Interreg Europe

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Smart Energy Management

A Policy Brief from the Policy Learning Platform for a greener Europe

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GREEN

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Summary

Smart energy management involves the efficient monitoring, controlling, and optimisation of energy systems and infrastructures through information and communication technologies and data-driven strategies. By integrating sensors, analytics, and automation, smart energy management systems collect and analyse real-time data to make informed decisions, optimise energy consumption, reduce waste, and lower costs. As well as working on an individual building or district level, smart energy technologies are core to the creation of the smart grid.

Together, these systems can support the energy transition by facilitating better load balancing and empowering users to make informed choices while ensuring reliable and cost-effective energy supply and use. Policy-makers across Europe have a role to play in the uptake of smart energy technologies, with regulatory frameworks, incentives and standards that encourage the adoption of efficient technologies. Support for research and innovation, as well as demonstration and pilot projects, is essential to bring technologies closer to market.

Policy-makers can also support uptake of technologies by sharing of good practices and providing advisory services targeted at end users, especially private households, and small and medium-sized enterprises (SMEs), as well as providing training and support for the construction and energy industries to learn about installation and maintenance.

The knowledge, solutions and good practices showcased in this policy brief come mainly from Interreg Europe projects.

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Smart Energy Management

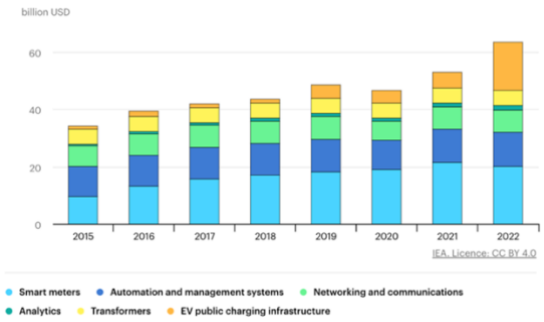
Europe's 2030 Climate and Energy Framework and the 2050 Long-Term Strategy set out ambitious targets for Europe to significantly cut its carbon emissions, becoming climate-neutral by mid-century. This requires a deep transformation to decarbonise our energy system and become more efficient. As well as introducing renewable energy technologies and renovating buildings, energy management has a key role to play as part of full system improvement. This includes using ICT to monitor energy use and enable behaviour change, as well as greater use of automation, and smarter connections between generators and users.

Energy Management refers to, "the proactive, organized and systematic coordination of procurement, conversion, distribution and use of energy to meet … requirements, taking into account environmental and economic objectives".[1] By extension, **Smart Energy Management means the use of advanced Information and Communication Technologies, combined with Data Analytics, to optimise the production, distribution, and consumption of energy, so that the system is more efficient, sustainable, and cost-effective**.

The level of complexity of an energy management system can vary greatly, from simply monitoring energy bills, to installing real-time monitoring equipment and automation technologies. In many cases, simply being aware of energy use with monitoring systems is enough to encourage improved efficiency. This is the most suitable approach for individual households. In others, complex multi-building monitoring and automation with integration of renewables will lead to maximum results, most suitable for companies and large organisations. As well as enabling individual residence, building or business management, public authorities will also be able to benefit from smart technologies, being better able to map and address energy poverty and plan energy and renovation projects.

Indeed, **digitalisation** is recognised by the International Energy Agency as a key enabler of the energy transition, helping to integrate renewables and improve the reliability of grids.[2] Integrating intermittent renewables, where peak generation may not meet peak demand, requires more sophisticated approaches if we are to avoid blackouts and grid overload. While grid-related investments in digital technologies have grown by more than 50% since 2015 to more than 60 billion EUR, there is still much that needs to be done to reach the full potential.[3]

Digital investment in grid technologies, 2015-2022



*Graph source: **International Energy Agency***

Smart Energy Management encompasses several technologies and strategies, which can be applied individually or in combination. The European Commission, in its **Action Plan on Digitalising the Energy System**, identifies the roll-out of smart devices and smart meters, 5G and 6G connectivity, and the creating of a pan-European energy data space and digital twins of the energy system as priority interventions. These would enable us to visualise energy consumption and make changes to improve performance, automatically control energy use, and manage appliances to benefit from the lowest possible energy prices.

Smart energy technologies will also enable the **Smart Grid** – advanced and digitally integrated electricity grids that use ICT to enhance the efficiency, reliability and sustainability of electricity generation, distribution, and consumption, helping to integrate intermittent renewable energy generation.

[1] *VDI Standard 4602 Blatt 1 – Energy Management – Fundamentals (2018)*
[2] *International Energy Agency – Decarbonisation Enablers: Digitalisation*
[3] *International Energy Agency – Decarbonisation Enablers: Digitalisation*

Approaches to Smart Energy

At its most basic, smart energy can involve simply monitoring energy use and adapting to reduce energy consumption. At the more complex end, it can entail full building automation and integration with smart grids. The technologies and approaches to be applied will depend on the size, scale, and use of the buildings, as well as available resources and overall ambition.

