ANNEX I

Identification of barriers and success factors to Energy Efficiency First implementation in buildings and related energy systems

The project ENEFIRST has received funding from the European Union's Horizon 2020 Research and innovation programme under grant agreement No 839509.

Introduction

This annex provides the details about the implementation of the first step of the methodology used to analyse the main barriers and success factors to the implementation of Energy Efficiency First in a selection of nine policy approaches, as presented in the core report ***Implementation map on barriers and success factors for E1st in buildings***.

In this first step, barriers and success factors to each selected policy approach were identified based on the examples identified in the ENEFIRST project, the literature and the consortium's expert judgement. The collection of barriers and success factors follows a standard framework and includes the stakeholder group affected by the barrier or responsible for the success factor as well as a categorisation of factors.

The table below present the classification of barriers and success factors used in this framework.

The results from this first step were used as inputs for discussions in an expert workshop. These inputs were presented in the form of preparatory documents per policy area, that are included in this annex.

Table 1. Classification of barriers and success factors.

Category of barrier/ success factor	How it can hinder or support E1st implementation
Political factor	Barriers or success factors might be inherent in the policy design, caused by political decision-makers or lie in the political system in general. For example, a policy might limit the scope of options considered or create a bias in the decision-making when the eligibility criteria favour specific options.
Regulatory factor	Regulatory barriers or success factors can refer to the energy system, networks or aspects within regulation in general. Such barriers occur for example when current regulations impede the choice of demand-side resources as alternatives to supply-side resources, or when current regulations create a bias in favour of supply-side resources.
Institutional factor	Barriers or success factors can be related to the way the policy approach is administered, and institutions are equipped with resources (financial, capacity) or interact with each other (role and structure of institutions).

Category of barrier/ success factor	How it can hinder or support E1st implementation
Economic factor	These barriers can point to either lack of money available or lack of returns when implementing the policy approach. Success factors can be a policy instrument with sustainable funding to ensure the long-term implementation of the scheme
Technical factor	These barriers or success factors cover the technical issues of implementing E1st, e.g. it might be technically easier to implement other measures, modelling software might not be designed to be able to simulate all possible options which can limit the scope of options considered.
Social and cultural factor	Social context, such as norms and attitudes of investors/ building owners (willingness to pay), expertise or cultural habits of professionals might limit the scope of options considered (e.g. installers suggesting only options they are used to)
Information/ awareness factor	Covering barriers or success factors linked to missing or well-structured information on the policy approach or awareness raising about the approach, for example in the case of a subsidy scheme

Barriers and success factors to Energy Efficiency First implementation in buildings and related energy systems

Expert Online Workshop | Thursday 15 April 2021

Preparatory document for the discussions on Buildings policies

This preparatory document presents an inventory of barriers and success factors in a summary table for each of the following policy approaches:

These policy approaches, and the related barriers and success factors, will be discussed at the workshop.

The main objective is to identify where policy guidelines are needed the most to facilitate the implementation of the Energy Efficiency First principle.

This work comes after a first step of review of the EU policy frameworks to identify policy approaches:

ENEFIRST, 2021. Priority areas of implementation of the Efficiency First principle in buildings and related energy systems. Deliverable D4.1 of the ENEFIRST project, funded by the H2020 programme. https://enefirst.eu/wp-content/uploads/D4.1_Priority-areas-for-implementing-Efficiency-First.pdf

Fabric first approach

Description of the policy approach	**Existing examples** of the policy approach
A 'fabric first' approach to building design and renovation involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building services systems (incl. heating systems) in order to achieve ambitious energy efficiency levels economically. It can either be applied directly in building regulations to cover new as well as existing buildings or as general approach in renovation subsidy schemes.	○ Fabric first in the Better Energy Homes subsidy schemes (e.g. Better Energy Communities schemes) by the Sustainable Energy Authority Ireland (SEAI) ○ Under consideration in the UK building regulations (Part L) ○ Similar approach in EnerPhit standard developed by the Passive House Institute.

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?)
		Policy design	Policy implementation		
More demanding requirements leading to less applications for a 'fabric first' subsidy scheme	Social, cultural Technical	x		Building owners or occupants Installers and other market actors	The fabric first requirements in the Irish Better Communities grant scheme led to an initial 50% decrease in applications, as applications were mostly driven by installers doing single action that were not eligible anymore if not combined with actions helping to reach a minimum energy performance level.
Lack of a reliable framework to set the minimum requirements	Regulatory, technical and economic	x	x	National authority, building owners	Energy Performance Certificates (EPCs) can be an easy way for setting minimum requirements. However, their reliability is not always ensured (e.g., if sufficient controls are not in place). Moreover, requiring an EPC for the application creates an extra cost (that can however be covered by the grant scheme).

