisory platform within the European Investment Advisory Hub (EIAH), developed in partnership by the European Commission and the European Investment Bank in the context of the EU One Stop Shop for Cities¹³⁹, was launched in November 2017. It provides advisory support to urban authorities to facilitate, accelerate and unlock urban investment projects, programmes and platforms. For the first year of its operation, URBIS has received more than 35 requests for advisory support. Without having a specific thematic focus on climate action, URBIS supports various relevant aspects such as energy efficiency, renewable energy, climate resilience and adaptation of cities, circular economy, clean energy, and smart cities. It assists project promoters in exploring the viability and establishing investment platforms in some of the areas mentioned above, which enables the financing of smaller projects which would otherwise face difficulties to be financed on an individual basis.

Another new initiative that is not focused on clean energy innovation but relates to the energy transition emerged in 2018 through the Task Force on “Circular business and financial models for cultural heritage adaptive reuse in cities”¹⁴⁰. It seeks sharing of best practice and exchange of knowledge, tools and approaches, fostering urban circularity, increasing regeneration, boosting inclusive economic growth and enhancing people’s well-being.

In terms of synergies and upscaling, the JPI Urban Europe¹⁴¹ has followed closely the Smart Cities Implementation Plan prepared by the ERANET Smart Cities & Communities II on Urban Transformations, and offered to support the implementation by dedicated actions, for

¹³⁴ <https://publications.europa.eu/s/dIqF>

¹³⁵ <https://www.eiseverywhere.com/ehome/index.php?eventid=334432&>

¹³⁶ <https://eu-smartcities.eu/news/investors-industry-cities-and-project-promoters-match-eusew-2018>

¹³⁷ <https://eu-smartcities.eu/news/eip-scc-participation-and-matchmaking-event-smart-city-expo-world-congress-13-15-november-2018>

¹³⁸ <http://eiah.eib.org/about/initiative-urbis.htm>

¹³⁹ https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development_en

¹⁴⁰ <https://www.clicproject.eu/task-force/>

¹⁴¹ <http://jpi-urbaneurope.eu/>

example through joint calls on Smart Cities, and programme management for the implementation plan. Austria is already committed to invest.

The Belmont Forum Sustainable Urbanisation Global Initiative selected 15 projects on Food-Water-Energy Nexus for funding which were launched between December 2017 and March 2018, with a total budget of EUR 19 million. These are all projects with high Technology Readiness level where the funding is aimed at supporting the solutions, proposed by the projects towards the market or be replicated in other cities at larger scale.

With regard to Horizon 2020, funding dedicated to clean energy in the urban context, has increased. To date there are 14 ongoing Lighthouse projects¹⁴², representing 40 lighthouse cities and 53 follower cities, the total EU contribution to these projects amounts to EUR 301 million. In 2014-2017 they were 12 projects, 2 more have joined now and in February 2019 there is the deadline for the new call, when more projects will join. To date projects have supported the deployment numerous clean energy solutions, such as EV charging stations, district heating, renewables (mini wind, mini hydro, tidal power, PV, building integrated PV, biomass, etc.), thermal and electric energy storage and measures for increasing the energy efficiency of buildings, among other numerous. Through the EeB cPPP¹⁴³ 58 projects are supported within Horizon 2020 calls. A recent progress monitoring survey¹⁴⁴ revealed that in total the projects have delivered a 38,9% reduction of energy use and a 40,6% reduction of CO₂ is expected by the end of the projects when compared to the situation when they started.

Six spin-offs (see annex to Action 20 for list of spin-offs) have already been launched to exploit the innovative outcomes of the projects. When it comes to Horizon 2020's Large Scale Demonstration Projects, total EU contribution for 2016-2019 for sustainable city topics amounts to EUR 243 million, with 16 ongoing projects from 2016 and 2017 calls. There is already a large set of project results mainly in the areas of energy, smart mobility/transport and ICT. For example: various solutions for building renovation; various energy solutions dealing with storage applications at residential/networks level, electro-mobility, smart charging; ICT solutions like urban data platforms to collect, store and manage data from buildings; mobility services like sharing services, clean solutions for goods delivery in the cities; among other clean energy solutions.

