ENPOWER

POWER IN OUR HANDS

ENPOWER Replication Roadmap

Updated structure, figures and EU policy recommendations

Version 2 | 20 August 2026

ICLEI Europe & RAP

August 2026

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement Nº 101096354

Energy Activated Citizens and Data-Driven Energy-Secure Communities for a Consumer-Centric Energy System

Grant Agreement Number 101096354		Acronym ENPOWER	
Full Title	Energy Activated Citizens and Data-Driven Energy-Secure Communities for a Consumer-Centric Energy System		
Topic	HORIZON-CL5-2022-D3-01: Sustainable, secure, and competitive energy supply		
Funding scheme	HORIZON Innovation Actions		
Start Date	1st September 2023	Duration	36 months
Project Coordinator	NTUA		
Deliverable	D7.3 | Replication roadmap, regulatory and administrative assistance		
Work Package	WP7 – Replicate, Integrate & Scale Up		
Delivery Month (DoA)	August 2026	Version	
Actual Delivery Date	20 August 2026		
Nature	Report	Dissemination Level	Public
Lead Beneficiary	RAP		
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Preface

ENPOWER will design, develop, and demonstrate SSH-driven methodologies, interactive and closed-loop tools, and data-driven services for energy-activated citizens and energy-secure cross-sector communities towards a citizen-centric energy system. We combine leading-edge ICTs with social/behavioural dimensions and with sharing economy and value stacking business models to deploy: 1) a Social Science Framework for energy citizens activation and innovative multidimensional incentives for citizens' participation in energy markets; 2) AI-based consumers clustering and segmentation algorithms; 3) interactive tools and facilitation services for energy community planning; 4) Energy Data Space adaptation to support community-level data-driven activation and interoperable automated privacy and sovereignty-preserving Demand Response (DR); 5) P2P DLT/Blockchain digital marketplace for tokenized energy and non-energy assets reciprocal compensation; 6) data-driven services and apps for energy efficiency and activation performance management; 7) ICT services and Digital Twins for community-level energy optimization and aggregated flexibility management to trade off local self-consumption against grid service provisioning, while boosting a beyond-energy community social welfare; 8) Edge monitoring hubs for automated DR; 9) Business Sandbox for novel sharing economy and social innovation-based business models; 10) methodologies for evaluating different energy community setups, upscaling and replication. ENPOWER framework will be validated along 4 Front Runners EnC's pilots and further replicated in 2 Early Adopters, covering different levels of maturity of communities, to demonstrate increased RES local self-consumption and consumers participation to the energy markets, while nurturing increased local security of supply. ENPOWER Leadership Programme and blueprints will support EU-wide replication and advice regulatory bodies on communities-friendly enabling frameworks.

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List of acronyms

AI	Artificial Intelligence
API	Application Programming Interface
BM	Business Models
CECs	Citizen EnC's
CER	Comunidades de Energia Renovável (Renewable EnC's - Portugal)
CRP	Citizen Renewable Platform
DCS	Dissemination and Communication Secretariat
DER	Distributed Energy Resource
DLT	Distributed Ledger Technology
DR	Demand Response
EAG	Erneuerbaren-Ausbau-Gesetz (Renewable Energy Expansion Act)
EC	European Commission
EDS	Energy Data Spaces
EEU	Electric Power Research Institute Europe DAC
EnC('s)	Energy community ('ies')
EV	Electric Vehicle
FATEC	Flexibility Assessment tool for EnC's
GA	General Assembly
GDPR	General Data Protection Regulation
HLUC	High-level use case
ICT	Information and Communication Technology
OSTEC	Optimised Scheduling Tool for EnC's
P2P	Peer-to-Peer
REC	Renewable Energy Community
RES	Renewable Energy Sources
ROI	Return on Investment
SSH	Social Sciences and Humanities
ToC	Table of Contents
USP	Unique Selling Points
WIS4Households	AI-Powered Virtual Energy Manager
WP	Work Package

1 Introduction

1.1 ENPOWER Overview

The European Union's (EU) Horizon 2020 research and innovation program funded project “Energy Activated Citizens and Data-Driven Energy-Secure Communities for a Consumer-Centric Energy System” (ENPOWER) strives to **transform** traditional passive **energy consumers** into **active energy citizens**, enabling them to take full control of their energy usage. The project engages with the principal actors of the energy value chain (*Distributed energy resource (DER) Owners, Grid Operators, Market operators, Aggregators, and End users*), to **achieve energy savings**, increase their **energy efficiency**, and **self-consumption optimisation**. It also aims to help energy consumers and communities **adopt digital solutions** to become better connected to the grid. Another key differentiator of the project is the inclusion of **social sciences and humanities (SSH) methodologies**. ENPOWER thus employs a comprehensive methodology integrating social, technological, and business aspects to empower communities. At its core, the project aims to **create a consumer-centred and socially responsible energy landscape.**

1.2 What are the ENPOWER replication roadmaps?

The project **aims to solve the challenge of empowering citizens and local stakeholders** to play an active role in the energy system by implementing the *ENPOWER approach*, which consists of measures focused on enhancing the operational effectiveness of energy communities through the use of technology (digital tools and data-driven solutions), innovative business models and social engagement approaches.

The ENPOWER Roadmaps are structured around a three-step methodology. Through this framework, six energy community pilots engage in co-creation activities to build a shared vision for future data-driven energy communities in their respective countries.

Each national roadmap’s expected impact and practical value go beyond the project's duration. Each national roadmap serves as a blueprint for the regulatory, administrative, organisational and business changes needed to fulfil the ENPOWER’s core vision: a future energy system where citizens and local stakeholders lead the transition through data-driven energy communities.

In general, the set of national roadmaps aims to **trigger high-impact change** by using **a multi-level governance (MLG) approach**, where we gather information from pilots at the local level, within the engaged communities but also reaching national and EU-level actors and policy makers. The roadmaps aim to show **what needs to change and how it needs to change** (specific additional measures) so data-drive energy communities can thrive in Europe.

1.3 ENPOWER Pilots and replicators

ENPOWER is being deployed in four *Front Runner* EnC’s’ pilots in Austria, Portugal, Greece, and Ireland, and will be replicated in two *Early Adopters* in Hungary, and Spain.

Front Runners are EnC’s (EnCs) with a degree of maturity in terms of organisational structure, technological deployment, or social engagement. Early Adopters, in contrast, are EnC’s still in earlier stages of their development. This approach is designed to adequately address different levels of maturity of EnC’s.

Front Runners

1. **Austria**: *OurPower* operates a cooperative-based peer-to-peer (P2P) marketplace matching renewable electricity from its members with consumers nationwide. The association gathers 13 EnC’s, with two of them participating as ENPOWER pilots: *Energiegemeinschaft Spörbichl-Dreißgen* in combination with REGIOS in Mühlviertel, Upper Austria, and *Energiegemeinschaft Poysdorf* in Weinviertel, Lower Austria. The Austrian pilot has been split into two pilot communities: Energiegemeinschaft (Renewable Energy Community) Spörbichl-Dreißgen (REC SD), with an operating region in Mühlviertel, Upper Austria, and Energiegemeinschaft Poysdorf (REC POY), with an operating region in Weinviertel, Lower Austria. The pilot has been split into two pilot communities:

   REC SD: A regional renewable energy community with a community-financed wind farm. During the start-up phase of the energy community, there were some major challenges with the energy service provider of the windfarm, as the participation of windfarms in energy communities is difficult and needs special support. Despite these challenges, the **energy cooperative REGIOS** with community-financed power plants in the region of the REC Spörbichl-Dreißgen was founded in November 2024. The REC Spörbichl-Dreißgen and its wind farm will also be part of this cooperative.

REC POY In June 2024, the Regional Renewable Energy Community Poysdorf started and joined the ENPOWER project. In August 2024, a kick-off event took place in Poysdorf with over 100 participants. On 13 December 2024, another onboarding event for new Energy Community participants took place. The energy community has been in regular operation since September 2024 and the framework conditions for further growth are in place.

2. **Portugal**: Portugal has a rich tradition of energy cooperatives, in this pilot there is an involvement of 60 members from *CEVE* and 50 to 100 members from *COOPERNICO*, exploring various contexts and geographical scope. The pilots will be working with models for collective self-consumption, flexibility services, and e-mobility integration with the goal of enhancing local energy resilience and self-sufficiency. For the Portuguese pilot, two pilots were envisioned, one where CEVE is the coordinator and another where Coopérnico is the coordinator. Being split in two, the Portuguese pilot has two different goals:

   CEVE will manage an EnC with up to 33 participants where an EnC management platform will be implemented (WIS4Communities) with a user engagement platform (WIS4Households – TE-13) that will help end users to be more efficient and, overall, maximizing the benefit of the EnC. Finally, if technically possible, demand response will also be implemented in up to 10 houses.

   Coopérnico , being a national-wide energy cooperative, has targeted 100 end users to participate in the pilot. As these participants will have various locations, a physical EnC will not be developed but rather the different strategies will be tested with the deployment of TE-13 – WIS4Households, where end users will have tailored feedback on their energy consumption profiles, demand response will be installed if technically possible in up to 10 houses and the EnC benefits will be simulated in a selection of end users.

3. **Greece**: The Greek pilot, **ChalkiOn**, focuses on establishing a community-centric energy system in the Chalki energy community. This initiative aims to optimize renewable energy utilization through advanced tools like demand response, and flexibility services. By integrating innovative technologies, ChalkiOn enhances energy autonomy, reduces costs, and promotes sustainable practices. The pilot has a goal to demonstrate scalable solutions for managing local energy resources, engaging community members as active participants in the energy transition, and showcasing a replicable model for other energy communities across Greece and the EU.

4. **Ireland**: The Dingle Peninsula in Ireland is a rural community dealing with challenges in managing electricity due to network congestion and increasing electrification. This pilot program looks for new solutions in homes, farms, and transportation. Key activities include:

   1. Farming Flexibility: Farmers will use renewable energy and flexible technologies through the Citizen Renewable Platform. This aims to save energy, cut costs, and reduce carbon emissions.

   2.Data-Driven Solution: The program will analyse energy usage and production patterns. This will help improve self-sufficiency and community resilience. The Digital Active Platform will provide energy scheduling tips based on local weather forecasts.

   3. Community Engagement: Residents will be encouraged to become "prosumers," meaning they will actively take part in the energy transition. The Citizen Renewable Platform will engage energy users to support renewable energy generation and flexible technology to enhance energy independence.

   Overall, the pilot program aims to build a more flexible and resilient local energy system that benefits both the community and the environment.

Early Adopters

1. **Hungary**: the Hungarian pilot is an Early Adopter in the ENPOWER project, meaning that a selection of technologies developed in the other pilots will be replicated here. For context, Békéscsaba (BCS) is advancing decarbonization through its "Smart Microgrid Phase I-II" energy program, aiming to become Hungary's first city with full smart meter coverage to support local energy generation and consumption. A following development phase involves expanding energy assets and engaging municipality buildings, industries, and citizens in an energy

community. While energy communities are new in Hungary, BCS plans to build one with support from Austria's OurPower and Hungary's ENASCO. OurPower will share expertise on citizen and industrial engagement, offer a P2P marketplace, and introduce its Nudging app, with BCS also replicating solutions from Chalki island.

2. **Spain**: The Spanish pilot is also an Early Adopter in the ENPOWER project. For context, DSOs play a key role in the energy transition by leveraging flexibility resources like batteries and EV chargers. CUERVA, a small DSO, will develop a Green Community in Fornes, which is a fully digitalized village in Granada with more than 500 residents. The project involves installing PV plants at six public supply points (e.g., school, town hall) to share energy among more than 25 residential participants already enrolled. CUERVA and VERGY will engage prosumers through energy planning and gamification, replicating data-driven services tested in Portuguese and Irish pilots.

2 ENPOWER National Replication Roadmaps

2.1 Methodology

The development and adoption of the national roadmap is divided into specific steps on an integrated management cycle, adapted from *ICLEI Green Climate Cities (GCC) Programme*. The cycle has been chosen as a basis for the roadmap since it promotes a holistic and future-proof approach to policy making (see figure 2).

- **Steps 1, 2, and 3** will be implemented during the ENPOWER project and are to be carried out by project partners. Within the scope of the project, only these three steps are considered.

- **Steps 4 and 5** are scheduled for a later stage and are intended as a future reference to support the further uptake of the roadmap. Once the full cycle has been completed for the first time, the process can be repeated and may serve as a foundation for future projects.

figure 1 Adapted from ICLEI Green Climate Cities Handbook 2016

2.1.1 National Roadmap Development

The first steps correspond largely to the activities carried out within the ENPOWER project and rely strongly on the findings of WP2 and WP7 activities. These three steps form the basis for the national roadmaps of the six ENPOWER Pilot countries.

2.1.1.1 Step 1: Stakeholder Mapping (identify & engage)

ENPOWER project carried out a first stakeholder analysis exercise in WP2, where the main actors that take part in ENPOWER's use-cases are identified. In WP7 activities stakeholder mapping is addressed as it is relevant to identify the importance of stakeholder groups regarding **the challenge of empowering citizens and local stakeholders to play an active role in the energy system**, but also to understand **what kind of networks & connections exist** between them.

Table 1 below serves as a simple template to help pilot partners complete the stakeholder mapping. Partners could fill in the pre-identified important actors based on activities in WP2.

Table 1 Stakeholder mapping in Pilot Countries:

Actor name	Actor type	National actors
Aggregator(s)	Organization	To be filled by pilots
Flexibility producer(s) / manager(s)	Organization	To be filled by pilots
Grid operator(s)	Organization	To be filled by pilots
DSO (Distribution System Operator)	Organization	To be filled by pilots
Market Operator(s)	Organization	To be filled by pilots
Distributed Energy Resource (DER) owner(s)	Organization/Person	To be filled by pilots
Other (National) EnC's	Organization	To be filled by pilots
Other(s)	Other(s)	To be filled by pilots

Once the most relevant stakeholders have been identified, project partners in each pilot country should take the lead in mobilising and inviting additional organisations from their national context to participate in the *roadmap co-creation process*. Ideally, these organisations confirm their attendance and actively contribute to the co-creation activities, ensuring that the roadmap reflects a broad and representative set of perspectives.