The most prevalent smart technology is that of the **smart meter**, which is an advanced digital device used for monitoring the consumption of electricity and/or thermal energy in homes and businesses. Compared to traditional analogue metres, measurements can be taken in real-time and provide more detailed and accurate information, such as usage over a set period, to identify peak use times, and which devices when used add most to energy bills. The smart meter can communicate data directly to the energy provider and network operator who, in the long-run, can use the information to improve generation and transmission. On the billing front, it allows utilities to remotely read consumption so that site visits are not needed, and time-of-use pricing allows users to see their energy costs in real-time, which can spur behaviour change and avoid bill shocks. Indeed, many smart meters also allow users to set a daily or weekly budget, highlighting when these limits are exceeded, to help in household financial management.

GOOD PRACTICE 1: Smart Energy GB

Smart Energy GB is a not-for-profit company that supports the roll-out of smart meters in Great Britain (United Kingdom, excluding Northern Ireland). The company runs awareness raising campaigns and provides information to homes and small businesses. Its website provides information on smart meters, where to get one, the installation process, and how to read them, as well as providing energy saving tips. The website has been promoted via a widespread advertising campaign, including television and radio advertising. The company also funds smart meter projects and awareness raising events via its 'Smart Energy GB in Communities' programme, run with the fuel poverty charity National Energy Action, to bring information to those on low incomes and without internet access.

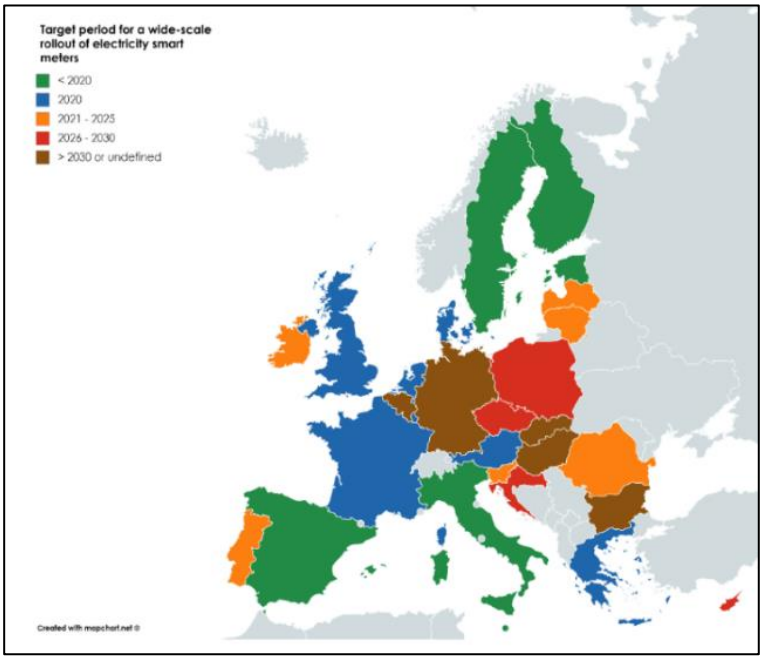
Interesting features: While the scale and ambition of Smart Energy GB may be difficult to replicate at regional or local level, there are many aspects that can provide inspiration. These include providing a single information point, establishing partnerships with energy companies and other organisations, and targeting efforts towards those most in need.

Click here to find out more about this practice.

Many European countries are making efforts to roll-out smart meters (see Good Practice 1). A 2022 study showed that 56% of EU+UK households already have a smart meter installed, but that performance varies widely across countries. Leading countries include Spain, Sweden, Finland, and Estonia which have already reached a 100% installation rate.[4]

Italy, Spain and France have introduced legislation to make smart meters mandatory, though 100% installation is some way off. Meanwhile, Germany only adopted its roll-out law in 2023, Ireland in 2021, and the Czech Republic Greece, Croatia and Cyprus have barely started. The map shows the target dates for when countries should achieve 'widespread' rollout – defined as 80% of all consumers having a smart meter, showing significant differences across the Continent.[5]

[4] *Tripica - Smart meter deployment in the EU: which countries are leading and which are trailing?*
[5] *European Commission – Benchmarking smart metering deployment in the EU-28 (2020)*



*Graph source: **European Commission***

While smart metres are suitable for households and some small businesses, most companies and larger organisations will benefit from a more elaborate management system. For this, **Energy Management Systems** are needed, defined by the European Commission, in the Energy Efficiency Directive, as "a set of interrelated or interacting elements of a strategy which sets an energy efficiency objective and a plan to achieve that objective, including the monitoring of actual energy consumption, actions taken to increase energy efficiency and the measurement of progress." The definition is also maintained in international standard EN ISO 50001 (Energy Management Systems), which specifies the requirements for an EMS.

An EMS is comprised of several mandatory components, following the Plan-Do-Check-Act (PDCA) management method:

- **Plan**: Allocate responsibility for the energy management system, with an energy officer and energy team. Generate an energy policy as a written statement with a policy goal and perform an energy audit to identify areas for intervention, resulting in an action plan.
- **Do**: Under the supervision of the energy team, train employees and implement the foreseen actions. Resources and responsibilities are to be clearly allocated.
- **Check**: Internal audit and control must ensure the EMS is working; monitor implementation and impact to find weaknesses.
- **Act:** Based on the internal audit, evaluate performance, and make corrective or preventative actions as required. [6]

Smart energy management technologies can help in monitoring performance and automating certain actions, feeding into all stages of the process. ISO-50001 can be applied by many different organisation types, not only businesses, but also the public sector (see Good Practice 2). Companies can also go further with an **Eco-Management and Audit Scheme** (EMAS), which also takes account of material consumption and environmental footprint.

