SmartSPIN

Smart energy services to solve the **SP**lit **IN**centive problem in the commercial rented sector

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D2.3 – REVIEW ON SES POLICIES

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List of Abbreviations

Abbreviation	Meaning
SMEs	Small and Medium Enterprises
EU	European Union
EED	Energy Efficiency Directive
EU MS	European Union's Member State
NECP	National Energy and Climate Plan
EPBD	Energy Performance of Buildings Directive
RRF	Recovery and Resilience Facility
RRP	Recovery and Resilience Plan
ESCO	Energy Service Companies
GHG	Greenhouse Gas
M&V	Measurement & Verification
KPIs	Key Performance Indicators

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EXECUTIVE SUMMARY

Several initiatives and an updated legislation were lauched by the EU in 2019 to achieve decarbonisation targets in 2030 and carbon neutrality in 2050. The COVID-related Recovery plan for Europe makes available funds to promote a sustainable recovery by means of programs with a specific focus on building renovation[1]. A consumer survey conducted by the EU in all 28 EU Member States revealed that the renovation rates in the three SmartSPIN pilot countries, Ireland, Greece and Spain are respectively 60.7%, 70.8% and 58.4%, whereas the European average is 59.8%2, which testifies the good uptake of building renovation in such countries. In Greece the recovery and resilience plan consists of 106 investment measures and 68 reforms which will be supported through €17.77 billion in grants and €12.73 billion in loans[3]. The objectives of the plan are to facilitate the decarbonisation of the national economy, the digitalisation of the public and private sectors, improvements to the business environment, tax and justice systems, health care systems and labour policies[4].

The objective of this deliverable is to review the policies and regulations existing in each of the SmartSPIN pilot countries represented in the consortium which may either drive or hinder the deployment of smart energy services in rented commercial buildings at European and national level.

At European Level the deliverable examines the applicable elements of the Energy Efficiency Directive and Energy Performance of Building Directive. This is followed by a review of how these directives are translated into national policies in the Member States which are represented in the consortium, to enable an assessment of the impacts that these policies are having on the national energy services markets.

Best practice examples from other countries that are not represented in the consortium are also identified. Policies and regulations considered for the review are related to driving uptake of energy efficient building renovation in rented properties; encouraging uptake of performance-based contracts; expanding the demand response and flexibility markets; smart meter roll out; use of the Smart Readiness Indicator; access to energy data; indoor climate conditions & comfort; health and safety.

[1] https://www.bpie.eu/wp-content/uploads/2022/02/rev6_SPIPA_EU.pdf
[2] https://ec.europa.eu/energy/sites/ener/files/documents/2.annex_to_final_report.pdf
[3] https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/greeces-recovery-and-resilience-plan_en
[4] https://ec.europa.eu/info/system/files/greece-recovery-resilience-factsheet_en.pdf

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1 INTRODUCTION

The EU has set the ambitious target of reducing the energy consumption of 32.5% compared to the expected energy use in 2030 (as predicted in their 2007 model) in its amended Energy Efficiency Directive (EU) 2018/2002 which came into force in December 2018[5]. This energy efficiency target corresponds to 956 Mtoe and/or primary energy consumption of 1,273 Mtoe in the EU-28 in 2030[6].

Article 18 of the EED refers to the Energy services and the support that EU Member States should provide to promote the energy services market and access for SMEs to the Energy services market. The EU MS are required to disseminate clear information about the existing types of contracts and their clauses ensuring that energy services deliver guaranteed energy savings and protect the rights of clients. Furthermore, information about available financial incentives, loans and grants must be made accessible to promote the development of energy efficiency projects. A list of qualified or certified energy service provides should be made publicly available and maintained up to date. The refurbishment of the public sector buildings should be supported by means of templates of energy performance contracts that comply with the requirements of the EED set in its Annex XIII, and by providing information on the best practices for energy performance contracting. Moreover, the life-cycle approach is recommended to conduct a cost-benefit analysis.

EED's article 18 also provides measures to ensure a smooth operation of the energy services market. The contact points where information about the energy services is provided to the final customers must be identified and properly advertised. The EU MS should identify and remove the regulatory and non-regulatory barriers hindering the uptake of energy performance contracting or other energy efficiency service models utilised to identify and/or implement energy saving measures. Mechanisms for ensuring an efficient handling of complaints and for stimulating the market development through intermediaries are also required for a proper functioning of the energy services market. Finally, the MS should watch over energy distributors, distribution system operators and retail energy sales companies to avoid that they rule out or preclude the market to competitors or abuse them through their dominant positions[7].

The deadline which was set for the transposition of the EU EED 2018/2002 into national law by the EU MS was 25 June 2020, except for metering and billing provisions which had as deadline the 25 October 2020. The transposition required the EU MS to establish a 10-years national energy and climate plan (NECP) for 2021-2030 detailing how they contribute towards the 2030 European targets for improving energy efficiency, for increasing the penetration of renewable energy and for the reduction of greenhouse gas emissions[8].

Buildings are expected to play a significant role toward the achievement of the 2030 European target for energy efficiency by reinforcing the long-term renovation strategies in the EU countries and

[5] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en
[6] https://energyindemand.com/2019/02/22/revised-eu-energy-efficiency-directive-now-requires-effective-implementation/
[7] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2002&rid=7
[8] https://www.europarl.europa.eu/factsheets/en/sheet/69/energy-efficiency

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achieving nearly zero-energy buildings. Specific tools facilitating the achievement of energy efficient buildings are energy performance certificates, smart technologies for energy metering and self-regulating and energy efficient equipment. The Energy Performance of Buildings Directive (EPBD) 2010/31/EU (revised in 2018) is relevant with energy efficiency as well as other topics such as e-mobility and air-quality. Renovation of buildings will determine not only a higher energy efficiency but also reduced emissions, an enhanced quality of life for people occupying them, and additional green jobs created in the construction sector. More specifically, three focus areas were identified in the renovation wave at European level: (i) improving the worst-performing buildings and reducing the energy poverty; (ii) the public buildings and social infrastructure; (iii) decarbonisation of heating and cooling systems. However, the current annual renovation rate of European building stock is only 0.2% and should be increased up to at least 3% by 2030 to support the achievement of climate neutrality by 2050[9].

The European Commission established NextGenerationEU in 2020 to provide the Member States with a recovery instrument from the severe effects of the COVID-19 crisis. It makes available €750 billion of aid to boost a sustainable recovery of the EU economy, of which €672.5 billion of loans and grants are made available to Member States through the Recovery and Resilience Facility (RRF). They can apply to RRF funds by submitting their Recovery and Resilience Plans (RRPs) to the European Commission. Nearly all the MS have already submitted their RRPs to the European Commission for evaluation. Significant attention has been paid by the MS to renovation of buildings which accounts for between 5 and 15% of the RRF grants provided to each of them[10].

The EU has defined a package of proposals as part of the European Green Deal aiming at revising and updating the EU legislation to ensure that EU policies are adequate with respect to the climate goals and measures to fight the climate change agreed by the Council and the European Parliament. This package has been named “Fit for 55 package” and includes the following policy and legislative initiatives: (i) an EU emissions trading system; (ii) the emissions reduction targets of the EU MS; (iii) an EU-level target for GHG removal and an EU-level objective of climate neutrality by 2035 accounting for land use change and forestry; (iv) Renewable energy; (v) Energy Efficiency; (vi) an infrastructure for recharging or refuelling vehicles using alternative fuels; (vii) new CO_2 emissions standards and EU-level 2030 reduction targets for cars and vans; (viii) Revised taxation of electricity and energy products; (ix) a mechanism preventing that emissions reductions of the EU are offset increasing emissions outside the EU by relocating production to non-EU countries; (x) advanced biofuels and electro-fuels for aviation; (xi) renewable and low carbon fuels in maritime transport; (xii) a social climate fund addressing the impact of the proposed emissions trading system for buildings and road transport. These initiatives and proposals will provide an integrated and well-balanced framework which will facilitate the achievement of the climate objectives set by the EU[11].

[9] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/long-term-renovation-strategies_en

[10] Policy briefing – National recovery and resilience plans, https://storage.googleapis.com/renonbill-website.appspot.com/image/multimedia/07_10_2021_10_33/06385%20RenOnBill%20policy%20briefing,%20issue%202_21_final.pdf

[11] Fit for 55, https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/

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1.1 BACKGROUND INFORMATION

The basic principle of Energy Performance Contracting used by Energy Service Companies (ESCO) is that the total amount of guaranteed operational cost savings (corresponding to operational energy savings) must be higher than the initial investments in energy efficiency measures, such that they can be repaid before the end of contract.

Methods for M&V and Monitoring and Targeting are validated approaches to measure energy efficiency savings, carbon and cost savings. They are based on regression and time series analysis and use calibration principles from statistical methodologies. These methods implement or extend techniques described by technical standards such as ASHRAE 14:2014, ISO 50006:2014, ISO 16346:2013 and technical guidelines and protocols like EVO and FEMP. These standards and guidelines provide thresholds and statistical KPIs to accept the models as calibrated[12].

Regulatory and market barriers may hinder the uptake of energy-efficient practices and measures in the building sector. These barriers determine an energy efficiency gap, which can be defined as the difference between the energy efficiency potential savings and the actual amount of energy efficiency savings. The possible causes of an energy efficiency gap include high upfront investment costs, obstacles to the access to capital, lack of a positive attitude toward energy efficiency, perceived high risk of investments in energy-efficiency, information gaps, split incentive issue, uncertainty about variations of fuel prices in the future

Split incentives may hinder the deployment of energy efficiency upgrades in leased commercial buildings. They occur when the tenants are responsible for paying energy bills, whereas the landlord or building owner is responsible for the capital investment decisions. Under these circumstances, the landlord is not motivated to implement energy efficiency measures and upgrades to building services because the benefits provided by the energy savings accrue to the tenant only. SmartSPIN is addressing this long-lasting barrier and is going to provide an effective solution for aligning the incentives between involved actors, by means of an effective redistribution of the costs and savings between landlord, tenants of the commercial rented sector and ESCO[13].

1.2 OBJECTIVES OF THE STUDY

The objectives of this study are to analyse the European and national policies (for Ireland, Greece, Spain, The Netherlands) related to energy efficiency and reduction of green-house-gases emissions, which may drive or hinder the uptake of the Smart Energy Services (SES) relevant with the commercial sector considered in SmartSPIN.

The analysis of the policies consists of summarising the policy, to determine its target, objective and outcome, to summarise the key learnings and the barriers associated with the policy, and the relevance of the policy with SmartSPIN. Moreover, the possible support provided to SMEs for energy

[12] Manfren, M., Nastasi, B., Tronchin, L., Groppi, D., & Garcia, D. A. (2021). Techno-economic analysis and energy modelling as a key enablers for smart energy services and technologies in buildings. *Renewable and Sustainable Energy Reviews*, *150*, 111490.
[13] Economidou, M., & Bertoldi, P. (2015). Practices to overcome split incentives in the EU building stock. In *ECEEE summer study proceedings*.

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audits or for implementation of energy efficiency measures by means of dedicated funds are also included in the review.

1.3 METHODOLOGY

This deliverable is based on a thorough desktop research to highlight the factors that may drive or hinder the uptake of smart energy services in Ireland, Spain, Greece and the Netherlands. These countries are represented in the SmartSPIN consortium by their members. Ireland, Spain and Greece are the countries where pilot-sites of SmartSPIN are located and where the demonstration of the SmartSPIN business model addressing the split-incentive issue will take place.

The participants in task 2.3 have defined a research template to gather information relevant with the policies related to the Smart Energy Services considered in SmartSPIN for the demonstration at the pilot-sites. These templates have been used to collect the information listed in section 1.2 for the analysis of policies. In section 4 – ANNEX -1, the filled in templates for the different policies analysed have been included. The information gathered has been used as starting point to write section 2 of this deliverable.

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2 POLICY REVIEW RESULTS

2.1 GREECE

2.1.1 National Energy and Climate Plan

National Energy and Climate Plan (NECP) 2021-2030 of Greece is focused on five main themes – Energy efficiency, decarbonisation, energy security, energy market, and research, innovation & competitiveness. NECP of Greece set objective of carbon emission reduction by at least 16% with respect to 2005 emission level and improve energy efficiency by 38% by 2030. To achieve above said targets, government of Greece has developed very clear regulatory framework and provides financial incentives to promote energy efficiency uptake actions at end user level. The plan of achieving this target is by replacing petroleum energy source with natural gas and increase the use of natural gas for the final energy consumption by at least 50% with respect to 2017 usage.