2.1.1.2 Step 2 Baseline Assessment (EU & National Context)

Previously in D2.1, the Gap analysis of EU legal framework took stock of the current state of play of EU legislation on consumer participation, supported the pilot projects and activities and developed a baseline for policy recommendations.

As part of the roadmap process, a baseline for what concerns regulatory barriers and challenges for **citizen's participation in the energy system** through data-driven Energy Communities was performed.

For that reason, within tasks T7.1 and T7.2 we conducted a three-part exercise:

– First, we shared a simple template (table 2) in which partners assessed the various regulatory, administrative, and/or organisational barriers (gaps or constraints) that pilots have faced when attempting to implement ENPOWER solutions.

Table 2 Template Barrier Analysis

Tool or Service	Barrier	How	Comments
To be filled by pilots	To be filled by pilots	To be filled by pilots	To be filled by pilots
To be filled by pilots	To be filled by pilots	To be filled by pilots	To be filled by pilots
To be filled by pilots	To be filled by pilots	To be filled by pilots	To be filled by pilots

– After receiving the filled templates by partners, during the ENPOWER General Assembly in Lisbon in February 2025, we conducted a World-Café exercise focusing on 3 pilots (Ireland, Austria and Spain) and collectively brainstorming how to tackle the different barriers (figure 3).

figure 2 World-Café analysis of Pilot barriers with partners

– Finally, the initial stocktakes and the discussions with pilots and replicators during the February meeting in Lisbon, bilateral sessions took place between task leader of T7.2 (RAP) and the pilots/replicators to further explore regulatory, organisational, and administrative barriers they might be facing in deployment of their activities.

These sessions took place over the course of April and May 2025 and were useful to set a first 'Baseline Assessment' of the regulatory and policy areas at the national / local level.

The following **Key policy areas** were identified through this 'Baseline Assessment process' and are presented in **Table 3**. These areas reflect how *citizen participation in the energy sector* is addressed in each national and local context of the ENPOWER Pilot countries.

Table 3 Baseline Assessment Outcomes (Key Policy Areas):

Key Policy Areas	Short Description
Regulatory Gaps	This category reflects on the regulatory gaps (missing, unclear or inconsistent frameworks) that hinder energy communities' creation, operation and scale and use of digital tools across the pilots' countries.
Economic incentives	Economic Incentives compromises the financial mechanisms that support the viability and scalability of EnCs in a complex energy market not designed for their participation.
Energy Community Digitalisation & Technical interoperability	Refers to the availability and integration of digital infrastructure, data access, and interoperable systems required for energy communities to operate efficiently and participate in energy markets. It also addresses how digital tools can be effectively used to optimise operations, enable coordination between actors, and bring citizens closer to the energy system.
Administrative (Licencing and Permitting)	Section dealing with the procedural and bureaucratic barriers related to the approval, connection, and operation of energy community projects in each national context.
Social acceptance	Deals with the challenge of increasing awareness (understand renewable energy systems and digital tools), trust, and willingness of citizens to participate and support community-led initiatives e.g. community energy.
Other(s)	Any other topic not covered by the previous sections.

2.1.1.3 Step 3 Vision: Set Strategic Goals & Develop an Action Plan

After stakeholders have been brought together and engaged, and the context has been assessed, including the key policy areas, the roadmap process moves from diagnosis to **direction-setting.** At this stage, the objective is to foster a common understanding of how citizens can participate more actively in the energy system through data-driven Energy Communities, while also asking a more strategic question:

What kind of energy community ecosystem should each pilot country aim to build, and what needs to change to get there?

The ***Future Radar methodology*** was used to co-create the roadmap actions to answer that question. Using this methodology, we asked each pilot country to **define a long-term vision** for its national/regional context. The vision served as a shared reference point for discussion, helping participants move beyond current barriers and imagine a future where citizens can participate more actively in the energy system through clearer rules, viable business models, digital tools, simpler procedures and stronger trust.

Starting from the vision, the methodology uses a canvas made up of two parts: the *Radar for Changes* (first cone) and the *Radar for Actions* (second cone):

- In the *Radar for Changes,* participants started from the envisioned future and worked backwards to identify the changes needed to reach it, considering areas such as regulation, financing, digitalisation, administrative procedures and social acceptance.
- In the *Radar for Actions*, participants moved from the present towards the future and identified actions that could help trigger those changes.

The actions were further specified by expected timeline and responsible actors. In this way, the exercise produced country-specific action tables showing **what should be done, by when and by whom**.

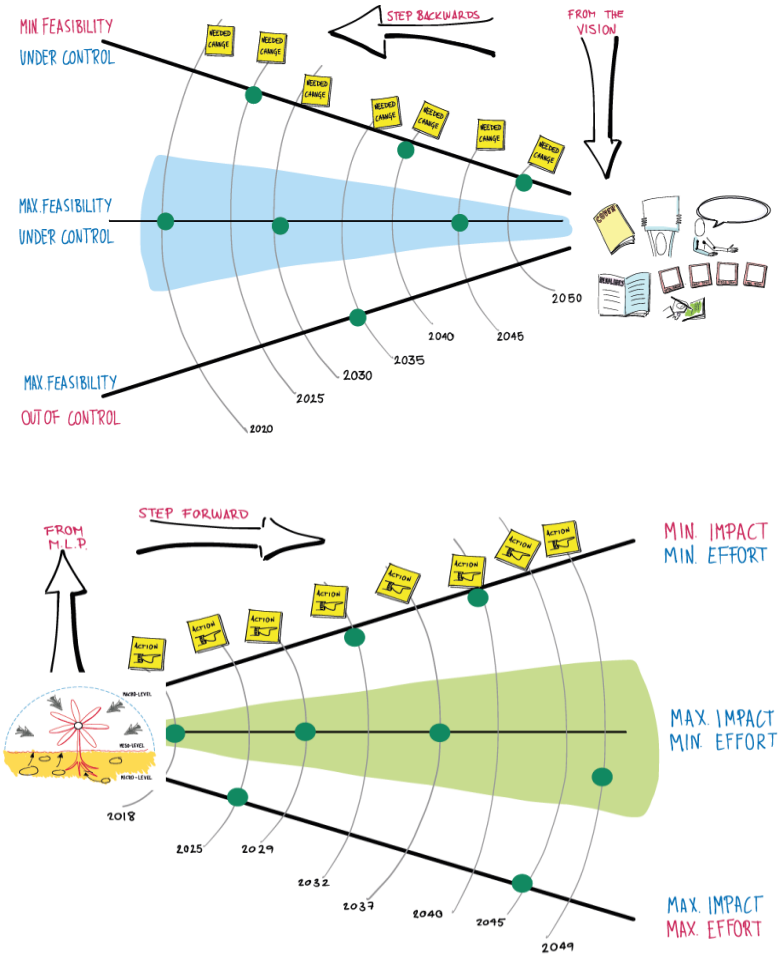

Figure 3 Adapted from Climate KIC Visual Toolbox for System Innovation 2020

2.2 Replication Roadmap Actions by Pilot country

The tables below summarise the **priority actions** identified by participants in each pilot country. Each action is accompanied by a deadline for completion and by a responsible institution, this was identified by stakeholders during the roadmap co-creation sessions using the Visioning "***Future Radar methodology"***.

Tables 4-9 below constitute the principal output of the sessions and helped translating the discussion from a long-term vision for 'data-driven energy communities' into concrete actions that could support replication and scale-up. Together, they provide the basis for identifying broader policy recommendations, implementation priorities, and potential areas for further work at local, national, and EU level.

The actions are organised according to the pre-identified **key policy areas**: Regulatory gaps, Economic incentives, Energy community digitalisation and technical interoperability, administrative procedures including licensing and permitting, and social acceptance.

2.2.1 Austrian Pilot

Table 4 Actions from the Austrian Co-creation National Roadmap activity

Key Policy Area	Actions to be implemented (from radar of actions)	By when? (from radar of actions)	By whom? (from radar of actions)
Regulatory Gaps	1. Standardize financing models 2. Include Energy Communities in district energy planning 3. Establish Energy Communities as a concept for regional resilience	2029 2030 2035	OurPower, NGO, District
Economic incentives	1. Integrate rural wind and hydro power 2. Create a funding scheme for PV and BESS 3. Enable full energy supply for Energy Community members	2029 2030-2033 2030	OurPower, (Regios)
Digitalisation of Energy Communities	1. One-Stop-Shop for Energy Communities and Energy Sharing setup 2. Enable (semi-) automatic flexibility 3. Creating reliable forecasts for Energy Communities	2027 2030-2035 2032	OurPower, TSO/DSO, OPTIVICE
Administrative complexities (Permitting and Licencing)	1. Establish an Energy Community pilot 2. Knowledge transfer for Vienna's districts 3. Participation in Energy Communities is just a signed contract	2026 2028 2030	OurPower, NGO, District
Social Acceptance	1. Information campaign for Energy Community pilot 2. Events and workshops for photovoltaics in Vienna 3. Events and workshops for heating, cooling and mobility	2026-2027 2030-2035 2035-2040	OurPower, NGO, District

2.2.2 Irish Pilot

Table 5 Actions from the Irish Co-creation National Roadmap activity

Key Policy Area	Actions to be implemented (from radar of actions)	By when? (from radar of actions)	By whom? (from radar of actions)
Regulatory Gaps	1. Develop peer to peer energy trading mechanisms 2. Glossary of terms and glossary of values for all actors DSO, TSO, CRU, EnCs	2030 2027	CRU (Commission for Regulation of Utilities) Dingle Peninsula SEC

Economic incentives	1, Develop local energy co-op to help raise finance renewable projects (e.g. access EIB finance)	2028	Led by SKDP (South Kerry Development Partnership), SECs to become members
Digitalisation of Energy Communities	1. Industry stakeholder consensus on standards for interoperability 2. Call for demand flexibility rules for SECs with respect for bottom-up needs and context in a transparent manner	2030+ 2027	International Standards Org with input from DSO/TSOs, utilities, SECs, manufacturers, entities providing management systems, tech providers ENPOWER Irish pilot team
Administrative complexities (Permitting and Licencing)	1. Establish a clear and structured process to support stakeholders in the development of energy communities.	2028 - 2029	SEAI with feedback from existing or aspiring RECs
Social Acceptance	1. Work with SEAI / CRU to develop case study materials of successful community-led projects / Playbook / toolkit 2. Long term inclusivity plan	2030 2027	SEAI / CRU with demand created from SECs All SECs, starting with Corca Dhuibhne T&H SEC

2.2.3 Greek Pilot

Table 6 Actions from the Greek Co-creation National Roadmap

Key Policy Area	Actions to be implemented (from radar of actions)	By when? (from radar of actions)	By whom? (from radar of actions)
Regulatory Gaps	1. Develop a new regulatory framework with clearer definitions of energy communities and their roles. 2. Establishment of standardized legal templates and governance structures for Energy Communities 3. Integration of Energy Communities into national energy and climate planning	2035 2035 2040	RAEY, Ministry of Environment and Energy
Economic incentives	1. Dedicated financing mechanisms (green funds, low-interest loans) for EC projects 2. Reduction of upfront participation costs (connection, equipment, fees) 3. Incentives for energy sharing and collective self-consumption schemes	2030 2035 2038	HEDNO; Ministry of Environment and Energy Ministry of Environment and Energy; European Parliament; Private sector RAAEY
Digitalisation of Energy Communities	1. Pilot program for data access between HEDNO and energy communities via smart meters 2. Standardisation of data exchange protocols for EnCs 3. Development of interoperable platforms between EnCs, DSOs, TSOs and regulators	2030 2035 2040	HEDNO; Private sector Ministry of Environment and Energy; RAAEY RAAEY; HEDNO; IPTO
Administrative complexities (Permitting and Licencing)	1. Establishment of a permanent working group to address licensing issues for renewable energy projects 2. Establishment of a fast-track procedure for small-scale renewable energy and energy storage projects initiated by communities 3. Standardisation of permitting requirements across regions	2026-2030 2040-2045 2030-2035	Ministry of Environment and Energy; RAAEY; HEDNO; IPTO Ministry of Environment and Energy; RAAEY; HEDNO RAAEY; Ministry of Environment and Energy
Social Acceptance	1. National awareness campaigns focusing on energy conservation, energy poverty, and local benefits.	2030 2030–2035 2035	Ministry of Environment and Energy; Local authorities; General public

	2. Participatory project planning with citizens, local organizations, and businesses 3. Inclusion of vulnerable consumers in Energy Community schemes	Local authorities; General public; Private sector Social services; Ministry of Environment and Energy; Local authorities

2.2.4 Portuguese Pilot

Table 7 Actions from the Portuguese Co-creation National Roadmap

Key Policy Area	Actions to be implemented (from radar of actions)	By when? (from radar of actions)	By whom? (from radar of actions)
Regulatory Gaps	1. Bottom-up operational guides: uniform national guidelines articulated with all system operators (DSOs) and other relevant actors - both from the energy system (e.g. energy agencies) and institutional actors (e.g. municipalities, local authorities). 2. Regulatory clarification between collective self-consumption (CSC) and renewable energy communities (REC). 3. Simplification of the licensing process for CSC and REC.	2030 2028 2028	Geology and Energy Agency /DSOs/ Municipalities/ Cooperatives Ministry responsible for energy Geology and Energy Agency
Economic incentives	1. Collective incentives (rather than individual) for decentralised renewable energy: reduced VAT rate (6%) for shared energy services and equipment.	2027	Ministry responsible for energy
Digitalisation of Energy Communities	1. Standardised interoperability between producers and DSOs, to ensure greater grid stability and flexibility. 2. Public management platform for CSC and REC.	2029 2030	Energy Services Regulatory Authority Geology and Energy Agency
Administrative complexities (Permitting and Licencing)	1. Simplification of the licensing procedure. 2. Transfer of the licensing procedure to DSOs (currently concentrated at national level in the Directorate-General for Energy and Geology). 3. Development of an agile and efficient data model for licensing processes.	2028 2028 2029	Ministry responsible for energy DSOs
Social Acceptance	1. Energy literacy campaigns in mainstream media and social media. 2. Mandatory 10% citizen/community co-investment and co-ownership in large-scale renewable energy projects.	2026 2026	Geology and Energy Agency/ Cooperatives/ Local authorities/ Energy agencies Ministry responsible for energy