[6] *C4S Project – Energy Management System Guidebook for Local Authorities (2019)*

GOOD PRACTICE 2: ISO-50001 Energy Management System

In 2015, Donegal County Council designed and implemented an EMS which could achieve ISO-50001 accreditation. The Senior Management adopted an Energy Policy and an energy review was carried out to demonstrate where energy was used in the organisation, finding that street lighting, road transport, and public buildings were significant users. Performance indicators were developed to allow for monitoring and performance tracking, resulting in an action plan for energy reduction projects. The County Council was able to reduce energy consumption by 10% without physical interventions and just by behaviour change and awareness. The Council hired a consultant to assist in developing the system, but otherwise resources were already in the council, with an energy team comprised of people that were in positions to impact energy use.

Interesting features: ISO-50001 is most frequently applied to private companies – applying it to a public authority and its various energy uses is a novel and interesting approach. The limited resource requirements and high impacts show it to be a practice worth replicating.

Click here to find out more about this practice.

Depending on the complexity of an energy management system, **Energy Management Software** may be used. This refers to software for improving energy performance by monitoring, and in some cases automating, energy performance. Such software can track consumption and bills, provide real time metering, or control temperature and lighting. Its application is more suitable for public buildings, buildings of multiple occupancy, industrial buildings, and communities, rather than single family or single-occupancy buildings (see Good Practice 3).

GOOD PRACTICE 3: Energy Management Information System

An Energy Management Information System monitors, analyses and controls energy use in buildings, or sets of buildings This example from the Croatian Ministry of Construction and Spatial Planning provides a transparent overview of energy and water consumption in all public sector buildings. The data contained is used for energy performance calculations, enabling easier understanding of how and when energy and water are consumed, identifying excessive consumption, and enabling a comparison between buildings. A dedicated energy manager in each public building is responsible for submitting data to the centralised platform for assessment, after receiving training on how to do so. The results inform local sustainable energy plans, including the development of renovation projects. It also enables monitoring after these renovations to be able to quantify the improvements.

Interesting features: The creation of a centralised, national platform for monitoring all public sector buildings is a large-scale initiative that can be more cost-efficient than individually managed systems. Public authorities own a lot of properties with significant potential for cost savings.

Click here to find out more about this practice.

While the above approaches are all widely used, greater focus is now being given to **demand response,** which aims to balance supply and demand, enhance grid reliability, and promote energy savings. It requires data to be delivered on energy consumption (for example, via smart meters), that can enable long-term demand forecasting to determine consumption behaviours. With this data, utilities can offer incentives to shift consumption to off peak hours, with lower energy prices. While on/off-peak tariffs have long been used, new approaches involve buildings using automated control systems, where smart appliances and equipment can be programmed to run at specific times. This could include heating, air conditioning, and household appliances such as dishwashers and washing machines, with the aim of reducing peak load, and shifting into off-peak hours whenever possible. Dynamic pricing schemes are essential part of that that effort. Commercial and residential energy storage systems will also need to be scaled up significantly to enable charging at off-peak times and use at peak times, as well as the possibility to sell into the grid.

This approach of peak shifting will become ever more important with the uptake of electric vehicles. Owners will need to be encouraged to charge at off-peak times, but systems can also be implemented whereby electric vehicles can sell demand response services to the grid, or otherwise temporarily reduce charging rates. This **Vehicle-to-Grid** (V2G) approach could be a way for flattening out demand and supply challenges, but the technology still needs further development, particularly to avoid degradation of batteries from a high number of charge cycles.

GOOD PRACTICE 4: FlexPower Amsterdam

The FlexPower pilot aimed to prove the technical feasibility of implementing large-scale smart charging for electric vehicles. In particular, it sought to measure the real-world impact of smart charging on the grid, how this is perceived by users, and the link with local sustainable energy generation. The project developed an energy steering mechanism, allowing an increase or decrease in energy provided to the charging stations based on the availability of locally generated renewable energy. Two hundred charging stations were used in the pilot, with electricity limited at peak times, to show that the charging contribution to the grid can be reduced with limited impact on users. An additional 700 charging points were added to the pilot in the second stage, with a more dynamic approach based on forecast demand and sustainable energy availability. The pilot was funded under the Interreg North Sea Region **SEEV4-City** project.

Interesting features: This practice demonstrates the importance of pilot and demonstration projects, which can be supported with European funding, for testing new technologies in a real environment. These can act as a starting point for wider roll-out, building up local acceptance and skills.

Click here to find out more about this practice.

All these different technologies form a part of the transition to **smart electricity grids**. These are electricity networks that use ICT to balance supply and demand in real-time. Smart technologies communicate directly with energy companies and can react to price changes and peak demand, while also enabling utilities to better optimise generation. Their role is to co-ordinate generators, grid operators, end-users and other market stakeholders to work as efficiently as possible and make the entire grid can be more resilient in the long-run. This requires a combination of smart metering, demand side support though smart meters, V2G, battery storage and integration of decentralised renewables.