Higher total investment costs caused by fabric first requirements per project resulting in less project applications	Economic, cultural		x	Building owners(private and institutional) or occupants	The fabric first requirements aim to encourage more ambitious renovation projects with increasing measures leading to higher total costs and required financial resources. The owners favour short-term affordability over long-term sustainability leading to a focus on investment cost instead of lifecycle cost, and energy performance not fully captured in the valuation of building asset.
Resistance from manufacturers and installers	Social, cultural Political		x	Manufacturers, installers and other market actors	Industry manufacturers lobbying impacts the production of new innovative solutions for adopting fabric first approach.
"Silo thinking" and lack of cooperation in professional cultures in building and construction industry	Cultural Technical		x	Professionals (designers, engineers etc.)	Professional attitudes tend to favour works done in silo (lack of cooperation between building trades). The SMEs rarely include professionals with various backgrounds to cover both, HVAC systems and building envelope. In practice, the installers are rarely able to suggest or advise their customers about actions they do not directly install (lack of independent energy advisors).
Lack of knowledge/ awareness about multiple benefits of a fabric first approach	Cultural Information, awareness	x		Building owners, housing associations Manufacturers, installers	Although many studies and papers on the multiple benefits of buildings' energy efficiency improvements – and thus fabric first - are available, the general awareness about the individual and macro-economic benefits is still low.
Lack of expertise/ guidelines to achieve minimum energy performance requirements without using mechanical services or systems (e.g. heat pumps, solar PV etc.)	Technical Institutional	x		National authorities and professionals	Lack of well-established guidelines at national level of how to achieve a minimum level of energy performance without the use of mechanical services or systems leaves the designers and engineers in confusion.

Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Long-standing experience in designing and administering grant schemes	Institutional	x	x	Implementing organisation National authority	The human and technical resources of the implementing organisation are crucial for a successful implementation of the scheme. For example, SEAI administered different subsidy schemes for energy efficiency in buildings for over a decade, they can build on existing capacity.
Well established and recognised framework to define energy performance of buildings (e.g., reliable scheme for Energy Performance Certificates)	Regulatory	x		National authority	Schemes including minimum energy performance requirements (as done by SEAI in Ireland) or adapting grant rates to the performance achieved (as done by KfW in Germany) most often use the EPCs (e.g., SEAI) or a dedicated label (Effizienzhaus for the KfW programmes) to set these requirements.
Benefiting from synergies between subsidy programmes (same technical requirements)	Institutional	x	x	Implementing organisation National authority	The energy performance technical requirements (SEAI Domestic Technical Standards and Specifications) are valid for all SEAI subsidy schemes which eases compliance control and implementation for SEAI Registered Technical Advisors
Experienced contractors and building professionals	Social, cultural		x	National authorities Local authorities Vocational and training bodies, market actors	Once the energy efficiency experts and contractors are familiar with the requirements and experienced with ambitious, comprehensive renovation projects, their initiative and advice are crucial, as they are key contacts of the building owners.
Support to the cooperation between building trades and energy advisors	Technical, Cultural, Information/ awareness		x	Implementing organisation, trade organisations	Open culture for collaboration between different manufacturers/ installers and energy advisors. Public bodies and trade organisations could organise workshops and training for professionals from various building trades to work together.

Best practice case studies	Information, awareness		x	Implementing organisation, trade organisations	Creation of a database of best practice case studies. Organise open days and set up information portal such as a one stop shop.
Bridges between industry players (e.g. manufacturers and installers) and markets (e.g. social housing and grant scheme managers etc.)	Social Institutional	x	x	Other market actors	Set up an independent hub to provide credible information and qualified design. Workshops and seminars for knowledge transfer and experience sharing.
Communication and awareness campaigns on lifecycle cost and multiple benefits of the fabric first approach	Information/ awareness		x	Implementing organisation, trade organisations	Informing building owners and occupants about lifecycle costs is essential to change the mindset. Similarly, about the communicating on the green value of buildings with higher energy performance. Moreover, the legitimacy of the scheme can be reinforced by a communication about the benefits at society's level, justifying why public money is invested in this type of grant scheme. This can also help to raise the interest of building professionals (e.g., by communicating on the job impacts).