2.2.5 Hungarian Pilot

Table 8 Actions from the Hungarian Co-creation National Roadmap

Key Policy Area	Actions to be implemented (from radar of actions)	By when? (from radar of actions)	By whom? (from radar of actions)
Regulatory Gaps	1. Formulate a legal framework to support peer-to-peer trading. 2. Develop detailed rules for energy sharing. 3. Establish a uniform, predictable entry pathway and eligibility logic.	H1 2026 H1 2027 H2 2027	Government / legislator; MEKH; distribution licensees / DSO; policy partners

Economic incentives	1. Open PV and energy storage grant schemes to non-profits and cooperatives. 2. Clarify municipal vs. state roles and demonstrate return on investment. 3. Develop an RHD tariff discount or compensation mechanism for DSOs.	H1 2026 H1 2027 From 2029	Government; financing institutions; MEKH; DSO; municipalities
Digitalisation of Energy Communities	1. Facilitate widespread adoption of smart meters equipped with P1 port readers. 2. Develop contract templates and a one-stop-shop process for the full project lifecycle. 3. Create a transparent online information platform to support registration.	H1 2027 – 2028	DSOs; metering and IT service providers; municipality; ENASCO / Békéscsaba ESCO; expert partners
Administrative complexities (Permitting and Licencing)	1. Make the MEKH registration process more transparent. 2. Provide traceable standard documents. 3. Provide targeted support for municipal and state actors to understand the process.	H1 2026 H1 2027 H2 2027	MEKH; ministries; municipalities; one-stop-shop / project coordinator organisations
Social Acceptance	1. Develop easy-to-understand business models. 2. Run communication campaigns on the benefits and impacts of energy communities. 3. Establish a regular knowledge-sharing platform.	H2 2026 H1 2027 H1 2028	Municipality; Békéscsaba ESCO / ENASCO; civil and professional organisations; communication partners

2.2.6 Spanish Pilot

Table 9 Actions from the Spanish Co-creation National Roadmap

Key Policy Area	Actions to be implemented (from radar of actions)	By when? (from radar of actions)	By whom? (from radar of actions)
Regulatory Gaps	1. Establish a clear and harmonised national regulatory framework for Energy Communities, aligning requirements between Autonomous Communities and municipalities. 2. Remove geographical distance limitations for energy sharing within energy communities. 3. Enable local energy markets and simplified surplus compensation schemes for community members.	2025–2030 2030 2030–2035	MITECO; Secretaría de Estado de Energía, CNMC; Comunidades Autónomas Coordinación con DSOs OMIE, REE y Agregadores
Economic incentives	1. Introduce tax incentives and subsidies for citizens participating in energy communities. 2. Create community tariffs with guaranteed minimum savings and welcome/referral incentives to attract new participants. 3. Promote collective purchasing schemes (PV, batteries, EV charging) and shared investment funds.	2025–2035 2025–2030 2025–2035	MITECO, Ministerio de Hacienda, IDAE, Comercializadoras, Operadores de EnCs como Vergy/Cuerva, Marco de CNMC/ Cooperativas/EnCs, sector privado

Digitalisation of Energy Communities	1. Develop integrated digital platforms allowing users to manage registration, permits, consumption, production and billing in one place. 2. Ensure interoperability and data exchange between DSOs, retailers and energy community platforms, including access to real-time energy data. 3. Deploy community Energy Management Systems (EMS) enabling optimisation, flexibility services and integration of assets (batteries, EVs, HVAC).	2025–2030 2030 2030–2040	Vergy/Cuerva/Bamboo/sector privado, DSOs, con estándares definidos por MITECO/CNMC DSOs, REE, proveedores digitales Sector privado tecnológico, EnCs operators, aggregators, DSOs where relevant
Administrative complexities (Permitting and Licencing)	1. Implement a digital single window for energy community permits, with traceability and automated notifications. 2. Standardise templates and automated validation processes (e.g., CUPS validation) to reduce administrative burden. 3. Introduce a single licence / fast-track permitting process combining installation, grid connection and operation permits.	2025–2030 2025–2030 2025–2030	MITECO, Junta de Andalucía / CCAA, Ayuntamientos, DSOs, IDAE as support body DSOs, CNMC
Social Acceptance	1. Launch national awareness campaigns explaining benefits, savings and participation processes in energy communities. 2. Promote energy education programmes in schools, universities and municipalities. 3. Create local energy leaders / ambassadors' networks to mobilise citizen participation.	2025–2030 2025–2040 2025–2035	IDAE, MITECO, CCAA, Ayuntamientos Ayuntamiento de Fornes; Diputación de Granada como actor provincial posible EnCs, asociaciones locales, cooperativas, ONGs
Other	Develop user tools such as savings simulators and transparency dashboards to visualize energy flow, savings and surpluses.	2025–2035	IDAE, EnC operators/facilitators, sector privado digital, DSOs for data

2.2.7 Comparative summary

Pilot partners collaboratively within their network of stakeholders developed the set of actions presented in tables 4-9. We analysed the proposed actions and identified common priorities across the pilot countries.

Common priorities: We found that the **strongest common priority** is the **transition from legal recognition of energy communities toward practical implementation**. Regulatory recommendations focus on clearer rules for energy sharing, peer-to-peer trading, local markets, governance roles and standardised procedures. **Digitalisation** was a highly important priority resulting from these exercises: within all countries the need for interoperable data exchange, digital platforms, smart-meter access and energy management systems was clear. Finally, **administrative simplification** was also a shared concern, particularly around licensing, permitting, standard templates and one-stop-shop processes.

Country-specific differences: Greece, Portugal and Hungary place stronger emphasis on foundational legal, administrative and data-access conditions; Ireland and Austria focus more on flexibility, interoperability and system integration; Spain is more focused on regulatory harmonisation with local markets. Economic and social acceptance measures vary strongly, ranging from cooperative finance in Ireland, collective incentives in Portugal, dedicated public finance in Greece, PV/BESS and rural generation integration in Austria, municipal/DSO support in Hungary, and tax incentives and community tariffs in Spain.

3 Policy recommendations

This chapter presents policy recommendations for policy makers and regulators across governance levels — EU and national — to support enabling environments for data-driven energy communities. The recommendations build on the learnings generated through the development, testing, validation and replication of the ENPOWER approach between 2023 and 2026. This approach focused on activating citizens through data-driven energy communities, supported by innovative digital tools, data-driven services and social engagement methods. The national-level recommendations presented in the following subchapters draw on two complementary processes described in this deliverable: the roadmap visioning exercise, which identified country-specific actions and priorities, and the regulatory and administrative assistance process, which analysed barriers identified through exchanges with pilot partners. Over the past years the EU has built a strong regulatory framework for energy communities. Where scaling up of energy communities is being held back by uneven, incomplete, or inconsistent implementation, overly complicated or lengthy procedures, and insufficient access to support and financing schemes. Specifically, unclear implementation of innovative concepts such as energy-sharing, peer-to-peer trading, and V2G charging, and delivery of demand-side flexibility is hindering the development of such services by energy communities for their members. The recent 'Citizens Energy Package', launched by the European Commission in spring 2026 already aims to address some of these remaining barriers, yet progress will depend on implementation at the national level. To this end, the majority of the policy recommendations focus on the member states in which the ENPOWER pilots are operating: Austria, Portugal, Greece, Ireland, Hungary, and Spain.

3.1 National level Policy Recommendations

The forty recommendations presented below are derived from the regulatory barriers identified throughout the ENPOWER pilots, the stakeholder consultations conducted during WP7 activities, and the replication experience documented in D7.2. This section presents the national policy recommendations developed for Austria (8), Portugal (6), Greece (7), Ireland (6), Hungary (6), and Spain (7). Figure 5 shows the recommendations grouped by EU-level category. Together, they reflect the specific national contexts and challenges identified in each country.

The recommendations aim to support the development of more inclusive, digitally enabled, and integrated energy systems by addressing regulatory, technical, financial, and governance barriers found throughout the ENPOWER project.

figure 4 Country Recommendations per Category

3.1.1 Austria

1. Standardise the processes for delegated access to data for energy communities and their service providers.

Consider establishing a standardised framework for secure data access to support the setup and day-to-day operation of energy communities building on the legal framework established in the new EIWG which entered into force in December 2025. Service providers need a legally robust and administratively efficient mechanism to obtain authorisation to access the relevant energy data of end customers and generation asset operators. As DSOs are

responsible for holding and managing this data in Austria, the framework could allow customers to delegate consent to the energy community, or to a service provider acting on its behalf, through a standardised and revocable power-of-attorney mechanism. This would accelerate onboarding and improve the practical functioning of energy communities while maintaining appropriate safeguards for data protection and customer control.

2. Mandate a national interoperable data management standard across all DSOs.

Consider requiring all DSOs to operate under a single national data exchange standard covering data formats, allocation logic, correction procedures, update frequency, and interface specifications. Although in principle legal and technical standardisation exists, implementation quality and service levels differ across DSOs. A fragmented DSO landscape creates avoidable inconsistencies in energy data allocation, settlement, and customer communication, which directly undermines digital service provision. The key requirement is full interoperability and harmonised service levels across DSOs.

3. Implement practical market rules for aggregated demand response and flexibility trading.

Following the adoption of the EIWG in December 2025, establishing the legal basis for aggregation, Austria could implement practical market rules for aggregated demand response and flexibility trading. These rules could clearly set out: baseline methodologies, metering requirements, processes for verification and settlement, data sharing obligations, DSO procurement processes, BRP/supplier compensation if relevant, and local flexibility products.

4. Preserve a credible consumer value proposition for energy communities.

Austria's legal framework could ensure that the economic benefits of participation in energy communities are visible, predictable, and not eroded by excessive administrative costs. Financial savings remain one of the primary drivers of participation in Energy Communities for households and consumers. Regulatory design could avoid unnecessary settlement burdens that reduce the net benefit to end customers. The objective could not be to guarantee savings in all cases, but to ensure that the framework allows efficient community models to pass through real value to households and small businesses.

5. Simplify participation and setup procedures for households and small consumers.

Austria could further simplify the administrative pathway for energy communities by addressing two distinct needs: the setup of energy communities and energy sharing schemes, and the participation of households and small consumers once these are operational. As a first step, Austria could strengthen the Austrian Coordination Office for Energy Communities to support the setup phase, including guidance on DSO/TSO procedures, data access, standard contracts, grid interaction, and available funding (see recommendation 2). As a second step, participation in energy communities could become as simple as "signing a standard contract". This would require easy-to-understand contractual arrangements, clear responsibilities between the energy community, service provider, supplier and DSO, and streamlined onboarding and withdrawal procedures.

6. Develop a standardised financing framework and further development of support schemes.

Increasing the standardisation of financing templates and community investment models at regional or national level could support the further upscaling of energy communities in Austria. This could include, for example, community shares, standardised cooperative or association-based finance templates.

As Austria already has support schemes for renewable energy and storage, the added value would be to further adapt these schemes to the specific needs of energy communities and energy sharing models. Such an approach would reduce transaction costs, improve bankability, and make it easier for citizens, municipalities and community actors to understand how costs, risks and benefits are shared.

7. Enable energy communities to integrate rural renewable generation into urban and regional energy sharing models.

Austria could further clarify the regulatory and market conditions under which energy communities can integrate renewable generation located outside dense urban areas, such as rural wind, hydropower or larger photovoltaic assets. This is particularly relevant where urban communities seek to diversify their renewable supply beyond rooftop PV.

The framework for linking rural renewable assets with energy communities could explicitly distinguish between locally or regionally limited Renewable Energy Communities and geographically broader Citizen Energy Communities. It could also clarify how the EIWG's definition of "local area" for tariff purposes, and the related restrictions on usable network levels for near-area shared energy use, affect different energy sharing models. This

would require clear guidance on how geographic scope, grid tariff treatment, usable network levels, energy allocation, settlement, and the role of service providers apply under the EIWG.

8. Integrate energy communities into district and regional energy planning.

Austria could integrate energy communities more systematically into district and regional energy planning. District energy plans could be required to assess the potential for local energy communities, energy sharing schemes, locally owned generation, and flexibility resources. Public authorities could also identify suitable public roofs, municipal assets, and grid areas where energy community models can reduce pressure on the grid, increase local renewable consumption, and strengthen local energy resilience. This could support the integration of energy communities into district energy planning and provide a basis for broader regional resilience planning.

3.1.2 Portugal

1. Develop bottom-up operational guidelines for CSC and REC implementation.

Portugal could develop uniform national operational guidelines for collective self-consumption (CSC) and renewable energy communities (REC), co-designed with DSOs, municipalities, cooperatives, energy agencies and relevant public authorities. These guidelines could clarify the practical steps required to create, operate and manage CSC and REC schemes, including the roles of system operators, local authorities and community actors. This action could be developed by **2030**, led by the Geology and Energy Agency, with input from DSOs, municipalities and cooperatives. The objective is to reduce fragmentation and ensure that local actors have clear, practical guidance for implementation.