On sharing best practices, the EU Covenant of Mayors (EU CoM) capacity sharing corner¹⁴⁵ launched in 2017 has been hosting and organised a variety of activities in 2018: 9 capacity-building workshops in 7 Member States with over 400 attendees in total, 11 capacity-building webinars organised in 3 languages (English, German and Slovakian) with over 600 attendees, and 7 local government pairs have been selected to participate in twinning programmes. Twinning can take the form of a peer to peer group, where EU CoM signatories have an exchange of their best practices; or it can be in the form of mentoring, in which an 'advanced'

¹⁴² <https://ec.europa.eu/inea/en/horizon-2020/h2020-energy/projects-by-field/879>

¹⁴³ http://ec.europa.eu/research/industrial_technologies/energy-efficient-buildings_en.html

¹⁴⁴ http://e2b.ectp.org/fileadmin/user_upload/documents/E2B/2018_EeB_cPPP_PMR_19072018.pdf

¹⁴⁵ <http://mycovenant.eumayors.eu/site/landing>

EU CoM signatory mentors a ‘less advanced’ EU CoM signatory, engaging in a capacity-building exercise aimed at developing the aptitude of the city to mitigate and adapt to climate change.

Modelled on the EU Covenant of Mayors, the Regional Covenant of Mayors in Sub-Saharan Africa (CoM SSA)¹⁴⁶ was launched in 2016, and to date, 150 cities from 34 countries became signatories of the CoM SSA. Thirteen pilot cities¹⁴⁷ have been supported to prepare planning documents, Sustainable Energy Access Climate Action Plans (SEACAPs) and small-scale pilot projects. In 2018 EUR 25 million has been allocated for scaling-up the EU support to the initiative, targeting more cities in Sub-Saharan Africa and catalysing access to finance for urban energy projects.

Events have also fostered sharing of best practices by bringing project beneficiaries together, such is the case of the 8th edition of the Euroscience Open Forum (ESOF) in Toulouse, where several RISE smart cities projects came together¹⁴⁸, and the ‘REA MSCA-IF new technologies for smart cities of tomorrow’ event in Berlin¹⁴⁹. In addition, activities such as the Sustainability Enabler promote synergies and exchange of practices as it brings the EIT Digital and EIT Climate KIC together to extend the FIWARE based CEDUS City Enabler¹⁵⁰ – an open source platform – to allow urban service providers (public and private) and local Governments to exploit urban data in the climate domain to enhance, among others, energy efficiency in cities. Furthermore, on November 2018, Horizon 2020 projects working on energy transition through the use of Nature Based Solutions in launched a cooperation Manifesto¹⁵¹ where they commit to work together in a cross-project collaboration frameworks to enhance impacts and benefits.

Under Cohesion Policy, the Urban Innovative Actions pilot initiative (EUR 372 million in the current programming period of 2014-2020) supports experimentation of innovative actions in European cities. The actions are aimed at testing how new innovative solutions work in practice and sharing these experimentations with other cities in Europe. In total, 55 projects are ongoing, and among these projects, three projects are focused on testing novel solutions in the area of energy transition (Gothenburg, Paris and Viladecans). In addition, six projects are supported under the theme of Climate Adaptation (Amsterdam, Barcelona, Manchester, Paris, Riba-roja de Túria and Seville) and five projects under the theme of air quality (Aix-Marseille-Provence, Breda, Ostrava, Helsinki, Portici).

¹⁴⁶ <http://comssa.org/>

¹⁴⁷ The 13 pilot cities are: Kampala – Uganda; Lubumbashi – DRC; Dakar and Pikine – Senegal; Bouaké - Ivory Coast; Zou – Benin; Nouakchott – Mauritania; Tsévié – Togo; Yaoundé III and Yaoundé IV – Cameroon; Bangui - Central African Republic; Bissau - Guinea-Bissau and Monrovia – Liberia. The supported actions target the development of Sustainable Energy Access and Climate Action Plans (SEACAP), and include among others, capacity building for local authorities on their development, guidelines, webinars on data collection and support for participation in international events such Africities.

