



PANTERA

Pan European Technology Energy Research Approach

Work Package WP3 " The state of R&I, standardisation and regulation "

Deliverable D3.3

Report on community energy policy and barriers

Grant Agreement No:	824389
Funding Instrument:	Coordination and Support Action (CSA)
Funded under:	H2020 LC-SC3-ES-7-2018: Pan-European Forum for R&I on Smart Grids, flexibility and Local Energy Networks
Starting date of project:	01.01.2019
Project Duration:	48 months

Contractual delivery date:	30.10.2020
Actual delivery date:	26.11.2020
Lead beneficiary:	UCC-IERC

Deliverable Type:	Report
Dissemination level:	Public
Revision / Status:	Final

This project has received funding from the European Union's Horizon 2020 Coordination and Support Action Programme under Grant Agreement No. 824389

Document Information

Document Version: 03
Revision / Status: Final

All Authors/Partners **Shafi Khadem** (IERC – WP and Task Lead)
Alireza Nouri (UCD)
Christina Papadimitriou/Venizelos Efthymiou (FOSS)

Contributing partners:
FOSS, DERlab, Suite5, IPE, IERC, RSE, UCD, TUS RDS

Keywords: Empowering Energy Citizen, Local Energy Market, Wholesale Energy Market, Consumer Engagement

Document History

Revision	Content / Changes	Resp. Partner	Date
00	Creation of the document.	IERC	2020-05-07
01	Content update	IERC/UCD	2020-10-10
02	Content update	IERC	2020-10-11
03	Final update	IERC/FOSS	2020-19-11

Document Approval

Final Approval	Name	Resp. Partner	Date
Review- Task level	Rad Stanev	TUS	2020-11-11
Review-WP level	Christina Papadimitriou	FOSS	2020-19-11
Review- Coordination level	Venizelos Efthymiou	FOSS	2020-25-11

Disclaimer

This document contains material, which is copyrighted by certain PANTERA consortium parties and may not be reproduced or copied without permission. The information contained in this document is the proprietary confidential information of certain PANTERA consortium parties and may not be disclosed except in accordance with the consortium agreement.

The commercial use of any information in this document may require a licence from the proprietor of that information.

Neither the PANTERA consortium as a whole, nor any single party within the PANTERA consortium warrant that the information contained in this document is capable of use, nor that the use of such information is free from risk. Neither the PANTERA consortium as a whole, nor any single party within the PANTERA consortium accepts any liability for loss or damage suffered by any person using the information.

This document does not represent the opinion of the European Community, and the European Community is not responsible for any use that might be made of its content.

Copyright Notice

© The PANTERA Consortium, 2019 – 2022

Table of Contents

Abbreviations	6
Executive Summary	7
1 Introduction	19
1.1 Scope of the document	19
1.2 Purpose of the document	19
1.3 Structure of the document	19
2 Overview on EU Energy Policy in relation to Consumer Centric Energy Transition	21
2.1 Empowering Energy Citizen	21
2.2 Energy Communities	22
2.2.1 Renewable Energy Community (REC)	22
2.2.2 Citizen Energy Community	23
2.2.3 How REC and CEC differentiate?	23
2.3 Consumer Centric Energy Market	24
2.3.1 Consumer participation in Local Energy Market (LEM)	24
2.3.2 Consumers participation in Wholesale Energy Market	24
3 National Energy and Climate Plan (NECP) on empowering the energy citizen in countries with Low R&I Activities in smart grid	26
3.1 Key findings	27
3.1.1 Bulgaria	27
3.1.2 Croatia	28
3.1.3 Cyprus	29
3.1.4 Czech Republic	31
3.1.5 Estonia	32
3.1.6 Greece	33
3.1.7 Hungary	34
3.1.8 Ireland	35
3.1.9 Italy	37
3.1.10 Latvia	39
3.1.11 Lithuania	40
3.1.12 Malta	42
3.1.13 Poland	43
3.1.14 Portugal	44
3.1.15 Romania	44
3.1.16 Slovakia	46
4 Identify the Gaps/Barriers in engaging Empowered Energy Citizens in Energy Markets	48
4.1 Define assessment criteria and approach for gap/barrier analysis	48
4.2 Gaps/barriers Analysis	52
5 Linking barriers with technology gaps (Customers and Market)	54
5.1 Linking process	54
5.2 Case study Examples	55
5.2.1 Malta:	55
5.2.2 Greece	57
6 Summary of key findings with emphasis on gaps and barriers	60
6.1 Bulgaria	60
6.2 Croatia	61
6.3 Cyprus	63
6.4 Czech Republic	63
6.5 Estonia	64
6.6 Greece	65

6.7	Hungary	67
6.8	Ireland	68
6.9	Italy	69
6.10	Latvia	70
6.11	Lithuania	71
6.12	Malta	73
6.13	Poland	75
6.14	Portugal	76
6.15	Romania	77
6.16	Slovakia	79
7	Conclusions	80
8	Reference	82

Abbreviations

Acronym	Meaning
BDR	Balancing Demand Response
CEC	Citizens' Energy Community
CSA	Coordination and Support Action
DER	Distributed Energy Resources
DERA	Distributed Energy Resource Aggregate
DRA	Demand Response Aggregator
DSO	Distribution System Operator
DN	Distribution Network
EC	European Commission
EDR	Energy Demand Response
ENTSO-E	European Network of Transmission System Operators for Electricity
ETIP-SNET	European Technology and Innovation Platform Smart Networks for Energy Transition
EV	Electric Vehicle
ES	Energy Storage
HV	High Voltage
ICT	Information and Communication Technology
IoT	Internet of Things
IRP	Integrated Research Program
LV	Low Voltage
LEM	Local Energy Market
LEN	Local Energy Network
MV	Medium Voltage
NECP	National Energy and Climate Plans
NRA	National Regulating Authority
PV	Photovoltaics
P2P	Peer to Peer
R&D	Research and Development
RD	Regional Desk
R&I	Research and Innovation
REC	Renewable Energy Community
RES	Renewable Energy Sources
RCS	Regulations, Codes and Standards
TSO	Transmission System Operator
TN	Transmission Network
WT	Working Team

Executive Summary

This deliverable focuses on identifying the key policies for consumers' empowerment and the missing links/barriers in related policies of the low spending countries as found in their National Energy and Climate Plans (NECP). This main outcome of this deliverable is of high importance for providing recommendations, build a profile of the countries and contribute to the PANTERA RICAP process in relation to the community energy policy and barriers.

Generally, it can be concluded that with the ambitious targets of 55% and 100% reduction in emissions compared to 1990 emissions by 2030 and 2050 respectively in European electricity markets and the fact that a very high share of these targets will be achieved by the empowered energy citizens, necessitate developing an effective framework for the establishment of local energy markets. The introduction of Local Energy Markets (LEMs) in the European energy system, it is necessary that this should be shaped through revisions of both the Electricity Directive, and the Renewables Directive.

For this reason and to facilitate the evaluation of the Member States approach to their community energy policies, a detailed analysis is done of the requirements of the European legislation that Member States are obliged to transform into national legislation.

Overall, the EU articles and policies that define the rules and the relevant types of target consumers are outlined in the table below:

Table: EU initiatives, relevant articles and targeted consumer to empower the energy citizen

EU legislative package	Relevant Legislative Acts	Relevant Articles	Target consumer
Clean energy for all Europeans package (CEP)	<i>Directive on common rules for the internal market for electricity (EU) 2019/944</i>	Art. 15 Active customers	individual and jointly-acting active customers
		Art. 16 Citizen energy communities	communities of shareholders (citizens)
	<i>Renewable Energy Directive (2018/2001/EU)</i>	Art. 21 Renewables self-consumers	individual and jointly acting renewables self-consumers
		Art. 22 Renewable energy communities	communities of household customers
	<i>Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999</i>	Art. 20 Integrated reporting on renewable energy	renewable energy communities and renewables self-consumers
		Art. 23 Integrated reporting on the internal energy market	individual and jointly-acting active customers
	<i>Regulation on the internal market for electricity (EU) 2019/943</i>	Art. 20 Resource adequacy in the internal market for electricity	individual and jointly-acting active customers
REMIT	<i>Regulation on wholesale energy market integrity and transparency (EU) 1227/2011</i>	Art. 9 Registration of market participants	individual and jointly-acting active customers

	<i>Commission Implementing Regulation on data reporting (EU) 1348/2014</i>	-	-
	<i>Guidance Notes 1/2019, 1/2018 and 1/2017</i>	-	-

For building the required knowledge of national energy policies, the PANTERA consortium has concentrated the analysis of this deliverable on the published NECPs of each country.

A template is provided in the Governance Regulation proposed by the EC to unify the format in which the Member States present the relevant policies in their NECPs. The NECPs should contain a minimum level of sufficient information and should follow the template to be comparable against each other. The aforementioned template proposes five sections relevant to the empowered energy citizens, LEMs and energy communities. Energy communities are mentioned explicitly in the template. However, the engagement of empowered citizen's energy communities, although they will play a role in the internal energy market integration are not directly cited in the template.

This deliverable has gone through the published NECPs of the low activity countries and conducted a brief review on the recent initiatives that have been taken so far to empower energy citizen at national level. The provided review also covers how the national energy plan and related policies adopt the EU definitions such as, energy communities (REC and CEC) or other communities to achieve the national and EU targets. One of the key aspects of empowering energy citizen is to make the path easy for the development of energy communities and their active participation in the local and wholesale energy markets. Hence, how the national energy policy is considering these issues in their 10 years' NECP? A brief review on these for each of the low-active countries is carried out and is presented in short in the following table and more in depth in Chapters 3 and 4 of this deliverable.

Table: NECPs on empowering the energy citizen in countries with Low R&I Activities in smart grid

Country	Empowering energy citizens	Energy community	End user's participation
Bulgaria	One of the key components to become an energy active citizen is to integrate RES for self-consumption.	There is no special legislative framework for prosumers, energy cooperatives or decentralised power generation.	The focus is given only on introducing smart metering devices as an incentive for the active and effective participation of consumers in the market
Croatia	The current regulatory framework for the use of RES is covered by several laws. Specific	Even though there is no current specific definition and regulation with regard	Prosumers are defined as end-users whose main objective is the procurement of

	measures to empower energy citizens have not been found in the NECP.	to energy communities there are some laws and standards concerning renewable energies generation.	energy for their own use, but they also can have a production capacity installed that can be used to inject energy into the network and suppliers are obliged to purchase the surplus.
Cyprus	Support schemes for the production of electricity from RES for own use such as Net-Metering for self-consumption have been implemented since 2013 as national policies. These are to evolve into net billing with the introduction of smart meters..	Currently, there is no policy framework for energy community establishment and operation.	The DSO has initiated the roll out of the Advanced Metering Infrastructure with 400.000 smart meters over 7 years together with a smart grid ready operation and control system for the Distribution grid of Cyprus..
Czech Republic	It is planned to establish a framework to support and facilitate the development of the renewable energy communities through both legislative and non-legislative measures, but yet no detail plan is given.	No definition has been found concerning energy communities in the current Czech Republic NECP	The conditions for the implementation of smart metering are being prepared within the framework of the National Action Plan for Smart Grids (2019-2030), along with other measures related to the integration of RES such as demand-side response, energy storage or flexibility aggregation and prosumers.
Estonia	The creation of renewable energy communities is enabled legally, conveniently and easily and the production of RES energy for own consumption. Cooperative collaboration is	Estonia has adopted the practice of the European Renewable Energies Federation as the basis for determining the role of energy communities and their designation as energy associations.	Since 1 January 2017, all Estonian electricity customers have smart readers that record and transmit at least the hourly data to the central database. Consumers have free access to their data, and they may also enable data access

	widespread in Estonia and can be appreciated in apartment, consumer, forestry or agricultural associations.		for the freely selected service provider. The Electricity Market Act prohibits discrimination of market participants.
Greece	Smart meters and smart networks will form a key part of the future planned smart and sustainable cities. Making a substantial contribution to the rational use of energy by final consumers at a city level. In conjunction with the new regulatory framework for the demand response mechanism and energy communities, it is expected to strengthen significantly the role of cities and people in the energy transition.	The creation of an energy communities' scheme is planned, which is deemed to be an indispensable tool for strengthening the role of local communities and consumers. An innovating net metering scheme for energy generation and consumption will be developed to support decentralised energy production and management. These are to be supported and strengthened by specific tools.	Plans are going ahead to allow the participation of decentralised energy schemes. Hence, the possibility of establishing Aggregators and Energy Communities has been instituted, enabling electricity consumers to operate in the electricity market, either as consumers or as producers, and through dynamic electricity tariffs, to contribute to the day to day operation.
Hungary	The spread of household-sized PV panels has allowed that a growing number of consumers can generate their own energy, which not only offers the option of a more active presence on the market beyond the conscious regulation of consumption, but also strengthens energy independence on a household scale.	No definition has been found concerning energy communities and their corresponding benefits for end users in Hungary.	1 million smart consumption electricity meters are being installed in these days. This installation also comprises part of the programme aimed at establishing innovative system balancing. In this manner, other related demand-side regulation and funding of smart metering promoting network flexibility are planned to be implemented under the relevant operational programmes of the 2021-2027 period.