Greek government has developed a number of policy framework to achieve the energy efficiency and carbon emission reduction target as mentioned in NECP. Law 3899/2005 on Public Private Partnerships enabled private companies to install energy efficient equipment and provide energy efficiency services for the public buildings. Law 3855/2010 (Measures to improve energy efficiency in end use, energy services and other provisions) encourages energy service market by developing supportive policies and defining content, principle and obligations (of service providers and clients) for any EnPC. Article 10 of Law 3855/2010 requires the development of ESCO registry for energy service companies providing EnPC services. Definition of EnPC was introduced in Greece by Law 4342/2015, which transposes EED in Greece. The Ministerial Decision (MD) 13280/2011 on Energy service companies. Function, Registry, Code of Conduct and related provisions was developed with the objective of resolving the problems related to ESCO market development in Greece and maintenance of developed ESCO registry.[14]
Law 4513/2018 defines term 'Energy Communities' in Greece. The aim of developing this law was to ensure energy security and encourage innovation and economic development in Greece. This law defines a list of mandatory and optional energy efficiency measures that energy communities should take to improve overall energy efficiency of the country. One of the innovative of this law is to encourages local authorities to join an energy community within their vicinity, as local authority could be a big help for the enhancement of energy communities in terms of funding and man power.[15]
More details can be found in section 4.2 GREECE

2.2 NETHERLAND

2.2.1 National Policy for Emission Reduction

In Netherland from 2008 to 2019 share of renewable energy have been doubled, however share of fossil fuel in total primary energy supply was reduced by just 2% (90% from 92%). Although Netherland have reported 15% improvement in energy efficiency from 2008 to 2018, but due to presence of energy intensive industries, Netherland is still highly dependent on fossil fuel-based energy and reduction of carbon emission have not been reduced considerably. Due to decreased

[14] https://qualitee.eu/wp-content/uploads/QualitEE_2-04_CountryReport_EL_2018.pdf
[15] https://lead-journal.org/content/c1701.pdf

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production of natural gas, Netherland is highly dependent on importing natural gas to fulfil the demand[16].

Government of Netherland have set an ambitious national greenhouse gas emission reduction target of 49% by 2030 and 95% by 2050 with respect to 19990 emission level. Policies and measures to achieve all these targets have been mentioned in Climate Plan, National Energy and Climate Plan (NECP) and National Climate Agreement[17]. In Climate and Energy Outlook 2020, Netherlands Environmental Assessment Agency (PBL) predicted that at the current rate of emission reduction Netherland will be able to achieve 34% reduction in emission against the target 49% reduction. Also, PBL recommended to double the reduction of carbon emission to 6MT per year for period 2020-2030 as compared to achieved 3MT reduction per year for period 2010-2019[18].

The Climate Act sets out legally binding climate goal for Netherland. Climate act is also comprised of policy frameworks to achieve the set target and provides three policy instruments named a five-yearly Climate Plan, a two-yearly progress report and an annual climate memorandum[19].

National Climate Agreement of Netherland (June 2019) determines a list of actions for higher energy consuming sectors like electricity, the built environment, industry, mobility, and agriculture and natural environment to achieve the above said carbon emission reduction goal[20]. Each sector has been assigned a sector specific indicative energy reduction target to be achieved by 2030. Targets have been assigned in a cost-efficient manner as such to not to financially encumbrance the households.

Stimulation of Sustainable Energy Production (SDE+) is one of the most important support schemes to drive the emission reduction mission by providing subsidies to renewable energy projects for 15 years of operation through competitive auctions. The subsidy value depends on quantity of renewable energy generated. €60billion subsidy was allocated from 2011 to 2020. In year 2020 SDE+ was upgraded to SDE++ (Sustainable Energy Transition Subsidy Scheme) to include more decarbonisation technologies to be eligible for availing subsidies. Also, in June 2020 government announced support measures for development of electric vehicles manufacturing infrastructure and tax incentives to end customers[21]. To further reduce emission government is focusing on generate

[16] https://www.iea.org/reports/the-netherlands-2020
[17] https://www.government.nl/topics/climate-change/climate-policy#:~:text=The%20National%20Climate%20Agreement%2C%20which,traffic%20and%20transport%2C%20and%20agriculture.
[18] https://www.pbl.nl/news/2020/climate-and-energy-outlook-2020-achieving-urgenda-reduction-target-2020-is-uncertain-cabinet-target-for-2030-not-yet
[19] https://www.raadvanstate.nl/climate/#:~:text=The%20Climate%20Act%20came%20into,people%20and%20the%20natural%20environment.
[20] https://www.iea.org/reports/the-netherlands-2020
[21] https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/The_Netherlands_2020_Energy_Policy_Review.pdf

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49TWh of electricity by 2030 through implementing wind energy farms, for which an effective offshore wind policy framework has been established[22].

In year 2021, Netherland introduced carbon tax in the energy bills for industries in order to compensate the carbon emission generated by them.[23] Apart from the carbon tax, industries are also obligated to improve their energy efficiency and lower natural gas usage.

Government is also implementing a new framework to support research and innovation with the aim to drive emission reduction activities across all the sectors. This research and innovation framework is being implemented under Integral Knowledge and innovation Agenda (IKIA) by outlining 13 Multiannual Mission-driven Innovation Programs (MMIP)[24].

The government is also encouraging significant production of low-carbon hydrogen and bioenergy-based gases and usage across all sectors through Hydrogen Strategy and Green Gas Roadmap. Another policy named Natural Gas Free District Programme sets target for 1.5 million homes to change their natural gas heating system to low-carbon gas heating by 2030.

Flexible, interconnected and digitalised energy system has also been identified as essential instruments for achieving the transition of low-carbon economy. Smart meters will play a significant role in achieving this target, as deployment of smart meters will enable the real time energy usage information and will offer improved energy management and energy efficiency.

Dutch National Energy and Climate Plan outlines measures to achieve the 2030 energy efficiency and emission reduction targets. The main focus of this policy is to replace the electricity generated from fossil fuel sources to the renewable sources. From 2030 electricity generation using coal will be banned. This policy also requires all the offices with more than 100m^2 floor area to obtain minimum building energy performance as C, to be eligible to be used as office from 1 January 2023 onwards[25].

More details can be found in section 4.4 NETHERLAND

2.3 IRELAND

In Ireland the Department of Environment, Climate and Communication (DECC) is responsible for the policies that promote energy efficiency in the built environment. We have outlined below some of the initiatives that they have introduced to help promote this. Ireland in terms of energy policy has adopted and legislated for much of what is contained in the Energy Performance of Building Directive (EPBD) and the Energy Efficiency Directive. There can be some delay and EU Directive amendments can take some time to be formally adopted in Ireland. At the time of writing (May 2022) Ireland hopes later this year to have a payment scheme in place for supply of electricity to the grid on site renewable reduction exceeds site demand. The electricity grid is being redeveloped similar

[22] https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/The_Netherlands_2020_Energy_Policy_Review.pdf
[23] https://www.pwc.nl/en/services/tax/webcast-series-state-of-tax/energy-transition.html
[24] https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/The_Netherlands_2020_Energy_Policy_Review.pdf
[25] https://energy.ec.europa.eu/system/files/2020-03/nl_final_necp_main_en_0.pdf

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to other EU countries to allow more grid scale renewables supply national energy needs however the process is slow. Licensed energy providers are the only parties that can sell electricity and therefore peer to peer trading is restricted at this stage and we'd see this as an important policy change to allow greater penetration of renewables. The concept of Smart Readiness Indicator (SRI) although contained in the EPBD has not been transposed into Irish Policy at this stage.

The Department of Environment, Climate and Communication (DECC) established the Energy Efficiency Fund, to provide a source of finance to public and private projects. It was also intended to further develop the market for energy performance contracting and energy service companies.[26] Irish government has set target of upgrading one third of commercial building to have Building Energy Rating of B by 2050[27].

2.3.1 Climate Action Fund (CAF)

DECC also established Climate Action Fund (CAF) to financially support (up to €500m till 2027) the energy efficiency actions with the aim to achieve the energy efficiency target for Ireland. CAF have been further divided in to three different calls based on the area of action. The first call is Community Climate Action Programme, in which €60m out of €500m will be invested in community climate action projects and capacity building actions over next three years. €60m will be invested in two phases (€30m each). In the first phase €24m will be provided to local authorities to support community climate actions (for example EV charging points, cycle parking, repair hubs, community biodiversity garden etc.) and €6m will be invested for community capacity building regarding climate education. €1m already allocated to Creative Ireland to setup Creative Climate Actions[28].

The second call is Creative Climate Action where €2m (launched on 31 March 2021) and will be invested via Creative Ireland to bring climate change through creative and cultural sector till end of 2022. 14 projects out of 166 applications were selected from across the Ireland[29].

The third call is co-financing EU LIFE Programme 2021, where CAF will co-finance the projects which successfully secured funding under EU LIFE Programme 2021 and satisfy the CAF funding criteria.

2.3.2 Excellence in Energy Efficiency Design (EXEED)

DECC is providing grant of €14m (up to €1,000,000 per project) for energy efficient design, construction and commissioning of new or existing processes through SEAI[30]. EXEED is applicable to all projects irrespective of their business sector and size of organisation. The aim to financially support the energy efficiency projects following EXEED certified standards. The project should either

[26] https://publications.jrc.ec.europa.eu/repository/handle/JRC106624
[27] https://ec.europa.eu/energy/sites/default/files/swd_commission_preliminary_analysis_of_member_state_ltrss.pdf
[28] https://www.gov.ie/en/press-release/ea869-minister-ryan-announces-60-million-for-community-climate-action-projects-across-ireland-and-the-launch-of-a-new-national-dialogue-on-climate-action-from-cop26/
[29] https://www.gov.ie/en/press-release/e8e4a-2-million-creative-climate-action-fund-announcement-by-ministers-catherine-martin-and-eamon-ryan/
[30] https://www.seai.ie/news-and-media/2021-exeed/

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reduce energy consumption, energy cost & CO_2 emission or improve competitiveness or improve sustainability. EXEED program provides opportunity to develop new best practices in energy efficient design and its management. EXEED designs, verifies, and manages energy performance processes from the very early stage of the process's lifecycle. EXEED provides three distinct certificates – Exceed Designed, EXEED Verified and EXEED Managed. All these certificates have different requirements and different period of validity. Although it's a very slow and complex process of application and does not cover the EnPC projects but SEAI is working and examining the ways to accommodate ESCO projects as well[31].

2.3.3 Accelerated Capital Allowance (ACA)

Since 2008 Accelerated Capital Allowance encourages investment in energy efficiency product or equipment by providing tax incentive on the purchase value of energy efficient products or equipment. ACA allows businesses to deduct the full cost of purchased equipment or products from their business profit values in the year of purchase, resulting in recued tax liability for the business. There are certain criteria for the equipment purchase to be eligible for tax incentive like product/equipment should be new and be for sole use of the business; should not be leased or rented to any third party and it should meet certain energy-efficient criteria. SEAI has created and is maintaining a searchable Triple E register for the energy efficient equipment. All the equipment/products listed in the Triple E register are eligible to avail ACA tax incentive. The minimum purchase value for all the equipment/product to be eligible for ACA is also mentioned in SEAI website and this value is different for different categories of the product/equipment.

More details can be found in section 4.5 IRELAND

2.4 SPAIN

2.4.1 Electric Smart Metering Program and New Electricity Tariff Structure

As per order ITC/3860/2007[32] of Industry, Energy and Tourism Ministry,all the electric meters of Spain with contract power over 15kW should be replaced by new smart meters with time enabled reading and remote management feature by end of 2018. This order also established that a new revised electricity tariff would be applicable to the new smart meters. This new tariff took into account time-of-use and real-time wholesale market elements for billing purpose. The methodology for deriving these charges were renewed through Royal Decree 148/2021[33]. The objective of smart meter rollout is to improve energy efficiency through demand side management, and encourage export of the electricity to grid, generated by means of micro-generation. Another objective of smart meter installation is to encourage innovation and digitalization in the energy market.

2.4.2 New business model linked to renewables

With the aim to ramp up the energy efficiency market and related economy, on 23 June 2020 Spanish council of minister approved Royal Decree-Law (RDL) 23/2020 and this law supports new business models in the energy sector. These new business model in the energy sector could be related to

[31] https://www.seai.ie/SEAI-EXEED-Grant-Guidelines-2021.pdf
[32] https://www.boe.es/buscar/doc.php?id=BOE-A-2012-2538
[33] https://www.boe.es/buscar/doc.php?id=BOE-A-2021-4239

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storage, hybridisation, aggregation and renewable energy communities.[34] This new law will Spain help towards achieving its decarbonisation targets by promoting new business models in the energy sector by eliminating administrative obstacles and same time implement a new legal framework to stimulate innovation, encourage economic activities and bring healthy competitiveness in the energy sector. The RDL 23/2020 is divided in to four titles. Title II promotes the news business models in the energy sector and title III promotes energy efficiency by allowing flexibility to the national funding scheme for energy efficiency[35].

2.4.3 Photovoltaic energy self-consumption and Energy Communities

Spanish RDL 15/2018 supports incorporation of renewable energy generation and improve energy efficiency by providing financial incentives for energy generation through renewable sources and energy efficient technologies. The aim of this RDL is to speed up the decarbonisation of Spanish economy and achieve its energy efficiency targets[36]. This RDL introduced the consumer's right to consume self-generated electricity without paying any fee/charges to any electricity suppliers. This RDL also introduced concept of shared self-consumption, in the event of both limited and excess generation[37]. A Register of Administration of Self-Consumption has been formulated with the aim to keep track of self-consumption activities and its effect on decarbonisation target.

Following this RDL 244/2019 was published to normalise the administrative, technical and economic conditions of self-consumption of electricity. This RDL simplifies administrative processes of self-generation and self-consumption and abolishes the sun-tax. This new RDL also enables the consumers to create an energy community and join the same generation facility and individually communicate with the distributor regarding metering and billing of self-consumption[38].