> *Smart electricity grid means an electricity network, including on islands that are not interconnected or not sufficiently connected to the trans-European energy networks, that enables cost-efficient integration and active control of the behaviour and actions of all users connected to it, including generators, consumers and prosumers, in order to ensure an economically efficient and sustainable power system with low losses and a high level of integration of renewable sources, of security of supply and of safety, and in which the grid operator can digitally monitor the actions of the users connected to it, and information and communication technologies for communicating with related grid operators, generators, energy storage facilities, and consumers or prosumers, with a view to transmitting and distributing electricity in a sustainable, cost-efficient and secure way.*
>
> ***TEN-E Regulation***

The transition to smart grids will need significant investment in advanced electricity networks. Much more has been done for the transmission grid (long-distance, higher voltage transmission from power station to substation) than the distribution grid (lower voltage, shorter distance distribution from substation to users), meaning significant limitations in the roll-out of the most advanced energy management systems, which require two-way communication. Investment is also required in large-scale interconnectors and cross-border projects to enable trading of excess power.

European framework and support

The **2030 Climate and Energy Framework**, and the **2050 Long-Term Strategy** provide a basis of the European energy framework, aiming to achieve obligations under the Paris Agreement to keep global warming below 2°C. To this end, Europe looks to cut carbon emissions by 55% by 2030 and achieve carbon neutrality by 2050.

Within this Framework sit several regulations and directives targeting specific sectors and technologies, several of which have been updated in recent years to reflect heightened ambitions under the Fit for 55 Package. These include the Energy Performance of Buildings Directive, the Energy Efficiency Directive, the Renewable Energy Directive, and the Trans-European Energy Infrastructure (TEN-E) Regulation, each of which contains provisions for integration smart technologies into the energy system.

The European Commission **proposed a revision** of the **Energy Performance of Buildings Directive** in 2021, which at the time of writing is under negotiation between the European Institutions and should come into force in 2024.[7] The revision is expected to advance the **Smart Readiness Indicator**, introduced in the last version of the EPBD. This indicator rates a building's 'smartness' – that is, its ability to sense, communicate and respond to changing conditions in the operation of technical systems, the external environment, energy grids, and demands from building occupants.[8] So far the SRI has only been tested on a limited number of buildings in eight EU countries.[9] Building on these experiences, the new EPBD will likely push for the Commission to bring in an implementing act by 2025.

The revised **Energy Efficiency Directive** (in force from September 2023) enables Member States to implement obligation schemes for TSO/DSOs (transmission system operator / distribution system operator), energy distributors and energy retailers, to make efficiency savings amongst end users, including requiring them to work with authorities to reduce energy poverty, including schemes to encourage replacement of appliances (Article 9). It also requires Member States to ensure that enterprises improve their energy efficiency through EMS and energy audits (Article 11). Specifically, they must ensure that enterprises with consumption of more than 10TJ in the past three years must implement an energy audit by October 2026, while those with annual consumption of more than 85TJ in the same period must implement an energy management system by October 2027.

The **TEN-E Regulation** (2022) sets out to connect the energy infrastructure of EU countries, targeting eleven priority corridors and three priority thematic areas, including deployment of smart electricity grids (Annex I).[10] It enables 'Projects of Common Interest', which are infrastructure projects to link the energy systems of EU countries, which can benefit from accelerated permitting, and funding under the **Connecting Europe Facility**.

The revised **Renewable Energy Directive** (in force from November 2023) requires Member States to amend their national regulations and building codes and support schemes to increase the use of renewable energy and support self-consumption and the installation of smart and bi-directional recharging technology for electric vehicles (Article 15a), as well as to provide incentives for smart grid upgrades (Article 20a).

Finally, the **Internal Electricity Market Directive** (updated 2022) sets EU rules for smart metering, requiring Member States to recommend that energy companies provide energy management services and smart metering systems to their customers (Article 19). It also sets out minimum functional and technical requirements for smart meters (Article 20) and states that in Member States where smart metres are not mandatory, they should still be available to consumers on request (Article 21). The Directive also sets requirements for data protection, interoperability requirements, and procedures to access data (Articles 23-24), and requires Member States to set up a single contact point to provide information on smart meters, as well as information on their rights and data security (Article 25).

[7] *The European Parliament's First Reading position is available here*
[8] *European Commission – Smart readiness indicator*
[9] *European Commission – SRI test phases*
[10] *European Commission – Trans-European Networks for Energy*

Strategies and Action Plans

In July 2020, the European Commission published its **EU Strategy for Energy System Integration** for linking energy carriers (electricity, heat, cold, gas, solid and liquid fuels) with each other, and with end-users, with the aim of optimising the entire system. This includes creating a more flexible, decentralised, and digital energy system that empowers citizens in their energy choices. The Commission expects therefore to implement further actions to better inform consumers about their options to interact with the energy market and support digital energy services including smart meters and smart chargers for e-vehicles.