Ireland	<p>Empowering energy citizen is the very first priority which is followed by the Markets, Regulation and Prices as outlined in the green paper on energy policy in Ireland. This encourages passive consumers to become active and prosumers. The very latest initiative by the government is that a new Renewable Electricity Support Scheme (RESS) has been placed to support the renewable electricity projects in Ireland.</p>	<p>No specific definition has been found concerning energy communities in the Ireland current NECP. Two examples of promoting the role of local energy communities in Ireland are constituted by the Better Energy Communities (BEC) grant scheme and the Sustainable Energy Communities network which are both active in Ireland.</p>	<p>Ireland has a range of policy measures in place aimed at fostering the generation through renewable energy as well as their corresponding integration to the electricity market.</p>
Italy	<p>In 2020 the Italian regulatory authority (ARERA) has published the rules for the application of grid and system fees for energy communities and self-consumption, while the Ministry of Economic Development has defined the incentives for the “shared energy” within collective self-consumption schemes and energy communities</p>	<p>Italian NECP is more focusing on formation of energy communities (REC and CEC). This is to establish a regulatory framework for the development of citizens energy communities that would be active in the generation, supply, distribution, storage, sharing and sale of electricity and the supply of energy services, including energy efficiency and electric vehicle recharging services</p>	<p>End uses have access to the Italian electricity market through multiplicity ways singly or aggregated. This covers dynamic tariffs for self-consumption options, participation in flexibility trading and ancillary services to the operators.</p>
Latvia	<p>Renewable electricity generation in Latvia is stimulated through a complex support system based on a feed-in tariff, which also includes</p>	<p>Energy community, especially renewable energy community, movement in Latvia is in the early development stage. Some of the</p>	<p>The state aid mechanism for renewable energy and cogeneration power plants will shape the free energy market of the future. The</p>

	<p>elements of a quota system and tenders. Moreover, since 1st January 2014 electricity coming from renewable energy sources is promoted also through net-metering.</p>	<p>initiatives, both by municipalities and by individual citizens, have been taken to form the energy communities or RES projects. Latvian NECP includes a plan by 2021 to develop a regulation on energy communities and regulation on including these in RES support schemes.</p>	<p>increase of energy poverty as well as lack of clarity about the most appropriate tools to prevent consumer vulnerability is a barrier. The energy communities' framework can alleviate energy poverty and support regional cooperation in the shaping of a well-functioning market for the end users.</p>
Lithuania	<p>To promote active participation of electricity consumers in the market, a scheme for generating electricity was created in 2015. In order to ensure that the electricity generating scheme is available to all electricity consumers, the acquisition of the power plant is funded from European Union Structural Funds and the National Climate Change Program. By the end of 2023, DSO plans to install smart meters for its customers. In addition to smart meters, there are plans to implement a smart metering system for meter management and reliable data collection, storage and analysis.</p>	<p>A renewable energy community is defined as a legal status accorded to a public body which fulfils the specified criteria and which owns and develops installations for the production of energy from renewables in a defined area and has the right to use them to produce energy, to consume and store it in energy storage facilities and sell it. Participants in the renewable energy community may be natural persons, small or medium-sized businesses and/or municipalities.</p>	<p>Prosumers may establish their own power plants or purchase them on the basis of bilateral contracts from third parties, thus making it possible for the occupants of multi-apartment buildings to become prosumers. Moreover, the power plant of the prosumer may be remote from the electricity consumption point. In this case, the power plant must be owned or managed by the prosumer.</p>
Malta	<p>In line with its programme to ensure</p>	<p>No definition has been found concerning</p>	<p>It is important to underline that there is</p>

	<p>an efficient distribution system, Enemalta has equipped 99.6% of its consumers with smart meters and has adopted a tariff system that favours the prudent use of energy. Additionally, a second generation of smart meters are being installed which will allow the consumer to be more aware of their energy consumption. This will be done through the consumer energy management system where in-house display systems, smart phones and other devices will provide the consumer with real-time information on their consumption. Through this readily accessible information, the consumer has the opportunity to better understand their consumption patterns, resulting in increased energy conservation.</p>	<p>energy communities and their corresponding benefits for end users in Malta NECP.</p>	<p>no liquid wholesale market in Malta. Malta is also eligible to derogate from the application of a number of provisions of Directive. Existing schemes supporting the installation of PV systems cater for the option of self-consumption of renewable electricity in both the residential and non-residential sector. The applicant may opt to sell all electricity generated by the PV system to the DSO (full export) or export only the surplus electricity (partial export). In the case where the installation operator does not apply for support, Regulation 4A of SL 545.27 ensures that solar PV may be installed primarily for self-consumption and that any surplus electricity supplied to the DSO through the grid will be bought at the proxy for the market price. The option for self-consumption is not applicable for PV installations owned by third parties, with full export to the grid being the only option.</p>
Poland	<p>The prosumer photovoltaic (PV) market has started growing. At the end of 2018 there were more</p>	<p>No definition has been found concerning energy communities and their corresponding</p>	<p>In 2016 Poland introduced net metering for non-commercial prosumers. Currently</p>

	<p>than 36,000 individual prosumers in Poland (almost exclusively in photovoltaic technology) owning small-scale PV systems. Nowadays there is an increasing number of renewable energy prosumers in the heating sector too, especially in solar thermal energy</p>	<p>benefits for end users in Poland's NECP. The NECP includes measures to support prosumers and energy communities and the promotion of smart grids.</p>	<p>the net metering scheme covers RES micro-installations with installed capacity of up to 50 kW.</p> <p>Local communities do not actively participate in the energy market in Poland, even though the government seems to support the idea of energy cooperatives and energy clusters.</p>
Portugal	<p>This promotion of self-consumption of renewable energy, whether individually or collectively or through energy communities, will in the short-term, be accompanied by an information and support programme for implementing self-consumption projects.</p> <p>It is crucial to promote energy literacy for consumers through more transparent information and to ensure greater knowledge on energy and climate, allowing citizens to make more informed choices and promote more and better information for consumers, contributing toward transparency and competition in the energy market.</p>	<p>Portugal has one of the most comprehensive and clear NECP which shows that they are in advance in adopting the CEC and REC in their policy and legal framework. The hindering legislations are updated to ease the engagement of REC. Even CECs are well discussed in the NECP. The link between energy citizens, REC and CEC and energy saving could have been better planed and explained.</p>	<p>To promote distributed production and self-consumption of power from renewable sources, a new legal framework was developed in Portugal, Decree-Law No 162/2019 of 25 October 2019, which allows and promotes individual self-consumption, collective self-consumption and the forming of energy communities. The legal establishing of these activities will allow individuals, companies and other public and private entities to produce, consume, share, store and sell energy produced from renewable sources, thus actively participating in energy transition.</p>
Romania	<p>Romania revisited the related legal definitions and framework. This allows for the</p>	<p>The NECP mentions prosumers. However, it is not clear how these prosumers contribute to energy</p>	<p>From 2020 onward, the day-ahead and intra-day markets are organised in a way to ensure that all market</p>

	<p>engagement of empowered energy citizens in energy markets by producing renewable energy. In order to achieve the RES-E share, Romania plans to encourage household, industrial and agricultural active consumers (prosumers) to be involved in measures such as the development and implementation of smart metering solutions and smart networks, for which a clear and adequate regulations should be put in place.</p>	<p>market. RECs and CECs have not received enough attention in the policies and targets.</p>	<p>participants can have access to the market individually or by aggregation. Final consumers may thus participate in organised electricity markets either directly or by aggregation if they have power above 500 kW approved in the connection certificate. The implementation of demand response measures will contribute to the integration of RES into the national electricity system by reducing / moving consumption at peak hours and providing for the final consumer's possibility to participate in the electricity market.</p>
Slovakia	<p>Current energy policy in Slovakia encourages the installation of small-scale RES for self-consumption of electricity as much as possible and to minimise their supply to the grid. This approach addresses their energy self-sufficiency and reduces the impact of variable RES on the electricity grid. As part of support for small sources, support for the installation of heat generation facilities using RES will continue.</p>	<p>No definition has been found yet concerning energy communities in Slovakia NECP</p>	<p>The Slovak Republic has implemented legislation promoting own electricity generation by introducing the "local source" institute on the promotion of renewable energy sources and high-efficiency cogeneration. The amended act provided a guaranteed purchase price for 15 years as well as guidelines for generating electricity using RES, which favoured the construction of small and decentralised installations.</p>

In most relevant sections of the NECPs the policies provided by Member States regarding energy communities are just mentioned or completely ignored. The only section that receives a fair share of attention in the NECPs supplied by some of Member States is section 3.1.2 (policies and measures for renewables). Even for this section a significant number of Member States, especially low activity countries did not include policies and measures for renewable energy communities. They only stated in their NECPs that such policies are planned for the future. Only a few of Member States explicitly provide some targets for RECs in their NECPs. Table below shows the summary of the assessment of NECPs for the 16 low active Member States based on the criteria presented in Table 4.1 of chapter 4 of this deliverable. The detailed analysis for each of these 16 countries is provided in the respective sections of Chapter 4 of this deliverable. Note that this analysis is conducted from the perspective of LEM, RECs and CECs. A similar type of analysis was conducted in [38] for the draft of NECPs provided by some of these Member States. The analysis was conducted using a detailed methodology that is presented in Chapter 4 of this deliverable.

Table: Summary of the results obtained by analysing the policies, objective and targets provided in the NECPs

Section	BG	HR	CY	CZ	EE	EL	HU	IE	IT	LV	LT	MT	PL	PT	RO	SK
2.1 Targets or objectives for renewable energy																
3.1.2. Policies and measures for renewable energy																
3.2. Policies and measures for energy efficiency																
2.4.3. Objectives for the internal energy market integration																
3.4.3 Policies & measures for the internal energy market integration																
	Fully Included				Only Planned/with no Detail				Self-Consumption Only				Ignored, Inapplicable, Vague			

Following the above referred detailed methodology a detailed analysis was conducted for all 16 low

activity countries and the results are presented in Chapter 4 of this deliverable. Below is a summary of gaps identified with recommendations.

Summary of gaps and barriers in low activity Member States' policies reported in their NECPs:

- 1) It seems that the awareness of policy makers in these Member States is moderate and sometimes acceptable, but the actual planning is not sufficient.
- 2) Lack of supportive local authorities and/or local energy agencies is the other challenge that the empowered energy citizens are facing for contributing in the energy markets.
- 3) The policies presented in most of NECPs suffer from lack of clarity on the dimensions presented for the better engagement of energy citizens and also from failure to distinguish between individual dimensions.
- 4) Renewable energy communities and self-consumption overshadow other dimensions where empowered energy citizens can contribute, e.g., energy community, flexible demand response, energy efficiency, consumers' awareness, etc.
- 5) Lack of an effective mechanism in order to adjust the tariffs for different RES technologies is the other barrier which can be seen in the policies of most of these Member States. The financial incentives are of highest importance to solve the barriers related to the resistance of the consumers against the change and transition.
- 6) Important roles that energy citizens and energy communities can play in energy transition are overlooked. Among these overlooked roles, are those related to grid stability, power quality and how technical issues can mitigate intermittent behaviour of RES. For instance, using an effective active voltage management algorithm, the RECs and CECs can be able to contribute to reactive power support [59].
- 7) It was also noted in this study that almost none of the low-activity member states for which the energy policies are analyzed, have targets directly related to the engagement of empowered energy citizens in energy markets and energy transition or to the LEM mechanisms.
- 8) An important weakness is the lack of clarity in the usage of consistent terminology across the NECPs provided by Member States.

General recommendations for low activity Member States, based on the discussions provided in this deliverable.

- 1) Introduce **quantitative** policy targets for evaluating the effective contribution of empowered energy citizens in energy markets.
- 2) Countries need to develop a roadmap to achieve the targets introduced in Table 4.2 as dimensions. It is important to take a wide range of factors into account. These factors include but are not limited to the importance of each dimension, maturity of technologies, market resistance, citizens' awareness and budget limitation. They need to clearly distinguish among different dimensions introduced in Table 4.2 for the effective engagement of the energy citizens in energy markets.
- 3) To include more detailed measures for enabling energy communities; as a key for energy transition with customers' in the centre of this transition.
- 4) To emphasize more on energy efficiency, energy storage, devising market instruments and new models and mechanisms to ease the contribution of energy citizens in energy transition and to achieve the targets presented in "Clean Energy for all Europeans" package.
- 5) Best practice examples from other member states should be pursued.

- 6) Regarding the market and for providing a competitive market structure, the Member States should provide an effective tariff mechanism with a plan to gradually move from a supportive tariff plan, e.g., feed-in-premium, to a competitive tariff mechanism, as the respective renewable technologies are becoming more mature and economically more viable. Distinct plans should be provided for each separate renewable energy technology.

The above recommendations will form the basis of the approach of the PANTERA consortium towards the policy makers and stakeholders of the targeted low activity countries for the remaining period of the PANTERA project.

1 Introduction

This report describes the work carried out within the task 3.3 of the PANTERA (PAN European Technology Energy Research Approach) project Work Package 3 (WP3 - The state of R&I, standardisation and regulation) with special attention to the activity “Energy policy and barriers”.

1.1 Scope of the document

Energy policies are a key instrument to make clean energy transition a reality and even if the European Union, with guidelines and directives, is driving the process towards a uniform evolution of the member states energy policies, the situation differs from country to country and several specificities are present.

Within the activity "Energy policy and barriers", PANTERA partners analyse the energy policies (considering National Energy and Climate Plans (NECPs) and other EU relevant documents) of the PANTERA target countries considering aspects of consumer engagement and citizen empowerment in the energy field. Through this analysis, the relevant barriers and gaps are spotted, highlighted and linked to the technology gaps that have been identified in Ref [1].

1.2 Purpose of the document

As mentioned, this deliverable reports the detailed analysis performed on community energy policy and barriers and tries to highlight which are the most relevant barriers that energy communities are facing and that are preventing a real citizen empowerment within the energy sector and especially considering participation in energy market related aspects. The main objectives of this task are the following:

- Identifying and highlighting the most relevant policy barriers that are hindering wide consumer engagement and empowerment in the context of energy communities and markets.
- Serves as a base for future deeper interactions with local stakeholders through the PANTERA regional activities. Having a starting baseline on the difficulties that the different countries are facing, would help to engage stakeholders and arrange more targeted discussions within the workshops and targeted regional activities that would be organised.
- Feed the PANTERA EIRIE platform with valuable information on regional issues and link technology with policy barriers

1.3 Structure of the document

This document consists of:

- Section 2 that analyse which are the EU regulations and energy policies that are most relevant for consumer empowerment and energy communities.
- Section 3 that reports the profiles of the regulations and policies of the different countries for what concerns empowered energy citizens.
- Section 4 where the barriers and the gaps in engaging empowered energy citizens are identified as a result of national energy policies limitations. Moreover, this section reports the mechanisms that facilitate integration of energy citizens into multiple markets that are or could be included in EU or national policies.
- Section 5 is dedicated on how the PANTERA project and the EIRIE platform could foster the

removal of the identified barriers thus helping the smart grid deployment especially within the targeted countries.

2 Overview on EU Energy Policy in relation to Consumer Centric Energy Transition

This section is engaged with the identification of the major EU energy policies setting out obligations of Member States with relation to the consumer centric energy transition. The overview made in this section serves as a basis for profiling the low-active countries in relation to how the empowered local energy citizens are participating in the energy market.