2. Simplify, digitise, and decentralise the licensing process for CSC and REC.

Portugal could simplify and digitise the licensing process for both Collective Self Consumption (CSC) and Renewable Energy Communities (REC) projects, reducing administrative complexity and making procedures more predictable. The current process involves multiple administrative steps linked to community registration, network capacity assessment, meter adequacy, and certification.

A **simplified** and **digital workflow** would speed up approval, reduce administrative bottlenecks, and make community energy projects more accessible to smaller actors. This could be done by establishing clearer application requirements and standardised documentation. Establishing **binding timelines** for authorities reviewing applications and ensuring **sufficient staffing** could further reduce administrative delays and barriers for CSC and REC projects. Simplification could be pursued by **2028**, with the Ministry responsible for energy and the Geology and Energy Agency playing central roles.

3. Establish collective economic incentives for decentralised renewable energy.

Portugal could introduce **collective incentives** that recognise the shared value created by CSC and REC models. This could include a reduced VAT rate for shared energy services and equipment, or equivalent fiscal mechanisms that make community-based renewable energy more financially attractive. This action is identified for **2027** and could be led by the Ministry responsible for energy, in coordination with relevant fiscal authorities where needed. The objective is to move beyond individual incentives and better support collective ownership, shared equipment, and community-based renewable energy services.

4. Standardise interoperability between producers, DSOs and energy community platforms.

Portugal could develop standardised interoperability requirements between producers, DSOs and CSC/REC platforms to support grid stability, flexibility and transparent energy sharing. This could include common data formats, interface requirements, procedures for data exchange, and operational protocols between community actors and system operators. This action could be done by **2029**, with the Energy Services Regulatory Authority as the lead actor.

A stronger interoperability framework would reduce technical barriers, improve coordination with DSOs, and enable data-driven services for monitoring, flexibility, settlement and citizen engagement.

5. Create a public management platform and data model for CSC and REC licensing and operation

Portugal could develop two complementary digital tools to support the full lifecycle of CSC and REC schemes: The first is an agile and efficient data model for licensing processes, designed to centralise information, improve transparency, streamline applications, track project status, and facilitate interaction between promoters, DSOs,

public authorities, and regulators. The second is a public platform for community energy management, supporting the day-to-day operation of CSC and REC schemes – including energy sharing allocation among members, individual consumption and production tracking, and billing – and enabling the data-driven approach to community energy management that the ENPOWER project has piloted.

The roadmap identifies an improved data model for licensing by 2029 and the operational management platform by 2030. Together, these tools would make CSC and REC development more transparent, traceable, and easier to manage at every stage, from project inception to day-to-day operation.

6. Strengthen citizen participation through energy literacy and community co-ownership

Portugal could strengthen social acceptance and participation through two complementary measures: energy literacy campaigns and community participation in large-scale renewable energy projects. Energy literacy campaigns in mainstream and social media, led by the Geology and Energy Agency, cooperatives, local authorities and energy agencies, could be implemented by **2026** to improve public understanding of CSC and REC models.

In parallel, Portugal could mandate a minimum level of citizen and community co-investment and co-ownership in large-scale renewable energy projects, as proposed in the roadmap exercise. This measure would embed community participation in the mainstream energy transition rather than confining it to small-scale initiatives. Its design could ensure that participation is meaningful, accessible and not limited to citizens with high investment capacity.

3.1.3 Greece

1. Simplify permitting and licensing for energy communities through coordinated governance and standardised procedures

Greece could establish a permanent working group involving the Ministry of Environment and Energy, RAAEY, HEDNO and IPTO to address licensing and permitting barriers for renewable energy and energy community projects. This could be implemented in the short to medium term, in line with the roadmap timeline of **2026–2030**. The working group could support the standardisation of permitting requirements across regions by **2030–2035** and prepare the ground for fast-track procedures for small-scale renewable energy and storage projects initiated by communities. This would reduce administrative uncertainty, improve coordination between authorities and grid operators, and make energy community development more predictable.

2. Simplify and expediate grid connection procedures for energy communities

In addition to permitting and licensing barriers, one of the most significant challenges for energy communities in Greece is limited grid availability and delayed connection procedures. Simplifying and expediating grid connection procedures and providing targeted administrative support to energy communities could be considered.

3. Strengthen technical and organisation capacity for deployment and operation of energy communities

Greece could strengthen the technical and organisational capacity of public authorities and relevant stakeholders involved in energy communities setup, approval and day-to-day operation, including the use of digital tools and services. As unclear responsibilities and fragmented internal processes can generate delays. Limited technical expertise can also constrain the implementation, maintenance and effective use of new systems. National and local authorities could therefore support targeted training programmes, financial incentives for upskilling, and recruitment measures to increase the availability of qualified technical staff.

4. Create a national data access and interoperability framework for digital energy communities

Greece could establish a data access and interoperability framework enabling energy communities to operate effectively through smart meters, standardised data exchange protocols and interoperable platforms. As a first step, HEDNO, together with the private sector, could develop pilot programmes for data access via smart meters by **2030**.

This could be followed by the standardisation of data exchange protocols for energy communities and the development of interoperable platforms between energy communities, DSOs, TSOs and regulators by **2040**. The objective is to reduce fragmentation, enable digital services, and support monitoring, optimisation, energy sharing and flexibility.

5. Expand targeted financial support for IT infrastructure upgrades and the procurement of digital tools

Consider expanding financial support mechanisms for the digital infrastructure required by energy communities and related pilot projects. Many organisations face significant upfront costs when upgrading IT systems or procuring the hardware and software needed to operate advanced digital solutions. National and European funding programmes could therefore provide targeted grants, subsidies, or dedicated support windows for digital infrastructure modernisation. Strengthening financial support in this area would lower entry barriers, accelerate implementation, and improve the long-term viability of digital services and tools provided by energy communities.

6. Develop dedicated financing and participation support mechanisms for energy community projects

Greece could reduce upfront participation costs for citizens, SME's, and communities to lower barriers of participations, including connection, equipment and administrative fees, while developing dedicated financing mechanisms such as green funds, low-interest loans and private-sector investment channels for energy community projects. Support could prioritise projects that enable energy sharing, collective self-consumption, PV, storage and citizen participation and can support increased demand-side flexibility. By **2030–2038**, these mechanisms could help make participation in energy communities financially accessible and attractive, particularly for households, small businesses and vulnerable consumers.

7. Integrate energy communities into national energy planning

Greece could develop a clearer regulatory framework for energy communities, defining their relationship with regulators, DSOs, TSOs, service providers and members. This framework could also ensure that energy communities are integrated into national energy and climate planning, recognising them as relevant actors for distributed renewable generation, local participation, energy sharing and flexibility. This aligns with the roadmap action identified for **2040**.

3.1.4 Ireland

1. Accelerate the regulatory framework for peer-to-peer energy trading by energy communities

Ireland could accelerate the development of a CRU framework for peer-to-peer energy trading, in line with the transposition of RED III. Early community trading pilots could be enabled within existing supplier rules, allowing Sustainable Energy Communities and other local actors to test how local renewable generation can be shared more effectively. The framework could clarify supplier roles, settlement arrangements, metering and data requirements, consumer protection, and the conditions under which community energy schemes can participate.

2. Establish demand flexibility rules adapted to community-led models and regional grid needs

Create a clear and accessible enabling regulatory framework for energy community participation in demand side flexibility markets and services. Demand flexibility rules could be linked to national flexibility strategy (National Energy Demand Strategy NEDS) and Ireland's first Flexibility Needs Assessment, clarifying aggregator roles and lower entry barriers so Sustainable Energy Communities (SECs) can join flexibility services, addressing both national needs & constrained local grids.

3. Improve energy data access for communities through clear governance and standardised data-sharing agreements

Ireland could establish clearer data access arrangements for energy communities, with a focus on enabling timely, consent-based access to relevant energy data. This could include progressing ESB Networks' data-sharing portal for community members, supported by standardised consent and data-sharing agreements that provide legal clarity while protecting privacy and data protection rights. The data access framework could be kept distinct from broader legal questions around the definition or geographic scope of energy communities, so that practical data access barriers can be addressed more quickly.

4. Promote interoperability standards for data and digital tools, aligned with international standardisation processes

Ireland could assign a clear national lead, (e.g. National Standards Authority of Ireland NSAI or CRU), to coordinate interoperability standards for community energy data and digital tools, aligned with EU and international standardisation processes. Priority areas could include smart meter APIs, DSO–TSO data exchange, common data formats, technical interfaces and communication protocols for energy community platforms. A phased approach

before 2030 would help reduce fragmentation, improve usability, and support scalable services for monitoring, optimisation, flexibility and citizen engagement.

5. Support local energy cooperative finance mechanisms by linking them to existing support schemes

Ireland could strengthen the ability of local energy cooperatives and SECs to raise and manage investment for community renewable energy projects. This could build on existing supports, including SRESS (small-scale renewable energy support scheme) and Sustainable Energy Authority of Ireland (SEAI) grants. Additional support could include expert guidance for accessing national or European finance, partnerships with local credit unions, and help preparing bankable project pipelines. It is also important to clarify the roles between SEAI and DCEE (Department of Climate, Energy and Environment) in providing technical assistance.

6. Formalise regulatory sandbox trials for community flexibility and demand response

Ireland could formalise regulatory sandbox pathways under the CRU to test how community-based demand response and flexibility models can operate in practice. This could build on existing Irish pilot experience, including community flexibility demonstrations such as those in Dingle, and allow Sustainable Energy Communities and local actors to test community DSR models under controlled regulatory conditions.

The key objective could be to ensure that lessons from these pilots are systematically captured and translated into permanent CRU frameworks, so that successful models can move beyond demonstration stage and inform future flexibility market design.

3.1.5 Hungary

1. Leverage smart meter reform to support energy communities

Use the recent smart meter tariff reform in Hungary to support the development of EnC, by ensuring that dynamic, time-based tariffs and improved consumer access to consumption data are integrated into a broader framework for local energy sharing, demand-side flexibility, and more efficient use of distributed generation.

2. Strengthen municipal energy management platforms for local energy planning

Build on support for municipal energy management platforms by promoting their wider use as a foundation for development of digital tools for EnC, including better local energy production and use monitoring, improved planning, and the generation of data that can support future community-based energy services.

3. Introduce locational network charges to incentivise local balancing

Introduce more locationally granular system charges, or targeted network charge discounts to incentivise the organisation of electricity production and consumption within the same transformer district and to better reflect the potential network benefits of local balancing.

4. Establish a clear legal and operational framework for energy sharing and peer-to-peer trading

Hungary could develop a legal framework for peer-to-peer trading and detailed rules for energy sharing, supported by a uniform and predictable entry pathway for energy communities. This could clarify eligibility, roles, responsibilities, licensing requirements, and the interaction between energy communities, DSOs, distribution licensees, MEKH and policy actors. This process could be led by the Government/legislator and MEKH, with input from distribution licensees, DSOs by end of **2027**. A clear framework is essential to enable replication across Hungarian settlements and avoid each new community having to navigate uncertain rules on a case-by-case basis.

5. Create a national one-stop-shop and standardised project development pathway for energy communities

Hungary could develop a one-stop-shop process for the full energy community project lifecycle, including transparent registration, contract templates, traceable standard documents, and targeted support for municipalities and state actors. This could take place between **2027 and 2028** aligned with the roadmap activity outcome. And establish transparent and standardised authorisation procedures for energy communities to reduce administrative uncertainty and facilitate implementation.

6. Align financial incentives and municipal business models to make energy communities investable and attractive

Hungary could open PV and energy storage grant schemes to non-profits and cooperatives, clarify municipal versus state roles and demonstrate return on investment, and develop an RHD tariff *(network/system usage tariff)* discount or compensation mechanism for DSOs by **2029**. These measures could be combined with easy-to-understand business models for municipalities and citizens. The goal is making energy communities financially understandable, investable and attractive, especially for municipalities expected to play a central role in EnCs deployment.

3.1.6 Spain

1. Create a national digital single window for energy community registration, permitting, activation and operation

Spain could establish, as a priority by **2030**, a standardised digital single window where citizens, municipalities and energy community promoters can manage the full energy community journey in one place: registration, permitting, CUPS validation, grid connection requests, membership activation, consumption and production information, billing, and project status tracking.

This could include automated notifications, clear timelines, standardised templates, automated validation processes and traceability of each administrative step. To reduce fragmentation, the platform could support a simplified or fast-track pathway combining installation, grid connection and operation-related procedures where possible. The objective is to make participation in an energy community as simple, transparent and predictable as switching an electricity tariff, while reducing administrative burden for citizens, municipalities and project promoters.

2. Harmonise national, regional and local rules for energy communities, energy sharing and local market participation

Spain could establish a clear and harmonised regulatory framework for energy communities, aligning requirements across the State, Autonomous Communities and municipalities. This could include standardised procedures, predictable timelines, common documentation requirements and clearer responsibilities for public authorities, DSOs, retailers and energy community promoters.

The framework could also review geographical distance limitations for energy sharing, ensuring that they do not unnecessarily restrict viable community models, while preserving grid efficiency and local system benefits. In parallel, Spain could clarify the conditions under which energy communities can participate in local energy markets and access simplified surplus compensation schemes for their members.

3. Ensure interoperable data exchange, transparent user information and clear citizen value propositions

Spain could require, by 2030, interoperable data exchange between DSOs, retailers, energy community platforms and relevant public bodies, including standardised access to real-time or near-real-time consumption, production, billing and surplus data. And could address data protection and privacy concerns by introducing standardised protocols for secure, interoperable, and where appropriate anonymised data sharing. This could be complemented by user-facing tools such as savings simulators and transparency dashboards that allow citizens to visualise energy flows, expected savings, costs, benefits and surpluses before and after joining an energy community.

To support uptake, energy communities and service providers could also be enabled to offer clear and easy-to-understand participation models, such as community tariffs, minimum savings guarantees where feasible, and welcome or referral incentives for new participants. These tools could be supported by national awareness campaigns explaining the benefits, savings potential and participation process in simple language.