¹⁴⁸ <https://www.esof.eu/en/programme.html>

¹⁴⁹ <http://intranet-rea.cea.cec.eu.int/sites/rea/news/Pages/New-Technologies-for-Smart-Cities-of-tomorrow--Monitoring-Meeting.aspx>

¹⁵⁰ <http://www.cedus.eu>

¹⁵¹ <https://platform.think-nature.eu/nbs-manifesto>

The Urban Agenda for the EU Partnership on Sustainable Land Use and Nature-Based Solutions finalised its Action Plan for “liveable and compact” cities¹⁵², it recognises that densifying urban population also means shorter journeys to work and services, whilst apartments in multi-family houses or blocks require less heating and less ground space per person. The Partnership on Climate Adaptation also completed its Action Plan, and through the implementation of the joint Actions, the Partnership aims to develop capacities of European cities to address and adapt to the impacts of climate change including energy-related issues. The Partnership on Energy Transition is on its final phases of completing its Action Plan that is expected to be finalised in the first half of 2019. The Partnership outlines 5 key actions in the draft Action Plan seeking the creation of a more integrated and smarter energy system that is better able to manage and balance dynamic patterns of supply and demand at an EU, national and local level.

Within the context of the Urban Agenda for the EU, Iclei – Local Governments for Sustainability¹⁵³ and the European Investment Bank are developing cooperation with Horizon 2020 projects taskforces working on governance, business and finance models and on indicators for cities – including indicators related to the energy transition. Also, to increase cooperation, the Commission launched in October 2018 the Community of Practice (CoP) on Cities. The initiative offers an open platform for the exchange of knowledge on urban issues in order to support European policies addressing cities, and discussing potential future challenges and opportunities for cities.

Smart cities financing for local players in cities

In December 2018 the partnership between the European Investment Bank and Belfius “Smart Cities, Climate Action & Circular Economy II”¹⁵⁴ increased its budget by further EUR 400 million¹⁵⁵, in addition to EUR 1 billion already allocated to 121 projects. This programme aims to help local authorities, inter-municipal groupings and non-commercial organisations in Belgium to implement their smart and sustainable projects in the areas of energy, mobility and urban development, among others.

¹⁵² <https://ec.europa.eu/futurium/en/sustainable-land-use>

¹⁵³ <https://www.iclei.org/>

¹⁵⁴ <https://www.belfius.be/publicsocial/FR/Themes/Smart-Cities/Projects/index.aspx?firstWA=no>

¹⁵⁵ <https://eu-smartcities.eu/sites/default/files/2018-12/Press%20release%20Belfius%20EIB%2004%2012%202018.pdf>

ANNEXES

Annex to Action 5– Example of Public Procurements

EE 8 – 2014: Public procurement of innovative sustainable energy solutions (EUR 1-1.5 million per project)

1. **CEPPI 2** (Network) – building organisational capacity in city authorities (Birmingham, Budapest, Castelló & Valencia, and Wrocław) on how to achieve more sustainable energy solutions through a pro-innovation procurement approach (PPI) and to demonstrate this by selectively intervening in scheduled public tenders. The project was less successful than planned, because it overestimated the readiness and the willingness of public authorities to engage in innovation procurement.
<http://www.ceppi.eu/home/>
2. **EURECA** (Network) – tackling the lack of knowledge and awareness of how to identify and procure environmentally sound and greener data centres. The work encompasses solutions for pre-commercial procurement (PCP) and procurement of innovative solutions (PPI). EURECA has successfully supported projects impacting more than 300 public sector data centres and leading to savings of well over 52.5 GWh/year of end-use electricity consumption due to increased energy efficiency.
<https://www.dceureca.eu/>
3. **GreenS** (Network) –establishing support units within participating Energy Agencies to strengthen the capacity of public authorities to successfully apply GPP with priority and enhance their ability and capacity to save energy, reduce CO₂ emissions and costs. The project carried out 49 GPP trainings, involving 1484 procurers. The project also successfully supported 21 pilot tenders in 7 EU Member States (BG, CY, ES, IT, LV, SE and SI), leading to energy savings of 75,37 GWh/y during the project lifetime.
<http://greensproject.eu/en/>
4. **SPP Regions** (Network) – promoting strong networking and collaboration among municipalities in seven European regions on sustainable and innovative procurement (SPP/PPI), whilst building capacity and transferring skills and knowledge. The project successfully realised the publication of 39 tenders (using a variety of procurement instruments) and during the project lifetime 90 capacity building and training events, involving 4 229 participants were organised.
<http://www.sppregions.eu/home/>