2.1 Empowering Energy Citizen

Historically, the Consumer was put in the centre of the EU clean energy transition efforts with the Energy Union Strategy Communication from the European commission [2], published on 25 February 2015. Besides the major aim of building an energy union that gives EU consumers sustainable, competitive and affordable energy, the communicated strategy envisioned the EU citizens to embrace energy transition and participate actively in the market. In November 2016, another communication from the European commission, **Clean Energy For All Europeans Package (CEP)** [3], presented legislative proposals covering energy efficiency, renewable energy, the design of the electricity market, security of supply and governance rules for the Energy Union. Among the aims of these regulatory proposals, there were: making it easier for consumers to generate their own energy, store it, share it, consume it or sell it back to the market –directly or as energy cooperatives, as well as the consumer to be able to offer demand response directly or through energy aggregators. **CEP** is a set of eight active legislative acts that were politically agreed by the Council and the European Parliament between May 2018 and May 2019. The EU Member States have to transpose these new directives into national laws by 2021 and consider these directives when proposing their **NECPs (National Energy and Climate Plans)**.

Among these CEP legislative acts, those, directly involved with the consumer's entitlements in the energy transition, are the *Renewable Energy Directive (2018/2001)* [4] and the *Directive on common rules for the internal market for electricity 2019/944* [5]. The former directive sets out a policy that allows households, communities and business to become clean energy producers. The new policy framework for renewables puts the consumer at the centre of the energy transition with a clear right to produce own renewable energy.

The latter directive, along with the revised *Regulation on the internal market for electricity 2019/943* [6], *Regulation on risk-preparedness in the electricity sector 2019/941* [7] and the *Regulation establishing a European Union Agency for the Cooperation of Energy Regulators 2019/942* [8], introduces a comprehensive framework for consumer protection, information and empowerment in the EU electricity sector. In particular:

- Customers will get a summary of key contractual conditions to help them better understand sometimes-complex terms and conditions;
- The technical process of switching suppliers must take less than 24 hours in all EU countries, by 2026 at the latest;
- Providers should give free-of-charge access to at least one energy comparison tool allowing consumers to find the best deal in the market;
- To help consumers better control their costs, information in electricity bills will be improved;
- New obligations will help better identify vulnerable and energy poor customers, making it easier to target assistance to those who need and this way tackle the growing issue of energy poverty;
- Consumers will be able to participate actively, individually or through communities, in all markets, either by generating electricity and then consuming, sharing or selling it, or by providing storage services;
- For the first time, consumers will have the right to request a smart meter and a dynamic price contract that allows them to be rewarded for shifting consumption to times when energy is widely available and cheap.

2.2 Energy Communities

The energy community refers to the community with collective energy actions that foster citizens' participation across the energy system. This initiative is offering new opportunities for citizens to get actively be involved in energy matters. The European Commission's CEP confirms the prominent role of prosumers and their collective forms will play in the future energy system. The EU legislative framework formally acknowledges and defines specific types of community energy as "Renewable Energy Communities (REC)" and "Citizen Energy communities (CEC)".

The energy community can support the operation of the energy system by providing flexibility and ancillary service locally. Furthermore, it can provide customers with lower energy prices and access to private capital from renewables investments through citizen participation. It is believed that engaging citizens through collective energy actions can reinforce positive social norms and support the energy transition. Community energy can foster citizens' participation and control over decision-making in renewable energy. The benefits for the energy communities are:

- **Local value:** Energy communities can help to implement local sustainability projects that can achieve energy independence, reduce carbon emissions and fuel poverty, as well as contribute to the local economy. They can generate local jobs and avoid the outflow of financial resources from the region [9]
- **Energy citizenship and democracy:** Citizens have democratic control over energy investments by becoming co-owners of renewables installations, usually through the principle of one member one vote. Participation in renewables ownership and decision-making can either be direct, in which case members approve decisions in assembly meetings and decide how the surplus is distributed or indirect participation through a board of directors, as in the case of EWS SchönaueG [10].
- **Generating financial return for the community:** Community assets (wind turbines, solar panels) are used to generate profits locally, within the community. Members have local control over financial resources and profit-sharing. Surpluses can be reinvested in community benefit funds and other activities. Co-investments can also help create local jobs and generate a stable return for investors.
- **Education and mobilisation of citizens:** Empowering citizens towards joint action for combating climate change alongside municipalities and local authorities.
- **Social cohesion:** creating a community feeling, trust.

2.2.1 Renewable Energy Community (REC)

The revised Renewable Energy Directive (RED) 2018/2001 sets the framework for "renewable energy communities" covering renewable energy. The directive asks the member states to support the renewable energy communities and allow them to participate in available support schemes on an equal footing with large participation. The lack of transparent rules and coordination between the different authorization bodies has led to hinder the development of energy from renewable sources. Therefore, it was recommended in the directive to provide guidance to applicants throughout their administrative permit application and granting process by means of an administrative contact point is intended to reduce complexity for project developers and increase efficiency and transparency, including for renewable self-consumers and renewable energy communities. In addition to that the directive highlighted the importance of including renewables self-consumers and renewable energy communities when developing the market for energy. Moreover, the role of renewable energy communities in advancing the energy efficiency at the household level and help in fighting energy poverty has been highlighted in the directive.

The directive asks the member states to ensure that renewable energy communities are entitled to produce, consume, store and sell renewable energy, including through renewable power purchase agreements and to give them access to energy markets both directly or through aggregation in a non-discriminatory manner.

Energy communities aim to help citizens and local authorities invest in renewables and energy efficiency. The participation of citizens in renewable projects may also overcome social acceptance at the local level. Community-owned projects may allow citizens to finance investments that bring benefits locally – such as harnessing local renewable energy resources, increasing employment and reducing fuel poverty in the region. There are almost 3500 renewable energy cooperatives, which are found mostly in North-Western Europe [11].

2.2.2 ***Citizen Energy Community***

Article 2(11) of the recast Electricity Directive under the Clean Energy Package introduces the term “Citizen Energy Community” (CEC) defined as a legal entity based on voluntary and open participation and effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises. The revised Internal Electricity Market (IEM) Directive 2019/944 introduces new roles and responsibilities for CEC’ in the energy system covering all types of electricity.

Both the energy communities (REC and CEC) are included as a non-commercial type of market actors that combine non-commercial economic aims with the objective to achieve the environmental and social benefits. The revised IEM Directive states that ‘citizen energy communities constitute a new type of entity due to their membership structure, governance requirements and purpose’. The revised RED refers to the specific characteristics of local renewable energy communities in terms of size and ownership structure [11].

The main purpose of a CEC is to provide environmental, economic or social community benefits to their members or shareholders or to the local areas where they operate rather than to generate financial profits. Citizen energy communities may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders. The development of a CEC using renewable generation at local scale is a driver for decarbonisation and consumer’s empowerment. At its core, the CEC definition describes a way to “organise” collective cooperation of an energy related activity around specific ownership, governance and a non-commercial purpose, as opposed to traditional market actors.

A main goal of the EU legislation on energy communities is to acknowledge their challenges in operating in the market and to ensure they are not excluded from the market through discrimination. Thus, they can participate on a level playing field with other market actors.

The Electricity Directive also states that “The definition of citizen energy communities does not prevent the existence of other citizen initiatives such as those stemming from private law agreements.” Consequently, Member States can allow other types of commercial and non-commercial market actors to establish, own and manage local energy systems.

2.2.3 ***How REC and CEC differentiate?***

Although the REC and CEC definitions contain similar elements, some differences between these energy communities’ terms could be noted.

CECs focus on electricity and do not have a technology-specific focus, while RECs engage specifically on activities related to renewables. Thus, RECs can generally be seen as a subset of CEC. This explains the narrower geographical scope of activities of RECs compared to CECs. Furthermore, there is a stronger obligation for Member States to promote the development of RECs. The Renewables Directive requires Member States to establish national enabling frameworks in order to promote and facilitate the development of RECs. Member States are also required to take RECs into account when designing their national renewable energy support schemes. Consequently, the eligibility requirements for qualifying as a REC are more restrictive.

Energy production, consumption, sharing, and distribution are the terms used for both types of energy community. However, for RECs the term “sale” is specifically mentioned while “supply” is used for CECs. These differences can be explained by the separate political processes for these directives. The ability to sell or supply is implied for both CECs and RECs.

Combined, the two directives advance that these communities [13]:

- can engage in energy generation, consumption, distribution, aggregation, storage, supply/sales, including through power purchase agreements, and/or energy efficiency services;
- are entitled to own, establish, lease, and autonomously manage community networks;
- should operate on the energy markets, directly or via aggregators or suppliers, on a level playing field without distorting competition;
- must benefit from non-discriminatory treatment in their activities, rights and obligations as final customers, generators, distribution system operators (DSOs) or aggregators;
- are subject to fair, proportionate and transparent procedures and cost reflective charges.

2.3 Consumer Centric Energy Market

Consumers are at the center of the EU's energy policy, and a wide range of initiatives have been taken to make consumers an active part of the clean energy transition. The CEP includes eight legislative files of which four are collectively known as the electricity market design. The new rules outline a comprehensive framework for consumer protection, information and empowerment in the EU electricity sector.

2.3.1 *Consumer participation in Local Energy Market (LEM)*

There is no clear separation between the description of local and wholesale energy market in the EU directives and the regulations for energy consumers/communities to participate in these market mechanisms. But, the EU policy in IEM directive clearly defines the energy consumer rights which have to be clearly set out in the national laws of EU countries and must reflect provisions in EU legislation. According to the EC, by 2030, 50% of the EU's electricity will come from renewable energy and most of this new intermittent capacity will be deployed on the customer premises, and must be fully market-integrated, to ensure RES cost effectiveness [14]. These developments are providing a framework to establish local energy markets (LEMs), which can be broadly defined as the marketplaces which enable prosumers and/or other local generating entities to trade energy volumes of their choosing within local communities. To establish this market, on that basis, the national legislation must for example guarantee consumers the right to:

- an electricity connection so that households are connected to the local electricity
- network and supplied with electricity
- a choice of electricity and gas suppliers as well as an easy and fast switch of suppliers, without extra charges
- clear contract information and the right of withdrawal
- accurate information on the consumption and billing based on it.

2.3.2 *Consumers participation in Wholesale Energy Market*

In relation to the wholesale market, the CERRE (centre for regulation in Europe) identifies three main groups of consumers [15]:

- Big consumers are the main players because of the large quantity of electricity they take from the grid. These customers can curtail their consumption from the electric grid either because they can interrupt their activity for short periods (industrial clients) or because they are equipped with alternative sources (large stores). Provided DSR (demand side response) regulation is well-designed, big consumers can pocket profits from a more active direct

participation in wholesale markets or by the subscription of retail contracts with time varying clauses. To avoid any risk of opportunism, their baseline must be carefully calculated.

- Medium and small consumers equipped with electric heating and air conditioning, as well as those who own energy storage capacity (for hot water or electricity) can be aggregated into subgroups by specialised operators. For this category of agents, the expertise in ICT is essential. Indeed, at each consumer's location, automation and remote control will necessitate large investment. Here, the gains are not in terms of energy saved because of the rebound effect. Consumption will be shifted to shoulder periods with two benefits: less capacity of production will be required and, since the peaking capacities are generally fossil fuelled power stations, lower polluting emissions can be expected. The number of consumers in this category will increase given the European Commission project to decarbonise the economy by electrifying housing and transport. Currently, the main brake is the fuzzy regulation of aggregators' business model.
- Finally, all the other consumers should be kept out of the wholesale market zone. For them, there is almost nothing to gain individually and collectively from DSR. In the short run, public authorities must encourage these small consumers to be more aware of retail opportunities and to switch whenever they find better offers. Switching will not help in balancing the electricity system, but it can put pressure on retailers and then on upstream demand.

Overall, the EU articles and policies that define the rules and the relevant types of target consumers are outlined in table 2.1.

Table 2.1 EU initiatives, relevant articles and targeted consumer to empower the energy citizen

EU legislative package	Relevant Legislative Acts	Relevant Articles	Target consumer
Clean energy for all Europeans package (CEP)	<i>Directive on common rules for the internal market for electricity (EU) 2019/944</i>	Art. 15 Active customers	individual and jointly-acting active customers
		Art. 16 Citizen energy communities	communities of shareholders (citizens)
	<i>Renewable Energy Directive (2018/2001/EU)</i>	Art. 21 Renewables self-consumers	individual and jointly acting renewables self-consumers
		Art. 22 Renewable energy communities	communities of household customers
	<i>Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999</i>	Art. 20 Integrated reporting on renewable energy	renewable energy communities and renewables self-consumers
		Art. 23 Integrated reporting on the internal energy market	individual and jointly-acting active customers
	<i>Regulation on the internal market for electricity (EU) 2019/943</i>	Art. 20 Resource adequacy in the internal market for electricity	individual and jointly-acting active customers

REMIT	<i>Regulation on wholesale energy market integrity and transparency (EU) 1227/2011</i>	Art. 9 Registration of market participants	individual and jointly-acting active customers
	<i>Commission Implementing Regulation on data reporting (EU) 1348/2014</i>	-	-
	<i>Guidance Notes 1/2019, 1/2018 and 1/2017</i>	-	-

The plans and policies in national legislation with regard to ensuring the participation of citizens in the energy system and the benefits of self-generation and new technologies, e.g., smart meters, should be modified by the transposition of Directive (EU) 2019/944 of the European Parliament and of the Council into national legislation. Particularly, the EU directives in this regard include the provisions on active consumer participation in the market in Chapter III (Dynamic price contract - Article 11, Active customers - Article 15, Citizen Energy Communities - Article 16, Consumption management through aggregation - Articles 13 and 17 and smart meters - Articles 19 to 21 and Annex II) and other related EU legislation on the “Clean Energy for All Europeans” package, in particular Directive (EU) 2018/2001 of the EP and of the Council on the promotion of the use of energy from renewable sources.

A template is provided in the Governance Regulation proposed by the EC to unify the format in which the Member States present the relevant policies in their NECPs. The NECPs should contain a minimum level of sufficient information and should follow the template to be comparable against each other. The aforementioned template proposes five sections relevant to the empowered energy citizens, LEMs and energy communities. Energy communities are mentioned explicitly in the template. However, the engagement of empowered citizen’s energy communities, although they will play a role in the internal energy market integration are not directly cited in the template. In the future release of this template, these concepts should be better discussed as they play an important role in the future energy transition of Europe.

Generally, it can be concluded that with the ambitious targets of 50% and 100% renewable energy productions by 2030 and 2050 in European electricity markets and the fact that a very high share of these targets will be achieved by the empowered energy citizens necessitate developing an effective framework for establishment of local energy markets. The introduction of LEMs in European energy system should be shaped through revisions of both the Electricity Directive, and the Renewables Directive.