4. Develop a clear regulatory framework for peer-to-peer trading and flexibility markets

Establish a clear and supportive regulatory framework for peer-to-peer (P2P) energy trading and flexibility markets to facilitate the transition from a centralised to a more decentralised energy system. This framework could define the roles and responsibilities of emerging market actors, including aggregators and prosumers, while ensuring compatibility with existing grid operation and market arrangements.

5. Expand local and regional pilots to test new market models

Support local and regional pilot projects to test and refine P2P trading models, flexibility services, and other decentralised energy arrangements. These pilots can help identify effective technical and regulatory solutions, generate implementation experience, and provide a basis for wider national deployment.

6. Strengthen coordination with DSOs and TSOs for system integration

Encourage close cooperation between policymakers, DSOs, and TSOs to support the integration of decentralised energy resources into the electricity system. Stronger coordination is needed to ensure that new local market models can develop in a way that maintains grid stability, operational efficiency, and system reliability.

7. Strengthen citizen uptake through local support, financial entry points and energy literacy

Spain could complement digital and regulatory simplification with measures that make participation in energy communities financially accessible and socially understandable for citizens. In the **short to medium term**, this could include targeted tax incentives or subsidies for households joining energy communities, collective purchasing schemes for PV, batteries and EV charging infrastructure, and shared investment mechanisms that reduce upfront costs. At local level, municipalities and energy community promoters could support networks of local energy ambassadors to explain participation processes, build trust and mobilise citizens beyond early adopters. These efforts could be reinforced through energy education programmes in schools, universities and municipalities, helping citizens understand energy sharing, self-consumption, savings, data use and their rights as participants.

3.2 EU-level Policy Recommendations

In its **Citizens' Energy Package Communication (COM(2026) 115)**, the Commission aims to increase the renewable energy capacity installed by energy communities to as much as **90 GW**. To help overcome technical and financial obstacles and assist Member States in putting this Recommendation into practice, the Commission has proposed an 'Energy Communities Action plan' focussing on five key areas:

1. Establishing effective enabling frameworks
2. Improving access to finance
3. Raising awareness and building capacity
4. Promoting social inclusion and public participation
5. Supporting digital innovation and energy system integration

This comprehensive plan will hopefully be able to significantly improve active participation of citizens in the energy transition, strengthen the economic viability of energy community models and support improved implementation of the existing EU regulatory framework for energy community.

Building on these measures, this report proses a set of three targeted EU-level recommendations derived from the ENPOWER roadmap process. These recommendations were developed through a two-layered analysis:

- First, the forty national policy recommendations developed across the ENPOWER pilot countries were reviewed and compared with the existing EU policy framework.
- Second, the analysis identified the recommendations with the strongest potential to complement current EU priorities, particularly in areas where ENPOWER provides pilot-based evidence on barriers related to data access, interoperability, market participation, grid integration and citizen activation.

figure 5 Three overreaching categories

1. Support improved digitalisation of Enc, access to data, and interoperability between systems.

The Citizens Energy Package and its Energy Communities Action Plan include digital innovation and energy system integration as one of its five areas of action. However, the ENPOWER pilot experiences show that practical implementation within national regulatory frameworks remains constrained.

Across the pilot countries, this challenge appears in different forms: the need for standardised delegated access to DSO-held data in **Austria**; smart-meter-based data access and interoperable platforms in **Greece**; and consent-based access to ESB Networks data and national interoperability coordination in **Ireland**, to name a few.

Therefore, EU institutions could expand support to Member States in improving the digitalisation of energy communities and the provision of digital services to its members, by promoting clear, standardised and consent-based procedures for access to relevant consumption, generation, billing, and flexibility data. Moreover, EU guidance could support the further development of interoperability standards to enhance cooperation and data exchange between energy communities, DSO's, service providers and other market actors.

2 Support improved system and market integration of energy communities through improved market frameworks for energy sharing, peer-to-peer trading, demand-side flexibility

Implementation of energy sharing and peer-to-peer trading is still limited in many Member States, further guidance and clarity from the EU level on how to best implement these novel concepts could support adoption. Including through increased clarity on roles and responsibilities.

These must be accompanied by the integration of Energy Community intro grid planning. Energy communities could be recognised as relevant actors in grid and energy system planning. Provide guidance to Member States on simplifying and accelerating grid connection procedures for community projects, improve coordination between DSOs, TSOs, regulators and public authorities, and ensure that energy communities are considered in energy planning.

3 Citizens activation

The University of Basel multinational DCE analysis used 5,856 respondents across the six ENPOWER countries, targeting around 1,000 respondents per country, with quotas for gender and age groups. The DCE findings point out that "citizens prefer automated participation with opt-out rather than active day-to-day energy management/monitoring", therefore future EU policy could not assume that "active consumers" must constantly monitor, decide, and respond manually.

This builds on the national recommendations gathered through ENPOWER, which repeatedly stress the need to simplify participation, strengthen energy literacy, create credible consumer value propositions, provide local support and reduce practical barriers for households and small consumers. Automated participation with clear opt-out mechanisms can be understood as a practical extension of these priorities, helping citizens engage without placing excessive administrative burdens on them.

EU and national policymakers could establish regulatory, market and technical frameworks that enable Energy Management Systems (EMS) to automate flexibility, self-consumption and energy-sharing services on behalf of consumers, while ensuring transparency, consumer protection and easy opt-out mechanisms. This would reduce participation burdens, increase citizen engagement, unlock community-level flexibility and support a more consumer-centric and grid-supportive energy system.