Financial incentives for RES linked to energy performance

Description of the policy approach	**Existing examples** of the policy approach
Financial support schemes for distributed renewable energy installations should be subject to predefined energy performance levels of the related building or energy efficiency requirements to give a priority to demand-side measures, for the renewable energy system to perform most efficiently and be sized adequately thereby limiting its impact in front of the meter, and/or to avoid lock-in effect (e.g., about roof insulation when installing PV panels).	○ Heat Pump Grant, Ireland (SEAI) ○ Feed-in tariff linked to minimum building standard, UK

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?) [Please describe]
		Policy design	Policy implementation		
Complex and more technical application process	Institutional, cultural	X	X	Building owner or occupant, installers or energy advisors	The requirement of a pre-assessment of the building energy performance level (e.g. by an EPC) might results in a more complex application procedure in the case of a governmental subsidy causing delays, making that building owners or market actors might be reluctant to use the scheme, and therefore will not consider an integrated approach as promoted by the scheme. Building owners might be looking for quick and turnkey investment option.
Complex and long approval process for subsidies	Social, cultural		X	Implementing organisation	The requirement of a pre-assessment of the building energy performance level might result in longer and more complex approval processes. It might also require putting in place additional controls.
Lack of sufficient energy efficiency experts (e.g. EPC auditors) for the pre-assessment of the buildings' energy performance	Institutional		X	Implementing organisation, building owners, installers	The administrative organisation or national regulator might need to take actions to ensure that sufficient qualified/certified experts are available on the market to carry out the pre-assessment additionally to regular building renovation activities

Low quality of the national EPC scheme or other monitoring framework	Political Technical	X		National authority Implementing organisation	If the regulation setting the EPC does not set requirements ensuring the quality of the assessment (e.g., methodology, qualification scheme, controls), this might result in low quality assessments that might not recommend the most appropriate actions and create bias in the decision of the building owners.
Costs for pre-assessment/ EPC issuing and possible related energy efficiency improvements	Institutional Economic		X	Building owner or occupant	The additional costs for pre-assessment/ EPC issuing/ prior energy performance improvements would not occur in a traditional incentive scheme. If part of this extra cost is not compensated by the scheme, building owners might be reluctant to use the scheme and might choose options with lower upfront cost, and probably not in line with the E1st principle.
Lack of awareness or interest of an integrated approach (EE+RES)	Information - awareness	X	X	Building owner, installers	Building owners might be interested only in installing a RES system. Installers might be focused on their own trade, not considering other options relevant for the buildings. Information about the added value of an integrated approach can thus be an important point to support or include in the scheme.

Identification of success factors

Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
EPC scheme with high quality and comparability	Regulatory	X	X	National authority	Clear and well-established methodology of assessment, clear requirements about the recommendations/advice to be included with the assessment, qualification or certification scheme for the auditors, controls of samples of EPCs. Long-term implementation and high trust of the national EPC scheme, reinforced by regular independent controls; It should be easy to acquire

Enough EPC assessors or energy advisors available on the market	Institutional, social		X	National authorities Vocational / training / certification bodies, market actors	Training programmes for EPC assessors and energy advisors, or having in place a network of local energy advisors.
Easily understandable application process	Institutional	X		Implementing organisation	Design of the scheme should be discussed with all relevant actors (including installers and representatives of building owners). Making accessible guidance and support available to building owners, energy advisors and/or installers.
Additional financial support for the pre-assessment/ EPC issuing process or possible energy efficiency interventions	Economic	X	X	National authority Implementing organisation	Enabling combination of grants to support the pre-assessment and possible conditional energy performance works The rationale for extra public support can be that a large part of the benefits from an integrated approach where EE is prioritized will be at the society's level (e.g., reduced overall energy system cost, higher reductions in GHG emissions).
Information about the benefits of an integrated approach [EE+RES]	Information - awareness	X	X	Implementing organisation	Studies (e.g., impact assessments) providing a quantitative assessment of the benefits from an integrated approach. Case studies or examples illustrating the benefits for 'real-life' projects.