One of the key actions foreseen in the Strategy was the launch of an **EU Action Plan for Digitalising the Energy System**, which was released in October 2022. This includes establishing requirements to enable data access for demand response and support the adoption of smart appliances. It also foresees investment of more than 580 billion EUR in the electricity grid by 2030, of which 400 billion EUR is for the distribution grid, and 170 billion EUR is for digitalisation. The Action Plan also planned for the creation of a Common European Energy Data Space through the Enershare project.

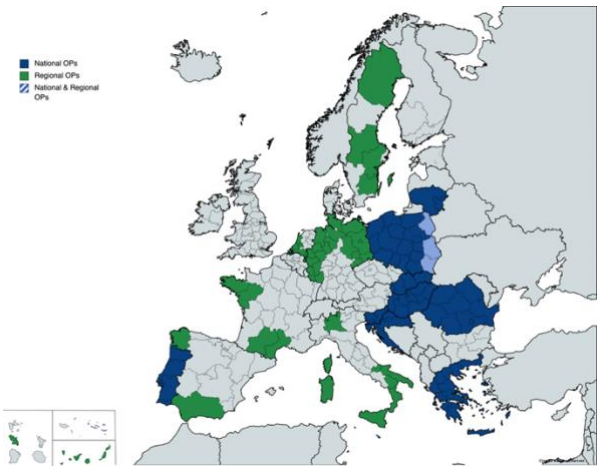
Efforts to install smart technologies are also core to the **Renovation Wave** initiative, launched in October 2020. It looks to support integrated renovation interventions for smart buildings, including Building Renovation Passports, and the aforementioned Smart Readiness Indicator.

European Funding

The main instruments for implementing European policy at the regional and local level remain the **European Structural and Investment Funds** (ESIFs). For the energy sector, these are mainly the European Regional Development Fund and the Cohesion Fund. These can be used to grants and financial instruments under Policy Objective 2, 'a greener, low-carbon Europe', specifically the priority, 'developing smart energy systems, grids and storage outside the Trans-European Energy Network (TEN-E)'.[11] Specifically, this targets outputs of 'digital energy management systems for smart energy systems', with REGIO Common Result Indicator (RCRs) of 'users connected to smart energy systems' and 'roll-out of projects for smart energy systems.'

Information from the **Cohesion Open Data Platform** shows that (as of December 2023) 49 **Operational Programmes** (OPs) from 16 different Member States contain provisions for Smart Energy Systems. On top of this, four Interreg VI-A/VI-B programmes also cover smart energy systems, namely Interreg VI-A programmes Belgium-Netherlands (Vlaanderen-Nederland), Germany-Denmark and France-Germany-Switzerland (Upper Rhine), and the Interreg VI-B North Sea programme.

Operational Programmes including Smart Energy Systems[12]



The indicators used in these OPs give an indication of funding priorities across regions, with a high number of Operational Programmes focusing investment on digital management systems, projects for smart energy systems, solutions for electricity storage, and support targeted towards enterprises, especially SMEs. The indicators also reveal an intention to fund pilot projects, develop financial instruments, and leverage private investments.

[11] *Common Provisions Regulation (EU) 2021/1060, ERDF & CF Regulation (EU) 2021/1058*
[12] *Made with MapChart from Cohesion Open Data Platform dataset 2021-2027 Achievements*

Smart Energy System Indicators in 2021-2027 Operational Programmes[13]

Indicator	Indicator Unit	Number of OPs
Digital management systems for smart energy systems	No. of system components	40
Roll-out of projects for smart energy systems	No. of projects	35
Solutions for electricity storage	MWh	35
Users connected to smart energy systems	End users/year	31
Enterprises supported (of which: micro, small, medium, large)	No. of enterprises	24
Enterprises supported by grants	No. of enterprises	18
Estimated greenhouse emissions	Tonnes CO2 eq./year	10
Private investments matching public support (of which: grants, financial instruments)	Euro	10
Small and medium-sized enterprises (SMEs) introducing product or process innovation	No. of enterprises	8
Enterprises with non-financial support	No. of enterprises	7
Gas transmission and distribution network lines newly constructed or improved	KM	5
Additional production capacity for renewable energy (of which: electricity, thermal)	MW	4
Jobs created in supported entities	Annual FTEs	4
Pilot actions developed jointly and implemented in projects	Pilot action	3
Population covered by projects in the framework of strategies for integrated territorial development	No. of persons	3
Solutions taken up or up-scaled by organisations	No. of solutions	3
Strategies for integrated territorial development supported	Contributions to strategies	3
Community-led local development strategies supported	No. of strategies	2
Enterprises supported by financial instruments	No. of enterprises	2
Joint strategies and action plans taken up by organisations	No. of joint strategies/action plans	2
Jointly developed solutions	No. of solutions	2
Organisations cooperating across borders	No. of organisations	2
Participations in joint actions across borders	No. of participations	2
SMEs innovating in-house	No. of enterprises	2
SMEs introducing marketing or organisational innovation	No. of enterprises	2
Strategies and action plans jointly developed	No. of strategies/action plans	2
Organisations cooperating across borders after project completion	No. of organisations	1
Participations in joint actions across borders after project completion	No. of participations	1
Patent applications submitted	No. of patent applications	1
Public events across borders jointly organised	No. of events	1
Total renewable energy produced (of which: electricity, thermal)	MWh/year	1

[13] *Created from Cohesion Open Data Platform dataset 2021-2027 Achievements*

Operational Programmes are one of the main policy instruments targeted through the **Interreg Europe** programme, under which regions can participate in projects to exchange experience and good practices and improve their own policy frameworks, as in the MonitorEE project.