EE-09-2015 – Empowering stakeholders to assist public authorities in the definition and implementation of sustainable energy policies and measures

PremiumLight_Pro (695931) 01/04/2016 – 31/03/2019, budget: EUR 2 million. The project will support the wide uptake of outdoor and indoor LED lighting systems in the public sector, by developing green procurement criteria and guidelines for LED lighting systems, the provision of capacity building and education for planners, architects, installers, consultants and other target groups. Finally, the project will support the national

implementation of the EPBD. Partner countries: Austria, Portugal, Italy, Czech Republic, Germany, Denmark, Spain, Poland and United Kingdom.

<http://www.premiumlightpro.eu/>

EE-22-2016-2017 — Project Development Assistance

NOEMIX (754145) 01/06/2017 – 31/05/2021 (48 months), budget EUR 90 000 The project focusses on the large-scale transition towards electric mobility of public administration fleets in the Friuli Venezia Giulia region. The project aims to deliver substantial investments in electric vehicles, charging stations, mobility management software and renewable energy production plants, implementing an innovative, cost-effective and replicable financing scheme based on aggregated demand and public-private partnership. This should result in private investments of EUR 13.47 million renovating the fleet used by regional public institutions with 560 new e-vehicles, installing 660 charging points and renewable energy production plants integrated in buildings or parking areas capable of producing, on an annual basis, a quantity of electricity equal to 50% of that consumed by electric vehicles. The projects focusses on innovation procurement by centralizing the tendering procedure, finding innovative solutions, effective legal/administrative schemes for a public/private partnership that will provide a ‘turn-key integrated e-mobility service’ for public institutions: e-vehicles, charging Infrastructure, a software platform for effective mobility management, installations generating energy from renewable sources (PV plants).

www.noemix.eu/en/

Annex to Action 8 – Examples of exploitation of results

Examples of assets from EIT InnoEnergy having obtained support from FP7/Horizon 2020 (sometimes before entering InnoEnergy’s portfolio, sometimes in parallel to the support provided by InnoEnergy):

- *Sylfen* is engaged in the REFLEX project
(<http://sylfen.com/fr/2018/05/22/le-projet-europeen-reflex/>)
- *Ferroamp Electronics AB* is engaged in the FERROHUB project
(https://cordis.europa.eu/project/rcn/197166_fr.html)
- *Elestor BV* is engaged in the FLOWCAMP project
(https://cordis.europa.eu/project/rcn/211627_fr.html)
- *Glowee* has been associated to the FP7 STUDIOLAB project
(https://cordis.europa.eu/project/rcn/99496_fr.html)
- *Minesto* is engaged in the PowerKite project
(https://cordis.europa.eu/project/rcn/199439_fr.html)
- *Skeleton Technologies* has been beneficiary of the SKLCarbonP2 project
(https://cordis.europa.eu/project/rcn/201780_fr.html)
- *GA Drilling* is engaged in the FP7 project STOICISM
(https://cordis.europa.eu/result/rcn/202551_fr.html)

- *Pro-drone* is beneficiary of the WIND-DRONE project (https://cordis.europa.eu/project/rcn/211547_fr.html)
- *HysiLabs* is beneficiary of the DeLIVERS project (https://cordis.europa.eu/project/rcn/208132_fr.html).

Examples of start-ups supported by EIT RawMaterials in the Clean Energy and Mobility sectors:

- *Circularise* – open, distributed and secure communications protocol for the entire (raw) materials value chain (circular economy). <https://www.circularise.com/>
- Metals Hub – online marketplace focusing on ferro-alloys and metals to promote a more efficient and liquid physical market. www.metals-hub.com
- *SpectriS-dot* – non-toxic semiconductor quantum dots based on abundant raw material sources, with efficient and tuneable emission for applications in, for example, renewable energy. www.spectris-dot.com
- *Flaxres* – new technology to dismantle photovoltaic panels using flashlight: flaxres.com
- *ROSI* – recycling of silicon from the photovoltaic value chain (end-of-life panels and production waste) www.rosi-solar.com
- *SiQAL* – mixed process to produce high purity silicon and alumina simultaneously; materials used in solar cells, battery cells, lighting. www.siqal.de
- *Ulix Innovation* – graphene based battery pack (G pack) for domestic energy supply and mobility markets (<https://eitrawmaterials.eu/supportedstartups/ulix-innovation/>)
- *REIN4CED* – new generation highly durable, impact-resistant and lightweight fibre composites for mobility and energy markets www.rein4ced.com