3 National Energy and Climate Plan (NECP) on empowering the energy citizen in countries with Low R&I Activities in smart grid

In 2019, when the EU completed a comprehensive update on its energy policy framework under the CEP, EU came to an agreement that the member states should identify concrete measures to implement the new rights given to energy communities (REC and CEC) in the revised Internal Electricity Market Directive and, respectively, the revised Renewables Directive, into national law and consider these when proposing their NECPs. The new rules will bring considerable benefits from an environmental point of view, from an economic point of view and more importantly from consumers’ point of view. From the perspective of this deliverable, this CEP has paved the way for a major transition of the European energy landscape towards the empowering energy citizen, forming energy communities and consumers active participation in energy markets.

In general, it is found that one of the main challenges in analyzing the policies of Member States is the lack of unified definitions for most of the terms and concepts that are related to the engagement of empowered citizens in energy transition. This makes it harder to clearly assess the policies in a unified format.

Still, this section provides a brief review on the recent initiatives that have been taken so far in the low-active countries to empower energy citizen at national level. Review also covers how the national energy plan and related policies adopt the EU definitions such as, energy communities (REC and CEC) or other communities to achieve the national and EU targets. One of the key aspects of empowering energy citizen is to make the path easy for the development of energy communities and their active participation in the local and wholesale energy markets. Hence, how the national energy policy is considering these issues in their 10 years' NECP? A brief review on these for each of the low-active countries is carried out here and followed by the next section where a further deep- down analysis is made to understand the barriers/gaps for each country.

Where appropriate, extracts from NECPs are provided and relevant references are included.

3.1 Key findings

3.1.1 *Bulgaria*

Empowering Energy Citizen:

There is no clear approach appearing in the NECP on empowering energy citizen. One of the key components to become an energy active citizen is to integrate RES for self-consumption. Current policy is not supportive here. The lack of a differential approach towards the integration of small-scale RES, in practice, means that the administrative paperwork for households and small businesses is much greater than for an energy company investing in a large-scale capacity. Even if a household wishes to install a renewable-based facility only for self-consumption, the barriers are similar to the one faced by industrial-scale producers. The introduction of a faster procedure for small-scale RES, or the creation of an exclusive institution accelerating the necessary bureaucracy is essential if the country wants to harness its enormous potential for decentralised power generation. The regulatory framework for the installation of RES is not limited to the national legislation governing the renewable energy sector but encompasses all the different administrative, regulatory and municipal normative acts such as ordinances and procedural regulations. For instance, the installation of a solar panel, a wind mill or a biogas generator has to take place on regulated land, which means that the legal designated use of the territory, where the facility would be installed, cannot be changed, resulting in this way the restrictions more similar to a civil construction project rather than the deployment of a new power plant and constraining small-scale RES investors from using agricultural and forest lands [16].

In order to raise citizens' awareness of and interest in using renewable energy, suppliers of equipment and systems and the competent bodies provide information regarding the net profit, costs and energy efficiency of the equipment and systems for use of renewable electricity, heating and cooling energy. The information is provided in an efficient and easily accessible manner.

Energy Community:

In Bulgaria, as occurs in many other countries included in this report, there is no special legislative framework for prosumers, energy cooperatives or decentralised power generation. However, some simplified procedures exist for small installations of less than 30 kW in buildings already connected to the network, even if the administrative process for small-scale installations is very tedious and more addressed to industrial producers [16]. Therefore, the only difference between the rules for the installation of new RES-based electricity capacity is related to the size of the facility. In this manner, as it has been previously mentioned, power plants below 30 kWp are the only RES plants that are

still eligible to receive fixed preferential feed-in tariffs if connected to the grid.

The majority of administrative procedures concerning micro RES installations are governed by the Law on Energy from Renewable Sources (LERS), Ordinance No.6 (more specifically chapter 5 on RES) and the Land use planning act (LUPA). The former governs the socio-economic issues related to the production and consumption of electricity, heating and cooling from the renewable energy sources. In addition, it collects the main elements of the state support mechanisms for new RES-based generation facilities. On the other hand, Ordinance No. 6 (as mandated by Art. 116 from the Law on Energy) lists the administrative steps to connect a power generating facility to the grid, and the LLUP governs the construction phase of the investment process. Special by-laws govern some of the specific tasks during the installation of the RES facility and during its exploitation [16].

End users' participation in the energy market:

The focus is given only on introducing smart metering devices as an incentive for the active and effective participation of consumers in the market [17].

3.1.2 **Croatia**

Empowering Energy Citizen:

The current regulatory framework for the use of renewable energy sources is covered by several laws in Croatia. Nevertheless, specific measures to empower energy citizens have not been found in the NECP yet. It emphasizes that the existing legal solutions need to be complemented by the development of a regulatory framework for active customers, aggregators and (renewable) energy communities. In addition to participation in local energy production, distribution, storage, supply and provision of energy, aggregation services and energy production for own needs, in accordance with the provisions of the renewable energy promotion and electricity directives, and the internal electricity market regulation [18].

In the same manner, the Croatian NECP also mentions for regional cooperation with regard to this point, which include the exchange of experiences related to energy communities and energy production from RES for own needs and the exchange of experiences related to the integration of RES into space and social acceptance of RES.

In terms of electricity generation for own needs, the largest contribution for the next years is expected from photovoltaic systems integrated in buildings. According to estimations, the installed capacity of such systems will be around 300 MW in 2030.

Energy Community:

Even though there is no current specific definition and regulation with regard to energy communities in Croatia, there are some laws and standards concerning renewable energies generation. Furthermore, the existing legal solutions concerning the use of renewable energy sources need to be complemented by the development of a regulatory framework for active customers, aggregators, energy communities, renewable energy communities (participation in local energy production, distribution, storage and supply and provision of energy and aggregation services) and energy production for own needs, in accordance with the provisions of the renewable energy promotion directive, the electricity directive and the internal electricity market regulation. NECP states that If necessary, an action plan will be developed for the development of energy and renewable energy communities.

End users' participation in the energy market:

The introduction of advanced metering systems by 2025 is defined as a priority for investment in the distribution system by the Croatian NECP. The main mechanism for the development and support of renewable energy sources generation in Croatia has so far been feed-in tariffs, in which the Act on RES and highly efficient cogeneration introduced later an incentive scheme through premiums. It is expected that this system of stimulation will continue in the forthcoming period for plants with an

installed power up to 500kW.

On the other hand, the Croatian NECP underlines also the importance that the measures proposed in the plan specifically address the islands and the needs that the islands have in terms of electricity generation. Since this encourages self-supply and the creation of renewable energy and energy communities in areas that are geographically separated from the rest of the country, while also solving the problem of increased electricity consumption during the summer months.

No further initiatives regarding the integration of decentralised generation or prosumers into the local or wholesale market are detailed for Croatia nowadays in its NECP. However, according to this new Act on renewable energies, high-efficiency and combined heat and power, RES and CHP can participate in the electricity market in Croatia in different ways, such as under the old FiT, market premium system, new FiT [19].

In Croatia, prosumers are defined as end-users whose main objective is the procurement of energy for their own use, but they also have a certain production capacity installed that can be used to inject energy into the network (such as rooftop PV, etc.). Suppliers are obliged to purchase the surplus of prosumers' generated electricity and pay them the following price. FiT preferential prices are different depending on the technology and size of an eligible producer. Preferential prices for smaller producers are higher than those for larger producers. This is because larger producers typically have decreasing cost per MW [19].

3.1.3 *Cyprus*

Empowering Energy Citizen:

For the time being, there are certain policies with the aim of fostering the development, installation and use of renewable energy sources on the citizens side

Regarding renewable energy use in buildings in Cyprus, as of 1st January 2017, a new legislation was applied for a minimum percentage of primary energy consumption to be covered by RES, indicating that at least 25% of primary energy consumption to be covered by RES for new single-family homes, 3% for new multi-apartment residential buildings, and 7% for non-residential ones (Republic of Cyprus, 2020).

Support schemes for the production of electricity from renewable energy sources for own use such as Net-Metering for self-consumption have been implemented since 2013 as national policies to promote RES electricity. Currently the Net-Metering scheme is applied for small scale photovoltaic systems with capacity up to 10kW, for all consumers (residential and non-residential). The scope of the net-metering is to provide the option to residential and small commercial consumers to cover all or part of their electricity consumption from RES i.e. PV. The generated RES electricity is subtracted from the building's overall electricity consumption. Consumers pay only for the difference between the energy consumed and energy produced (net electricity used) plus a cost that reflects the cost of the electricity grid to support continuous supply and taxes (VAT, RES levy). This scheme is expected to continue, with some modifications in the near future in order to enhance better the self-consumption for small systems (Republic of Cyprus, 2020).

For household owners and for those having a building permit prior of 2017, there is a support scheme in operation for the period 2018-2020. The grant support was set at a level of 250 Euro/kW installed with a maximum possible grant per system of 1,000 Euro. In addition, if this measure is combined with roof insulation there is a total grant of 3,000 Euros, where the grant for PV itself is increased to 300 Euro/kW. Furthermore, a support scheme for vulnerable consumers is in place since 2013 with the financial grant of 900 Euro/kW with the cap recently revised from €2,700 to €3,600 [20].

For Self-consumption / Net-billing with Self-consumption and Net-billing schemes, PV generated

energy has to be self-consumed within the same 20-min time period it was generated in. If local energy demand exceeds PV production, energy is imported from the grid. With Self-consumption scheme, excess PV generation is exported to the grid without any economic compensation, whereas a compensation for excess energy is foreseen by the Net-Billing scheme. The size of these systems is basically unlimited (up to 10MW). This support scheme is the most effective for both industrial and commercial consumers, since the self-consumption is almost excluded for all the taxes for the energy that is self-consumed. Consumers are billed on energy consumed from the grid at the retail electricity price and receive a credit based on a variable tariff known as the 'avoidance cost' for any excess power they inject back into the grid. The avoidance cost is intended to reflect the savings offered to the country by avoiding the generation of fossil-fuel based energy. If the PV system owner generates more power than they consume during any two-month period, the avoidance cost credit is rolled over into subsequent billing periods and is likely to be cancelled out over the course of each year because of the constraints applied to the generation capacity of eligible arrays. In the unlikely instance of a system owner exporting more power to the grid than they consume in 12 months, the excess does not secure any credit. Prosumers who qualify for net billing are taxed on all the energy they consume, whether generated on-site or imported from the grid, and also pay a fee for using the network.

Energy Community:

Currently, there is no policy framework for energy community establishment and operation. The national legislation will be amended, according to the Electricity Directive, to provide a proper framework for the activation of citizen energy communities. The Regulatory Framework for the Citizens Energy Communities is expected to be ready 8 to 12 months after the transposition of the Electricity Directive (recast) into law i.e. September 2021-December 2021.

It is clear -and this is stated in the NECP of Cyprus- that different energy priorities of Cyprus can be promoted through Energy Communities and this is why it is of crucial important that a framework is established.

End users' participation in the energy market:

As far as the internal energy market is concerned and regarding the competitive electricity market, in 2021 it is expected that a number of key projects that are under tendering or implementation will materialize, so that electricity is traded on competitive terms, based on the design principles of the Regulation (EU) 2019/943 on the internal market for electricity as applied to Cyprus (Article 64). The completion of the two primary systems currently under construction, i.e. the Meter Data Management System (MDMS) (completion est. December 2020) and the Market Management System (MMS) (completion est. Oct. 2021) will signify the operation of the competitive electricity market based on the Trade and Settlement Rules v.2.1.0.

In parallel, the DSO is in the process of initiating the roll out the Advanced Metering Infrastructure (AMI) with 400.000 smart meters (installation will start in 2020 to be completed within 7 years) together with a smart grid ready operation and control system for the Distribution grid of Cyprus (Supervisory Control and Data Acquisition/Advanced Distribution Management System - SCADA/ADMS). All the above systems are a prerequisite for the gradual removal of barriers of entry for new electricity market participants and technologies (active customers, citizen energy communities, aggregators, demand response).

The competitiveness of the retail energy sector can be improved following the operation of the new electricity market in 2021. It is a certainty, that the energy communities framework establishment will definitely help towards this direction.

3.1.4 **Czech Republic**

Empowering energy citizen:

The Czech Republic will establish a framework to support and facilitate the development of the renewable energy communities through both legislative and non-legislative measures, but yet no detail plan is given. This framework will be developed on the basis of an evaluation of existing barriers to the development of community energy and will include specific objectives, plans and policies. In this context, the EU directive on the promotion of the use of energy from renewable sources will be transposed into the Czech legal system, which will strengthen the rights of community energy participants and lead to the expansion of several related projects. Furthermore, it is also planned to introduce some financial support for the community energy projects, with the purpose of helping to promote renewable energy sources and fighting energy poverty [20].

In the same manner, it is planned to reduce administrative burdens related to the framework for the self-consumption of electricity from renewable sources and the renewable community in accordance with Articles 21 and 22 of Directive (EU) 2018/2001 [20].

Energy Community:

No definition has been found concerning energy communities in the current Czech Republic NECP. However, the NECP states that the participation of citizens and local authorities in community energy projects creates significant added value in terms of local acceptance of renewable energy sources and access to private capital. What is more, its development is accompanied by local investment, greater choice for consumers and increased citizen participation in energy transformation. Above all, the participation of citizens and local authorities in community energy is linked to the desirable increase in renewable energy production and the emphasis on energy savings. Community energy can thus become an important element for meeting the Czech Republic's objectives in individual areas.

End users' participation in the energy market:

The conditions for the implementation of smart metering in the Czech Republic are being prepared within the framework of the National Action Plan for Smart Grids (2019-2030), along with other measures related to the integration of RES such as demand-side response, energy storage or flexibility aggregation and prosumers. Partial measures with regard to demand-side flexibility are also included in the approved European legislation, in particular Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU. The measures required by this Directive will be gradually transposed into national legislation [20].

In order to meet its national contribution to the European RES target at 32% by 2030, the Czech Republic has amended Act No 165/2012, on supported energy sources. Under Act No 165/2012, a new RES support scheme after 2020 is proposed, which should ensure progress towards the national contribution in this area. Nonetheless, it must be emphasized that this is only a draft amendment to the act, which still has to go through the legislative process of the Czech Republic, which usually lasts between one and two years.