ANNEX 1: Roadmap Visioning Exercise per Pilot

Austrian Pilot

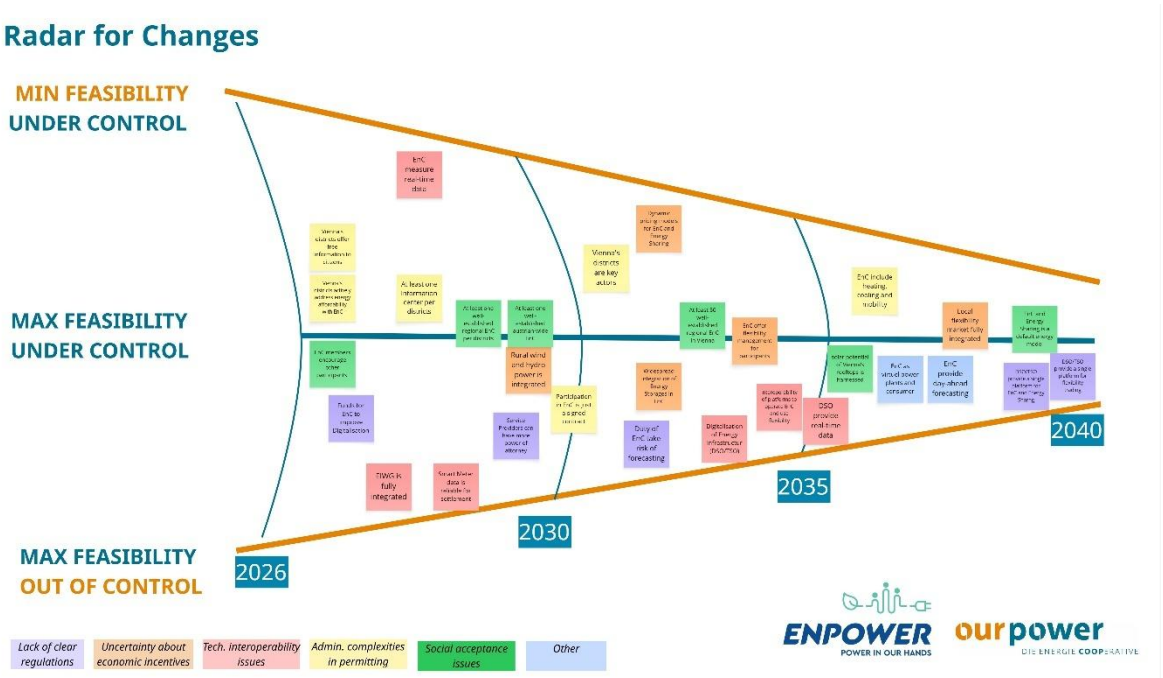

figure 6 Austrian Pilot – Radar for Changes

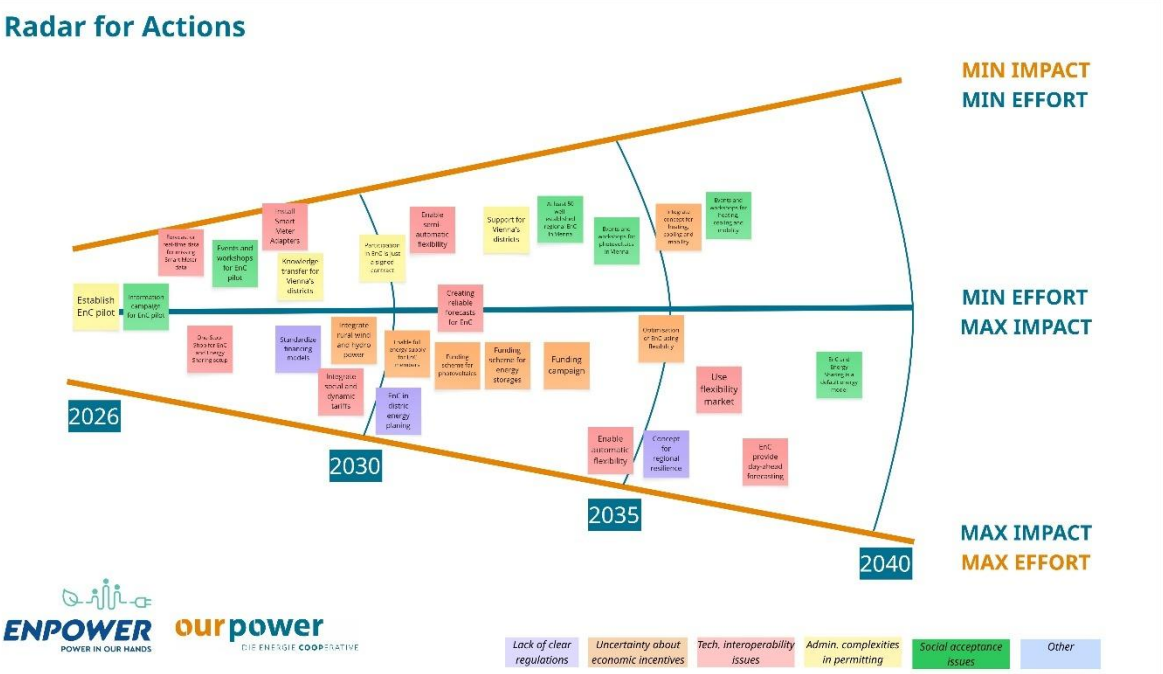

figure 7 Austrian Pilot – Radar for Actions

Irish Pilot

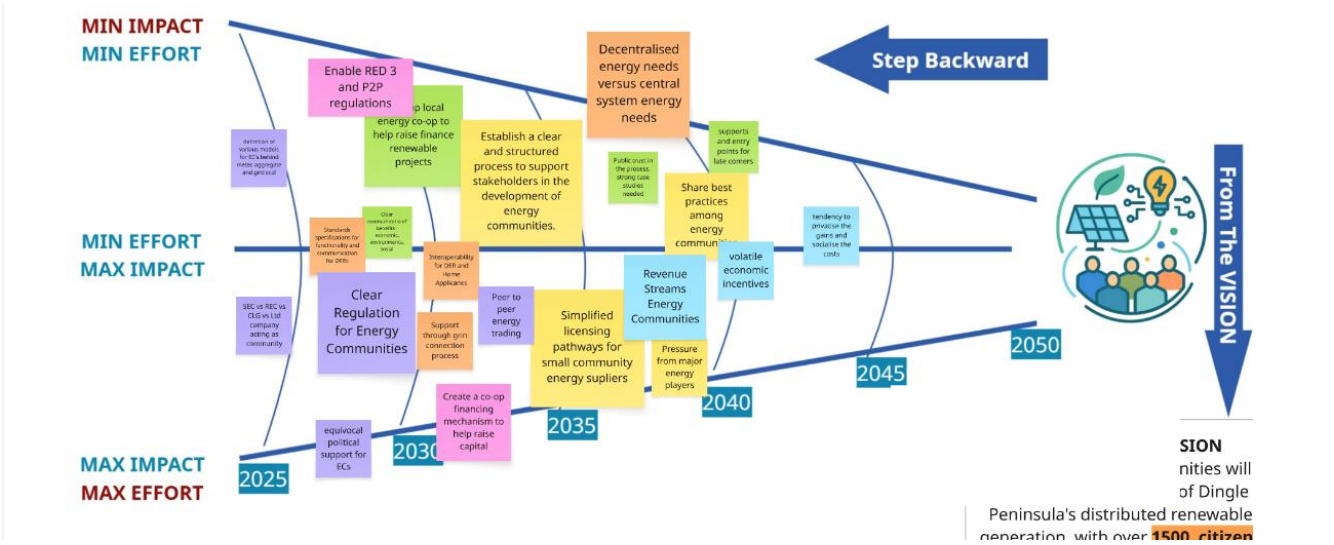

figure 8 Irish Pilot – Radar for Changes

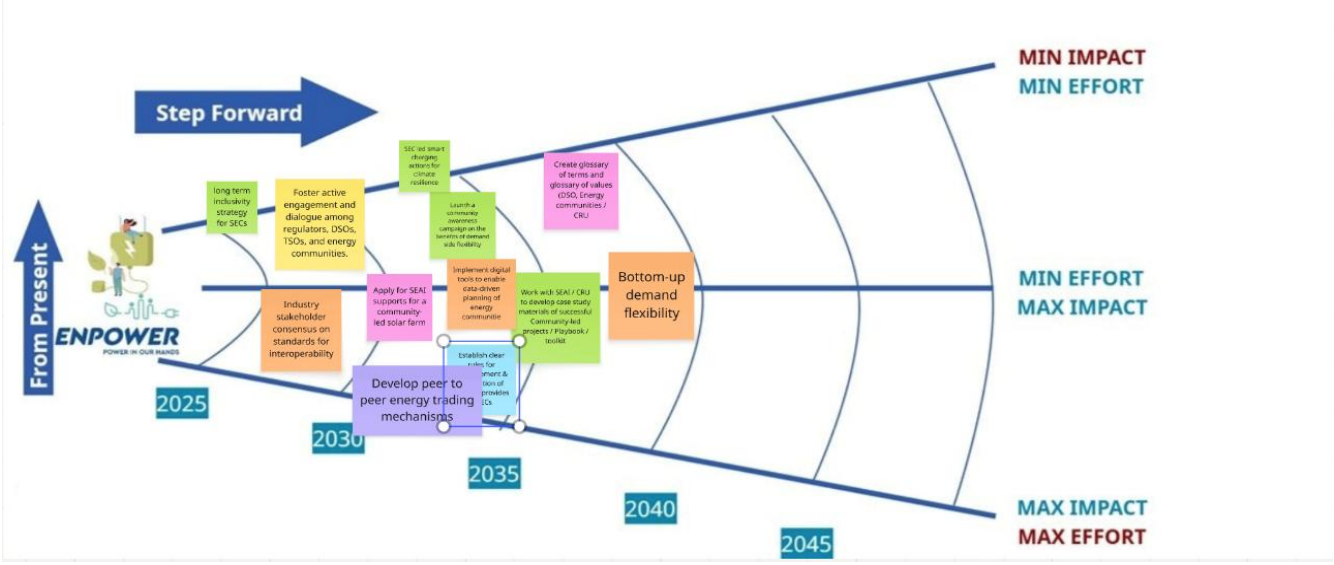

figure 9 Irish Pilot – Radar for Actions

Greek Pilot

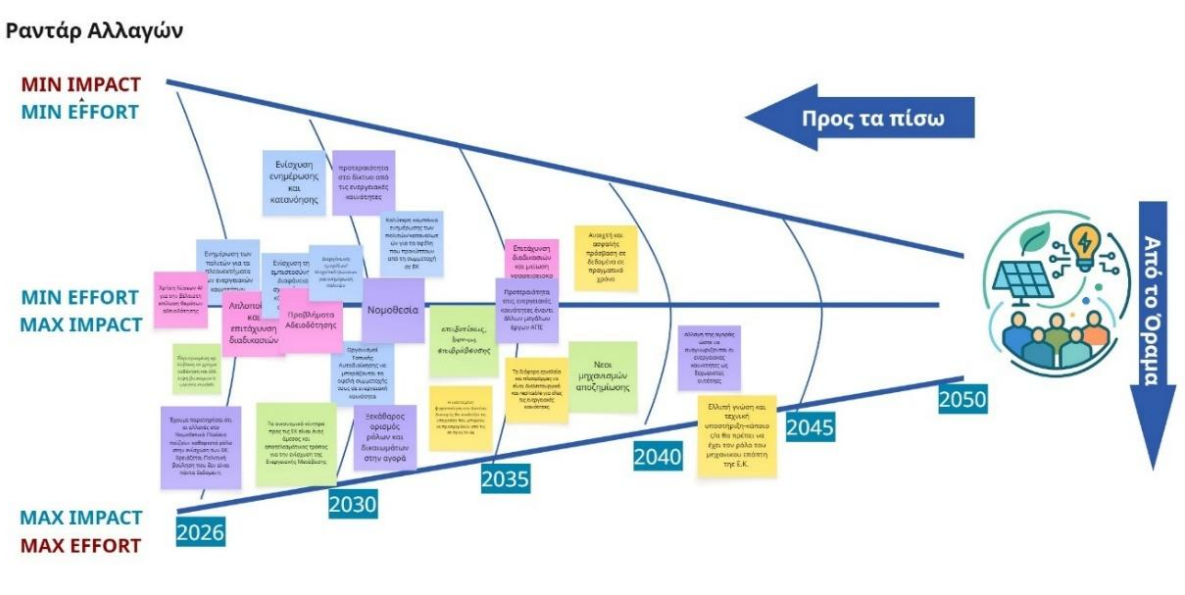

figure 10 Greek Pilot - Radar for Changes

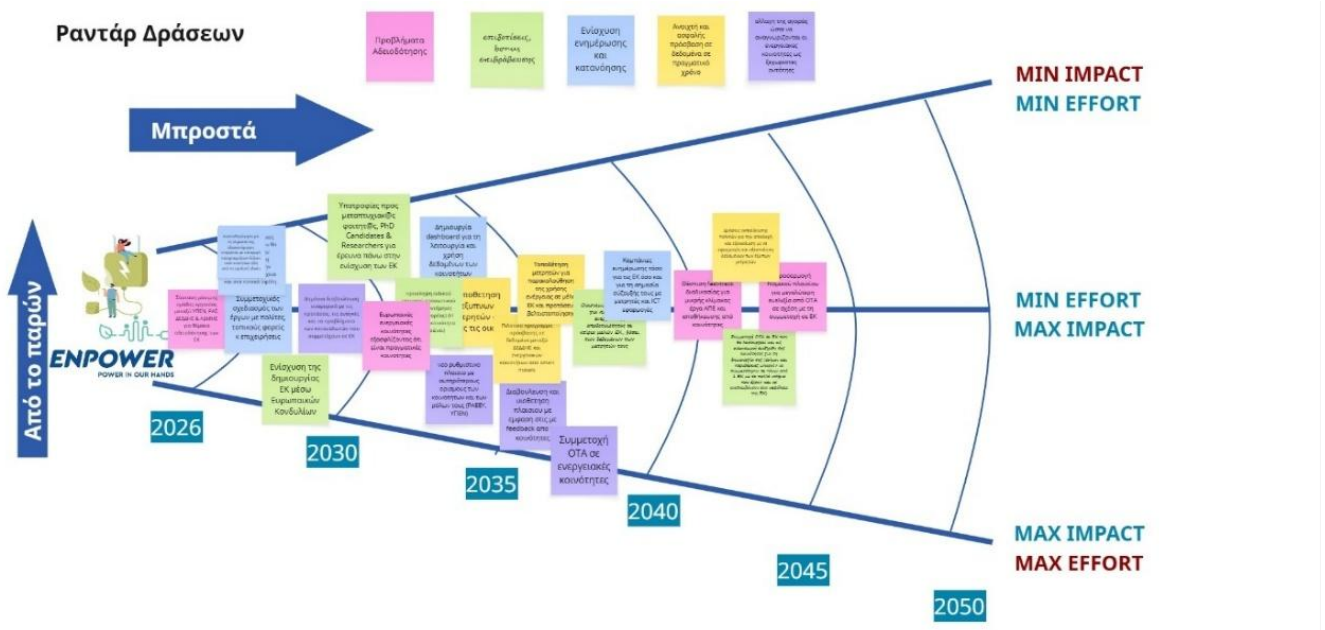

figure 11 Greek Pilot – Radar for Actions

Portuguese Pilot

"*By 2050, energy communities will contribute at least **15%** of Portugal's distributed renewable generation, with over **200,000** citizens actively participating at over **500** local, data-driven energy communities.*"