Further RDL 732/2019 implements European Directives 2010/31/EU, 2012/27/EU and 2018/844/EU into Spain. RDL 732/2019 modified Technical Building Code (CTE) and incorporated new requirements for buildings to improve their energy efficiency and subsequently thermal comfort and safety of the occupants. This new law requires new buildings to have improved contribution of

[34] https://www.mariscal-abogados.com/promotion-of-new-business-models-in-the-energy-sector-in-spain/
[35] https://cms.law/en/media/local/cms-asl/files/publications/publications/analysis-of-royal-decree-law-23-2020?v=1
[36] https://climate-laws.org/geographies/spain/policies/royal-decree-law-15-2018-on-urgent-measures-for-energy-transition-and-consumer-protection#:~:text=Tax%20incentives-,Royal%20Decree%2Dlaw%2015%2F2018%20on%20urgent%20measures%20for,energy%20transition%20and%20consumer%20protection&text=This%20decree%20law%20aims%20to,economy%20and%20promoting%20energy%20efficiency.
[37] https://www.osborneclarke.com/insights/the-main-novelties-of-the-royal-decree-law-152018-5-october-on-urgent-measures-for-the-energy-transition-and-the-protection-of-consumers
[38] https://www.osborneclarke.com/insights/analysis-key-developments-introduced-new-royal-decree-2442019-5th-april-regulating-administrative-technical-economic-conditions-self-consumption-electrical-energy

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renewable energy sources[39]. All the building projects that need municipal building license as of 28 June 2020, must comply with the new requirements[40].

2.4.4 Regulation for accounting of individual consumption in thermal installations of buildings

Royal Decree 736/2020 transposes article 9 of the EU directive 2012/27/EU in Spain for regulating the accounting of individual consumption in thermal in thermal installations in the buildings[41].

This RDL puts requirements on the operators of central heating & cooling systems in new and existing buildings to install individual meters for each energy consumer, provided that it is technically and economically viable (maximum 4 years[42] of payback period). In buildings where technical difficulties will arise to install the individual meters, a heat cost allocation must be installed[43]. This will allow individual metering and billing for each consumer. The individual metering and billing will allow better monitoring of energy consumption and will ultimately encourage energy efficiency upgrades and carbon emission reduction at individual consumer level.

More details can be found in section 4.3 SPAIN

2.5 EUROPE WIDE

2.5.1 Energy Efficiency Directive

Energy Efficiency Directive (EED) 2012, set binding target to achieve 20% energy efficiency at EU level by 2020, which was revised in 2018 (as part of Clean energy for all European package) to target of achieving 32.5% energy efficiency at EU level by 2030 with respect to 2007. EED also requires all the member state to set a 10-year National Climate and Energy Plan (NECP) drawing their plan to achieve the above said target.[44] The 2018 amendment provides individual rights to each building occupant to receive more detailed and more frequent thermal energy consumption data. EED also requires each MS to set their own national long-term renovation strategies and mandates obtaining energy performance certificates for all the buildings being rented and sold. EED supports deployment of smart meters for electricity and gas across the EU MS with the aim to provide detailed energy consumption insights and encourage behavioural changes for energy efficiency improvements. The amended directive also emphasises the actions to address the energy poverty, and improve consumer's awareness regarding energy efficiency. EED further addresses requirements to identify and address the barriers to split incentive issues between tenants and building owners. The other relevant element of EED is increasing the uptake of energy performance

[39] https://green-ecolog.com/15343514-royal-decree-7322019-modification-of-the-technical-building-code
[40] http://www.sistemamasa.com/en/noticias/detalle/222/the-technical-building-code-and-ventilated-facades
[41] https://www.ga-p.com/wp-content/uploads/2020/10/Actualidad-Normativa_n.o-33_eng.pdf
[42] https://www.nedgia.es/colaboradores/en/approval-of-obligatory-individual-consumption-metering-in-community-installations/
[43] https://www.nedgia.es/colaboradores/en/approval-of-obligatory-individual-consumption-metering-in-community-installations/

[44] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en#content-heading-0

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contracting by putting requirement for large non-residential buildings to carry out feasibility assessment through energy performance contracts before starting the renovations.

2.5.2 Energy Performance of Building Directive

Energy Performance of Building Directive is the key political instrument to achieve the 2030 and 2050 energy efficiency and decarbonisation targets. The aim of EPBD is to achieve the building renovation target mentioned in European Green Deal and have modernised energy efficient buildings by 2050. EPBD sets out a number of policies and support measures at EU and national level for improving the energy performance of existing buildings. It requires EU MS to set up their national long-term renovation strategies with the focus to achieve the decarbonised building stock by 2050. EPBD also requires EU MS to set up minimum energy performance requirements for all new buildings and building being renovated. EPDB pronounces that all the new buildings from 2021 (new public buildings from 2019) must be nearly zero-energy buildings and all the buildings being sold or rented, must have building energy performance certificate. EPBD also requires the installation of building automation and control systems for room temperature regulation.

EPBD was first published in 2002, to make clarifications it was a recast was published in 2010 and was revised in 2018 to introduce new features in the directive to strengthen EU's commitment towards achieving the set targets[45]. In December 2021 European Commission proposed to further revise the EPBD as part of 'Fit for 55' work program with the aim to achieve net zero emission building stock by 2050[46]. The revision proposes to accelerate the energy performance renovation of highly energy inefficient buildings in all EU MS with consideration given to improve air quality and enable digitalisation of building energy system. The proposed revision also emphasises the provision of financing targeted for building energy performance improvement. This revision also promotes the roll out of EV charging stations and dedicated bicycle parking space in residential and commercial establishments. To ensure overall monitoring of progress and efforts National long-term building renovation plan should be fully integrated into National Energy and Climate Plan. The revision further proposes to work on road map to phase out use of fossil fuel for heating and cooling latest by 2040. Proposed revision is being reviews and considered by Council and European Parliament.

More details can be found in section 4.1 Europe Wide

2.6 BEST PRACTICES ACROSS EUROPE

2.6.1 Energy Saving Meter programme - Germany

order to boost innovation and digitalisation of German energy market and energy system Government of Germany is offering financial support up to €2m for each business for promoting and implementing innovative digital energy efficient technologies. The amount of funding depends on metered energy saving achieved and type of fuel for which energy have been saved. To promote

[45] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en
[46] https://eur-lex.europa.eu/resource.html?uri=cellar:c51fe6d1-5da2-11ec-9c6c-01aa75ed71a1.0001.02/DOC_1&format=PDF

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the integration of flexibility and distributed RES in the energy system the government is providing bonus incentives for each unit of energy saved. This funding is provided till 5 years to support operation and market rollout of suggested innovative digital technology. During first phase of programme implementation from May 2016 to December 2018, €62m of grant was provided to more than 50 energy efficiency pilot projects implemented by start-ups, SMEs and large enterprises. The second phase of programme (2019 to 2022) has been extended until 2022 and funding value has been increased to €100m. This programme stimulated a start-up culture in the German energy efficiency market. SMEs are granted 10% additional funding as compared to large enterprises to support the implementation of innovative digital technologies.

2.6.2 Smart Metering Implementation Programme – United Kingdom

In July 2010, British government launched Smart Metering Programme to install 53 million smart electricity and gas meters in domestic and small businesses in non-domestic (Public and Private) sectors of Great Britain by 2020. This programme was planned in three stages – Policy design stage, Foundation stage and Mass roll-out stage. Since the initial set targets were not achieved by 2020, the government has set a new four-year framework 'Smart Meter Policy Framework Post 2020' which started in January 2022. This programme was launched with the aim to bring user behavioural changes through detailed real-time data and achieve long term energy efficiency and decarbonisation targets. This will allow energy networks as well to manage and plan their activities and achieve smart grids and low-carbon energy system. By 30 September 2021, 26.4 million smart meters have been installed in homes and small businesses out of which 1.1 million smart meters were in non-domestic sector. The predicted cost saving across domestic and non-domestic sector is £18.6 billion with the net saving £7.3 billion over next 20 years from 2011. The program is targeted for small business (non-domestic sector). This program doesn't encourage/obligate SMEs to undergo energy audit.

2.6.3 EPBD Implementation in France

Implementation of EPBD started in France from 2010. Energy efficiency aspects were included in The Law 2010-788 of July 12, 2010, adopted by the French Parliament (also referred to as the "Grenelle II Law"). Grenelle II Law addresses the need to improve energy efficiency of building stocks and also includes decarbonisation measures via energy efficiency labelling of the energy consuming products. The Grenelle II law also supports the deployment of renewable energy sources and development of new decarbonising fuels generated from plants or organic wastes.

Thermal regulation RT 2020 is another regulation implementing EPBD in France which came in force from summer 2021. RT 2020 aims at development of passive and positive energy buildings. This law requires all the new housing built from 2020 must be positive energy buildings[47]. RT 2020 further encourages innovation is the building design to achieve the positive energy buildings (BEPOS) with particular focus on better insulation and deployment of renewable energy generation sources. RT

[47] http://www.rt-2020.com/

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2020 defines maximum energy consumption of buildings and requires the incorporation of at least one renewable energy source in the building[48].

Implementation of EPBD in France introduced requirement on energy performance for new and existing buildings, introduced energy performance certificates of buildings and inspection of heating and AC systems.

More details can be found in section 4.6 Best practice EUROPE WIDE

3 DISCUSSION AND CONCLUSION

Policies related to energy efficiency and carbon emissions reduction are found in all the analysed countries: Spain, Greece, Ireland and The Netherlands as well as at EU-level and in other European countries. These policies support the implementation of Smart Energy Services in commercial building such as the pilot-sites of SmartSPIN. In Greece the market of SES is still immature, and the policy focus mainly on industrial demand response (interruptible loads), deployment of smart metering technologies, and modernization of the distribution network. In Spain the policy focuses on smart metering technologies like in Greece, but also on energy services based on the aggregation of energy consumers and on the self-consumption thereby promoting renewable communities and utilisation of energy storage. In the Netherlands the policy provides operational subsidies to the technologies which can avoid CO_2 emissions including carbon capture and storage (CCS) and low-carbon hydrogen, but also tax deduction schemes applicable to a broad set of energy efficiency measures of interest for the SMEs of various sectors. In Ireland the national policy supports retrofitting homes, new public transport systems, training of workers, and supporting changes toward energy efficiency and a low carbon economy. It also supports energy auditing and the technologies for energy monitoring and energy management.

In conclusion it can be said that both the EU and the countries of main interest for SmartSPIN have established policies that support energy efficiency and decarbonisation, which will contribute to the growth of the market of the Smart Energy Services. The existing policies provide a good support for the SES which are under consideration in SmartSPIN, that are primarily based on an improved monitoring of the energy consumption using smart metering technologies, improved self-consumption and energy management based on a cost-effective load scheduling to minimise the energy purchase from the grid. Improvements in the monitoring systems for tenant's' energy consumption and for the energy consumption of the common areas of rented commercial buildings, along with a smart measurement & verification method which can determine accurately the energy savings with respect to the baseline, are the key assets for establishing a fair business model which can be accepted by all the parties and solve the split incentive issue.

[48] https://www.les-energies-renouvelables.eu/conseils/reglementation-thermique-2012/lobjectif-de-la-reglementation-thermique-2020/#:~:text=Les%20objectifs%20de%20la%20R%C3%A9glementation,%C3%A0%20%C3%A9nergie%20positive%20(BEPOS).

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4 ANNEX -1

4.1 EUROPE WIDE

Name	**EU Policy for Energy Efficiency**	**Type**	EU Policy – The European Union
Date of establishment	2012		
Targeted	Energy generation, transmission and distribution, buildings, industry.		

Brief Description

The EU policy on energy efficiency (Directive 2012/27/EU of the European Parliament and of the Council) aimed at setting an EU target for the reduction of the primary energy consumption by 2020 with respect to projections, to make further energy efficiency improvements after 2020, and to promote energy efficiency in Europe by requiring that Member States set national targets in collaboration with the Commission and indicate in their National Programmes how they plan to achieve them. The policies and measures promoted cover the whole energy chain: energy generation, transmission and distribution, the public sector, buildings, industry, appliances, energy management.

Objective

The EU policy aimed at reducing by 20% the primary energy consumption by 2020 and to continue with the improvements after 2020 by recommending the design of energy efficiency measures through adoption of innovative technologies such as smart metering, cogeneration of heat and power, district heating and cooling, demand response. The most important targets of the policy are:

- Implementation in the Member States of intelligent metering systems for electricity and gas. At least 80% of consumers must be equipped with intelligent metering systems for electricity by 2020. Preparation of a timetable for the roll-out of intelligent meters for gas is required.
- Thorough assessment of the potential for high-efficiency cogeneration and district heating and cooling to provide investors with information about national development plans. The distributed energy generation using plants with rated thermal input of less than 20 MW is encouraged.
- National energy regulatory authorities to ensure that network tariffs and regulations incentivise demand response based on final customers' responses to price signals or on building automation.
- To promote energy performance contracting and other third-party financing arrangements for energy savings identifying and removing relevant regulatory and non-regulatory barriers, and the access to European Funds to support investments in energy efficiency measures.