This new RES support scheme proposed can be summarised as follows [20]:

- Modification of the current form of support for small sources up to 1 MW, where the support will no longer be used in the form of feed-in tariffs, but only in the form of an hourly green bonus. This is the most 'pro-market' approach and financially most effective form of support for small sources.
- Introduction of support through competitive tenders (auctions) for sources above 1 MW. This is a 'pro-market' principle, which, moreover, also follows for these sources as an obligation from EU legislation.

- Introducing a new form of support so that some existing sources can be maintained in operation and some other new sources can develop, as well as introducing new forms of support to ensure the required sectoral RES targets in heating and cooling.
- Introduction of new forms of support in order to ensure the achievement of sectoral RES targets in transport required by the revised RES Directive. This involves the promotion of bio methane.

The scope of support will only be for non-fuel sources (except PVPP) and landfill or sludge gas. The form of support for new electricity plants will be applied by an hourly green bonus, with a division into electricity plants, which will compete for the support in an auction. For sources up to 1 MW (6 MW for wind power) support will be provided in the form of a green bonus laid down in an ERO price decision, whereas for sources above 1 MW, the support will be provided by means of auctions in the form of the 'auction bonus'. The duration of the support will remain unchanged – over the lifetime (20 or 30 years).

On the other hand, it is significant to underline that in accordance with Act No 165/2012, on supported energy sources, the transmission or distribution system operator is obliged, in its licenced territory, to preferentially connect to the transmission or to the distribution system a facility generating electricity from a supported source. To comply with this premise, the manufacturer must request and meet the conditions of connection, except for the demonstrable lack of capacity of the transmission and distribution facility or in the case of the risk to safe and reliable operation of the electricity system.

3.1.5 **Estonia**

Empowering energy citizen:

The current legal system in Estonia enables the creation of renewable energy communities conveniently and easily and the production of renewable energy for own consumption. Cooperative collaboration is widespread in Estonia and can be appreciated in apartment, consumer, forestry or agricultural associations. For instance, local communities can use the supports designed with measures that are related to reconstruction of buildings and heating sector primarily via apartment associations. However, the experience shows that the activity, interest and readiness of local communities to create an energy community or association was low, at least some years ago. For this reason, ongoing studies and analyses addressing community benefit instruments and consumer engagement mechanisms are planned to combat phenomena such as the "Not in My Backyard" effect [21].

The potential and socio-economic impact of Estonian energy associations was assessed in 2015. The greatest energy-related potential for the establishment of energy associations is in apartment buildings and public buildings that are not located in district heating regions or are located in low consumption density district heating network regions. The results showed that potential of local cooperative electricity generation with solar panels amounts to 30 GWh/year, whereas wood gasification with energy cogeneration reaches 22 GWh/year.

Energy community:

Estonia has adopted the practice of the European Renewable Energies Federation as the basis for determining the role of energy communities and their designation as energy associations. Estonian legislation does not designate energy communities or energy association separately, but their activities overlap with the forms highlighted in the Commercial Code, namely, the renewable energy communities can act within the meaning of the Commercial Code as private or public limited companies. Here an energy association means community joint activities with the purpose of generating, distributing or selling electrical energy and heat to their members through their own equipment for covering self-consumption. On the other hand, public renewable energy generation means the generation of decentralised renewable energy whose owners (at least to the extent of 50%) are operators or citizens, local initiatives, communities, local governments, charity or non-governmental organisations, agricultural producers, associations or SMEs that create local value

that may remain in the region.

For renewable energy communities, the only restriction is that they cannot be a general partnership or a limited partnership within the meaning of the Commercial Code, since the members of these two legal entities cannot be local governments. However, local governments may form the renewable energy community under the new Renewable Energy Directive. End consumers, primarily households, retain their rights and obligations according to the statutes of the company, articles of association, etc.

End users' participation in the energy market:

Since 1 January 2017, all Estonian electricity customers have smart readers that record and transmit at least the hourly data to the central database. Consumers have free access to their data, and they may also enable data access for the freely selected service provider.

More specific regulations regarding tariffs and dynamic pricing will be drawn up as needed, based on the results of the pilot projects in progress. At this moment only a general regulation is covering this point.

The Electricity Market Act prohibits discrimination of market participants. The network operator, in response to a request from a consumer, producer, line operator or any other network operator, is obliged to connect any electrical installation which conforms to requirements and is located in its service area to the network and to amend the conditions of consumption or generation. As from 20 February 2018, aggregators are able to enter into a contract with the TSO (Elering AS) to provide a balancing service, which means that the aggregators are able to participate in the electricity market on the same principles as the other market participants. The regulation will be updated to cover independent aggregators and energy storage in accordance with Directive (EU) 2019/944 on the internal market for electricity.

Furthermore, connection conditions are facilitated for connecting to the grid power generation equipment using renewable energy sources and with a capacity of under 15 kW. Electricity producers also do not require an activity licence if the net capacity of the production equipment is below 200 kW.

3.1.6 **Greece**

Empowering energy citizen:

The NECP considers the development of clean forms of energy through funded projects implemented by energy communities with the participation of natural persons, and/or local authorities and/or legal persons governed by private/public law, aiming to promote renewable energy sources and reduce energy poverty [22]. This axis could include in addition, biomass/biogas projects, with the participation of local livestock cooperatives and generally self-consumption projects with the possibility of utilising existing energy infrastructure.

Smart meters and smart networks will form also a key part of the future planned smart and sustainable cities, allowing for the monitoring and management of the large amounts of information that are necessary for their harmonious operation and making a substantial contribution to the rational use of energy by final consumers at a city level. In conjunction with the new regulatory framework for the demand response mechanism and energy communities, it is expected to strengthen significantly the role of cities and people in the transition and ultimately in the restructuring of the energy sector.

Energy community:

The new Greek NECP includes the creation of an energy communities' scheme, which is deemed to be an indispensable tool for strengthening the role of local communities and consumers. In the same manner, an innovating net metering scheme for energy generation and consumption will be

developed to support decentralised energy production and management. In turn, the functioning of these schemes will be supported and strengthened by specific tools.

Therefore, the contribution of net metering and energy community schemes is twofold, as they will contribute both to the implementation of RES and energy saving investments and to the more active participation of the local community and ultimately to the strengthening of the role of people in energy activities. The quantitative objective is to set up and operate new self-consumption and net metering systems, primarily with a view to covering own needs of over 600 MW by 2030 (to reach in total more than 1 GW of installed capacity), and to engage aggregators through the possibility of participation of energy communities and of people in energy markets.

End users' participation in the energy market:

Clear provision will be made for the direct participation of RES plants in the electricity market without their obtaining any kind of aid or guaranteed contract. However, the sliding feed-in premium scheme will continue to be the key tool for supporting RES technologies in power generation as a whole, whereas specific provision will still be made for plants with a low installed capacity to receive fixed price operating support. In this context, a special monitoring mechanism and procedure are already in place aimed at adjusting the reference price of each technology and category of RES plants in respect of projects that have not yet been put into operation, depending on the evolution of the financing costs and of the development and operating costs of such plants.

On the other hand, demand participation in the electricity market will be made possible and strengthened through the installation of 'smart' meters for all electricity consumers, a project expected to be completed in the following decade. This will allow to send orders to grid users remotely, so that they change their load curve, to reduce electricity prices and to participate in ensuring the power adequacy of the electricity system.

As part of the reform of the electricity market regulatory framework, the necessary adjustments will also be launched to allow for the participation of decentralised energy schemes. Hence, the possibility of establishing Aggregators and Energy Communities has been instituted, enabling electricity consumers to operate in the electricity market, either as consumers or as producers, and through dynamic electricity tariffs, to restrict both the electricity costs of the System and the costs for consumers involved in these bodies.

Finally, Greece's objective is also to strengthen the role of electricity market by promoting the deployment of storage systems that will ensure lower electricity and gas prices and will strengthen RES penetration in the system and adequate system capacity.

3.1.7 Hungary

Empowering energy citizen:

Hungary is lagging behind other European countries in terms of both renewable energy utilisation and community energy, as well as supporting the transition to a prosumer culture, all of which would require a more flexible and less centralised energy system [23]. Nonetheless, there are some laws related to the fostering of renewable energies generation and their selling in the electricity market in Hungary as well as future regulation plans for energy communities. The spread of household-sized PV panels has allowed that a growing number of consumers can generate their own energy, which not only offers the option of a more active presence on the market beyond the conscious regulation of consumption, but also strengthens energy independence on a household scale. The intention reflected in the NECP by the Hungarian Government is to continue encouraging energy production for private purposes (based on renewable resources), strengthening the energy independence of consumers and consumer communities.

Furthermore, in parallel with growth in decentralised production based on locally available RES, it is necessary to support initiatives ensuring the local consumption of electricity too, since this could

reduce costs associated with energy supply and simplify the integration of renewable sources of energy. In this aspect, the encouragement and support of energy communities is the most important task for the Hungarian Government [24].

Energy community:

No definition has been found concerning energy communities and their corresponding benefits for end users in Hungary NECP [25]. However, for the Hungarian government, the energy community, as a separate consumer-producer unit and settled entity, should be clearly defined in regulation. Moreover, it is also necessary to define in regulation a community metering point besides the metering point of production-consumption.

End users' participation in the energy market:

In Hungary, 1 million smart consumption electricity meters are being installed in these days. This installation also comprises part of the programme aimed at establishing innovative system balancing. In this manner, other related demand-side regulation and funding of smart metering promoting network flexibility are planned to be implemented under the relevant operational programmes of the 2021-2027 period.

The increase in electricity generation for the grid in Hungary was primarily boosted by the feed-in system (FIS) until the end of 2016, which provided operational support (guaranteed feed-in tariff higher than the market price). This system was replaced by the Renewable Energy Aid Scheme (REAS) in 2017, which also provides operational support and supports the market integration of renewable energy generation. To ensure cost-effective levels of aid, in the future aid within the REAS framework will only be available through technology-neutral renewable capacity tenders; production aid will be available within the conventional feed-in system only for experimental technologies and model projects [24].

Under the REAS scheme, aid aimed at the installation of capacities of at least 1 MW is awarded only under artificially established competition. Within the framework of the REAS green bonus tender, aid is available not only to newly invested power plant units, but also to existing power plant units undergoing major overhaul or an upgrade in excess of 50 % of the original initial investment cost. The amount of aid available under the REAS scheme depends on the production capacities of the given power plant. Within the REAS category of feed-in aid (REAS-FIS), power plants with a capacity of less than 0.5 MW are eligible (except for wind).

Nevertheless, the falling cost of renewable energy production, digitalisation and the growing affordability of smart metering are leading to a major paradigm shift: the notion of the 'passive consumer' is increasingly replaced with that of the active (partially self-sufficient) prosumer. This necessitates complex, differentiated energy policy solutions for consumer segments, and at the same time a tailored and flexible approach, with the development of diversified service packages. A fundamental prerequisite for active consumer participation on the market is the regulation of consumption in cases where this is not yet possible.

To this end, the establishment of independent aggregators is required, as they combine several consumer load or production units for buying and selling on a regulated energy market. This aggregation of consumers belonging to various consumer segments also plays an important role in exploiting consumer-side flexibility.

3.1.8 Ireland

Empowering energy citizen:

Empowering energy citizen is the very first priority which is followed by the Markets, Regulation and Prices as outlined in the green paper on energy policy in Ireland [26]. This encourages passive consumers to become active and prosumers, but there is no FiT policy exist for microgeneration systems placed at the consumer end. The very latest initiative by the government is that a new

Renewable Electricity Support Scheme (RESS) has been placed to support the renewable electricity projects in Ireland. With a primary focus on cost effectiveness, the RESS will deliver a broader range of policy objectives, including an Enabling Framework for Community Participation through the provision of pathways and supports for communities to participate in renewable energy projects. This first phase of support for micro generation is targeting solar PV installation and domestic customers for self-generation. A grant of up to a maximum €3,800 is now available (max 4kWp + battery) for homes built before 2011. The new solar PV support scheme also aligns with the recently agreed recast Renewable Energy Directive which brings the prosumer to the heart of new energy policy across the EU. Furthermore, there is a 6-month in-built review which will explore opportunities for broadening the scheme to include other micro renewable technologies and also to expand the scheme out to target other customer groups such as farmers and small businesses [27].

It is also proposed that agencies should be resourced to support community ownership projects and that policies around small-scale battery storage should be developed to aid self-consumption. District heating and community participation should be encouraged along with the elimination of subsidies for peat burning. Provision should be made for community owned energy developments and feed-in tariffs for domestic energy production, to allow the growth of bottom-up solutions for domestic energy sources, demand response and energy storage.

Energy community:

No specific definition has been found concerning energy communities in the Ireland current NECP. Two examples of promoting the role of local energy communities in Ireland are constituted by the Better Energy Communities (BEC) grant scheme and the Sustainable Energy Communities network. The BEC scheme encourages and supports community-based partnerships to improve the thermal and electrical efficiency of the building stock and energy poor homes and facilities, encouraging the implementation of deeper and more technically and economically challenging measures. These partnerships can be between the public and private sectors, domestic and non-domestic sectors, commercial and not-for-profit organisations and energy suppliers.

On the other hand, the Sustainable Energy Communities network works with groups from all around Ireland to build their technical and project management skills. The starting point is energy efficiency, but the next step can be renewable energy generation within communities, which forms another link between the sectoral mitigation measures for the Built Environment sector and those for Electricity Generation sector.

However, it is important to distinguish between ‘community ownership’ and ‘participation’ in a local project versus ‘community benefit’ or ‘community gain’. In Ireland, for wind energy developers, the Irish Wind Energy Association of Ireland (IWEA) has developed guidelines on Community Benefit which provide advice on payments or benefits made by commercial developers to local communities. Such payments can be perceived as goodwill, compensation or “payoffs” and while they can be very beneficial to communities, they continue to treat citizens as passive consumers of energy, rather than active contributors. Community ownership and participation, on the other hand is about active engagement by communities in energy generation, distribution and efficiency. Community energy models suggest that the community itself is choosing to accept responsibility for some or all aspects of the development or project and will have a share in any profits. Having a stake in this sense is far more powerful than ‘benefit’ alone [28]. The very recent initiative from the regulatory authority shows that the Ireland is preparing to adopt the EU regulations on RECs and CECs [29].

End users’ participation in the energy market:

Ireland has a range of policy measures in place aimed at fostering the generation through renewable energy as well as their corresponding integration to the electricity market. These policies can be summarised as follows:

- Alternative Energy Requirement (AER) Scheme. The AER scheme was launched in 1996 and was the first step towards a market support for wind energy to promote the generation

of electricity from renewable resources. The programme involved the tendering for contracts of certain fixed amounts of capacity, by potential renewable energy generators. The AER will remain in place until 2021.