Planning instruments for investments in buildings

Description of the policy approach	**Existing examples** of the policy approach
Buildings have a long lifecycle and are only renovated at certain intervals which makes them prone to lock-in effects and stranded assets if the renovation is not done taking into account all aspects of the building's energy demand. Buildings are also closely connected to the energy system as a whole and involve a variety of stakeholders (owners, tenants, contractors, manufacturers/ installers, financing institutions, municipalities). Planning instruments and services can implement the E1st principle by facilitating the comparison of renovation scenarios or patterns, prioritizing demand side measures, making the process of renovating easier, more transparent and more efficient.	○ Digital building logbooks ○ Building renovation passports (BRP) ○ Tailored advice from one-stop-shops ○ Energy Service Contracting (EnPC)

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?)
		Policy design	Policy implementation		
Lack of knowledge of building professionals regarding different options for implementing renovation measures regarding E1st.	Information - awareness Social, cultural		X	Implementing organisation Local authorities Building owners or occupants Other market actors	Building professionals (e.g. architects, contractors, manufacturers) often look at the standard solutions for building renovation and don't necessarily have the full picture of demand and supply measures which are possible. Moreover they don't always know how to weigh demand and supply side options and what the benefits of E1st are – therefore they don't take it into account when making a decision or recommendation on a renovation
Lack of awareness about planning tools from the perspective of the building owners	Information Awareness		X	Building owners or occupants	As the implementation of these planning tools is not yet widespread, there is a lack of awareness of building owners and also building professionals regarding availability and benefits of such tools.

Lack of widespread implementation of and incentives to use building logbooks or similar tools	Political, regulatory	X	X	Implementing organisation Local authorities Other market actors	In order to make a difference for building renovation and implementation of the E1st principle, planning instruments need to be embedded in EU and/or national legislation as tools with clear guidelines how to compare demand and supply options in buildings and how and why to put efficiency first measures first.
Financial schemes not linked to planning tools	Economic	X		Building owners or occupants Other market actors Implementing organisation	The design of the financial incentives might not be aligned with the recommendations from the planning tools. For example, if the financial schemes provide incentives per type of measure or separate schemes for measures on the building envelope and installation of RES systems, this makes it difficult for the building owners to align them with the recommendations from the planning tool.
Lack of sufficient energy efficiency experts (energy auditors) who can conduct the assessment of the building's energy performance and integrate the E1st principle in the recommendations	Institutional, social		X	Implementing organisation, building owners	The administrative organisation or national regulator needs to employ sufficient qualified/certified experts to carry out the assessment of the building's energy performance. The implementation of the planning tool requires that advisors are available and trained to use the planning tools for making relevant recommendations. The rules of who can carry out the assessment varies according to countries but generally trained energy advisors should carry out this work.
Lack of comparable, high-qualitative EPC schemes in all Member States as a basis for building performance assessment	Political Technical Regulatory	X		National authority Implementing organisation	In cases where planning tools use EPCs for recommendations: If the regulation on the EPC does not set requirements ensuring the quality of the assessment (e.g., methodology, qualification scheme, controls), this might result in low quality assessments that might not recommend the most appropriate actions and create bias in the decision of the building owners.
Extra cost of the planning analysis	Economic		X	Building owners	Building owners might not be willing to pay for an analysis prior to the renovation activity if the benefits are not clear, instead of simply following the recommendations from a contractor. The cost of the planning analysis might thus prevent them from going through a planning phase before deciding on specific renovation measures.

Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Providing information on the E1st principle, how it can be implemented in the planning tools and what are its benefits (including multiple benefits)	Information - awareness		X	Local authorities Building professionals Other market actors	Informational materials aimed at different actors along the supply chain, information on demand and supply side options, information on multiple benefits
Information for market actors about the added value of the planning tools for buildings, and about the opportunities of cooperation between building trades	Technical, Information - awareness	X	X	Implementing bodies, trade organisations	Consultation of trade organisations when developing the planning tools. Case studies illustrating the use of the planning tools.
Ensuring that the planning tools are enabling fair comparisons of renovation scenarios that include scenarios prioritizing the improvement of demand-side savings (e.g. the building envelope) in the renovation patterns.	Institutional, Technical	X		National authority Implementing organisation	Clear legislative rules on calculation methods and guidance on what renovation scenarios or patterns should be considered and how to compare them (considering multiple impacts) for individual cases.
Aligning financial instruments with the E1st principle	Economic	X		National authority Local authority	Data on financial instruments and their impact, providing an overview of what instruments can be used by building owners engaged in a planned renovation process. Clear guidelines for financial schemes for building renovations

Good practice examples	Information/awareness		X	EU institutions National authority Implementing organisation Other market actors	Existence of good practice examples, knowledge of lessons learned through their work, transferability to other contexts, testing planning tools on exemplary buildings
Clear guidelines for integrating the E1st principle in Building Renovation Passports and Digital Building Logbooks as foreseen under the Renovation Wave	Political	X		EU institutions	By 2023 the EU Commission aims to propose Building Renovation Passports and a single digital tool to harmonise them with Digital Building Logbooks (Renovation Wave), the link to E1st should be made clear

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Expert Online Workshop │ Thursday 15 April 2021

Preparatory document for the discussions on the Power Sector

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These policy approaches, and the related barriers and success factors, will be discussed at the workshop.