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Outcome
The Member States have produced a number of National Implementation Reports: https://www.ca-eed.eu/Outcomes/Archive/CA-EED-1-outcomes/National-Implementation-Report The EU did not achieve the energy efficiency targets set for energy efficiency in 2020, while being substantially on track regarding the targets on greenhouse-gas emissions and renewable energy. In fact, energy consumption has stopped decreasing since 2014 and in 2020 the consumption was even higher than in 2012, when the Directive set the targets for reduction[49] The energy efficiency targets for 2030 and beyond will be set by the National plans of the Member States of EU.
Key learning points/Barriers
• Only buildings where final customers have a means to control their own individual consumption (for example using radiators equipped with thermostatic valves) benefit from district heating or common central heating • In multi-apartment buildings supplied by district heating or common central heating, the adoption of individual heat meters is hindered by the fact that the hot water used for heating enters and leaves the apartments at several points. Metering solutions based on multiple metering points must be evaluated on case-by-case basis to determine whether they are cost-effective in relation to the achievable energy savings. • High efficiency combined heat power (CHP) generation generates energy savings by means of the combined production of heat and electricity (instead of their separate production). The costs per kWh of produced electricity and heat should be evaluated considering the cost of fuel and electrical/thermal efficiencies of the CHP and compared against cost of electricity purchase from the grid and heat purchase or generation using a different equipment (e.g., a gas fired boiler or a heat pump). Economic convenience of installing a CHP must be evaluated case by case considering grid electricity tariffs. • Demand response is not smoothly accessible for many final customers, especially the small ones. The national regulatory authorities must ensure that adoption of energy efficiency measures is incentivised and that energy tariffs based on time-of-use or dynamic pricing stimulate the adoption of demand response controls by the final customers. • Member States should implement certification schemes for the providers of energy services, energy audits and energy efficiency measures to ensure that competent professionals are available for all the tasks related to the improvement of energy efficiency.

[49] Why is EU off track for 2020 energy efficiency target? https://euobserver.com/energy/147407

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Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

The EU policy recognizes that most of the businesses in Europe are SMEs and that they have a potential for huge energy savings. Therefore, the policy encourages the Member States to implement programs which can provide technical assistance and targeted information to the SMEs.

Moreover, the EU policy promotes the development of financing instruments supporting training and certification programmes related to energy efficiency and provides support for all the programmes undertaking actions to promote energy efficiency in all dwellings; the energy audits are clearly included among these actions. The Member States are responsible for implementing nationwide support actions and incentives for energy auditing.

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

The SES supported by this policy are smart metering for electricity, smart metering for gas, energy supply using cogeneration plants (electricity and heat), demand response using network tariff (user behaviour), demand response using building automation. The EU policy provides recommendations to the Member States which can be used to promulgate their National Policy. The EU policy mentions two funds which can be used to trigger investments in energy efficiency improvement measures: the Structural Funds and the Cohesion Fund.

Relevance to SmartSPIN

The SES supported by the EU policy are all relevant with SmartSPIN. In particular, a new flexible dynamic electricity tariff will be developed to incentivize the customers to adopt the implicit demand response measure in the commercial rented sector.

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Name	**EU Policy for Energy Performance of Buildings**	**Type**	EU Policy – The European Union
Date of establishment	2010		
Targeted	Buildings		

Brief Description

The EU policy on energy performance of buildings (Directive 2010/31/EU of the European Parliament and of the Council) aims at promoting energy efficiency in buildings considering outdoor climatic conditions, indoor requirements for climate and cost effectiveness of the technical solutions. The policy provides guidelines for evaluating energy performances of buildings and defines minimum requirements for energy performances of both new and existing buildings. Moreover, it prescribes regular inspections of heating and air-conditioning systems.

Objective

The objective of the Policy is to prescribe to the Member States the achievement of a minimum level of energy performance requirements for buildings while guaranteeing cost optimality, and to provide a methodology to evaluate energy performance and cost-optimality.

- For the new buildings, the Policy requires that the feasibility analyses showing that the building can achieve the targeted energy performance level are available before that the construction begins; the following alternative systems are considered by the Policy: decentralised energy supply systems based on renewable sources, cogeneration, heat pumps, district or block heating or cooling (especially those using renewables).

- For existing building, the Policy's objective is to achieve a minimum level of energy performance when they are retrofitted considering both interventions on the building envelope and/or application of the same alternative systems recommended for the new buildings.
- In addition, the Policy prescribes that all new buildings are nearly zero by 31 December 2020 and that new buildings either occupied or owned by public authorities are nearly zero after 31 December 2018. The definition of nearly zero-energy buildings should be given by each Member State considering their national, regional, or local conditions, and providing the indication of the building's primary energy consumption expressed in kWh/m2 per year.
- The Policy requires that Member States ensure that an energy performance certificate is issued for the buildings or building units when occupied by a new tenant or for the buildings with a useful floor area greater than 500 m2 occupied by a public authority and frequently used by the public (the threshold of 500 m2 was lowered to 250 m2 in July 2015).

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Other key objectives associated with the Policy are[50]:

- a periodic review of energy performance standards for buildings in each EU Member State with findings' report to the EU Commission at least once every five years.
- to make energy consumption in buildings more transparent and easier to understand across all the EU Member States

Outcome

The Policy has significantly contributed to several energy efficiency achievements in the EU through [1]:

- Decoupling of energy demand and economic growth; the ratio of aggregate primary energy use to Gross Domestic Product decreased by about 20% from 2000 to 2014.
- Improved standards of building energy efficiency, with an evident decrease in energy consumption per unit floor area after the Policy entered into force in 2006.
- Reduced energy demand in heating, hot water, and lighting; the Policy has promoted the uptake increase of more efficient heating, hot water, and lighting systems to meet the more demanding requirements of energy certification.
- The "Clean Energy Package" adopted by the Commission on 30 November 2016, which includes a revision of the 2010 Directive.

Key learning points/Barriers

- The energy performance of a building is transparently expressed through the numerical value of primary energy required to maintain the desired indoor temperature and to supply the domestic hot water demand.
- The Policy identifies several factors that have a positive influence on the energy performance: the local solar exposure conditions, active solar systems, heating, and electricity systems based on renewables, electricity produced by cogeneration, district or block heating and cooling systems, natural lighting.
- The cost-optimal performance levels must be calculated using a comparative methodology framework that needs to be fully developed by the Member States, defining reference buildings for both new and existing ones, characterized by their geographical location, indoor and outdoor climate conditions and building typology (residential or non-residential) and defining energy efficiency measures that can be applied to reference buildings. After that the final and primary energy consumptions are evaluated for all the reference buildings and for all the measures, and the costs of the energy efficiency measures are assessed, the optimal cost-levels can be determined.
- Possible market barriers to the implementation of energy efficiency measures needed to achieve the cost-optimal levels of energy performance required by the Policy can be mitigated by the availability of financial incentives.

[50] Hywel Davies, The Energy Performance of Buildings Directive: Where Are We Going, SDAR Journal od Sustainable Design & Applied Research, Vol. 5, Issue 1, 2017.

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Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

This policy applies to all the buildings and therefore also to the buildings occupied by SMEs. The policy encourages the SMEs to undergo energy audits because it requires that EU Member States put in place the necessary measures to establish regular inspections of all the accessible parts of heating systems (for the boilers with an effective rated output higher than 20 kW) and air conditioning systems (for the systems with rated output higher than 12 kW).

Inspections should occur at least every two years for heating systems with boilers having size greater than 100 kW. Otherwise, the period can be extended to four years for gas boilers.

The audits may include a verification of the boiler/air conditioning system efficiency and of the boiler/air conditioning system sizing with respect to the energy demand of the building.

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

All the services related to the electric and thermal energy supply using the alternative systems determined by the Policy: decentralised energy supply systems based on renewable sources, cogeneration, heat pumps, district or block heating or cooling using partially or totally renewable energies. Energy supply services can be implemented using diverse business models. In addition, SES related to installation of cost-optimal energy efficiency measures determined using the methodology outlined by the Policy. Funding opportunities for increasing energy efficiency in buildings are available through the structural funds and framework programmes, funds from European Investment Bank and other public finance institutions, national funds.

Relevance to SmartSPIN

The SES supported by the EU Policy for Energy Performance of Buildings are based on a wide set of energy efficiency measures and are relevant with SmartSPIN, being all applicable within the commercial rented sector.

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4.2 GREECE

Name	National Energy and Climate Plan	**Type**	National Policy-Greece
Date of establishment	23 Dec 2019		
Targeted	The entire economy		
Brief Description			
In terms of the energy policy framework in Greece, the National Energy and Climate Plan for the period 2021–2030 includes national objectives and planned measures for five key dimensions: decarbonization, energy efficiency, security of energy supply, internal energy market, and research, innovation and competitiveness. The target for 2030 is to reduce greenhouse gas emissions by at least 16%, compared to 2005, for non-ETS sectors and the largest impact is expected to come from emissions reductions of fluorinated gases and treatment of organic waste as well as from energy efficiency measures in the residential and tertiary sector. Regarding the energy efficiency targets, according to Greece's NECP the objective is to improve energy efficiency in final energy consumption by at least 38% in relation to the foreseen evolution of final energy consumption by 2030. An additional target is set in respect of the cumulative amount of energy savings to be attained over the period 2021-2030 in accordance with the Article 7 of the Directive 2012/27/EU on energy savings obligations. Within this context, Greece has put in place policies that incentivise and support energy conservation and energy efficiency, which further contribute to the national GHG emission mitigation efforts. One of the major developments of the last decade is the existence of a quite explicit regulatory framework, setting specific goals and providing supportive laws, directives, standards and methodologies, in line with requirements arising from EU agreements shaping the operating framework of the green energy market. Energy efficiency related policy development and implementation are the responsibilities of the Ministry of Environment and Energy. The Centre for Renewable Energy Sources and Saving (CRES), whose mandate from the Ministry of Environment and Energy also extends to energy efficiency, provides technical analysis and modelling services in support of policy development.			
Objectives			
According to the NECP, the objective is to improve energy efficiency in final energy consumption by at least 38% in relation to the foreseen evolution of final energy consumption			

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by 2030 and thus, resulting in final energy consumption levels of not more than 16.5 Mtoe in 2030.

An additional objective is set for the cumulative amount of energy savings to be attained over the period 2021-2030 in accordance with Article 7 of Directive 2012/27/EU on energy savings obligations. In this regard, cumulative energy savings of at least 7.3 Mtoe should be achieved over the period 2021-2030.

Moreover, the aim is also to increase the use of natural gas in final consumption, as the intermediate fuel for switching to a low GHG emissions model in all final consumption sectors. A key aim is achieving a higher gas share in all final consumption sectors and, essentially, to ensure that its use replaces part of the current consumption of petroleum products in these sectors. The quantitative objective for this priority is to increase the direct use of natural gas in the final consumption sectors by at least 50% compared to 2017.

Outcome

Greece has applied a wide range of energy efficiency policies in recent years, most of which are based on adapting the requirements of the European Commission Directive on Energy Efficiency to the Greek legislation. These include:

- Law 3899/2005 on Public Private Partnerships
- Law 3855/2010 on the institutional framework for the provision of energy services
- Ministerial Decision D6/13280/07.06.2011 on the Operation, Register, National Code of Conduct and related provisions for energy service providers
- Law 4342/2015, which is the transposition of the EED into national legislation, includes references to Energy Performance Contracting (EPC)
- The Ministerial Decision (MD) 13280/2011 "Energy service companies. Function, Registry, Code of Conduct and related provisions", aims to implement the existing legislative framework and fix all relevant issues related to the development and activation in the Greek market of Energy Service Companies"
- The Greek Regulation for the Energy Efficiency of Buildings (KENAK), which determines the minimum energy efficiency requirements for buildings.
- Law 4513/2018, which enables the establishment of energy communities

Key learning points/Barriers

Lack of funding, legal framework, exhausting bureaucratic procedures, and the reduced capacity in public services are referred to be the main obstacles to the implementation of innovative actions and projects in Greece. The difficulties in obtaining financing for projects are more obvious in large-scale projects and they concern a lack of liquidity, reduced financial capacity, lack of business models to adopt energy-efficient equipment as-a-service, and lack of standardisation of financing structures for energy-efficient investments. Another factor is the complex legal framework regarding ESCOs and their involvement in energy efficiency projects.

Is there any support available specifically for SMEs? Does this policy encourages SMEs to undergo energy audit?

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Presently, in Greece, there is no available national support scheme for SMEs regarding their access on Energy Efficiency Services.

However, under Article 19 of Law 4342/2015, an ESCO registry has been created at www.escoregistry.gr, managed by the Directorate of Energy Policy and Energy Efficiency of the Ministry of Environment, Energy and Climate Change, with a view to promoting the energy services market and access of SMEs to this market. The ESCO Register website (http://www.escoregistry.gr/) provides information material that includes:

- available EPC and clauses that should be included in such contracts to guarantee energy savings and final customers' rights,
- financial instruments, incentives, grants and loans to support energy efficiency service projects,
- a list of available energy service providers who meet the criteria for registration in the ESCO Register,
- Model EPC, mainly for building renovations,
- best practices for EPC, mainly for building renovations, which include a cost-benefit analysis using a lifecycle approach.

Which all SES are supported in the policy? If yes, what kind of supports are available? Is there any fund dedicated to promote SES implementation?

The demand response market in Greece is still immature and focuses only on industrial customers (mainly in the form of interruptible load). However, National Energy and Climate Plan as well as the resulting legislation, introduce a framework that can support related activities, enabled by smart metering technologies. One of the ways to achieve this is by modernizing the Distribution Network and transform it into a "Smart System. On the other hand, a greater uptake of smart technologies and the development of smart energy metering systems is expected to significantly contribute to the planned widespread implementation of SES in the near future.

Relevance to SmartSPIN

In the case of Greece, as the implementation of EPC projects remains extremely small, there is a big untapped potential for market actors to take actions and be engaged in the SMARTSPIN project. On the other hand, SMAPTSPIN will enhance and refine successful EPC models and thus pave the way for their further implementation in the Greek context.