Figure 12 Portuguese Pilot – Vision 2050 Horizon

figure 13 Portuguese Pilot - Radar for Actions

figure 14 Portuguese Pilot – Radar for Changes

Hungarian Pilot

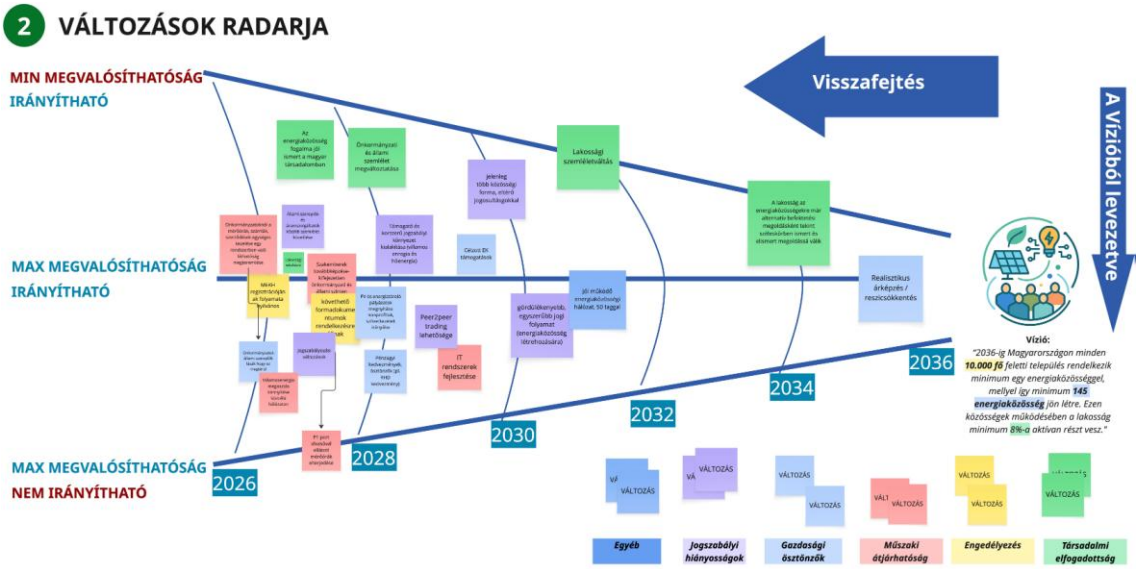

figure 15 Hungarian Pilot – Radar for Changes

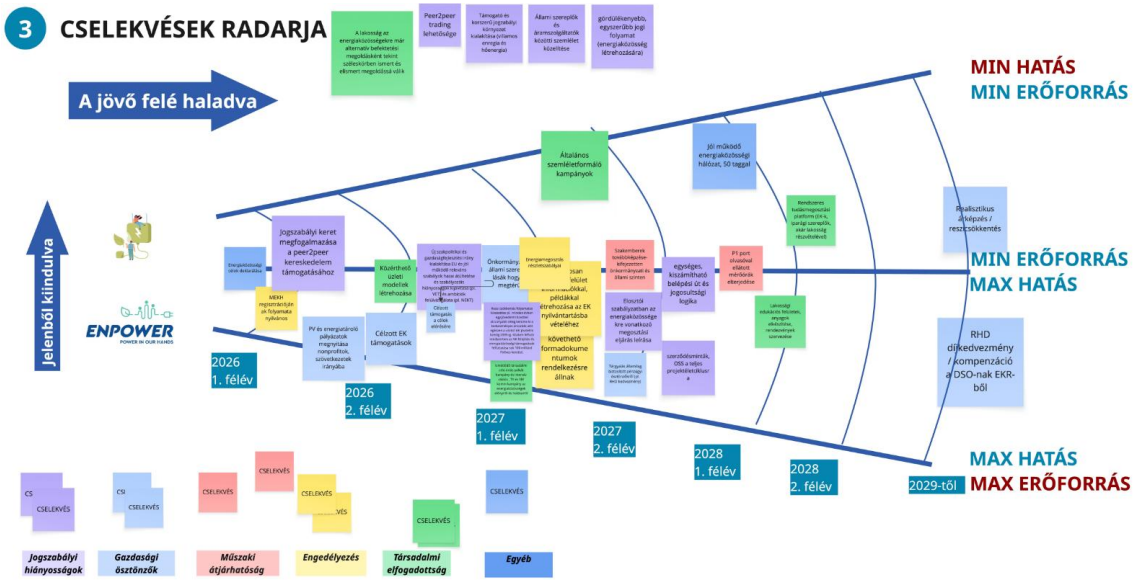

figure 16 Hungarian Pilot – Radar for Actions

Spanish Pilot

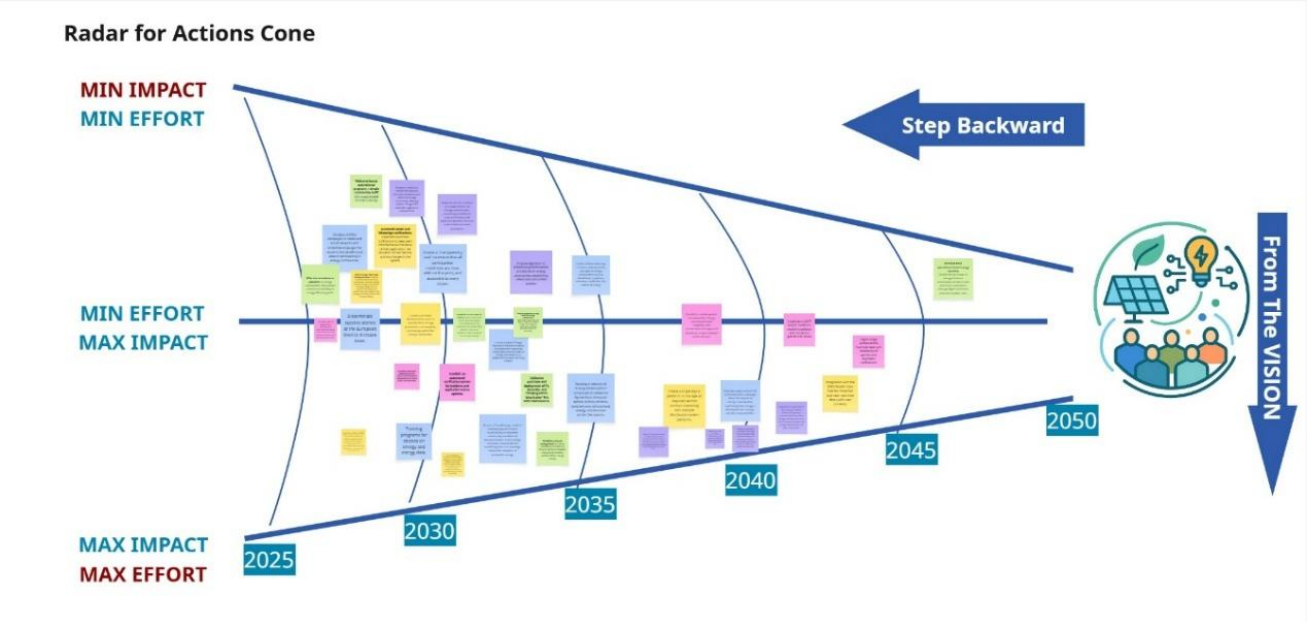

figure 17 Spanish Pilot - Radar for Actions

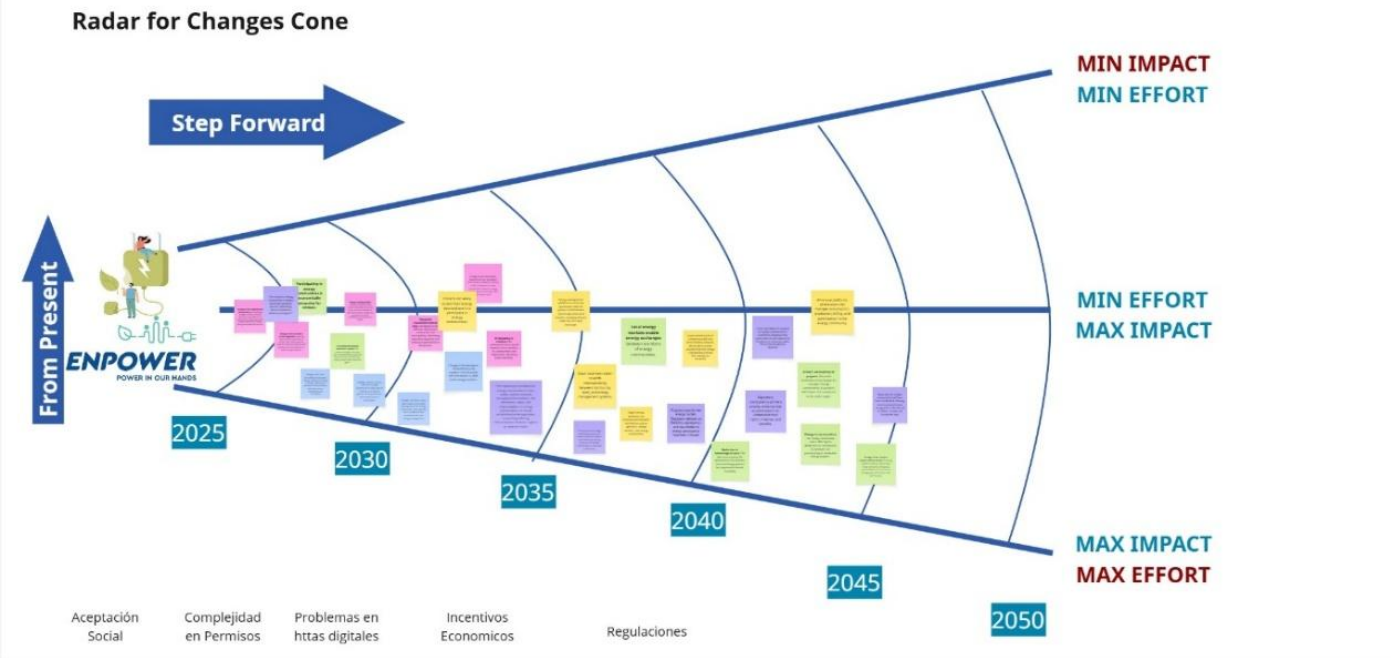

figure 18 Spanish Pilot - Radar for Changes

ANNEX 2: Public consultation results

Which stakeholder category best describes your organisation? 6 responses

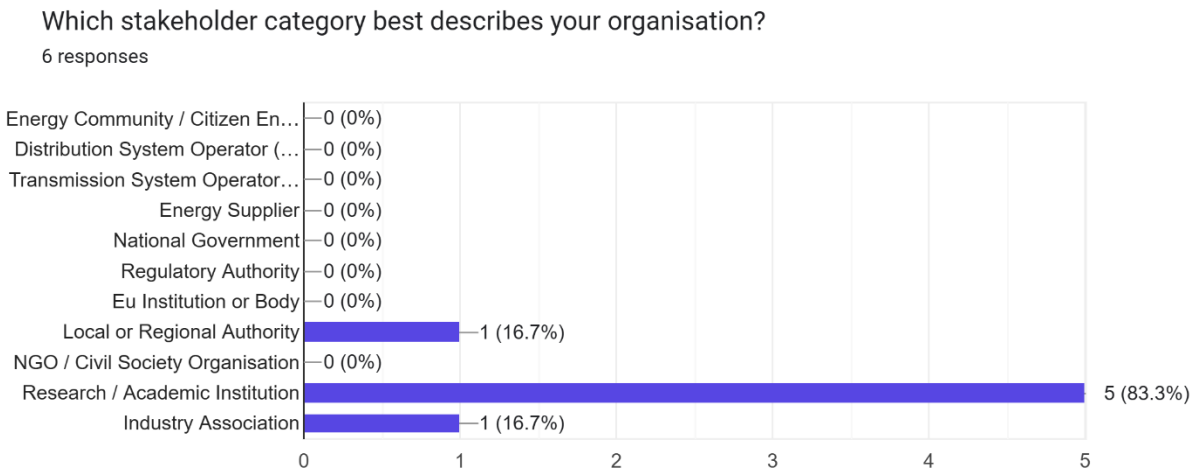

figure 19 Consultation response 1

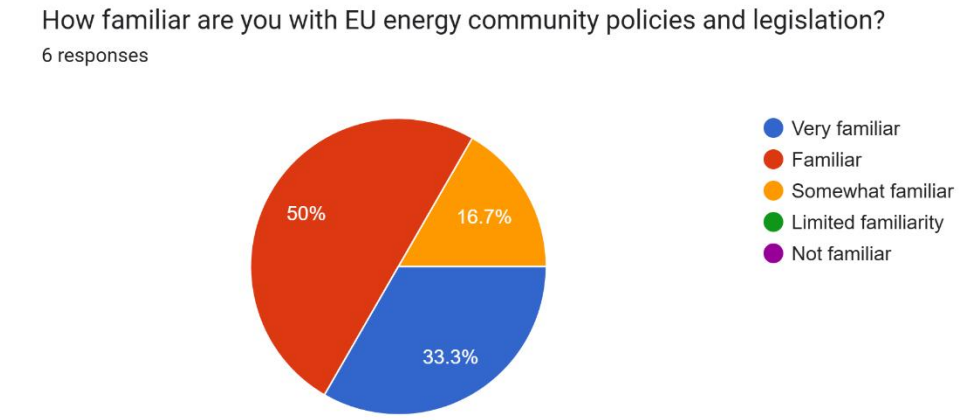

figure 20 Consultation response 2

EU-level Policy Recommendations

Recommendation 1 - Support improved digitalisation of energy communities, access to data, and interoperability between systems.

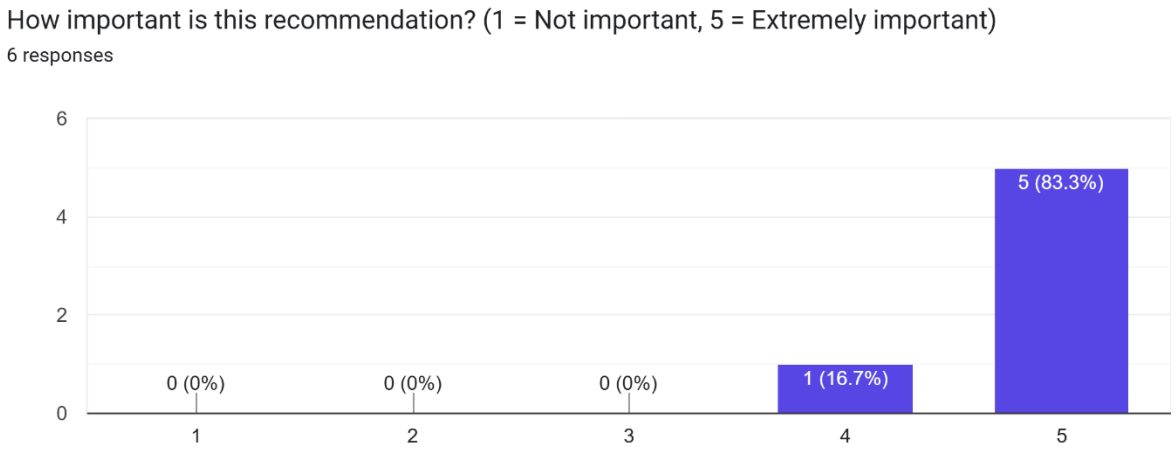

figure 21 Consultation response 3

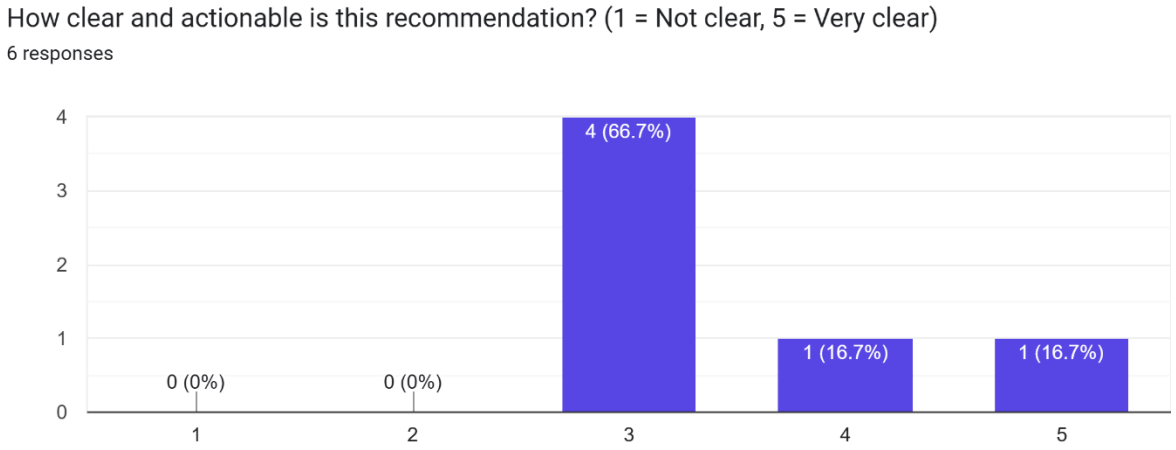

figure 22 Consultation response 4

Please provide any comments or suggested improvements.

1. The recommendation is highly relevant and should be considered a key enabler for the future growth of Energy Communities. However, digitalisation and interoperability should be complemented by cybersecurity and trusted digital infrastructure requirements. Future Energy Communities will rely on a large ecosystem of connected devices, including smart meters, EV charging systems, inverters, battery storage systems, gateways, and edge controllers. Therefore, interoperability frameworks should also address device identity, authentication, integrity, and resilience. The recommendation could be strengthened by explicitly promoting: Secure-by-design principles, Secure Boot and Secure Firmware Update mechanisms, Hardware Root of Trust technologies, PKI-based device identity management, Compliance with the EU Cyber Resilience Act (CRA), Long-term preparedness for Post-Quantum Cryptography (PQC). Trust, security, and

resilience should be considered essential components of digitalisation and interoperability to ensure the reliable operation of future Energy Communities across Europe.

2. The issue of intelligent data management and algorithmic and technological support is clearly essential to ensure the participation of energy communities in energy service markets. However, in reality there is a funding gap in energy assets and software that could make this technology accessible to standard energy communities.
3. Digitalisation and interoperability frameworks appear to be primarily adopted within EU-funded projects and R&D environments, with limited visibility in broader market applications. In addition, effective use and understanding of the tool often require face-to-face demonstrations and guidance. Without adequate introduction and support, end users (especially older people) tend to focus mainly on tangible outcomes, such as energy bill reductions, rather than engaging with the broader functionalities and benefits of the platform.