The main objective is to identify where policy guidelines are needed the most to facilitate the implementation of the Energy Efficiency First principle.

This work comes after a first step of review of the EU policy frameworks to identify policy approaches:

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Note: in the following, “energy companies” encompass both, network operators (TSO and DSO) and energy suppliers/retailers.

Power market rules

Description of the policy approach	**Existing examples** of the policy approach
Demand-side resources can be mobilized next to generation to guarantee that supply and demand in the power system are balanced at all times. However, this requires market rules that provide access to them to the various power markets (wholesale, balancing) and the capacity mechanisms as well, where applicable.	• Participation of DR in French wholesale market - France • Assessing the value of demand resources – US • Energy efficiency as a resource in the ISO New England forward capacity market (Jenkins et al., 2011; Rosenow and Liu, 2018; SENSEI 2020) - US • Enabling rules for demand-side aggregators - EU

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?)
		Policy design	Policy implementation		
Unclear rules on supplier compensation	Regulatory	√	√	Energy companies, aggregators, regulatory bodies	DR (Demand-Response) aggregators business model is highly dependent on whether they have to compensate suppliers, and if so, then under what conditions. Even though the Electricity Regulation sets the rules on this, national implementation often lack clarity.
Too high transaction costs for Demand-Response aggregation	Regulatory		√	Energy companies, aggregators	DR aggregation is hindered by the complex contractual requirement. In Germany, e.g. the aggregator has to set up a contract with the balance responsible partner, the retailer and the DSO as well. The procedures and contract are not standardised.

Individual prequalification of demand-side resources	Regulatory		√	Energy companies, aggregators	Demand-side resources are often required to qualify individually for power markets whereas they should be considered as a pool of resources in the qualification process.
Too large bid size in the various energy markets	Regulatory	√	√	Energy companies, aggregators	Demand-side resources are usually smaller sized than generation. Setting too high bid size create a barrier even if they are aggregated. In Europe minimum bid sizes of 0.5-1 MW is still common. In the US 100 kW is the rule of thumb.
Unclear baseline calculation methodology	Regulatory, technical, economic	√	√	Energy companies, aggregators	Demand reduction is usually measured against a hypothetical baseline and hence affect the business case of DR. If it is not known in advance for the provider and need to be negotiated case-by-case, it becomes a revenue risk.
Lack of adequate metering infrastructure	Technical		√	Energy companies, aggregators	The rollout of smart meters by some Member States or, alternatively, the availability of third-party aggregators supplying their own metering/control devices is a prerequisite for DSO flexibility procurement.

Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Setting of a national DR target	Political	√		National authorities	Even though well-designed energy markets can provide incentives for the DR, setting a national flexibility target (cf. France) gives a political commitment for the development of the flexibility market, hence lower political and regulatory risk for private actors.
Scrapping of capacity markets	Political	√		National authorities, regulatory bodies	By their very nature, capacity mechanisms distort energy prices by draining revenues from the energy market and thereby undermine the economics of alternative clean and flexible resources such as demand response.
Involvement of consumers	Social and cultural		√	Energy companies, aggregators	Consumers traditionally do not consider themselves as power system resources. Apart from giving them a financial incentive to participate in power markets, there is a need for a cognitive paradigm change as well.