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4.3 SPAIN

Name	**Regulation for accounting of individual consumption in the thermal installations of buildings**	**Type**	National Policy - Spain
Date of establishment	2020		
Targeted	Commercial and domestic sector		
Brief Description			
The Government of Spain launched in 2020 the National transposition of the article 9 of the 2012/27/UE through the Royal Decree 736/2020[51], further included in the national regulation of thermal installations in buildings. This set of normative establishes that all metering devices in thermal supplies in new and existing buildings should be individual meters that allow individual billing for the thermal energy consumed by the costumers, both for heating and cooling.			
Objective			
The objective of regulating the individual consumption in the thermal installations of buildings is to encourage energy efficiency, properly accounting for the heating and cooling consumption of individual customers. Its application will result in lower energy expenditure in buildings with an estimated average reduction of 24%, increasing the autonomy of users to decide how to optimize their consumption and improve their living comfort. This new technology have replaced older, mechanical meters located at boiler level.			
Outcome			
It is estimated that more than 1,4 buildings will be installed by May, 2023 in Spain.			
Key learning points/Barriers			
The smart meter has put the consumer at the centre of the energy world, and companies need to transform business models to keep up. The smart meter roll out will encourage innovations for efficient use of energy with the use of digital technologies.[52]			

[51] https://www.boe.es/eli/es/rd/2020/08/04/736

[52] https://www.ey.com/en_ie/digital/how-smart-meters-are-disrupting-the-energy-industry

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Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?
NA
Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?
Installation of smart energy meters is the main SES supported by this policy. The consumer need not to pay for replacement of their old meter with new smart meter, but it is charged for its use on a regular basis.
Relevance to SmartSPIN
Smart meters can now facilitate greater smart services functionality that can provide more frequent and accurate information on customer's thermal usage and reduce the need for estimated bills. Smart meter will help the customers to account for savings on heating and cooling. Smart meter installation can serve as one of the Smart energy service for SmartSPIN implementation.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	**New business models linked to renewables**	**Type**	National Policy - Spain
Date of establishment	2020		
Targeted	Commercial and domestic sector		

Brief Description

The Government of Spain launched in 2016 the National transposition of the 2012/27/UE in those aspects related to energy audits, accreditation systems for energy service providers (ESCOs) and energy auditors and the promotion of energy efficiency in the processes of production and use of heating and cooling[53]. To complement this, in 2020 it was launched the Royal Decree 23/2020[54], with the definition of new business models linked to renewables, that incorporates into the Spanish legal system business models that will be key in the energy transition and that offer opportunities for economic growth, employment and improvement of competitiveness. This is the case of storage, regulated by this standard, which will allow managing and optimizing the energy generated in the new renewable plants; and hybridization, which makes it possible to combine various technologies – photovoltaic and wind, for example – in the same installation.

Additionally, and in compliance with community regulations, the figure of the independent aggregator and of renewable energy communities and the associated regulations are incorporated.

Objective

The objective of the definition of new business is to provide legal certainty to the applicable regulatory framework, allowing the rapid and efficient development of renewable projects, taking advantage of the network already built, minimizing the cost for consumers and generating positive and immediate effects on industrial activity and employment.

The introduction of the independent aggregator will introduce greater dynamism in the electricity market. This new business model is based on combining the demand of various electricity consumers or that of various generators for their participation in different market segments.

The introduction of renewable energy communities seeks to favouring the participation of citizens in the ecological transition, allowing citizens and local authorities to be partners in renewable energy projects in their localities.

Furthermore, the Government is empowered to regulate a special procedure for the authorization of facilities whose main purpose is R&D&i, which represent a technological, energy and industrial opportunity in areas such as storage or management networks, among

[53] https://www.boe.es/buscar/pdf/2016/BOE-A-2016-1460-consolidado.pdf
[54] https://www.boe.es/eli/es/rdl/2020/06/23/23/con

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

others, which constitute a strategic factor for economic growth, both in the short and medium term.

Outcome

The recent publication of this regulation does not allow to estimate the outcome.

Key learning points/Barriers

Lack of technicians and expertise.

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

NA

Which all SES are supported in the policy? If yes, what kind of supports are available? Is there any fund dedicated to promote SES implementation?

SES through aggregation of energy consumptions by independent aggregators, which are participants in the electricity production market that provide and are not related to the client's supplier, with aggregation being understood as that activity carried out by individuals or legal entities that combine multiple consumptions or electricity generated of consumers, producers or storage facilities for sale or purchase in the electricity production market.

Self-consumption, including energy storage, through renewable energy communities, which are legal entities based on open and voluntary participation, autonomous and effectively controlled by partners or members that are located in the vicinity of the renewable energy projects that are owned by said legal entities and that these have developed, whose partners or members are natural persons, SMEs or local authorities, including municipalities, and whose primary purpose is to provide environmental, economic or social benefits to their partners or members or to the local areas where they operate, rather than financial gain.

There is no fund available.

Relevance to SmartSPIN

Aggregators and renewable energy communities facilitate to offer SES to greater energy consumers rather than small contracts to individual users, providing bigger opportunities for SES such as demand response and lower paybacks through economy of scale.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	**Photovoltaic energy self-consumption and Energy Communities**	**Type**	National Policy - Spain
Date of establishment	2018-2021		
Targeted	Commercial, residential and industrial sectors		

Brief Description

After some years of policy barriers for certain types of PV facilities, Spanish Royal Decree-Law 15/2018 included urgent measures for energy transition and consumer protection, abolishing the main existing barriers to self-consumption[55]. Following it, Royal Decree 244/2019 regulated the administrative, technical and economic conditions for electric self-consumption[56], where diverse schemes for PV facilities were offered including self-consumption without surplus, with surplus compensation, etc. and introduced the collective self-consumption schemes, enabling the constitution of energy communities. In this sense, recently the ministerial Order TED/1247/2021 updated the dynamic distribution coefficients rules for community self-consumption facilities.

Moreover, the Technical Code for Buildings[57] (applicable for any new or integrally renovated building) was updated through Royal Decree 732/2019, making mandatory a minimum contribution from PV sources to the electrical demand of tertiary buildings over certain size:

- Supermarkets > 5000 m^2
- Malls and recreation centers > 3000 m^2
- Warehouses > 10.000 m^2
- Administrative > 4.000 m^2
- Hotels and hostels > 100 guests
- Hospitals and clinics > 100 beds
- Pavillions and fair centers > 10000m^2

Finally, the Spanish Recovery, Transformation and Resilience Plan (the key instrument for the development of the Next Generation EU recovery funds) which is structured in 10 lever policies and 30 components, in its component #7 titled Deployment and integration of Renewable Energies, includes a set of policy reforms and investments estimations.

Objective

The objective is to stimulate the deployment of PV technologies on buildings (with specific requirements for tertiary and commercial buildings), enabling attractive self-consumption schemes for consumers and the configuration of energy communities based on collective self-consumption facilities. At strategic level, it is aligned with Spanish National Climate and Energy Integrated Plan, which includes the objective of increase the renewable sources over

[55] https://www.boe.es/buscar/doc.php?id=BOE-A-2018-13593
[56] https://www.boe.es/diario_boe/txt.php?id=BOE-A-2019-5089
[57] https://www.codigotecnico.org/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

national final energy use (74% of electricity, and 42% total final energy use by 2030), towards decarbonizing the energy system, while growing economically and creating sustainable jobs.

Outcome

Increase the renewable sources in the national energy mix.

Penetration of self-consumption schemes on buildings.

National Self-Consumption Strategy.

Development of energy communities.

Key learning points/Barriers

The collective self-consumption schemes facilitate the implementation of energy communities on blocks of buildings and/or among commercial buildings and industries located nearby.

This normative allows that self-consumer and owner of the facility to be different persons or entities, which enables innovative financing/management business models.

The collective self-consumption facilities might be installed nearby the building and/or other roofs (below 500m distance), which enables an energy community to seek better oriented and larger installation surfaces.

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

NA

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

The design and operation of energy communities is the main SES supported by this policy, where the diverse permitted self-consumption schemes require of innovative proposals towards maximizing the energy-economic benefits.

The government has recently published grants (€40m dedicated) for pilot projects on energy communities.

Relevance to SmartSPIN

Installation and operation of PV facilities on commercial buildings would lead to energy savings and costs reduction. Since the roof surface is limited and there might be multiple owners and other shops under renting on the commercial buildings, the best way to make them participant of a SES based on rooftop-PV technologies would be through an energy community where the local renewable production would be self-consumed with diverse distribution shares between stakeholders.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	**Electric Smart Metering program and New Electricity Tariffs structure**	**Type**	National Policy - Spain
Date of establishment	2012-2021		
Targeted	Commercial and domestic sector		
Brief Description			
The Minister of Industry, Energy and Tourism launched in 2012 the Order IET/290/2012 - Review of National Electric Tariffs[58], which establishes that all metering devices in electricity supplies with a contracted power of up to 15 kW should be replaced by new equipment that allows time discrimination and remote management before December 31, 2018.The methodology for calculating the charges on electricity tariffs was renewed through the Royal Decree 148/2021[59], which implies variations based on time-of-use and real-time wholesale market evolution.			
Objective			
The objective of smart meter roll out is to encourage tariff discrimination, reducing the grid energy consumption in peak-periods and encouraging shifting to those periods with low consumption (weekends, night-time). Smart meters, and consequently demand response activities, can provide tools for a much more efficient operation of electric power systems. As smart meter can measure the demand profile of the premises and allows customers to access detailed energy information (like real time and cumulative energy consumption, current time of use tariff, direction of feed i.e. import/export etc.) if they wish to use it. Also Smart meters can measure the export of micro-generation installations to facilitate access to remuneration for residual electricity exported to the grid. This new technology has replaced older, analogic meters. Once the smart-meters are deployed, the new structure of tariffs seeks to promote energy efficiency and savings, PV self-consumption, implicit demand response and the penetration of e-vehicle charging stations in buildings.			
Outcome			
Wide-scale roll-out of smart-meters (at least 80% of consumers by 2020) [60]. New electricity tariffs structure came into force 1 June 2021.			
Key learning points/Barriers			

[58] https://www.boe.es/buscar/doc.php?id=BOE-A-2012-2538
[59] https://www.boe.es/buscar/doc.php?id=BOE-A-2021-4239
[60] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0189&from=EN

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Large scale roll outs are very long and costly processes, requiring considerable capital investment along with enhanced and significant change in IT system and strong customer support by electricity suppliers. [61] The smart meter has put the consumer at the centre of the energy world, and companies need to transform business models to keep up. The smart meter roll out will encourage innovations for efficient use of energy with the use of digital technologies. [62] Finally, the new charges structure was coincident with the scaling-up of wholesale electricity prices across Europe (since summer 2021) so the final consumers have not feel so much benefits in their bills until the moment.

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

NA

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

Installation of smart energy meters is the main SES supported by this policy. The consumer need not to pay for replacement of their old meter with new smart meter, but it is charged for its use on a regular basis.

The financing of smart metering is mostly secured through an adequate remuneration of the Regulatory Asset Base via network tariffs. Some countries like Austria or Spain have provided for an explicit metering tariff or for a rental price for the smart meter. Only in Italy, Denmark and Sweden, has a significant part of the implementation been initiated by the DSO on their own funds, with remuneration through network tariffs introduced only at a later stage. In Italy, a full recovery of the investment was allowed through the metering tariff (introduced in 2004). In the case of Denmark and Sweden a partial recovery of the investment has also been allowed through the network tariff, whereas in Malta the roll-out has been financed by network tariffs with no direct charge to the consumer. In the United Kingdom — Great Britain the roll-out is to be financed through private investment.

Relevance to SmartSPIN

Smart meters can now facilitate greater smart services functionality that can provide more frequent and accurate information on customer's electricity usage and reduce the need for estimated bills. Smart meter will help the customers to effectively use 'Time of Use' tariffs to efficiently use energy. Smart meters will play an important role in the Microgeneration Scheme encouraging customers to generate their own power and sell some of it into the grid. Smart meter installation can serve as one of the Smart energy service for SmartSPIN implementation. Smart Energy Services will be more attractive under a real-time-tariff market conditions, where flexibility strategies are more interesting.

[61] https://www.cru.ie/wp-content/uploads/2012/07/cer12213d-1.pdf
[62] https://www.ey.com/en_ie/digital/how-smart-meters-are-disrupting-the-energy-industry

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

4.4 NETHERLAND

Name	**National Policy for Emission Reduction**	**Type**	National Policy – The Netherlands
Date of establishment	2019		
Targeted	The entire economy		
Brief Description			
The Netherlands is facing challenges in the different energy sectors because fossil fuels dominate the energy supply, and the import dependency is increasing because of Groningen natural gas production phase-out. Although the GHG emissions have been lowered, further reductions have slowed down. The 2019 Climate Agreement defines measures to win these challenges and to accelerate the energy transitions.			
Objective			
The 2019 Climate Act has set ambitious GHG emissions reductions targets. The Collaboratively developed emissions reduction measures cover the entire economy. The two programs SDE+ to SDE++ are the main subsidy programme focusing on avoided CO_2 emissions. In the electricity sector, the policy promotes the development of offshore wind farms to phase out coal-fired generation. In industry the policy will impose carbon levy on emissions, whereas the SDE++ policy will support the emissions reductions. In the mobility sector the policy will provide a strong support for EVs and smart charging infrastructure[63].			
Outcome			
The outcome of the national policy on emission reduction is defined by the Climate Act targets in term of reduction of GHG emissions with respect to 1990 baseline, with a target of –49% by 2030 and –95% by 2050.			
Key learning points/Barriers			
Achievement of EU targets for RES and energy efficiency will have an impact on GHG emission reduction. Emerging technologies will play a role to achieve cost-effective emission reductions. Low-carbon hydrogen development will be one of the key technologies for the future. To be successful, the markets must support innovation and integration of variable renewable generation.			