Recommendation 2 - Support improved system and market integration of energy communities through improved market frameworks for energy sharing, peer-to-peer trading and demand-side flexibility

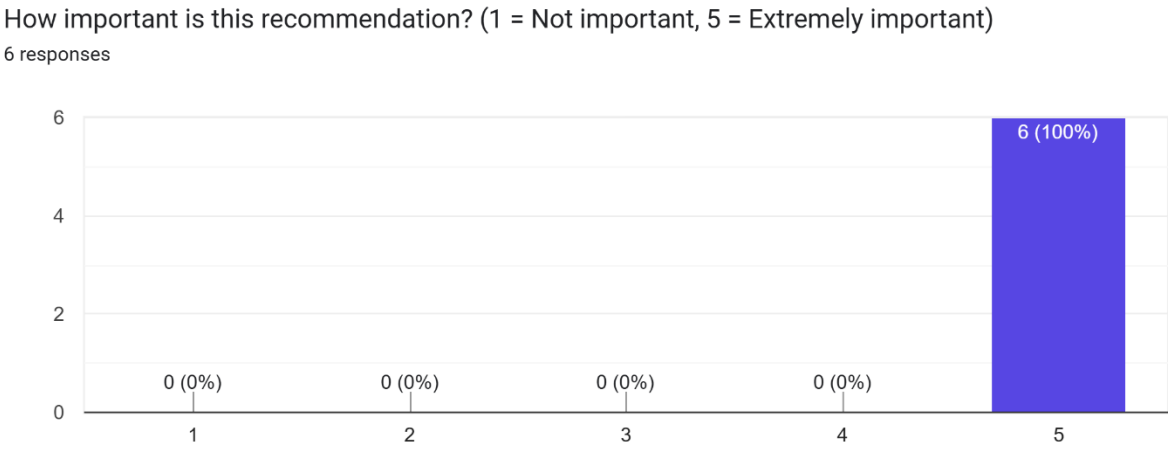

figure 23 Consultation response 5

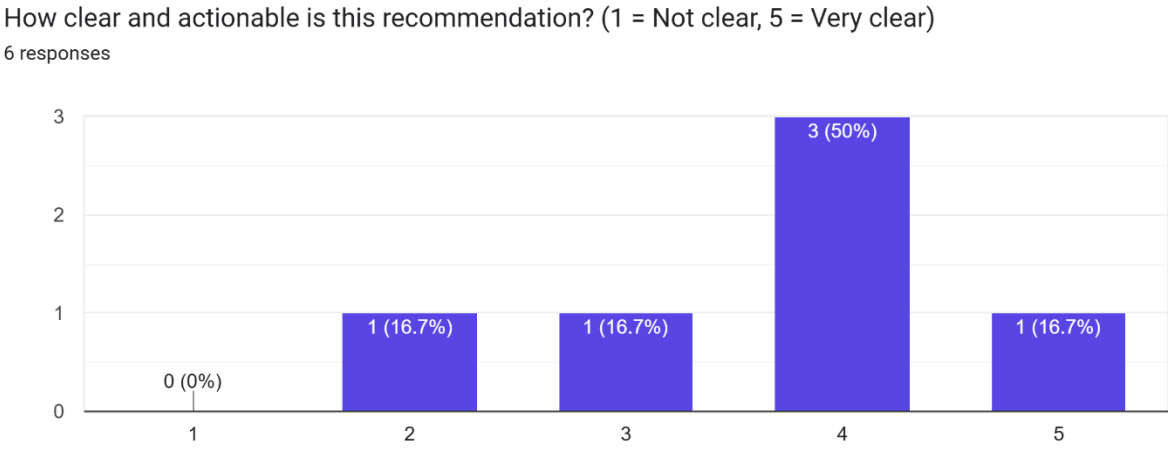

figure 24 Consultation response 6

Please provide any comments or suggested improvements.

1. The recommendation is highly important for unlocking the full value of Energy Communities and enabling active participation of citizens in the energy transition. To facilitate large-scale adoption, the EU should provide more detailed guidance on governance models, roles and responsibilities of market participants, settlement mechanisms, and interoperability requirements between Energy Communities, aggregators, suppliers, DSOs, and TSOs. In addition, future frameworks for energy sharing, peer-to-peer trading, and demand-side flexibility should incorporate cybersecurity, trust, and digital identity requirements from the outset. As energy transactions become increasingly digital and automated, secure authentication, trusted device identities, data integrity, and resilient communication infrastructures will become critical for market confidence and system reliability. The framework should also encourage harmonised approaches across Member States to reduce fragmentation and facilitate cross-border innovation and market development.
2. I believe the difficulty of real-world implementation depends on the legislation of each country. Undoubtedly, the European Union must ensure the transposition of European regulations, which, incidentally, need to be updated to respond to the needs of new emerging actors in the energy value chain, particularly those coming from citizens. In countries such as Spain, this P2P relationship, as well as the challenge of aggregation to provide flexibility services among small actors (such as energy communities), faces regulatory barriers.
3. Compared to the previous point, the adoption of energy sharing and peer-to-peer trading may be less dependent on end-user understanding, as these schemes are often facilitated by DSOs or other intermediary actors. However, their implementation remains technically challenging, requiring clear allocation of roles and responsibilities, as well as extensive data monitoring, interoperability between systems, and integration of distributed energy assets.

Recommendation 3 - Improve integration of energy communities intro grid planning

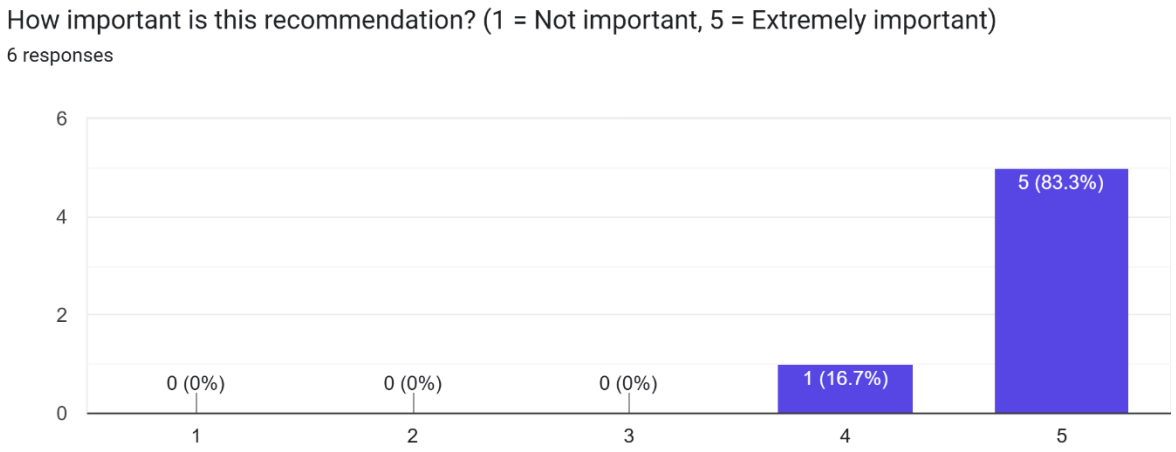

figure 25 Consultation response 7

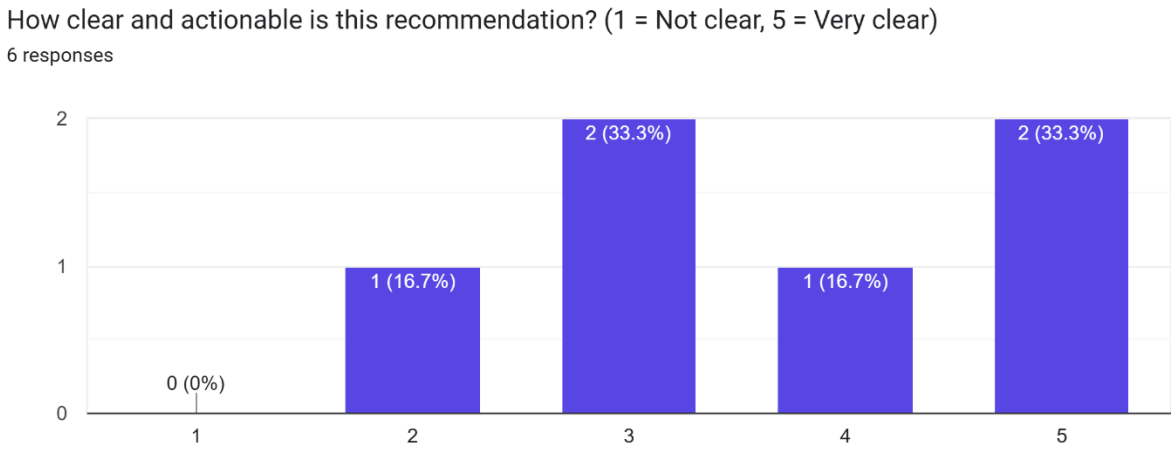

figure 26 Consultation response 8

Please provide any comments or suggested improvements.

1. I strongly support this recommendation. Energy Communities should be recognised as important actors within future distributed and decentralised energy systems, and their integration into grid planning is essential for achieving a resilient and flexible energy infrastructure. In addition to simplifying grid connection procedures and improving coordination among DSOs, TSOs, regulators, and public authorities, the recommendation should also consider secure and trusted grid integration mechanisms. As increasing numbers of distributed energy resources, smart meters, EV charging stations, energy storage systems, and community energy platforms become connected to the grid, secure identification and authentication of participating entities will become critical. The EU should encourage the adoption of PKI-based trust frameworks, digital certificates, and secure machine-to-machine authentication mechanisms to support trusted grid operations. Furthermore, given the long operational lifetime of energy infrastructure assets, future grid integration frameworks should consider a transition path toward Post-Quantum Cryptography (PQC) to ensure long-term protection of device identities, communications, control systems, and energy transactions. Secure and trusted interoperability should become an integral part of future grid planning and energy community integration strategies.
2. The relationship with DSOs is sometimes perceived as unequal, between large and small players. I believe that public authorities should introduce corrective measures to balance this situation. In the course of our projects, we have also observed that when energy communities manage to work cooperatively with distribution companies, citizens' pride and empowerment become evident, and this in turn nurtures the growth of the energy community.
3. I fully agree. Energy communities can play an important role in providing flexibility and supporting the integration of distributed renewable energy resources. However, implementation remains challenging without adequate support from regulators and public authorities, as administrative and permitting procedures are still major barriers. Streamlining these processes would accelerate deployment and encourage broader participation in energy communities.

Overall assessment

Are there any recommendations that should receive greater emphasis? If so, please elaborate.

– Yes. While all three recommendations are important, greater emphasis should be placed on digital trust, cybersecurity, and regulatory alignment. As Energy Communities become increasingly data-driven and reliant on connected devices, digital platforms, and AI-enabled services, future policy frameworks should ensure stronger alignment between the Cyber Resilience Act (CRA), Data Act, AI Act, and related energy-sector regulations. A coherent framework should promote secure-by-

design digital infrastructures, trusted device identities, secure data sharing, interoperability, and long-term cyber resilience. In particular, the security of connected energy devices should be addressed through mechanisms such as Secure Boot, Secure Firmware Updates, and hardware-rooted trust. Energy Communities will become part of Europe's critical energy infrastructure, making trust, security, and regulatory coherence essential enablers of their long-term success.

- All recommendations are important and can be developed in parallel. However, greater emphasis should be placed on establishing common frameworks and clear guidance at EU and national levels, as these provide the foundation for successful implementation and support replication and transfer of best practices from one initiative or region to others more effectively.

Are there any important policy areas missing from these recommendations? If so, please elaborate.

- Yes. One important policy area that is currently underrepresented is Digital Trust and Cyber Resilience. The recommendations strongly address digitalisation, interoperability, market integration, and citizen participation. However, the long-term success of Energy Communities will also depend on the security and trustworthiness of the underlying digital infrastructure. Future policy frameworks should address secure device identity, trusted data exchange, secure software lifecycle management, and resilience of connected energy devices such as smart meters, EV charging systems, inverters, battery management systems, and gateways. In addition, greater alignment should be encouraged between the Cyber Resilience Act (CRA), Data Act, AI Act, and energy-sector regulations to ensure that Energy Communities can adopt digital and AI-enabled services in a secure, interoperable, and compliant manner. Strengthening digital trust and cyber resilience will be essential as Energy Communities become an increasingly important component of Europe's critical energy infrastructure.
- Regulatory framework for Active demand response services
- The recommendations seem to cover the main stakeholders involved.

Do you have any additional comments or suggestions?

- The ENPOWER recommendations provide a valuable and practical framework for accelerating the adoption of Energy Communities across Europe. The strong focus on citizen participation, digitalisation, interoperability, and market integration is particularly welcome. As implementation progresses, it will be important to ensure that technological innovation is accompanied by trusted governance, cybersecurity, and regulatory coherence. Energy Communities are evolving into complex digital ecosystems that combine energy, data, connected devices, and increasingly AI-enabled services. For this reason, continued alignment between energy policy and broader EU initiatives such as the Cyber Resilience Act, Data Act, and AI Act will be important to support secure, scalable, and citizen-centric Energy Communities. Overall, the roadmap provides a solid foundation for strengthening Europe's transition towards a more resilient, participatory, and sustainable energy system.

Member States Recommendations

Which country's recommendations have you reviewed or feel qualified to comment on?

6 responses

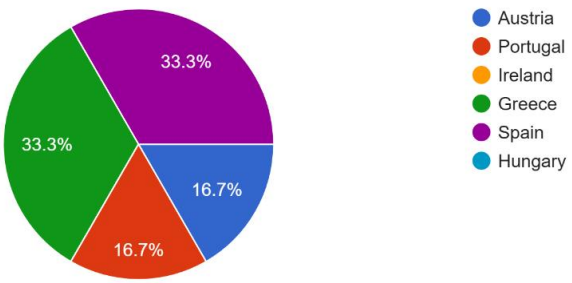

figure 27 Consultation response 9

Austria

- The Austrian recommendations are comprehensive and well aligned with current efforts on data access, interoperability, energy sharing, and flexibility services. One area that could receive additional attention is digital trust and cybersecurity. As Energy Communities increasingly rely on smart meters, distributed energy resources, EV charging infrastructure, battery systems, and digital platforms, a cyber incident affecting connected devices could impact not only individual participants but also broader grid operations and public trust.
- Therefore, interoperability should be accompanied by trusted device identity, secure software lifecycle management, secure firmware updates, and alignment with EU frameworks such as the Cyber Resilience Act. Given the long operational lifetime of energy infrastructure, future-proof security architectures should also be considered as part of long-term resilience planning.

Portugal

- Academically, they were at an adequate level.

Spain

- In Spain, energy communities have grown significantly in recent years, although most are still focused on collective PV self-consumption schemes, as is the case in many EU countries. E-mobility is also becoming increasingly relevant.
- Various digital tools developed through R&D projects and regional initiatives are available, but their benefits and associated business models are often not well understood by citizens, which remains a barrier to digitalisation. On the positive side, many energy communities address social objectives, including support for vulnerable consumers, and are frequently promoted by municipalities.
- Regarding flexibility, energy communities can already contribute through surplus energy management and potentially flexibility services for DSOs, while more advanced concepts such as P2P trading are still largely absent. Simpler approaches, such as community storage and energy-sharing schemes benefiting vulnerable users, may be more feasible in the near term.
- Academically, they were at an adequate level.