T&D (transmission and distribution) utility provisions	
Description of the policy approach	**Existing examples** of the policy approach
Provisions for network companies - both at transmission and distribution levels - that require the consideration of demand-side resources in grid planning and operations.	• Deferring T&D infrastructure through local end-use energy efficiency measures • Replacing a polluting power plant with demand-side resources • Water heaters as multiple grid resources • Social Constraint Management Zones to harvest demand flexibility • Updating distribution system planning rules in Colorado and Nevada

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?)
		Policy design	Policy implementation		
Low maturity of residential flexibility market	Information/awareness raising		√	National and local authorities, energy companies	DSOs face problem with procuring demand-side resources as potential consumers are not aware of the possibility of selling their flexibility. Network companies have to invest into developing the market upfront.
Lack of awareness and knowledge or experts about flexibility and demand-side resources among TSO and DSO staff	Information and awareness		√	energy companies	While some TSO and DSO are front-runners in developing projects or procurement approach to integrate demand-side resources in their planning and investments, some TSO and DSO might not have enough in-house experts about flexibility and demand-side resources to develop such activities.
Lack of adequate metering infrastructure	Technical		√	Energy companies, aggregators	The rollout of smart meters by some Member States or, alternatively, the availability of third-party aggregators supplying their own metering/control devices is a prerequisite for DSO flexibility procurement.

Forecasting uncertainty	Economic, technical		√	Energy companies	Forecast uncertainty is a problem in deferring infrastructure investments: difficult to foresee if the procured resources will be proper and suitable at the end as many fundamentals change in the meantime such as load, supply and potential non-delivery.
Priority to security of supply and doubts about the reliability of demand-side resources	Cultural		√	Energy companies	Based on their background and experience, TSO and DSO decision makers and experts are more familiar with supply-side investments and might be reluctant to consider demand-side resources.
Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Transparency requirement of grid capacity/flexibility need	Regulatory		√	Regulatory bodies	State regulation on integrated resource plans and distribution resource plans were crucial in forcing transparency on the grid in the US. In Europe, the Electricity Regulation requires DSO to publish their plans biannually but to do them online and updated monthly would be needed for the efficient integration of consumers as system resources.
Guidance on CBA that can assess both demand- and supply-side options	information	√	√	National authorities	European network companies have to assess demand-side options as well in their planning procedures. However, they lack the experience of assessing these, in many aspect, different types of resources in their traditional methods. Guidance would speed-up and facilitate a harmonised assessment and integration of these solutions in network development and operation.

Involvement of consumers	Social and cultural, Information / awareness		√	Energy companies	Consumers traditionally do not consider themselves as power system resources. Apart from giving them a financial incentive to participate in power markets, there is a need for a cognitive paradigm change as well.
Experience sharing between network operators and regulators	Institutional		√	energy agencies, energy companies	Demonstration projects and experience of front-runners can be very useful to convince the network companies and regulators that demand-side resources can be reliable. Such experience sharing can be supported by working groups already in place at European level. Research organisations can also provide a technical support through reviews and independent evaluation of available experiences.
Capacity building on the integration of demand-side resources in network planning and operation	institutional	√	√	Energy agencies, technical institutes	The evolution of the networks requires new skills. The development of specific vocational training for current and future staff of TSO, DSO can ensure that there will be professionals with the skills needed to implement new practices and services.

T&D (transmission and distribution) utility incentives					
Description of the policy approach				**Existing examples** of the policy approach	
Financial incentives for regulated network companies (DSOs, TSOs) to consider and invest into demand resources as an alternative to building new grid capacities.				• Decoupling utility sales and revenues	
Identification of barriers					
Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?)
		Policy design	Policy implementation		
Risk averse regulators	Regulatory	√		Energy companies	National regulators are inherently risk averse. Hence, changing existing remuneration schemes running the risk of providing non-intended incentives for regulated network companies is challenging.
Endowment of regulatory authorities	Institutional		√	Regulatory bodies	Compared to traditional regulation, NRAs require substantially more financial and human resources to administer and monitor performance incentives.
Opposition of TSOs or DSOs to regulatory changes	Political, cultural	√		National authorities, regulatory bodies	TSOs or DSOs might not be willing to change their practices and have no incentives to engage in regulatory changes.
Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]			Which prerequisites/ enabling factors are important?