Examples of up-scaling projects funded by EIT RawMaterials that build on R&I conducted in Horizon 2020 projects:

- *ECO COM'BAT* – Ecological Composites for High-Efficient Li-Ion Batteries, builds on the FiveVB; e-CAIMAN projects (<https://cordis.europa.eu/project/rcn/194886/factsheet/en>; <https://cordis.europa.eu/project/rcn/194849/factsheet/fr>)
- *ECOPADS* – Eliminating copper from brake pads and recycling, builds on the LOWBRASYS project (<https://cordis.europa.eu/project/rcn/193410/factsheet/en>)
- *HIPERCO* – High performance composite based on aluminum, builds on the AllForAMA project (<https://cordis.europa.eu/project/rcn/211048/factsheet/en>)
- *MONICALC* – Integrated system for monitoring and control of product quality and flexible energy delivery in calcination, builds on the SOLSA project (<https://cordis.europa.eu/project/rcn/199901/factsheet/en>)
- *SUPRIM* – Sustainable management of primary raw materials through a better approach in Life Cycle Sustainability Assessment, builds on the MEASURE and the REPAiR projects

[\(https://www.spire2030.eu/measure;](https://www.spire2030.eu/measure;)
[https://cordis.europa.eu/project/rcn/203259/factsheet/en\)](https://cordis.europa.eu/project/rcn/203259/factsheet/en)

Cases from Climate KIC: the following examples provide a snapshot of the investment secured for clean energy early stage start-ups in the KIC's system.

- *Envelio* (currently in stage 3 in the Frankfurt accelerator programme) enables the energy transition with a cloud-based analytics platform for smart grids. Grid planning and operation processes are automated by Envelio to enable a faster and more cost-efficient integration of renewable generation and electric vehicle charging. The core of Envelio's technology are optimization and machine learning algorithms. The company has raised EUR1 million in its latest funding round. Envelio wants to scale-up the development of additional modules and get first pilot customers into a full roll-out.
- *Volterion* is the world's leading developer and manufacturer of Redox-Flow stacks. It produces the most advanced Redox-Flow battery (RFB) stack in the world and reduces Stack cost by 50% as well as reduces RFB system cost significantly. The technology enabler for Redox-Flow-Batteries has raised about EUR 4 million, providing the breakthrough that enables high performance, low cost Redox-Flow batteries. Volterion team wants to expand production capacity to 2MW stack output. Additionally they want to close a Series-A Funding round of EUR 5M by end of 2018.
- *Tado* is an example of start-up who participated in the Climate KIC accelerator in 2012-13 and is continuing to grow. Tado is an intelligent climate control for private households, small businesses and shops. It detects where the residents currently are and controls the temperature accordingly. It also takes current weather forecasting data and building characteristics into account. It went through this accelerator programme in 2012 and 2013 and recently raised an additional EUR 43.9 million in October 2018, bringing total funding raised to date to EUR 102 million.

EU funded Solutions certified by Bertrand Piccard's World Alliance for Efficient Solutions

<https://solarimpulse.com/network/EUFunded>

- *Stirling Engine* – recovery of exhaust heat.
- *Ecostock* – recovery of waste heat converted to electricity.
- *ELISA* – wind turbine assembly offshore wind turbines.
- *QPinch* – chemical heat transformer.
- *EP –Tender* – extending the range of electric vehicles using a trailer/tender which can be either battery or combustion engine driven.
- *LACTIPS* – biodegradable packaging from waste milk protein.
- *REGMAX* – recovery of waste acid.
- *K-RYOLE* – electric trailer for bicycles.
- *SABCO solutions* – solar lanterns and lighting systems.