[63] The Netherlands 2020 – Energy Policy Review, International Energy Agency (Report)

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Among the various energy sectors, the building heating sector is seen as a strategic one. The Natural-gas Free Districts Programme will support the transition to low-carbon heating through the conversion of 1.5 million homes and public & commercial buildings to low-carbon heating by 2030. The existing obligation of a gas connection has been turned into a ban of connecting new homes and buildings to the gas network through an amendment of the Gas Act in 2018[64].

Barriers to the achievement of policy's objectives match at a large extent with the barriers for the organisations to avail of the opportunities to contribute to the policy's targets while obtaining a profit and may be found in the areas of: Awareness, Technology, Information, Economic, Behavioural, Organisational, Competence[65].

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

In the Netherlands energy audits are mandatory at least every 4 years for all the companies with more than 250 employees or with a gross annual turnover of more than €50 million and a balance sheet greater than €43 million.

The policy prescribes the implementation of energy-saving measures to those medium-sized companies whose annual energy consumption is greater than 50,000 kWh for electricity and 25,000 m3 for the gas, or the equivalent in another fuel, and in case the payback time of the measures is less than 5 years. A list of recognised energy saving measures has been determined for each sector by the Government. Therefore, it can be concluded that the MEs with high energy consumption are encouraged and facilitated to undergo energy audit[66].

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

All the SES involving energy efficiency measures and renewable generation are potentially supported by funding for R&D and pilot projects, loans and grants for energy efficiency and renewable energy projects, and operational subsidies for renewables and emissions reduction projects. In addition, new SES enabling the conversion of the domestic heating system into a low-carbon heating system will be supported.

In particular, the Sustainable Energy Transition Incentive Scheme (SDE++) is using competitive auctions to award operational subsidies to renewable energy projects and to a wide set of technologies based on avoided CO2 emissions, which also include carbon capture and storage (CCS) and low-carbon hydrogen. The SDE++ funding will allow to reduce industrial emissions and will also provide support for projects in the sectors of electricity, heating, renewable gases, and transportation fuels.

[64] The Netherlands 2020 – Energy Policy Review, International Energy Agency (Presentation)

[65] Cagno, E., Trianni, A., Abeelen, C., Worrell, E., & Miggiano, F. (2015). Barriers and drivers for energy efficiency: Different perspectives from an exploratory study in the Netherlands. Energy conversion and management, 102, 26-38

[66] Taking measures to save energy, https://business.gov.nl/regulation/taking-measures-to-save-energy/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

In the sector of built environment, there are several support programmes and requirements for the low-carbon heating transition as well as energy efficiency and distributed renewable energy.

Some incentive schemes are available in the rental housing sector to enable achievement of energy savings. Landlords may apply to the energy performance incentive scheme for the rental sector to implement improvements of energy performances of their rented properties. They may also apply for low interest loans to the energy savings fund for the rental sector to implement energy efficiency measures[67].

Relevance to SmartSPIN

Support schemes for energy efficiency interventions are immediately relevant with SmartSPIN – if applicable to the commercial rented sector. Policy's support and incentive schemes related to emission reduction are relevant because clearly have the potential to deliver multiple energy and/or non-energy benefits for building owners and renters, which need to be evaluated on a case-by-case basis.

[67] Central government promotes energy savings, https://www.government.nl/topics/renewable-energy/central-government-promotes-energy-savings

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	**National Policy for Energy Efficiency**	**Type**	National Policy – The Netherlands
Date of establishment	2020		
Targeted	Industry, buildings, transport, rental housing		
Brief Description			
Several measures and policies for energy efficiency, applicable to various sectors are defined by the Climate Agreement (even though its focus remains emissions reductions). Other energy efficiency programmes defined outside of the Climate Agreement also exist and provide support in the form of tax deductions or incentives.			
Objective			
The policy applies to all the companies and institutions with an annual energy demand equal to or above 50 000 kWh electricity, 25 000 m³ of natural gas (or equivalent fuel) to implement all energy saving measures having a payback period of 5 years or less. The policy defines a list of Recognised Energy Efficiency Measures, including the building components, industrial processes, appliances, equipment, and lighting options that can be installed[68]. The Environmental Management Act explains how to perform the calculation of payback periods for energy efficiency measures and how to update the list of the efficiency measures. There is an energy efficiency notification obligation for companies subjected to the policy, which requires the companies to report implemented energy efficiency measures before certain dates.			
Outcome			
The outcome of the policy are the targets about the final energy consumption (in 2020 target was no more than 2 186 PJ) and the primary energy consumption (2020 target was of 2 541 PJ). Final energy consumption's target for 2020 was met, whereas primary energy consumption's target for 2020 was not met. Moreover, the Netherlands defined an additional target in the 2013 Energy Agreement to achieve additional 100 PJ in final energy savings by 2020 but the target was not met (estimated savings: 81 PJ). The total final energy consumption in the Netherlands was 2734 PJ in 2010. In 2014, it decreased to 2323.7 PJ, and increased again to 2432.5 PJ in 2018, whereas it was close to 2000 PJ in 2020[69].			
Key learning points/Barriers			

[68] The Netherlands 2020 – Energy Policy Review, International Energy Agency (Report)

[69] 11% of energy consumption from renewable sources in 2020, https://www.cbs.nl/en-gb/news/2021/22/11-percent-of-energy-consumption-from-renewable-sources-in-2020 accessed on November 8th, 2021.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Overall, it can be said that The Netherlands is struggling to meet the policy targets related to energy consumption. The Netherlands should make the implementation of energy efficiency measures more attractive for all the companies, especially SMEs which don't have specific obligations to implement costly measures. An analysis of the policies revealed that tax-relief schemes have been implemented and that support is provided to the companies which want to perform energy audits to comply with the EU Energy Efficiency Directive. Barriers to the achievement of policy's objectives are in the areas of: Awareness, Technology, Information, Economic, Behavioural, Organisational, Competence[70].

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

- Energy audits are facilitated for all the companies obligated to submit them through information and tools about audit requirements of the EU Energy Efficiency Directive and by running the website used to submit the energy audits to the EC. Medium enterprises which have consumption above the thresholds included in the objective section (high energy consumption) are encouraged by the policy and facilitated to undergo energy audit[71].
- The Energy Investment Allowance (EIA) policy comprises a tax deduction scheme for the energy efficiency investments by private companies. The sectors covered are: industry, services, transport and agriculture. Individuals, associations, and foundations are not eligible. Under this policy, the qualifying investment costs can be deducted from the taxable profits up to 45%, on top of the other deductions permitted by the Dutch tax law. Investments in energy efficiency measures out of the approved list are eligible; the list is revised annually. The EIA budget varied from 2015 to 2019 between EUR 106 million and EUR 166 million and it was EUR 147 million in 2020.
- Two tax schemes support investments of companies in environmental technologies in the Netherlands, they are the Environmental Investment Rebate (EIR) and the Arbitrary Depreciation of Environmental Investments (ADEI). The list of eligible technologies includes many which may improve energy efficiency. The EIR policy enables a deduction up to 36% on qualifying investments from the taxable profits, which can be added to the regular depreciation. The allowed investment costs vary between EUR 2 500 and EUR 25 million. The ADEI policy provides an additional allowance for 9% from the same list of qualifying investments used for the EIR. Application to both the EIR and ADEI is allowed, whereas application to both the EIR and the EIA is not allowed. The budgets for the EIR and ADEI are determined on an annual basis. In 2019, the EIR budget was EUR 114 million, whereas in 2020 it was EUR 124 million. The budget available for ADEI was EUR 25 million in 2019 and in 2020.
- Specific sectors, such as buildings, industry and transport are also addressed by specific policies that encourage energy efficiency. Policies and incentives applicable to the rental housing sector are described here.

[70] Cagno, E., Trianni, A., Abeelen, C., Worrell, E., & Miggiano, F. (2015). Barriers and drivers for energy efficiency: Different perspectives from an exploratory study in the Netherlands. Energy conversion and management, 102, 26-38.
[71] Taking measures to save energy, https://business.gov.nl/regulation/taking-measures-to-save-energy/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?
The policy supports the application of recognized energy efficiency measures in the following sectors: Metal electro and SME metal, Car body repair companies, Healthcare and welfare institutions, Offices, Educational institutions, Commercial data centres, Rubber and plastics industry, Foodstuffs, Agricultural sector, Mobility industry, Sports and recreation, Hotels and restaurants, Printing, paper and cardboard, Construction materials, Paint and printing ink, Gas stations and car washes, Furniture and wood, Company halls, Retail. The list of recognized energy efficiency measures can be found on the website in Dutch language. The policies EIA, EIR and ADEI provide support in the form of tax relief.
Relevance to SmartSPIN
A broad set of energy efficiency measures are supported by the national policy in The Netherlands which can be applied to SMEs of various sectors. The available tax deduction schemes promote energy efficiency and the smart energy services that rely on energy efficiency measures.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

4.5 IRELAND

Name	Climate Action Fund (CAF)	**Type**	
Date of establishment	2021		
Targeted			

Brief Description

The Climate Action Fund (CAF) was created to provide financial and technical assistance to projects that will help Ireland meet its climate and energy goals. The CAF expects the government to contribute at least €500 million to this goal by 2027. The Fund will enable the development of advanced ideas that would otherwise be impossible to realize without this funding. The Fund's operation is overseen by the Department of the Environment, Climate Change, and Communications (DECC)[72].

The Minister for the Environment, Climate Change, and Communications proposed using the Climate Action Fund (CAF) to provide co-financing for Standard Action Projects (SAP) that are (1) successful in securing funding under the EU LIFE Programme 2021 and (2) considered to meet CAF criteria after a competitive evaluation process outlined in Section G of the accompanying Guide for Applicants. Because of the changing nature of this Scheme, the limited cash available, and the desire to finance a diversity of diverse initiatives, all applications matching the two criteria above may not be successful in obtaining co-financing from the Climate Action Fund.[73]

Objectives

The CAF's mission is to promote projects and innovative initiatives that contribute to Ireland's climate and energy targets being met in a cost-effective manner. The CAF also aims to fund initiatives that would not otherwise be established if it weren't for the CAF.

The CAF also seeks to facilitate projects that have co-benefits that help other government policy initiatives, such as:

- Fostering innovation and capacity development in the creation of climate change solutions that can be scaled and provide advantages that go beyond a one-time effect; and

[72] https://www.gov.ie/en/publication/de5d3-climate-action-fund/
[73] 199145_b4308669-f42b-417a-a626-17dd87950cdb (5).pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

- Providing wide socioeconomic advantages such as job creation, improved air quality, decreased fuel poverty, biodiversity, climate change knowledge and behavioural change, and community resilience and development.[74].

Outcome

The government also recognizes the public's critical role in combating climate change. This supports public engagement by assisting people, societies, enterprises, and institutions in take action that will bring us to a climate-neutral, sustainable society by 2050.

One of the most significant global concerns for today and the future is how we confront climate change. Climate change will have an impact on all aspects of society, and we must all consider how Ireland can best find answers. We now have insufficient resources to take effective action to protect current and future generations so that people can live in a low-carbon, climate-resilient future.

The Irish government is tackling this issue and guaranteeing a consistent and tactical strategy to gradual and fixed decarbonization. It is vital that everyone, including the government, people, and society at large, participate in this strategy, which also incorporates climate change modernisation and adaptation.

Key learning points/Barriers

Citizens, communities, and companies will all play a role. The modifications will be funded by the government's €165 billion National Development Plan, which includes a fund for renovating houses, developing new public transportation, reskilling employees, and promoting change.

The government will also assist impacted individuals and communities in making a just transition to a low-carbon economy.

Carbon tax increases are allocated for targeted social protection programs, retrofitting, including free improvements for low-income families, and agri-environment programmes.

ENSHRINED IN LAW

- Independent Climate Change Advisory Council to recommend Carbon Budgets and evaluate policy
- Climate Action Plan to be Reviewed and Updated every year
- Climate Action Delivery Board overseen by the Department of the Taoiseach to monitor delivery
- Strong accountability to an Oireachtas Climate Action Committee

[74] 76389_a38dd65b-09e8-45b0-b423-4894ba79c65e.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

- Carbon proof all government decisions and major investments[75].

National Climate Policy

Ireland's government recognizes the problem of lowering greenhouse gas emissions. National climate strategy will demonstrate the government's determination and commitment to ambitious EU goals. The National Climate Policy Position lays the groundwork for the national goal of achieving a competitive, low-carbon, climate-resilient, and ecologically sustainable economy by 2050. It illustrates the necessary greenhouse gas mitigation ambition and defines the strategy for achieving the overall goal. According to the National Policy Position, policy development will be directed by a long-term vision based on:

an aggregate reduction in carbon dioxide (CO2) emissions of at least 80% (relative to 1990 levels) by 2050 in the power, built environment, and transportation sectors An method to carbon neutrality in agriculture and land use, including forestry, that does not jeopardize dimensions for long-term food supply.