- REFIT 1, was open for applications until 31 December 2009. The technologies covered in REFIT 1 are small wind (< 5MW), large wind (>5MW), Hydroelectricity and Biomass/Landfill gas. The support is provided for a period of 15 years.
- REFIT 2, which succeeded REFIT 1, came into operation in March 2012. It provides for up to 4,000MW of renewable generation. The technologies covered are small wind (< 5MW), large wind (>5MW), Hydroelectricity and Biomass/Landfill gas. The backstop date for REFIT 2 is 2032.
- REFIT3 aims to support the addition of 310MW of biomass technologies including anaerobic digestion (AD) and Combined Heat and Power (CHP). The backstop date for REFIT 3 is 2030.

The National Smart Metering Programme (NSMP) is a multi-year investment project including the roll out of new digital electricity (and gas) meters, a communications network to support them, and investment in new IT systems. In phase one (2019-2020), 250,000 smart meters have been installed. Smart services such as time-of-use tariffs and smart bills will become available at the end of 2020, so that consumers can benefit from the additional services provided even before the entire NSMP has been delivered. Approximately 500,000 meters will be installed in each of the four subsequent years.

Furthermore, in the Ireland NECP it is recommended that value be given to renewable/sustainable/indigenous resources such as biomass, biogas, hydrogen, electricity, etc. One proposal says the high cost of trading is prohibitive and suggests re-introducing proposed Aggregator of Last Resort, to provide options for small renewable generators to participate in wholesale electricity market.

3.1.9 *Italy*

Empowering energy citizen:

In Italy, an early and partial transposition of the Directive on Renewable Energy (RED II) regarding collective self-consumption and energy community was started in 2019. Recently the Italian regulatory authority (ARERA) has published the rules for the application of grid and system fees for energy communities and self-consumption, while the Ministry of Economic Development has defined the incentives for the “shared energy” within collective self-consumption schemes and energy communities [31]. In few words, to the “shared energy”, that is energy produced by RES plant consumed in the same hour by members of the scheme, an explicit incentive is recognized, together with a partial exemption from variable grid charges (avoided grid losses, avoided utilization of upper voltage levels).

With the decree law 169/2019, now buildings may own local electricity generation plants (up to 200 kW) dedicated to supply not only loads in shared areas, as previously, but also for individual consumers, with allocation of costs and revenues through a virtual scheme.

Energy community:

Italian NECP is more focusing on formation of energy communities (REC and CEC). One of the main goals of the NECP is to establish a regulatory framework for the development of citizens energy communities that would be active in the generation, supply, distribution, storage, sharing and sale of electricity and the supply of energy services, including energy efficiency and electric vehicle recharging services [30].

To avoid inefficiencies in the development of the network, as established by the decree renewable energy communities have to rely on the existing electricity network. They will help support the

economies of the smaller regions, often rich in renewable resources, and will also make it possible to produce and consume renewable energy locally, including in situations where self-consumption is technically difficult. Renewable energy communities will be able to play an important role in terms of reaching local consensus on the authorisation and building of energy plants and infrastructure. In addition, given their aims as set out in the Renewable Energy Directive, ways in which those communities can also provide support to families in conditions of energy poverty, especially where direct interventions (for example, self-consumption plants) are not technically feasible, will be explored. Renewable energy communities will be promoted in economic terms by means of direct support mechanisms for production, including by more than one plant (similarly to the general production support mechanisms) and for locally consumed energy. The benefits to be reaped in terms of network use in this last case will be considered, with due regard to the rights and obligations of the members of the community as customers. These set-ups will have privileged access to support mechanisms.

Renewable energy communities will also be promoted through information on locally available resources (also making use of the procedure for identifying suitable local areas, as mentioned below) and on the opportunities offered by support mechanisms. The development of standard tools for setting up and managing the communities and for exploiting energy production will be assessed. Given that in Italy the first local trials have already been launched on the initiative of certain Regions and municipalities, these experiences will be reviewed and monitored within the framework of the INECP Observatory to assess the possibility of developing facilitation and support measures. In those local areas where it is possible and appropriate, the use by those communities of thermal energy from renewables will be promoted. In the context of the transposition of the Renewable Energy Directive and in line with the transposition of the Electricity Market Directive, special attention will be paid to the relationships between renewable energy communities and citizens' energy communities. These groups appear to have the possibility, in addition to producing, storing and consuming energy from renewable sources, of providing other services such as energy-efficiency services and electric vehicle recharging services. This last aspect will be examined to assess the potential of promoting forms of aggregation and cooperation in the production and consumption of renewable energy, as well as in the provision of energy-related services, including in the context of production clusters.

The scope of the renewable targets, along with the fact that increases in electricity production are expected predominantly from wind and photovoltaic sources, means that significant surface area on which to install such plants is needed. For large wind plants in particular, operators will be encouraged to carry out careful preliminary assessments involving local communities and economies, with adequate priority given to upgrading and renewing obsolete plants.

End users' participation in the energy market:

A regulatory framework governing the collection of general system charges and electricity tariffs is introduced in 2018 that favours instantaneous self-consumption. The variable tariff structure is provided for the application of energy consumption from the public networks. For collective self-consumption, especially in cases where the use of existing public networks is preferred, as a direct form of support, is currently set by the above-mentioned transposition process. In this case, due to the decreased use of network, reward is being given to the distributed generation operator. In any case, the direct and indirect costs of promoting new systems of self-consumption, including collective consumption and renewable energy communities, will be monitored, keeping the equilibrium of the system under control. The aim is to strike a balance between the promotion of self-consumption and equal participation of electricity customers in covering these which can also be increased by installing accumulation systems, and for plants which go on to provide services to ensure the regular operation of the electricity system on medium- and low-voltage networks. In all cases, promotion of individual self-consumption will be aimed primarily at distribution plants for which, moreover, the simplicity and automated nature of the support mechanisms make them preferable to other tools which are more complex and expensive to manage. Further instruments to support self-consumption, both individual and collective, will be:

- Reinforcing minimum quota obligations for renewable energy sources in new buildings or buildings subject to major renovation, in line with the targets for near-zero emissions buildings.
- Progressive and gradual extension of the minimum quota obligation for renewable energy sources (which, as mentioned, is currently envisaged only for new buildings or buildings subject to major renovation) to existing buildings, starting with several categories such as warehouses used for manufacturing activities and service sector buildings. As an alternative to construction of plants, methods will be assessed for transferring rights to roof surfaces to third parties, with a renewable installation preferably for the service of the building.

Besides single self-consumption, previous regulation foresaw Closed Distribution System (CDS), defined as a system which distributes electricity within a geographically confined area to non-residential customers. Many places such as train stations, airports or hospitals can include closed distribution systems owing to the specialized nature of their operations. This category is then divided into “Users’ Inner Networks” (RIU, in Italian) and “Other Closed Distribution Systems” (ASDC, in Italian) [33].

The Italian legislation on this type of system is nearing completion. RIUs, like other private networks, are comparable with distribution networks with duty of connecting third parties. CDS operators are considered as Distribution System Operators (DSOs) with the exception of having no constraints set by the Italian Energy Authority (ARERA) in applying connection, transport and measurement fees to its customers. On the other hand, the SDC operators haven’t access to recognition of costs and equalization bonuses provided by ARERA. The electricity price part covering overall grid charges have to be applied fully to the energy amount consumed by each SDC user while a lump application of 5% is set to the self-consumption energy. As established by ARERA, for the dispatching service is not provided a different treatment among RIU customers and ASDC ones [33].

With respect to the ancillary service markets, with the act 300/2017 the NRA has opened the participation also to LV small customers, in an aggregate way. Currently they can provide flexibility for the tertiary reserve, balancing and congestion relief services. Some Balance Service Providers have started to engage them, for example aggregating prosumers already equipped with storage devices (“Accumuli Lombardia”, RSE, <https://accumulilombardi.rse-web.it/>)

3.1.10 *Latvia*

Empowering energy citizen:

Like in other countries of this report, renewable electricity generation in Latvia is stimulated through a complex support system based on a feed-in tariff, which also includes elements of a quota system and tenders. Moreover, since 1st January 2014 electricity coming from renewable energy sources is promoted also through net-metering [31]. It means, self-consumption is allowed, but it is netted out of the amount of electricity for which generator receives RES support. Therefore, the consumption cost is decreasing. Nevertheless, network tariffs are applied to total consumption, not to the netted one.

The existing support mechanisms for energy production from RES are being assessed and revised since its beginning in 2007. A new national support mechanism for electricity production from RES was expected to be developed before December 2018; however, no new plans have been presented yet.

Currently, the access of renewable energy plants to the grid is subject to the general legislation on energy, but electricity from renewable sources is not given priority [35].

Energy community:

Energy community, especially renewable energy community, movement in Latvia is in the early

development stage. Some of the initiatives, both by municipalities and by individual citizens, have been taken to form the energy communities or RES projects.

Latvian NECP includes a plan by 2021 to develop a regulation on energy communities and regulation on including these in RES support schemes, as well as conduct a survey by 2026 on at least one viable business model for energy community operation [32]. Additionally, some soft initiatives in their initial phase exist, like participation in COST action CA19126 - Positive Energy Districts European Network.

End users' participation in the energy market:

The key measures implemented in the context of the energy market are related to the interconnections of the Baltic energy market and energy security. Regional cooperation between the Baltic States is currently of particular importance not only for the development of energy policy and energy market development of all three countries, but also on a larger scale, including Finland, Sweden, Poland, Denmark, and Germany. At the EU level, there is the Baltic Energy Market Interconnection Plan (BEMIP) that covers infrastructure planning and helps attract and make good use of financial instruments, including the Connecting Europe Facility established in 2014 that will support only cross border energy projects, which will facilitate even closer cooperation in the Baltics. (Latvia, NECP 2020). It is expected that through this regional cooperation and the infrastructure development as well-functioning internal energy market can be achieved with an improved liquidity.

On top of that, the state aid mechanism for renewable energy and cogeneration power plants will shape the free energy market of the future. The increase of energy poverty as well as lack of clarity about the most appropriate tools to prevent consumer vulnerability is a barrier for further integration of the internal energy market.

Again, the energy communities' framework can definitely alleviate energy poverty and support regional cooperation in the shaping of a well-functioning market for the end users.

3.1.11 Lithuania

Empowering energy citizen:

In view of the ambitious objectives in the field of RES, it is planned to promote the use of RES by granting EU support in 2021–2027. EU support will be granted to the installation of low-power plants generating electricity from renewable sources, giving priority to prosumers, energy communities, businesses or individual energy consumers. The need for EU support funds, possible measures in this area of activity and the expected results are currently being assessed [33].

To promote active participation of electricity consumers in the market, a scheme for generating electricity was created in 2015. The target for 2030 is to have 30% of the producing consumers compared to the total number of electricity consumers. In order to ensure that the electricity generating scheme is available to all electricity consumers, the acquisition of the power plant is funded from European Union Structural Funds and the National Climate Change Program. As of 2019, prosumers received 323€/kW in support. In total, it is planned to invest more than 16 million € from EU funds by 2023, with four invitations being planned during this period.

Potential electricity prosumers and persons wishing to produce electricity for their own use and for the needs of the household, without supplying electricity to the grid, enjoy simplified procedures for the installation of power plants up to 30 kW. Such persons are not required to apply for the authorisation to develop electricity capacity or for the electricity generation permit. They may start operations by informing the electricity network operator.

In order to promote the development of prosumers, the Prosumers Alliance, made up of representatives of RES business associations and consumer organizations, is being created. The

aim of the Alliance is to promote small green energy focused on residents and business by promoting consumer education and awareness of green energy and the possibility of owning and generating electricity. In addition, all partners in the Alliance are expected to offer high-quality and competitive products and services.

Energy community:

A renewable energy community is defined as a legal status accorded to a public body which fulfils the specified criteria and which owns and develops installations for the production of energy from renewables in a defined area and has the right to use them to produce energy, to consume and store it in energy storage facilities and sell it. Participants in the renewable energy community may be natural persons, small or medium-sized businesses and/or municipalities, of which:

- At least 51 per cent of the voting members or shareholders are natural persons whose place of residence is declared in the municipality in which the construction or installation of the power generating unit(s) is planned, or in the sub-districts of another municipality adjacent to this municipality.
- Each member or shareholder has a maximum of 20 percent of the voting rights in another energy company.

Renewable energy communities are entitled to participate in the auctions without the obligation to produce and supply to the grids the total amount of electricity they have won in the auction. The communities may also carry out any activity in the energy sector subject to authorization. In order to facilitate the establishment of renewable energy communities, municipalities are obliged to evaluate and make public the locations where a renewable energy community's energy production facility may be built or installed. Opportunities for facilitating the transfer of electricity within the renewable energy community are currently being assessed.

End users' participation in the energy market:

By the end of 2023, DSO plans to install smart meters for its customers. Smart meters will be installed in stages, starting with largest electricity consumers and followed by the rest of consumers. In addition to smart meters, there are plans to implement a smart metering system for meter management and reliable data collection, storage and analysis.

Natural and legal persons planning to produce electricity in solar, wind and biomass power plants with an installed capacity of not more than 500 kW can become the producing consumers. Through this, prosumers are able to 'store' the electricity produced by them and not consumed for their own or household use and in the electricity networks from April 1 of the current year to March 31 of the following year. The producer is charged the grid access fee for the amount of electricity 'stored' and received back from the electricity networks. The amount of electricity supplied to the grid in excess of the electricity consumed by the prosumer during the storage period is not carried over to the next storage period. It is envisaged that this scheme will be continued until 1 April 2040, nevertheless, an assessment of the established conditions will be carried out in accordance with the Directive 2018/2001.

Prosumers may establish their own power plants or purchase them on the basis of bilateral contracts from third parties, thus making it possible for the occupants of multi-apartment buildings to become prosumers. Moreover, the power plant of the prosumer may be remote from the electricity consumption point. In this case, the power plant must be owned or managed by the prosumer.

However, the growing share of decentralized generation will require major structural changes in the electricity market. With the introduction of smart meters and the growing number of prosumers, a legal framework is being developed for the aggregator mechanism, which, having three different types of users, would create preconditions for demand-side response and avoid a part of the peaks in the electricity demand market.