		Policy design	Policy implementation	Stakeholder type responsible for the success factor	
Regulatory sandboxes	Regulatory	√		Energy authorities	National regulators are inherently risk averse. Hence, changing existing remuneration schemes running the risk of providing non-intended incentives for regulated network companies is challenging. Piloting regulatory design can help to alleviate this inertia.
Environmental mandate for energy regulators	Political	√		Energy regulators	Most NRAs have no mandate to pursue environmental objectives when designing energy regulation. This is not a prerequisite for shifting to DSO/TSO remuneration compatible with demand-side resource use but could reduce the risk perception of NRAs to be bolder.
Involving the TSOs and DSOs in the preparation of the regulatory changes	Political, institutional	√		National authorities, regulatory bodies	Engaging discussions early enough in the process can help to get a shared view of what regulatory changes are needed
Including the development of the use of demand-side resources as part of the missions of the TSOs and DSOs	Political, regulatory	√		National authorities, regulatory bodies	A clear recognition of the role of demand-side resources in network planning and operation implies that TSO and DSO shall have experts in charge of this topic, who can then be in-house advocates in favour of regulatory changes.
Assessing the resources needed at the regulatory bodies for the implementation of the regulatory changes	Political, institutional		√	Regulatory bodies	A comprehensive impact assessment about the proposed regulatory changes should provide a cost-benefit analysis from the consumers' and TSOs' or DSOs' viewpoints. It should also clarify what resources would be needed for the monitoring by the regulatory bodies.

Dynamic tariff design	
Description of the policy approach	**Existing examples** of the policy approach
Network and retail tariffs incentivising the smart use of existing networks by consumer and hence reducing the need for grid capacity extensions.	• Using time-of-use tariffs to engage consumers and benefit the power system

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?)
		Policy design	Policy implementation		
Lack of adequate metering infrastructure	Technical		√	Energy companies	The rollout of smart meters by some member states or, alternatively, the availability of third-party aggregators supplying their own metering/control devices is a prerequisite for DSO flexibility procurement.
Regulated retail pricing	Political	√		Energy companies	It is difficult to convince consumers to change for dynamic retail tariffs that entails price risk until they are eligible for below-cost regulated price, hence the potential savings is negligible or none.
Contradictory EU legislation on network tariff design	Regulatory	√		Energy companies	The Electricity Regulation is unclear on the preferred network tariff design. This might inhibit the national regulatory discussion on design suitable to incentivise demand response and energy efficiency.

Difficulty to provide effective price signals while keeping tariffs simple for consumers to understand and use	Technical	√		Energy companies	Needs in flexibility for the network might evolve over time. Whereas the information to consumers should remain simple so that they can easily adapt their demand as expected.
Dynamic tariffs are accompanied by a price risk for consumers compared to the traditional flat rate design	Social and cultural	√		Energy companies	Consumers might be reluctant to introduce another risk factor even if it promises savings on the bill.
Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Consumer awareness policies	Information/awareness		√	Energy companies	Consumers might reject changing from their traditional and simple volumetric flat rate tariff in fear of bill increase or inconvenience. They should be given the opt-out option and further temporary risk reduction measures such as rebate in case of bill increase in the first year or shadow bill issuance.
Piloting dynamic tariffs	Institutional	√		Energy companies	New tariff design should be tested on a pilot groups to reduce the risk of consumers negative attitude towards time differentiated pricing.
Providing clear benefits to consumers	Economic	√	√	Energy companies	Adapting consumption to ToU tariff represents a constraint for consumers. The offer should therefore provide a sufficient incentive to be attractive and to maintain the interest of consumers to adapt their usage

Coupling ToU tariff with automated devices for Demand-Response	Technical		√	Energy companies	For some end-uses, it can easily become a routine for the users to adapt the use to price signals (e.g., washing machine). However, for some end-uses, there could be a need for automated controls to make the adaptation of use fit with the ToU tariff (e.g., hot water tanks). Inconvenience can be a major barrier for DR.

Barriers and success factors to Energy Efficiency First implementation in buildings and related energy systems

Expert Online Workshop │ Thursday 15 April 2021

Preparatory document for the discussions on District Heating

This preparatory document presents an inventory of barriers and success factors in a summary table for each of the following policy approaches:

These policy approaches, and the related barriers and success factors, will be discussed at the workshop.

The main objective is to identify where policy guidelines are needed the most to facilitate the implementation of the Energy Efficiency First principle.