Project focus: MonitorEE

The MonitorEE ('Improving energy efficiency through smarter management systems') project is a partnership of six regions in Croatia, Finland, France, Poland, Romania and Spain, looking to improve policies for reducing energy consumption of buildings. The project looks to monitor the impact of energy investments to demonstrate their real impact in buildings, with the aim of enabling their replication and optimised leveraging of public funds. The project was inspired by Ireland's **Public Sector Monitoring & Reporting Programme**, identified in the **EMPOWER project**, which tracked energy consumption in the public sector. The project will analyse each partner region, identify additional good practices and enable experience exchange, and prepare for transfer of the monitoring system. MonitorEE runs from March 2023 to May 2027.

Click here to visit the MonitorEE website.

While ESIF funding focuses on technology uptake, interventions for further-from-market (lower Technology Readiness Level) technologies can be funded under other programmes, such as **Horizon Europe** and the **LIFE Clean Energy Transition** programme. Horizon Europe funds research and innovation in smart energy, with topics under Cluster 5, 'Climate, energy and mobility', Call 'efficient, sustainable and inclusive energy use'.[14] The LIFE sub-programme has one billion EUR available over 2021-2027 to facilitate the transition towards an energy-efficient and renewable energy-based economy by funding co-ordination and support actions, including for technology roll-out, digitalisation, and creating new policy frameworks.[15]

REPowerEU was launched in response to the Ukraine war, with Member States integrating a dedicated chapter into their **Recovery and Resilience Plans**.[16] As well as the funds remaining under the RRF – 225 billion EUR at launch of REPowerEU – Member States could also transfer up to 12.5% of their Cohesion funds to the RRF. Certain countries are using the RRF to advance smart energy management, such as Cyprus and Croatia, which will use the funds for smart metre roll-out, and Italy and Spain, which will invest in smart electricity grids.[17]

Initiatives and platforms

The European Union has funded initiatives to support research and development of smart energy technologies, to enable stakeholders to collaborate, and to inform European decision making

- The **BRIDGE Initiative** brings together smart grid, energy storage, islands, and digitalisation projects funded under Horizon 2020 and Horizon Europe to foster knowledge sharing and deliver conclusions and recommendations. Bridge has four working groups: data management, business models, regulations, and consumers & citizen engagement.
- The **European Technology & Innovation Platform on Smart Networks for Energy Transition** (ETIP SNET), created under the Integrated Roadmap Strategic Energy Technology Plan (SET Plan), helps to guide research, development and innovation to support the energy transition.
- The **European Interconnection Platform for Research Innovation & Entrepreneurship** (EIRIE Smart Grids), funded under Horizon 2020, brings together research and innovation stakeholders working on smart grids, storage and local energy systems.

[14] *Horizon Europe, Cluster 5: Climate, Energy and Mobility*
[15] *LIFE Clean Energy Transition Sub-programme*
[16] *Guidance on Recovery and Resilience Plans in the context of REPowerEU*
[17] *European Commission – Recovery and Resilience Scoreboard: Thematic Analysis on Clean Power (2021)*

- The Smart Grids Task Force was established by European Commission DG Energy in 2019 to advise on policy and regulation in the area of Smart Grids. In line with the Energy Digitalisation Action Plan, the group will be renamed the **Smart Energy Expert Group** to guide the Commission on the sustainable digital transformation of the energy system and the development and deployment of smart energy solutions.

The role of regions and local authorities

Regional and local authorities can support the roll-out of smart technologies in several ways, as demonstrated by good practices identified in Interreg Europe projects. This can involve different policy instrument types, from incentives for uptake, investment in research and development, demonstration and pilot projects, advisory services, training and education.

Firstly, regional authorities can establish **long-term strategies and goals** in their territories, or integrated smart energy into existing strategies, giving a long-term perspective that illustrates the contribution of technologies to the wider regional vision, and showing linkages between different sectors. It should take account of key stakeholders to be engaged, government departments to be co-ordinated, regional strengths and weaknesses, priority areas of intervention, available resources and identification of necessary policy interventions.

As demonstrated, a significant number of regions in Europe are using structural and investment funds (ESIFs) for providing **financial support** to consumers, with a particular focus on enterprises, which will also help to achieve the requirements of the energy efficiency directive for improving performance in the private sector. Funding should be targeted towards private households, especially those at risk of energy poverty, and SMEs for maximum impact, as both are most likely to miss the financial resources required for investment. For households, a first step should be the installation of smart meters, while for SMEs investment should be for energy management systems. Incentives can also be provided for new, innovative projects.