Ongoing technology-neutral auctions increase the share of local power generation each year, but also create additional challenges such as system balancing. To analyse the possibilities of connecting/integrating electricity and gas markets, an analysis of applicability and relevance of power-to-gas technology for Lithuania will be carried out, the economic, legal and technical issues of the technology's applicability will be addressed, whereas potential product consumers will be questioned and a technology review will be prepared in 2020.

In the same manner, DSO is developing a data hub, which will be implemented in several steps:

- A standard for electricity suppliers will be developed and introduced by 2020, modifying the existing information technology systems.
- A joint platform for data collection and exchange (data hub) will be created by 2023.
- Last but not least, other planned objectives for the next years in terms of energy market integration in Lithuania include:
 - For the purpose of ensuring electricity market (100%), to enter into cooperation agreements for the development of reliable and affordable local electricity production under market conditions and/or to distribute the support for the implementation of the required measures by means of an auction.
 - To speed up the process of connecting the consumer's electrical installations to the electricity and natural gas distribution networks

3.1.12 **Malta**

Empowering energy citizen:

Existing schemes supporting the installation of PV systems cater for the option of self-consumption of renewable electricity in both the residential and non-residential sector. Under existing legislation, the applicant may opt to sell all electricity generated by the PV system to the DSO (full export) or export only the surplus electricity (partial export). Furthermore, in the case where the installation operator does not apply for support, Regulation 4A of SL 545.27 ensures that solar PV may be installed primarily for self-consumption and that any surplus electricity supplied to the DSO through the grid will be bought at the proxy for the market price. The option for self-consumption is not applicable for PV installations owned by third parties, with full export to the grid being the only option. Since the introduction of support schemes in the form of feed-in tariffs, Malta's regulatory framework supported self-consumption and ensured that there would be no legal or technical barriers to renewable self-consumption. Systems which prioritise self-consumption face no additional charges when selling their excess production of renewable electricity to the grid. Self-consumption is promoted as a way in which consumers can offset their consumption of electricity from the grid (in real time) and thus, reduce their electricity bills, particularly in cases where such offsetting places the consumer in a lower electricity tariff band.

It is expected that under the 'With Planned Measures' scenario, Malta will reach a Solar PV capacity of 266 MW by 2030, thus fulfilling its currently estimated technical potential. It is important to highlight that the Government intends to reach this capacity by extending its current framework of RES support schemes post-2020 for both residential and non-residential systems, including in the form of feed-in-tariffs (FITs)/ feed-in premiums. As the support period for several PV systems come to an end, it is expected that most of these will switch to a "self-consumption" billing option. Thus, consumers opting for this option are expected to increase, reaching about 50% of installed PV systems by 2030. This shift is also expected to drive demand management (to minimize electricity exported to the grid), which may be beneficial to the grid operator if well managed to reduce demand peaks.

As of 2020, a pilot scheme supporting the integration of battery storage with PV systems will be launched. Early adopters of solar PVs whose feed-in-tariff has expired will be eligible to receive a 25% grant (capped at €1,000) against the purchase of a battery system for the storage of renewable energy and therefore, increase the share of self-consumption. It is likely that a large-scale roll-out of

battery storage systems for households, PV-integrated or standalone, would require a significantly higher level of support or lower cost of storage than at present. In this regard, Malta shall be seeking EU funds to bridge the gap.

Energy community:

No definition has been found concerning energy communities and their corresponding benefits for end users in Malta NECP.

With respect to renewable energy communities, there is limited potential for their development and for establishing targeted policies and measures, mainly as a result of the structure of the electricity distribution and supply system and related derogations for Malta under Directive 2009/72/EC and Directive (EU) 2019/944.

However, some institutions state that energy community incentives, such as purchasing of PVs or roof-space are necessary to give power to the community to be able to produce its own energy. Solar PV farm schemes should be extended to citizens who will be given the opportunity to invest.

In this manner, the Government will continue to promote renewable self-consumption of electricity from solar PV systems and ensure that no discriminatory or disproportionate procedures and charges apply. In this regard, and in line with future requirements under Article 21(4) of Directive (EU) 2018/2001, Malta will be conducting an assessment to explore any potential unidentified barriers to renewable self-consumption.

End users' participation in the energy market:

In line with its programme to ensure an efficient distribution system, Enemalta has equipped 99.6% of its consumers with smart meters and has adopted a tariff system that favours the prudent use of energy. Additionally, a second generation of smart meters are being installed which will allow the consumer to be more aware of their energy consumption. This will be done through the consumer energy management system where in-house display systems, smart phones and other devices will provide the consumer with real-time information on their consumption. Through this readily accessible information, the consumer has the opportunity to better understand their consumption patterns, resulting in increased energy conservation.

It is important to underline that there is no liquid wholesale market in Malta. Malta is also eligible to derogate from the application of a number of provisions of Directive (EU) 2019/944 [34].

3.1.13 Poland

Empowering energy citizen:

The prosumer photovoltaic (PV) market has started growing. At the end of 2018 there were more than 36,000 individual prosumers in Poland (almost exclusively in photovoltaic technology) owning small-scale PV systems. Nowadays there is an increasing number of renewable energy prosumers in the heating sector too, especially in solar thermal energy [35].

Energy community:

No definition has been found concerning energy communities and their corresponding benefits for end users in Poland's NECP. The NECP includes measures to support prosumers and energy communities and the promotion of smart grids. Moreover, it provides some details on simplification of administrative procedures on the enabling frameworks for renewable self-consumption and renewable energy communities [36].

End users participation in the energy market:

In 2016 Poland introduced net metering for non-commercial prosumers. Currently the net metering scheme covers RES micro-installations with installed capacity of up to 50 kW.

Local communities do not actively participate in the energy market in Poland, even though the government seems to support the idea of energy cooperatives and energy clusters. However, there

are good perspectives of change: the Act on Renewable Energy Sources was modified in 2018 and the auction support scheme for electricity produced from RES started at the end of the same year [35].

3.1.14 **Portugal**

Empowering energy citizen:

To promote distributed production and self-consumption of power from renewable sources, a new legal framework was developed in Portugal, Decree-Law No 162/2019 of 25 October 2019, which allows and promotes individual self-consumption, collective self-consumption and the forming of energy communities. The legal establishing of these activities will allow individuals, companies and other public and private entities to produce, consume, share, store and sell energy produced from renewable sources, thus actively participating in energy transition.

This promotion of self-consumption of renewable energy, whether individually or collectively or through energy communities, will in the short-term, be accompanied by an information and support programme for implementing self-consumption projects. The aim is to reduce information asymmetries and support companies, municipalities and citizens in the development of such systems.

According with Portugal NECP, it is crucial to promote energy literacy for consumers through more transparent information and to ensure greater knowledge on energy and climate, allowing citizens to make more informed choices and promote more and better information for consumers, contributing toward transparency and competition in the energy market.

Energy community:

Portugal has one of the most comprehensive and clear NECP which shows that they are in advance in adopting the CEC and REC in their policy and legal framework. The hindering legislations are updated to ease the engagement of REC. Even CECs are well discussed in the NECP. The link between energy citizens, REC and CEC and energy saving could have been better planed and explained.

End users' participation in the energy market:

In February 2018, ERSE (Portugal Energy Services Regulatory Authority) approved the rules for implementing, as of 1 June 2018, two pilot-projects, including the introduction of dynamic tariffs for network access in mainland Portugal. Based on the results of the pilot-projects, ERSE will conduct a cost-benefit analysis to assess the merits for the electricity system and the possible setting of specific targets for installing smart meters.

There is a need to provide incentives for the distributed production of energy, particularly in relation to local production of electricity using solar energy. This will play a fundamental role in reinforcing consumers as active agents and promoting energy communities. It will have an impact on the need to reinforce networks and the centralised production of energy while simultaneously promoting the emergence of new markets and technological solutions.

Furthermore, to achieve more integrated markets in the energy sector, it will be important to develop a regulatory framework that promotes such integration by guaranteeing competitiveness among market agents. Defining the regulatory and legal framework will similarly meet the challenges raised by new community legislation, derived from the clean energy package for all Europeans, particularly instruments associated with designing and configuring the market.

3.1.15 **Romania**

Empower energy citizen:

Romania revisited the related legal definitions and framework (Romanian Law No. 220/ 2008 on energy originating from renewable sources) and completed them as the Law no. 184/ 2018 (regarding the approval of the Emergency Ordinance no. 24/ 2017 for the amendment of the REL, Official Gazette no. 635/ 20.07.2018). This allows for the engagement of empowered energy citizens in energy markets by producing renewable energy.

In order to achieve the RES-E share, Romania plans to encourage household, industrial and agricultural active consumers (prosumers) to be involved in measures such as the development and implementation of smart metering solutions and smart networks, for which a clear and adequate regulations should be put in place.

Moreover, the integration of distributed generation systems and prosumers in the electricity system is also important. In the following years, photovoltaic capacities are foreseen to be developed in Romania in the form of average capacity solar parks established on degraded or less productive lands and in the form of small scattered capacities developed by energy consumers who can achieve transition to the prosumer.

In the context of the “Smart City” strategies under preparation, local authorities have planned a series of projects focused on the production of electricity and heat from renewable sources by using photovoltaic panels, heat solar panels or biomass.

Energy community:

The NECP mentions prosumers. However, it is not clear how these prosumers contribute to energy market. RECs and CECs have not received enough attention in the policies and targets.

End users’ participation in the energy market:

The introduction of smart measurement systems including smart metering in the energy sector is a national priority and the first step in the digitisation of the infrastructure.

In addition, the implementation of demand response measures will contribute to the integration of RES into the national electricity system by reducing/moving consumption at peak hours (towards no-load hours) and providing for the final consumer’s possibility to participate (as a prosumer) in the electricity market.

The regulatory framework fostering prosumers’ participation in the energy market in Romania was improved by Law No 184/2018, providing for a clearer definition of the concept of “prosumer”. The main advantages of this new law are as; (i) the maximum RES installed capacity for prosumers is 27 kW per consumption place in individual households, residential blocks, residential, commercial or industrial areas, (ii) prosumers have the possibility of selling electricity to suppliers, (iii) prosumers are exempted from the payment of excise duties for the amount of electricity produced from RES for self-consumption, and the excess production sold to suppliers, (iv) prosumers as natural persons are exempted from the obligation of purchasing green certificates annually and quarterly for the electricity produced and used for own final consumption, other than own technological consumption of power plants.

Furthermore, from 2020 onward, the day-ahead and intra-day markets are organised in a way to ensure that all market participants can have access to the market individually or by aggregation. Final consumers may thus participate in organised electricity markets either directly or by aggregation if they have power above 500 kW approved in the connection certificate. If they have such approved power up to 500 kW inclusive, final consumers may participate in organised electricity markets excluding aggregation.

In relation to the objectives concerning demand response, Romania has already introduced a secondary legislative framework regarding [37]:

- The obligation of TSO to offer dynamic transmission tariffs, at the request of final consumers connected to the electricity transmission grid, from 2019 onward.
- The obligation of DSO to offer dynamic distribution tariffs, at the request of users or their suppliers, from 2020 onward.

3.1.16 **Slovakia**

Empower energy citizen:

Current energy policy in Slovakia encourages the installation of small-scale RES for self-consumption of electricity as much as possible and to minimise their supply to the grid. This approach addresses their energy self-sufficiency and reduces the impact of variable RES on the electricity grid. As part of support for small sources, support for the installation of heat generation facilities using RES will continue. Along with electricity generation, more emphasis has been given in NECP on creation of a support mechanism to increase the RES share in the heating sector and in district heating systems, also through generation from RES in high-efficiency cogeneration.

The basic form of support for installations with RES of over 500 kW will remain a surcharge, while the electricity producer is responsible for selling the electricity on the market and for any deviation caused. Auction success is a prerequisite for providing support in the form of a surcharge. This system is complemented by a system of support through purchase prices set in advance (FIT support system), which applies to new producers with an installed capacity of up to 500 kW.

The plans and form of national legislation with regard to ensure the participation of consumers in the energy system and the benefits of own electricity generation and new technologies, including smart meters, will arise from the transposition of Directive (EU) 2019/944 of the EP and of the Council into Slovak legislation [45].

In particular, the provisions on active consumer participation in the market will be collected in Chapter III (Dynamic price contract - Article 11, Active customers - Article 15, Citizen Energy Communities - Article 16, Consumption management through aggregation - Articles 13 and 17 and smart meters - Articles 19 to 21 and Annex II) and other related EU legislation on the “Clean Energy for All Europeans” package, specifically Directive (EU) 2018/2001 of the EP and of the Council on the promotion of the use of energy from renewable sources.

Energy community:

No definition has been found yet concerning energy communities in Slovakia NECP. Nonetheless, it includes some of the advantages of energy communities with regard to heating and cooling. Thus, in accordance with Articles 21 and 22 of Directive (EU) 2018/2001, renewables self-consumers and RECs will be entitled to install their own RES for self-consumption, storage and the sale of excess production. In districts with district heating and cooling systems, it will only be possible to install these solutions by connecting it to the district heating and cooling system, except for the existing buildings that are not connected to the district heating and cooling system and that do not have an obligation to connect to carry out a major renovation of an existing building.

National trajectories and plans regarding communities generating electricity from renewable sources and renewable prosumers have not yet been approved, however the regulation of these issues concerning heat and thermal generation is more defined.

End users' participation in the energy market:

The main measures in the development of smart metering systems (SMS) and smart networks (SN) are summarized in the Energy Policy of the Slovak Republic, 2014.

The Slovak Republic has implemented legislation promoting own electricity generation by introducing the “local source” institute through an amendment to Act No 309/2009 on the promotion of renewable energy sources and high-efficiency cogeneration (Act No 309/2018). The amended act

provided a guaranteed purchase price for 15 years as well as guidelines for generating electricity using RES, which favoured the construction of small and decentralised installations.

District heating and cooling system operators will be able to connect suppliers of RES heat under Article 24(4)(b) of Directive (EU) 2018/2001, self-consumers and RES-producing communities. The connection of suppliers of heat from RES will be ensured through a mandatory heat take-off mechanism based on non-discriminatory criteria and, in order to meet the demand of new customers, by replacing existing heat and cooling capacity or by extending existing capacity under Article 24(5) of Directive (EU) 2018/2001. Non-discriminatory conditions and reasonable charges shall be applied that are associated with the operation of the district heating system and the storage to meet the heat demand due to insufficient capacity of the RES heat supplier's equipment.