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

SMEs can access the CAF by co-financing already acquired EU Life Programme funding. This money will only cover up to 30% of the eligible expenses of the project in question and, in general, does not encourage SMEs to conduct an energy audit.

[75] 203546_a183a324-40ed-49c9-b630-bab0fbdd2ce2.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	EXEED	Type	
Date of establishment	2017		
Targeted	Grants to support excellence in energy-efficient design		

Brief Description

EXEED is SEAI's most recent initiative designed to incentivize, reward, and facilitate energy efficiency in enterprises.

Excellence in Energy Efficiency Design (EXEED) enables enterprises to create a systematic approach to design, building, and commissioning procedures for new investments and asset improvements. The program's goal is to influence and provide new best practices in energy-efficient design management. EXEED designs ensure optimal energy performance and management from the start of the lifespan.

The EXEED scheme is both a funding program and a certification program based on Energy Efficiency Design (EED).

Objectives

The primary goal of the EXEED grant scheme is to encourage the use of the EXEED certified procedure and to aid in the growth of the EXEED certified program. In summary, the EXEED program's goals are as follows:

- • Stimulate and promote a wide range of project types for which the EXEED Certified Program is appropriate.
- • Assist projects of varying size, type, and complexity in testing the EXEED process.
- • Assist projects pursuing various certification distinctions, such as Design, Verified, or Managed.[1.]

Outcome

The EXEED standard supports project innovations to aid future success even if circumstances change, and it can benefit in the following ways:

- lowering operating energy costs and carbon emissions,
- increasing competitiveness, and
- displaying a commitment to sustainability, which may increase reputation.

Key learning points/Barriers

Barriers - A lengthy and complicated application process limits the appeal of the award to fund energy efficiency measures.

The funding scheme does not presently support Energy Performance Contracting as a strategy for delivering energy enhancements.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

The EXEED funding scheme assists organizations working towards EXEED certification of an asset. Applicants must demonstrate a commitment to obtaining EXEED certification for their asset.

With EXEED, there are two tiers of grant funding available:

• Stage 1 EXEED will reimburse up to 70% of pre-investment professional expenses incurred as a result of the EXEED procedure. A thorough energy audit is part of the EXEED procedure. As a result, it is obvious that the EXEED plan encourages SMEs to do energy audits.

• Stage 2 contributes up to half of the qualifying capital expenditure.

Level of grant funding

EXEED will grant support to organizations of any size. The EXEED award will cover up to 50% of eligible costs for SMEs. The EXEED funding scheme will cover the additional professional services and money needed to implement and certify the EXEED asset. Each initiative can receive up to €1,000,000 in funding (including all support at Stage 1 and Stage 2). Grant support in excess of €500,000 will be granted only for Stage 2 applications when the grant amount given is estimated to achieve savings at or above the following value for money:

• €0.10 / kWh primary energy savings (annual); and

• €33 / tCO2 reduction (over a 15-year lifetime)

• Within the SME category, a small enterprise employs fewer than 50 employees, and which has an annual turnover and/or balance sheet not exceeding €10M.

1. https://www.seai.ie/publications/Exeed-Grant-Scheme-FAQ.pdf

2. https://www.seai.ie/publications/EXEED_Certified_Programme-FAQs.pdf

3. https://www.seai.ie/Overview-of-EXEED-Scheme-Changes.pdf

4. https://www.seai.ie/SEAI-EXEED-Grant-Guidelines-2021.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	Optimising Power @ Work	**Type**	OPW's Staff Energy Awareness Campaign
Date of establishment	Since the earlier 1990s		
Targeted	Aims to change staff behaviour's towards energy use and eliminate energy wastage within our own buildings		
Brief Description			

Since the early 1990s, the OPW has been interested in energy security.

The goal was to reduce yearly carbon dioxide emissions by 15% in around 270 big buildings owned or leased by the OPW for use by government departments and organizations across the country.

Optimising Power @ Work is an all-encompassing behavioral change initiative that operates in over 270 big Central Government Buildings around Ireland. The Central Government funds this initiative.

This will contain a Sustainability Policy and an application plan that will be governed by the 'Guidelines on the Preparation of Strategy Statements for Ministers and Secretaries General/Heads of Office' (July 2007). In January 2008, a statewide energy conservation initiative called "Optimising Control @ Work" was launched.

The project's major goal was to establish a concentrated staff energy awareness campaign in each building, ensuring that buildings were operating effectively while maintaining or enhancing comfort levels.

Building energy audits were also part of the project. The campaign was focused on influencing attitudes and assisting individuals in achieving objectives by capitalizing on their goodwill.

The campaign is based on three fundamentals:

1) Technology – energy monitoring device installation

2) Specialist Resources - use of enough and appropriate specialist resources (energy consultants)

3) Energy Teams - forming appropriate active energy teams in each participating building. Currently, annual average energy savings of 20.4 percent are obtained.[76]

[76] https://www.interregeurope.eu/policylearning/good-practices/item/2931/optimising-power-at-work/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Objectives
a) One of the most important factors in the success of Optimising Power At Work is that each building has been outfitted with gear that automatically tracks energy usage. The data is used to set goals and prepare energy reports for individual buildings; b) high levels of engagement with the campaign from all levels of the organization that occupies the specific building; c) to reduce energy consumption and greenhouse gas emissions across the OPW; d) to reduce and avoid waste generation through life cycle thinking and improved reuse and recycling; and e) to procure products in a sustainable or green manner. f) Reducing hazards to health and the environment from OPW operations and improving health and well-being; and g) Raising knowledge of sustainability concerns and ensuring that all OPW employees understand sustainability, OPW's sustainability goals, and how they relate to how they operate. [77]
Outcome
To date, the participating buildings have saved an average of more than 18% on electricity.[78]
Key learning points/Barriers
Barriers One of the challenges in implementing a staff energy awareness program in the past was the difficulty in collecting and reporting on the outcomes. It was difficult to keep the drive going without timely and precise feedback on the findings, but that problem has now been rectified. Because energy expenditures are not always obvious or substantial to certain people, limiting energy use is sometimes overlooked. In the absence of an imperative to act differently, such as regulation, the status quo tends to be the default attitude.
Is there any support available specifically for SMEs? Does this policy encourages SMEs to undergo energy audit?
No, this scheme is aimed at the public sector and does not serve SMEs.

[77] https://assets.gov.ie/40566/301440beea46405d85539639442a8743.pdf
[78] https://www.gov.ie/en/organisation-information/e50f93-sustainability-in-the-office-of-public-works/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	**SI 426 (**Statutory Instrument 426)	**Type**	Regulation
Date of establishment	The year 2014		
Targeted	Mandates large organizations to complete energy audits every four years		
Brief Description			
On December 4, 2014, Statutory Instrument 426 of 2014 became law, putting the European Union Energy Efficiency Directive into Irish/Ireland law. The European Union (Energy Efficiency) Regulations 2014 are abbreviated as S.I. No. 426 of 2014. All companies matching the stipulated criteria were required to conduct a full energy audit. Furthermore, if the system is later certified to ISO 50001 within four years, the firm will be able to verify EAS compliance without having to pass another SI 426 assessment. The energy audit examined how energy is utilized and suggests ways for businesses to save energy. This might result in cheaper energy costs, more profitability, and decreased CO2 emissions. However, there is no requirement to implement the proposed actions. An organization needs a SI 426 Energy Audit if it has 250 or more employees (on payroll) or if it has fewer than 250 employees but revenue of over €50m per year.[79] 1. Non-SME companies are required to conduct an independent High-Quality Energy Audit by December 5th, 2015 (and every 4 years thereafter).			
Objectives			
The Energy Auditing Compliance Scheme is nominated by SEAI (Sustainable Energy Authority of Ireland) as meeting the minimum requirements of the Energy Efficiency Directive.[80] The Energy Auditing Compliance Scheme consists of: (a) impose responsibilities on public bodies relating to the efficient use of energy; (b) require the publication of minimum standards for energy audits and the establishment of a National Registration Scheme for the registration of energy auditors;			

[79] https://www.seai.ie/business-and-public-sector/energy-auditing/Minimum-Criteria-for-Energy-Audits.doc.pdf

[80] https://www.ecolex.org/details/legislation/european-union-energy-efficiency-regulations-2014-si-no-426-of-2014-lex-faoc138183/

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(c) require that a calculation of the availability of qualification, accreditation, and endorsement schemes for energy audits be undertaken; (d) set out other necessities and measures relating to energy efficiency
Outcome
• Nor SEAI or other government bodies have evaluated the impact of the SI426 regulation.
Key learning points/Barriers
The main barrier found in Ireland is a lack of enforcement of the SI 426 regulation. Although enforcing is becoming stricter, a large proportion of the eligible businesses/organizations were not submitting their SI 426 audit in due time.
Is there any support available specifically for SMEs? Does this policy encourages SMEs to undergo energy audit?
No, SI426 is aimed at larger organisations and not at SMEs.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	Triple E	**Type**	
Date of establishment			
Targeted	To get products approved as energy-efficient products to enable improvement through procurement that help all sectors to reduce carbon emissions and energy costs.		

Brief Description

The Triple E Items Register is a registry of the most energy-efficient products available. All products on this register must fulfill a minimum set of severe efficiency standards and are often of best-in-class efficiency. As a result, procuring against this registry provides organizations with the certainty that they are getting a high-efficiency product. Projects are urged to commit to buying plant, machinery, or equipment from the relevant product/technology categories specified on the Triple E register, or similar where applicable.[1]

Triple E establishes minimal requirements that items must fulfill in order to be included. These criteria for items are continually revised, with the goal of include only the top 10 - 15% most energy efficient devices in every technology.

Triple E approved items may be eligible for the Accelerated Capital Allowance scheme (ACA). This is a tax incentive program that encourages investment in Triple E registered equipment. Organizations can deduct up to the entire cost of their investment in energy-efficient items from their earnings. Companies, lone traders, and farmers in Ireland are eligible for the ACA plan.[81]

Objectives

To provide a register of best-in-class energy efficient products that meet a minimum standard of quality and performance.

Outcome

- Lower energy costs: Investing in energy-efficient equipment will help businesses save money on energy over the life of the product. Typically, the savings considerably outweigh the capital expenditures of acquiring the equipment.
- Trust: Businesses have faith that their equipment has passed a minimum acknowledged testing level.
- Best in class products: The Triple E Register typically includes equipment that ranks in the top 15% of similar items in terms of energy efficiency.

[81] https://www.seai.ie/publications/Community-Areas-Housing-Efficiency-Strand-2020-Application-Guidelines.pdf

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- Lower carbon footprint: Triple E designated equipment reduces carbon impact by consuming less energy.

Key learning points/Barriers

Not applicable

Is there any support available specifically for SMEs? Does this policy encourages SMEs to undergo energy audit?

The Triple E Register assists SMEs by creating a registry of best-in-class items that enterprises can rely on to achieve a minimal level of quality and performance. Furthermore, by purchasing Triple E equipment, SMEs may take advantage of the Accelerated Capital Allowance tax incentive program, which allows them to save on tax expenditures in the year the purchase was made.

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4.6 BEST PRACTICE EUROPE WIDE

Name	**Energy Saving Meter Programme**[82]	**Type**	**National Policy – Germany**
Date of establishment	**2016**		
Targeted	**SMEs and Large enterprises**		
Brief Description			
Government of Germany (Federal Ministry for Economic Affairs and Energy) is providing funding of up to €2m to each business for promoting and implementing digitally enabled energy efficiency solutions. Business will get this funding according to achieved energy saving. Eligible businesses propose innovative digital energy efficiency measures to their client. 75% of eligible funding is provided against the metered energy savings. The funding amount changes according to type of fuel being used and end use of energy by the customer. For each unit of electricity saved will grant funding of €0.28 for residential consumers and €0.15 for other consumers. €0.05/kWh of funding is provided for saving on oil, gas, biomass or heating and cooling energy and saving of primary energy is eligible for funding of €0.04/kWh. Bonus funding of €0.02/kWh is granted for the innovative solutions integrating grid flexibility and distributed RES. The aim of granting these funds is to cover the cost of digital energy efficiency solution development. This funding provided for 5 years to support the market roll-out of suggested innovative solution.			
Objectives			
The main objective of this policy is to boost the digitalization of energy service market. Digitalization of energy service market will further encourage innovative energy efficiency solutions and business development. This program will also help to establish the viability of new and state-of-the-art digital solutions for energy efficiency.			
Outcome			
During the first period of policy implementation (from May 2016 to Dec 2018) the government has granted €62m of funding to start-ups, SMEs, and large enterprises including offices and retail stores, industrial sites, restaurants, hospitals etc.			

[82] https://www.iea.org/articles/case-study-energy-savings-meter-programme-in-germany

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

After successful implementation of first phase, the government decided to extend the second phase of programme until 2022.

This programme stirred 'lively start-up culture' in Germany as more than 50 energy efficiency pilot projects have been funded through this program.

This program has also supported the largescale deployment of smart meters in residential and commercial sectors of Germany.

Key learning points/Barriers

Barriers-

To increase the uptake of program, it was designed with a high level of flexibility to increase the number of eligible businesses/projects and solution offerings. This high level of flexibility supplemented the difficulty in managing the proposal assessment and funding disbursement stage of the programme for e.g. establishing a routine evaluation process, evaluating claimed energy saving against baseline. All these complexities resulted in higher administrative cost.