This work comes after a first step of review of the EU policy frameworks to identify policy approaches:

ENEFIRST, 2021. Priority areas of implementation of the Efficiency First principle in buildings and related energy systems. Deliverable D4.1 of the ENEFIRST project, funded by the H2020 programme. https://enefirst.eu/wp-content/uploads/D4.1_Priority-areas-for-implementing-Efficiency-First.pdf

Integrated district heating planning and operation

Description of the policy approach	**Existing examples** of the policy approach
DH planning and operation should determine an optimal mix of both various supply options (generation, network, storage) and demand-side measures (e.g. thermal renovations in buildings). This requires guidelines for regulators and DH companies, as well as effective regulatory instruments to incentivize private DH companies to exploit demand side potentials.	○ Demand flexibility in district heating networks (IT and UK)

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?) [Please describe]
		Policy design	Policy implementation		
Lack of regulatory framework	Regulatory		x	DH companies	As natural monopolies, DH companies are reluctant to embark on innovative activities and to significantly alter their established business model of selling kilowatt-hours of heat without an incentive to do so. To promote integrated DH planning, it needs to be financially attractive to the utilities in terms of utility remuneration. The current institutional and legal framework for DH at the supranational EU level provides little impetus for significant change. Also, the variety of DH utility arrangements (public vs. private) inhibits a harmonised approach to regulation.
Supply-side competition	Economic	x		DH companies	DH systems compete with alternative heat supply technologies, e.g., individual gas boilers and heat pumps. DH companies are highly risk-adverse, making them less inclined to experiment with demand-side measures.
Lack of practical experience with integrated planning	Information / awareness	x		Local policymakers, regulatory authorities, DH companies	Real-life applications of integrated DH planning are scarce and thus cannot serve as examples for new applications.

Planning complexity	Institutional		x	Regulatory authorities, DH companies, consumers	Determining and implementing technology potentials is a complex process that concerns various stakeholders. Suitable decision-making institutions and committees are needed.

Identification of success factors

Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Data availability	Information, technical		x	Regulatory authorities, DH companies, consumers	DH planners are lacking coordinated framework data (e.g. technology costs) to structure their CBA in a way that adequately reflects demand side resources.
Human resources in regulatory authorities	Institutional		x	National and local authorities	Compliance with DH planning provisions needs to be checked by national and local regulatory agencies. Lack of control may provide leeway to DH companies to continue their established practices without consideration of demand-side resources.
Demonstration projects	Institutional, technical		x	National and local authorities, energy agencies, regulatory bodies, DH companies	The development of demonstration projects can provide examples for DH companies to replicate. It is also good opportunities for stakeholders to discuss what is needed to improve DH planning practices.

Network access for third-party waste heat providers	
Description of the policy approach	**Existing examples** of the policy approach
Integrating waste heat in DH systems enhances supply-side efficiency, i.e., the amount of primary energy needed to supply a unit of heat delivered to consumers for purposes of space and water heating. To establish a level playing field between third party waste heat providers and conventional DH generation, adequate market access regulation needs to be in place.	None example yet among the ones identified in the ENEFIRST project

Identification of barriers

Key barriers of the policy approach	Type(s) of barrier	Barrier to [Please select]		Stakeholder type facing the barrier	Why is it a barrier to E1st implementation (and not a traditional barrier?) [Please describe]
		Policy design	Policy implementation		
Supply risk	Economic		x	DH companies, third party supplier	DH companies require economic security concerning consistent feed-in of third-party waste heat. Lower or non-continuous delivery necessitates the investment/use of back-up boilers, which lower profits generated.
Transaction costs	Economic		x	DH companies, third party supplier	Network feed-in prices need to be negotiated between the DH system operator and third-party providers. This creates transaction costs (money, time) that can be prohibitive to interaction.
Unreasonableness of third-party feed-in	Economic		x	DH companies	Operators of existing DH systems must ensure long-term economic viability. Additional heat means that own dispatchable generation of the DH company would have to be throttled, which is economically unreasonable unless appropriate compensation payments exist.
Technical feasibility	Technical		x	DH companies, third party supplier	Technical incompatibility may be given if the third-party generators want to feed in a pressure, temperature or aggregate state which does not correspond to the condition of the conduit pipe of the district heating network.

Identification of success factors					
Key success factors of the policy approach	Type(s) of success factor	Success factor in [Please select]		Stakeholder type responsible for the success factor	Which prerequisites/ enabling factors are important?
		Policy design	Policy implementation		
Enabling regulatory framework	Institutional		x	National authorities, regulatory authorities	Various exemptions in the EU legislation on third party access raise doubts about the effectiveness of these provisions. Additional rights would need to be provided to third party suppliers whilst ensuring economic viability for incumbent DH companies.
Energy planning as part of urban planning	Institutional	x	x	Local authorities	Long-term energy planning and commitment of local authorities to sustainable and efficient heat supply.
Financial support	Economic / Institutional	x		National and local authorities	Risk-hedging strategies to overcome the mutual dependence and perceived risk of production/ heat supply uncertainties.