GOOD PRACTICE 5: Smart Synergy Project

The Smart Synergy Project was launched in the Dél-Alföld Region of Hungary, to gain experience on rolling out and operating smart metering and smart grids. The specific objectives of the project were to examine consumer attitudes and modify behaviour, demonstrate technical possibilities and conditions for smart grids, test appropriateness of smart metering, contribute to appropriate business models, and test compliance with data protection and data security. Around 3,000 smart meters were installed in the region, delivering more than 12,000 test measurements. The project demonstrated high acceptance of the smart meters with most respondents willing to modify their behaviour to make energy savings. However, it also showed that the elderly and people with lower educational attainment were more resistant in their use, which may give incentive to more targeted future interventions.

Interesting features: As well as checking technical feasibility, the project specifically explored social aspects. Determining consumer reaction to new technologies can indicate sectors of society where specific efforts are required.

Click here to find out more about this practice.

Given the novelty of many smart energy technologies, which are not at full market readiness, **pilot and demonstration projects** are a crucial stepping stone towards widespread adoption. They can provide real-world examples of technologies and show their impact on existing systems, showcasing feasibility, functionality and socio-economic benefits of innovative solutions, and highlighting where further improvements may be needed. In the mid-term, demonstrations also help to de-risk technologies by providing data on real performance as well as lessons for roll-out at a wider scale, and by building confidence amongst policy-makers, investors, and citizens.

GOOD PRACTICE 6: Smart Grid Incentive Programme

The Andalusian Energy Strategy 2020 included a pillar on smart grids, including incentives for the development of new projects, targeted at citizens, self-employed individuals, companies and public entities. The incentives were funded using the European Structural and Investment Funds, covering up to 60% of costs, or 80% for small municipalities. Projects could carry out studies on energy demands, implementation of ICT tools for demand management, equipment purchase and installation of network infrastructure in rural areas, amongst others. The programme was managed by the Andalusian Energy Agency, with easy submission of applications via web. By the end of the programme almost 200 projects had been funded, with investment of over 28 million EUR.

Interesting features: This practice made use of ESIF funding to support new projects in smart grid development. The programme had high flexibility, allowing different types of projects to be supported, also featuring simplified online submission.

Click here to find out more about this practice.

Households and businesses can struggle to adopt new technologies, not only because of a lack of financial resources, but also because of a lack of awareness of technologies and capacity to decide on what technologies to install, and how to operate them. **Advisory services**, including one-stop-shops, can help consumers to identify the most cost-effective interventions, and even match consumers with available financial support. (For more on one-stop-shops, see our **policy brief**). **Awareness raising** campaigns are also beneficial for uptake of new technologies, explaining benefits to consumers (See Good Practice 1).

As with many new energy technologies, efforts need to also be made for **developing new skills** and abilities in the sector. Regional authorities can kick-start this by collaborating with training and educational institutes to develop vocational skills required for installation, monitoring and maintenance of new technologies. This will be essential for widespread implementation of smart energy solutions, including installation on management systems.

GOOD PRACTICE 7: LVISKA Vocational Training for Building Automation

LVISKA, established by the North Karelia Municipal Education and Training Consortium, provides a learning environment for individuals working in technical building services to discover building automation technologies. While there are many smart technologies now available that can be integrated into buildings, the challenge remains to make technicians and decision-makers aware of their availability, as well as their performance and cost effectiveness. The learning environment opened in 2021 to provide multidisciplinary training and promote low-carbon building solutions. The modern building includes renewable energy technologies and data is transferred in real-time to a cloud-based control room and a single user interface. The environment can be used to simulate the effects of different devices. Electricity and heat are produced with solar panels, solar collectors and a wind generator, and can also be stored via battery, while both heat and cold are stored in their own accumulators. The lab was supported by the European Regional Development Fund and European Social Fund, which covered 70% of the total costs. Hundreds of students have already received training in the learning environment.

Interesting features: This practice targeted a skills gasp to set the ground for long-term regional transformation. Partnering with an existing training partner is a good practice, and the use of ERDF and ESF funding could be replicated in many different Operational Programmes across Europe.

Click here to find out more about this practice.

Policy recommendations

Digitalisation, ICT, and smart technologies will be major enablers of decarbonisation, able to optimise supply and demand as well as removing or limiting human errors. Significant investment is needed to make that transition. While some technologies are market ready, others require more investment to bring them closer to deployment. Investment in technologies should be accompanied by the design of long-term strategies embedding the development of new skills, the creation of advisory services, the support to pilot demonstration projects. Some key learnings deriving from the analysis made in this brief are summarised here below:

- **Monitoring energy use** and providing real-time data will be transformative across all sectors, starting from individual buildings to, eventually, entire grid transmission and distribution systems, helping to balance loads and integrate renewables.

- A starting point is to ensure the roll-out of **smart meters for individual households**. Many countries are already making good progress but there is more to do. Even countries that do not make their use mandatory will need to make provision for households and consumers to access them on demand. Good practices such as **Smart Energy GB** can provide a model on informing citizens and businesses, by working with companies, utilities and charities.

- Regions will also need to focus on **supporting businesses to implement Energy Management Systems**, including smart technologies, which will become mandatory for many under the Energy Efficiency Directive. SME advisory services should be getting ready for this transition – see our policy brief **Championing Sustainable Energy in SMEs** for more in this area;

- The newly updated energy framework will also introduce a number of new smart energy requirements including roll-out of bi-directional charging and smart technologies under the RED, grid upgrades under TEN-E, and the Smart Readiness Indicator under EPBD.