Low priority of energy efficiency upgrades in residential and commercial sector was also an added barrier for the programme.

Lessons learnt –

1. Promote other benefits of energy efficiency other than energy and cost savings.
2. Predictive maintenance is an important driver for the uptake of smart meters

Is there any support available specifically for SMEs? Does this policy encourages SMEs to undergo energy audit?

Under this policy SMEs are granted with additional 10% funding as compared to large enterprises.

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

All the innovative and digitally enabled SES are supported in the policy for example tailored energy saving advice to customers on real time basis, automatic "energy-saving-assistants", innovative solutions integrating artificial intelligence and weather forecast etc. Government is providing funding to all the business for developing innovative digital energy efficiency solutions against actual metered energy saving. Funding dedicated for the second period of policy implementation (2019 to 2022) has been increased to €100m.

Relevance to SmartSPIN

Identified/funded innovative solutions could be further analysed for the applicability in the SmartSPIN pilot sites. Barriers to the program and lesson learnt could also be relevant for the SmartSPIN pilot implantation.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	Smart Metering Implementation Programme	Type	National Policy
Date of establishment	July 2010		
Targeted	Domestic and Non domestic sector		
Brief Description			
British government launched Smart Metering Implementation Programme to install 53 million smart electricity and gas meters in domestic and small businesses in non-domestic (Public and Private) sectors in 30 million household and small business of Great Britain by 2020.[83] [84] The smart meter implementation is one of the major and most complex market changes commenced by the energy industry.[85] The installation is planned in three stages: 1. Policy Design Stage – from July 2010 to March 2011 managed by the Office of Gas and Electricity Markets (Ofgem) on behalf of DECC. 2. Foundation Stage – Began in April 2011, all the groundwork was competed together with industry, customers and other stakeholders. Few selected customers received and got smart meters installed within their premises and pilot study was done with these installations. 3. Mass Roll-out Stage – Started in late 2014 to install planned 53 million gas and electricity smart meters in domestic and non-domestic (Public and Private) sectors. Since the initial set targets were not achieved by 2020, the government has set a new four-year framework 'Smart Meter Policy Framework Post 2020' which started in January 2022.[86]			
Objectives			
The smart meter implementation programme was launched with the objective to achieve the long term energy efficiency goal (EU requirement of 20% reduction in energy consumption by 2020[87] and net zero GHG emission target by 2050[88]) and evolution of low-carbon economy to			

[83] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/87894/ND17Jan_SMIP.pdf
[84] https://smartenergycodecompany.co.uk/smip/
[85] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/42742/1475-smart-metering-imp-response-overview.pdf
[86] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/990525/smart-meter-policy-framework-post-2020-govt-response-minimum-annual-targets.pdf
[87] https://www.slideshare.net/M2MTelefonica/uk-smart-metering-implementation-programme-smip
[88] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/990525/smart-meter-policy-framework-post-2020-govt-response-minimum-annual-targets.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

ensure affordable, secure and sustainable energy supply. The smart meters will future proof the energy sector by moving the data into digital format.[89]

With the help of smart meter consumers can see their real-time energy consumption and can control their energy consumption. With the help of real time data, the energy suppliers will have precise data and customers will receive their actual energy bills instead of estimated energy bills.

- Energy networks will have improved/better data which can be used to manage and plan current activities and the move towards smart grids and a secure, low-carbon energy system.

Outcome

By 30 September 2021, 26.4 million smart meters have been installed in homes and small businesses out of which 1.1 million smart meters were in non-domestic sector.[90] [91]

Installation of smart meter will result in saving of energy, cost and carbon emission.

The predicted cost saving across domestic and non-domestic sector is £18.6 billion with the net saving £7.3 billion over next 20 years from 2011.[92]

Key learning points/Barriers

Lessons learnt from the programme is being reflected in the meter installer training provided by National Skills Academy for Power (NSAP).

Energy suppliers can share the outcome of their consolations related to smart mete installations to the policy developers to shape the upcoming policies accordingly.

Engagement with non-domestic (hospitality, schools and retail sector) consumers varies to address the barriers related to cost, time and lack of ability to understand data.

Government is further spending money to promote the engagement strategies and benefits of installing smart meters. There is lack of awareness and engagement among microbusiness consumers and hard to reach vulnerable domestic consumers.

A governing body 'Smart Energy GB' was established for leading consumer engagement activities. To assess the efficacy of the programme, a Performance Management Framework (PMF) Forum was established which consisted members from representatives of energy

[89] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/830668/smart-meters-benefits-realisation.pdf

[90] This includes smart meters operated by large suppliers at the end of September 2021 and small suppliers at the end of 2020.

[91] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1035290/Q3_2021_Smart_Meters_Statistics_Report.pdf

[92] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/42742/1475-smart-metering-imp-response-overview.pdf

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suppliers. Some coordination issues were identified between these groups as PMF Forum is not part of Smart Energy GB.[93]

Another challenge aroused with consumers who doesn't have know-how of the smart meter and have moved into premises with installed smart meters may face problem to utilise the smart meters.

Some of the smart meters that doesn't comply with the Smart Meter Equipment Technical Specifications (SMETS) standards due to early stage installations, needs to be replaced with smart meter with upgraded software. This led to added unwillingness amid consumers to accept the technology. As smart meter installation is voluntary action by citizen, they can refuse the installation or opt out the usage after installation.

Due to variation in coordination of smart meter installation by local government, there are some regional differences in the implementation progress across the country.

Emergence of COVID-19 pandemic posed further challenges on the implementation of the program.[94]

Because of all the above mentioned reasons the implementation of the programme has been slow or even stalled.[95]

Is there any support available specifically for SMEs? Does this policy encourages SMEs to undergo energy audit?

The program is targeted for small business (non-domestic sector). This program doesn't encourage/obligate SMEs to undergo energy audit.

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

This program supports the nationwide rollout of smart meter installation. The installed meters need to comply UK and EU product safety legislation. Customers are provided with in-home display (IHD) units to watch and monitor their real time energy consumption and energy cost data.[96]

[93] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/830668/smart-meters-benefits-realisation.pdf
[94] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/990525/smart-meter-policy-framework-post-2020-govt-response-minimum-annual-targets.pdf
[95] https://www.cambridge.org/core/journals/journal-of-public-policy/article/abs/making-energy-personal-policy-coordination-challenges-in-uk-smart-meter-implementation/6FB6946C8EAC0AA806EE7AEA70C46ED5
[96] https://www.gov.uk/government/publications/2010-to-2015-government-policy-household-energy/2010-to-2015-government-policy-household-energy#appendix-7-smart-meters

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Smart meter installers will advise best practices for energy efficiency tailored to the need of customers as part of their installation visit.

Public Health England (PHE) assist with advice and information on the effect of smart meters in the health of customers.[97]

In order to protect the privacy of consumers. smart meter needs to comply the privacy regulations. The program is biddable with The Smart Meter Data Access and Privacy Framework 2012.

To raise the nationwide smart metering awareness among the consumers Smart Energy GB has been set up which will help consumers to know the working principle of smart meters.

The program is focused to maintain safety of customers and installers both. During the installation a visual safety check of all the downstream appliances is carried out. During this check from the January 2017 to September 2018 around 550,000 unsafe conditions were acknowledged.[98]

Government has plan to invest over £11.3 billion for the rollout of smart meter across Great Britain.

Relevance to SmartSPIN

Learnings from the Smart Meter Implementation Program can be used for the SmartSPIN pilot countries where smart meters roll out has not been initiated and in the countries where roll-out has been initiated best practices and learnings can be compared and implemented if that has not been implemented.

Cost benefit analysis performed by UK government for the program shows that there is a great energy and cost saving potential with the implementation of Smart meters in domestic and small businesses in non-domestic sector.

[97] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/245736/smart_meters_domestic_leaflet.pdf

[98] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/767128/smart-meter-progress-report-2018.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Name	EPBD implementation in France	Type	National Policy and legislation
Date of establishment	Since 2010		
Targeted	Building sector		

Brief Description

France has begun the implementation of Directive 2010/31/EU in 2010. The Law 2010-788 of July 12, 2010, adopted by the French Parliament (also referred to as the "Grenelle II Law.") includes six Titles: I. Buildings and Urban Planning, II. Transport, III. Energy and Climate, IV. Biodiversity, V. Risks, Health, and Wastes, and VI. Governance. Energy efficiency aspects are covered in the first and third title. The first title specifically addresses the improvement of the performance of the energy utilization of buildings, whereas title III covers further measures aiming at reducing energy consumption and carbon emissions by means of product labelling and at promoting the production of renewable energy and the development of new fuels obtained from plants or organic waste.

Another law relevant with the implementation of the EU Directive is the thermal regulation RT 2020. This law came into force in 2020 and aims at positive energy housing or buildings (which produce more energy than the amount consumed) and passive houses (which spend very little energy and recycle the energy produced). For existing buildings, two regulations apply, the "RT par élément" (Regulation by Building Component) and the "RT globale" (Global Thermal Regulation). Additional requirements will follow in 2023 for envelope components. RT par élément is the regulation normally applied whereas RT globale can be applied in case of major renovation of large buildings. The RT globale regulation is based on the overall building consumption and sets out minimum requirements for each component of the building such as envelope and technical systems.

Finally, the Energy Transition for Green Growth Act (LTECV) of 17 August 2015 addressed requirements for improving thermal renovation by insulating envelope parts[99].

Objectives

The outcomes of the EPBD implementation in France are:

- requirements on energy performance for new buildings
- requirements on energy performance for existing buildings
- Energy Performance Certificates (EPCs)
- inspection for heating and AC systems

[99] EPBD implementation in France, https://epbd-ca.eu/wp-content/uploads/2018/08/CA-EPBD-IV-France-2018.pdf

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Outcome

The Title I of the Law 2010-788 required a reduction of the energy consumption of existing buildings of 38% by 2020.

The RT 2020 law prescribes the following requirements for an energy positive building:

- Heating consumption must be less than 12 kWh/m².
- A total energy consumption of less than 100 kWh/m² (with hot water, lights, etc.).
- The ability to produce energy so that the energy balance is positive on the 5 utilities: heating, lighting, hot water, air conditioning, auxiliaries thanks to photovoltaic panels for example.

In France an EPC called “Diagnostic de Performance Energétique” (DPE) can be issued by a qualified expert following the assessment of the thermal efficiency of the building through an on-site inspection of the envelope, HVAC and domestic hot water systems. The energy performance of the building can be obtained from energy bills or estimated using a calculation methodology. The DPE is automatically sent to the national database and remains valid for 10 years.

Boilers between 4 and 400 kW must be subjected to annual maintenance to check, clean and tune the boiler, measure the concentration of CO, evaluate their energy performance, provide advice on recommended use. A certificate of maintenance must be issued within 15 days after the visit. Boilers between 400 kW and 20 MW require an inspection at least every 2 years which is like the inspection of the smaller boilers.

Moreover, the inspection of the AC systems and reversible heat pumps with an output of 12 kW or more must be performed at least every 5 years. The building owner or the manager is responsible for the inspection. A report with the results of the inspection and recommendations on the use of the AC system will be issued within one month after the inspection. The inspection of the AC systems covers:

• inspection of the AC handbook

• assessment of AC performance

• assessment of the sizing of the system with respect to the building cooling demand

• recommendations regarding the best use of the system in place

• possible improvements to AC system, including its replacement and other interventions

Key learning points/Barriers

Low-cost interventions such as boiler maintenance and training of the tenants may deliver some benefits concerning energy efficiency. Interventions to make the building energy positive are more expensive but may be required by the law in France. The barriers associated with building upgrades are mainly related to investment costs and the split-incentive issue in

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rented buildings may create an additional barrier due to lack of motivation of building owners in investing in energy efficiency measures.

Is there any support available specifically for SMEs? Does this policy encourage SMEs to undergo energy audit?

Financial instruments and incentives are available for existing buildings and SMEs owning buildings could benefit from them:

- The energy transition credit tax (CITE), a scheme which allows to deduct from taxes the 30% of the price of materials and equipment enabling energy saving and reduction of greenhouse gas emissions.
- Energy Saving Certificates Scheme, awards ESC subject to the compliance with the energy saving standards or to finance heating system upgrades.
- 0% Eco-Loans, which are loans with a 0% interest rate enabling to finance building renovations, for improvements of heating systems.

Some support for energy audit is also available (SMEs could use it if eligible) such as: ENERGETIS: energy audits for housing (Grant: €350) and Energy audit for condominiums (Grant: up to 40% of total costs and max. €12,000)[100] although not specific for SMEs.

Which all SES are supported in the policy? If yes, what kind of supports are available? IS there any fund dedicated to promote SES implementation?

All the SES which can deliver a better energy performance of a building are relevant with this policy. This will include new energy management systems, energy monitoring systems, new HVAC controls, etc. The most important supports available have been described in the previous answer and apply to all buildings' owners.

Relevance to SmartSPIN

Energy efficiency improvements in buildings are relevant with SmartSPIN. The tuning of Heating and Air Conditioning systems (boilers, heat pumps) is a low-cost measure which could deliver energy savings in the SmartSPIN's pilot sites. More costly measures are also part of SmartSPIN but may require a loan (ESCO financing is one option) if the landlord is not willing to finance them directly.

[100] https://energy-cities.eu/wp-content/uploads/2019/01/infinite_solutions_comparative_analysis_web.pdf

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