- Smart energy management can be achieved in single buildings or in multi-building complexes, but ultimately, this will all be linked to smart grid expansion. This long-term trajectory needs to be included in **planning documents, with investments now for demonstration projects and skill development**.

- Only a few countries and regions have included provisions for smart energy in their ESIF Operational Programmes. Modifications can be made to introd**uce new funding lines, which can enable new financial instruments or pilot projects**. Funding is also available for research, innovation and pilot projects under Horizon Europe and LIFE, as well as for technology roll out under REPowerEU, which can be used for smart metre and smart grid roll-out, as in Cyprus, Croatia, Italy and Spain.

- **There is much that local and regional policy-makers can do in supporting households and businesses to adopt smart metres and energy management systems** with integrated ICT, including citizen focused pilots (as in Hungary, Good Practice 5), innovative demonstration projects (as in Spain, Good Practice 6), and training and skills development (as in Finland, Good Practice 7).

- Lots of **advice and guidance is available at the European level**, including from the BRIDGE Initiative, ETIP SNET and EIRIE Smart Grids. Support and guidance can also be enabled by the Interreg Europe Policy Learning Platform, through bespoke peer-learning opportunities.

Sources and further information

Our experts provide a tailored set of resources, contacts, or in-depth analyses to help you find the answers you are looking for. Explore our services that can help you solve your regional policy challenges.

Interreg Europe Policy Learning Platform information

- **One-Stop-Shops for Energy Efficiency in Private Households**
- **Funding Energy Efficiency through Financial Instruments**
- **Championing Sustainable Energy in SMEs**
- **Behaviour Change for Energy Efficiency**
- **Tackling Energy Poverty with Low-Carbon Interventions**

European Union publications

- European Commission – **Action Plan on Digitalising the Energy System** (2022)
- European Commission, DG Energy – **Benchmarking smart metering deployment in the EU-28** (2019)
- European Commission – **Cohesion Open Data Platform**
- European Commission – **EU Strategy for Energy System Integration**
- European Commission – **EU Initiatives for Smart Energy Systems**
- European Commission - **Guidance on Recovery and Resilience Plans in the context of REPowerEU** (2023)
- European Commission – **Recovery and Resilience Scoreboard: Thematic Analysis on Clean Power** (2021)
- Directive (EU) 2019/944 on the **Internal Electricity Market**
- Directive (EU) 2023/1791 on **Energy Efficiency**
- Directive (EU) 2023/2413 on **Renewable Energy**
- Regulation (EU) 2021/1058 on the **ERDF & Cohesion Fund**
- Regulation (EU) 2021/1060 on **Common ESIF Provisions**
- Regulation (EU) 2022/869 on **guidelines for trans-European energy infrastructure**
- **EMAS presentation for public authorities - a premium environmental management tool for organisations**

Other publications

- ACER – **Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2017 – Consumer Empowerment Volume** (2018)
- C4S Project – Energy Management System Guidebook for Local Authorities (2019)
- Kessels, et. al. – **Fostering residential demand response through dynamic pricing schemes: a behavioural review of smart grid pilots in Europe** (2016)
- International Energy Agency – **Decarbonisation Enablers: Demand Response**
- International Energy Agency – **Decarbonisation Enablers: Digitalisation**
- VDI Standard 4602 Blatt 1 – Energy Management – Fundamentals (2018)

Interreg Europe Programme

Interreg Europe is an interregional cooperation programme co-financed by the European Union. With a budget of 379 million euros for 2021-2027, Interreg Europe helps local, regional and national governments across Europe to develop and deliver better policies through interregional cooperation projects and its Policy Learning Platform services. The programme promotes good practice sharing and policy learning among European regions in 29 countries – the EU27, Norway and Switzerland. Interreg Europe contributes to the EU cohesion policy together with the other European Territorial Cooperation programmes known as Interreg.

Interreg Europe Policy Learning Platform

The Policy Learning Platform is the second action of the Interreg Europe programme. It aims to boost EU-wide policy learning and builds on good practices related to regional development policies.

The Platform is a space where the European policy-making community can tap into the know-how of regional policy experts and peers. It offers information on a variety of topics via thematic publications, online and onsite events, and direct communication with a team of experts.

Interreg Europe Policy Learning Platform expert services

Our team of experts provide a set of services that can help you with regional policy challenges. Get in contact with our experts to discuss the possibilities:

Via the **policy helpdesk**, policymakers may submit their questions to receive a set of resources ranging from inspiring good practices from across Europe, policy briefs, webinar recordings, information about upcoming events, available European support and contacts of relevant people, as well as matchmaking recommendations and peer review opportunities.

A **matchmaking session** is a thematic discussion hosted and moderated by the Policy Learning Platform, designed around the policy needs and questions put forward by the requesting public authority or agency. It brings together peers from other European regions to present their experience and successes, to provide inspiration for overcoming regional challenges.

Peer reviews are the deepest and most intensive of the on-demand services, bringing together peers from a number of regions for a two-day work session, to examine the specific territorial and thematic context of the requesting region, discuss with stakeholders, and devise recommendations.

Discover more: **www.interregeurope.eu/policylearning**

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