4 Identify the Gaps/Barriers in engaging Empowered Energy Citizens in Energy Markets

The EU's 2030 climate and energy legislative framework proposes a wide opportunity for citizens to get involved in the energy transition. This section takes on NECPs of low active countries to overview and elaborate on the treatment of empowered energy citizens, energy communities and end users' participation in energy market, such as local energy market (LEM) to highlight the gaps and barriers. So, the focus is on the shortcomings of the policies reported in NECPs and other reports provided by the governments of the Member States that hinder the engagement of energy citizens in energy markets.

Note that the policies provided by the governments might have various dimensions. These dimensions determine the extent to which a government may influence the engagement of empowered energy citizens in energy market and energy transition. These cover a wide range of topics included but not limited to energy/reserve tariffs, local market platform and competition regulation, restrictions on quality and quantity of product, legal frameworks, tax rates, double tax removal, tax incentives, policy stability and related changes, government involvement in trades and agreements, legal terms, consumers' data protection.

Though it is promising that most Member States positively acknowledge the role of energy citizens, LEMs and ECs, it is clear from the assessment presented in this section that the understanding among the Member States on the role that these players can play in the markets is very limited. This becomes more obvious when considering that most NECPs are not accompanied by concrete policies and effective measures and for the NECPs that contain some policies and measures, the details are not provided and the policies are usually vague or incomplete in scope. The next subsection compile relevant information included by each of the 16 low activity Member States on the role of energy citizens, LEMs and ECs in their NECPs. These subsections present an evaluation of targets, objectives, policies and measures in the sections of NECPs that are related to energy citizens' participation in energy sector, namely renewables, energy efficiency and market integration. Overall, while some of these Member States are planning for the development of policies and measures to enable renewable ECs (discussed in section 3 as well), no targets and measures for energy efficiency and market integration have been presented yet.

4.1 Define assessment criteria and approach for gap/barrier analysis

In order to analyze the policies of each Member State on the engagement of empowered energy citizens in energy transition and especially in energy markets, the respective NECP is analyzed based on the criteria presented in Table 4.1. These criteria are selected according to the analysis recently reported in [38]. The relevant possible policies are then categorized in eight main categories, each of which with a number of dimensions. To elaborate, the dimensions related to each category introduce the main barriers, gap and challenges that should be addressed in the futuristic policies of the Member States. These categories along with their respective dimensions are presented in Table 4.2. For selecting the dimensions of Table 4.2, the barriers and gaps reported in [39], [40], [41], [42], [43] are contemplated and categorized within the categories of Table 4.2. For each Member State, the policies presented in the respective NECP are analyzed by investigating the level of fulfilment of these dimensions according to the criteria outlined in Table 4.1.

Although, most of these Member States developed some policies and measures on models and mechanisms for engagement of consumers in energy markets, other criteria and dimensions, for instance targets/objectives, consumer-oriented policies and market integration were mostly ignored or insufficiently discussed.

Table 4.1 Criteria for assessment of national policies for engagement of energy citizens in energy markets

Criteria	Explanation
Awareness	Acknowledgment of a certain dimension of policies in the NECP. The outcome of NECP analysis can be positive, negative or lack of acknowledgment.
Comprehensiveness	Completeness and the amount of aspects that are linked to the dimension in the NECP.
Preciseness and clarity	Level of details for planned measures, distinction between this dimension and the others in the NECP.
Practicality	The level of the measures introduced to guaranty the realization of the dimension.

Note that this analysis does not directly focus on the purely technical problems (for example, Dimension 6.8.2 in Table 4.2), e.g., the real-time management of local energy flows, to switch from grid-connected to island mode and vice versa in microgrids, maintenance of local power quality and reliability, DER synchronization, fault detection and protection coordination with bi-directional power flows, islanding and cyber-security challenges. However, in order to complete the study on the energy policies related to the proper integration of empowered energy citizens in energy transition, the NECPs are also analyzed in terms of the policies that may target these purely technical issues that may hinder the engagement of energy citizens in energy markets. It is necessary to develop the related policies and to assign the related organizations, such as regulation/grid code authority, to revisit the network codes in this regard and follow up the progress by defining some effective performance measures. This objective will be served by the analysis in Section 5.

Table 4.2 Dimensions of the national policies for the engagement of energy citizens in energy markets

Category	Dimension(s)
1. Market regulations and requirements for engaging energy citizens in energy transition	<ul style="list-style-type: none"> 1.1. Challenges and opportunities of market instruments (feed in tariffs, feed in premium or perfect competition models) for incentivizing the citizens¹ and consumers (especially vulnerable consumers) to contribute in energy markets and creating willingness. 1.2. Establishment of suitable market trading platforms (especially for LEMs²)

¹ Though these market instruments are detrimental to the market competitive structure and are not directly amenable to a competitive market, in some Member State, they might be necessary to incentivize renewable production. In either case, the way that policymakers are going to handle this issue should be clear to the public and reflected in the policies and targets.

² The concept of engagement of empowered energy citizens in energy transition is still new and under development. There are some issues related to establishing secure and transparent LEM trading platforms.

<p>2. Energy policies corresponding to consumers' participation models and mechanisms</p>	<ul style="list-style-type: none"> 1.3. Resistance of present market actors who may see LEMs, RECs, CECs and energy citizens as a threat to their business³. 2.1. Local Energy Markets <ul style="list-style-type: none"> 2.1.1. Citizens' Energy Community (CEC) 2.1.2. Renewable Energy Community (REC) 2.1.3. Energy Demand Response (EDR), energy provision in normal conditions 2.1.4. Balancing Demand Response (BDR), emergency energy provision for frequency control 2.1.5. Distributed Energy Resource Aggregate (DERA) with focus on diverse DERs (ramp providers and energy providers) 2.1.6. Demand Response Aggregator (DRA), as a third party 2.1.7. Peer to Peer (P2P) Energy Trading
<p>3. Consumer-oriented policies</p>	<ul style="list-style-type: none"> 3.1. Customer awareness of the opportunities, technologies and management systems and environmental concerns, since they are not energy professionals.
<p>4. Policies for easing financial / economic challenges</p>	<ul style="list-style-type: none"> 4.1. High upfront cost of RESs. 4.2. Lack of project portfolios (which makes it hard to compete). 4.3. Long administrative procedures and sudden changes and policy instability that cause additional risk for the investors. 4.4. The ownership of some DERs, especially for the maintenance of the units that serve a whole CEC [44], [45].
<p>5. Policies to remove legal and legislation hurdles</p>	<ul style="list-style-type: none"> 5.1. Unfamiliar legal forms and lack of definition 5.2. Lack of experience of citizens and communities in navigating procedural and administrative hurdles to access the market 5.3. Legislations hindering the full-blown deployment of multiple DERs especially RESs and storage. 5.4. Taxation and double taxation⁴.
<p>6. Policies for removing technical issues and strengthening the Required Infrastructure for enabling contribution of energy citizens in energy transition</p>	<ul style="list-style-type: none"> 6.1. Smart meters 6.2. Energy efficiency and building energy management systems 6.3. Exploitation of Electric/Thermal Storage 6.4. E-Mobility, V2G and V2B 6.5. Motivate higher penetration of RESs 6.6. Intermittency of RESs 6.7. The effects of the network constraints on the trades between DERs and LEMs. 6.8. Upgraded energy ICT infrastructure

³ As an example, DSOs may face a decrease in their revenues from network services as a result of the increase in the customer self-production. On the other hand, new opportunities would emerge for the system operators as they are able to provide new services to prosumers, as the distribution networks are still one of the main elements for local energy trades among costumers. Following the proliferating engagement of energy citizens in LEMs, the operator companies and centralized generations are forced to change their business plans. From this point of view, the policies should incentivize the smooth energy transition from until a new balance is reached in the market.

⁴ Some taxation issues hinder the effective contribution of empowered energy citizens in LEMs. As an example in some Member States, e.g., Finland, the owners of the electric storages have to pay tax for charging the storages. Another tax should be payed again as they deliver electricity for consumption by discharging the storages. This leads to double taxation. Price-dependent taxation for electricity was proposed in the literature to improve the market flexibility and to provide better market signals for the customers engaged in electricity markets. This has also been proposed as a possible solution by the smart grid working group of the Finnish Ministry of Employment and Economy's.

7. Research Policies	<ul style="list-style-type: none"> 6.8.1. Data handling and customer data protection (Data privacy challenges) 6.8.2. Development, compatibility and full-scale interoperability of control/communication systems (perhaps provided by different vendors), ICT standardization 6.8. Standardization and network codes <ul style="list-style-type: none"> 6.8.1. Reactive power support as ancillary services 6.8.2. Policies to tackle the other purely technical barriers of successful engagement of energy citizens
	7.1. Future investment plans for R&I activities for the engagement of energy citizens in energy markets and electric/thermal storage
8. Main targets/objectives presented in NECPs	8.1. Targets related to integration of energy citizens into energy markets

It is already mentioned that there is a lack of unified definitions for most of the terms and concepts that are related to the engagement of empowered citizens in energy transition. Hence, this hinders the standardization and development of good engineering practice for the Member States.

Among the sections proposed in the template provided for drafting NECPs, the sections presented in Table 4.3 are directly or indirectly related to the engagement of energy citizens, LEMs, CECs and RECs. Note that the template provided for the NECPs of Member state explicitly refers to RECs in the sections related to RESs (2.1 and 3.2.1), while the sections on market integration (2.4.3 and 3.4.3) only refer to consumer participation and self-generation. In other words, CECs are not directly mentioned in these sections. PANTERA proposes that the dimensions provided in Table 4.2 can be mapped among these sections as shown in Table 4.4.

Table 4.3 Sections (which have been proposed in the template of NECPs) related to energy citizens, LEMs, CECs and RECs

Section	Subject
Section 2.1	Targets or objectives for renewable energy.
Section 3.1.2	Policies and measures for renewable energy
Section 3.2	Policies and measures for energy efficiency
Section 2.4.3	Objectives for the internal energy market integration
Section 3.4.3	Policies and measures for the internal energy market integration

Table 4.4 Dimensions related to the sections of Table 4.3

Section	Related Dimensions
Section 2.1	4.1, 5.2, 6.5, 6.6, 6.8.1, 6.8.2, 7.1, 8.1
Section 3.1.2	4.2, 4.3, 4.4, 5.1, 5.3, 5.4, 6.7
Section 3.2	3.1, 6.1, 6.2, 6.3, 6.4, 6.5
Section 2.4.3	1.2, 2.1.1, 2.1.2
Section 3.4.3	1.1, 1.3, 2.1.3, 2.1.4, 2.1.5, 2.1.6, 2.1.7, 4.4

4.2 Gaps/barriers Analysis

In most sections presented in Table 4.3, the policies provided by Member States regarding energy communities are just mentioned or completely ignored in NECPs. The only section that receives a fair share of attention in the NECPs supplied by some of Member States is section 3.1.2 (policies and measures for renewables). Even for this section a significant number of Member States, especially low activity countries did not include policies and measures for renewable energy communities. They only stated in their NECPs that such policies are planned for the future. Only a few of Member States explicitly provide some targets for RECs in their NECPs. Table 4.5 shows the summary of the assessment of NECPs for the 16 low active Member States based on the criteria presented in Table 4.1. The detailed analysis for each of these 16 countries is provided in the following sub-sections. Different sections presented in Table 4.3 are analyzed in order to achieve the results of Table 4.5. Note that this analysis is conducted from the perspective of LEM, RECs and CECs. A similar type of analysis was conducted in [38] for the draft of NECPs provided by some of these Member States. This deliverable focus on the extended gap analysis for the low-active Member states.

Table 4.5 Summary of the results obtained by analysing the policies, objective and targets provided in the NECPs

Section	BG	HR	CY	CZ	EE	EL	HU	IE	IT	LV	LT	MT	PL	PT	RO	SK
2.1 Targets or objectives for renewable energy																
3.1.2. Policies and measures for renewable energy																
3.2. Policies and measures for energy efficiency																
2.4.3. Objectives for the internal energy market integration																
3.4.3 Policies & measures for the internal energy market integration																
	Fully Included				Only Planned/with no Detail				Self-Consumption Only				Ignored, Inapplicable, Vague			

There is a notable gap in coverage of energy communities in the NECPs of these 16 Member States. From the perspective of this chapter, in most of these NECPs, (except for the NECPs of Ireland, Italy and Portugal) the citizens energy communities were never directly mentioned in the section related to policies and measures regarding market integration. The main focus of the policy makers were on the section related to the policies and measures regarding renewables, in which three of these 16 Member States (CZ,MT,PL) provided no clear policies.

Among these 16 Member States, Greece, with a quantitative target of installing 500 MW capacity for renewable energy communities by 2030, has the most complete and detailed plan regarding RECs. A summary table of measures for RECs under their proposed enabling framework is also provided in their NECP. Some other Member States (Bulgaria, Romania and Slovakia) proposed to introduce quantitative renewable targets only for self-consumption. The focus in supporting the growth of energy communities in Ireland, Italy, Croatia and Poland was on policies related to education (dimension 3.1) and capacity-building measures (dimension 6.5). In the NECPs provided by Greece, Bulgaria, Hungary, Ireland and Italy simplification of administrative procedures (dimension 4.3) was also one of the main concerns for effective integration of RECs into energy markets. Ireland, Greece, Poland also provided some policies for investment support (related to dimension 4.1). Among the Member States for which the result of the assessment of section 3.1.2 (related to the policies and measures for engagement of RECs) are presented by red colour, Czech Republic and Poland have provided vague and unclear policies in this regard in their NECPs. However, Malta's NECP rejects the engagement of energy communities. This mostly happens due to the lack of an electricity market. Malta has provided some policies regarding self-consumption, which could be undertaken by RECs. This is why Malta still needs to reconsider its approach towards RECs.

From the assessment of the related policies of these 16 Member States, it is clear that there is a lack of understanding of the potential roles of energy communities. It is also unclear that which national energy transition objectives the energy communities (especially CECs) might be able to contribute to. For instance, the role of energy communities in district heating is neglected in all NECPs.

Among these 16 Member States only Hungary linked RECs and CECs to the national policies around energy security. The role of these energy communities in flexibility provision is only envisaged in the policies provided by Bulgaria and Hungary. Even though the local energy communities can contribute in reactive power provision as an ancillary service (for voltage management), an effective active voltage control based on the roles that RECs and CECs can play is not proposed or planned in the policies of these Member states. The role of energy communities in energy efficiency is the other role of energy communities that is overlooked in some of these Member States, while in the meantime, in the NECPs of these Member States, one can find many policies developed for energy saving such as those developed for increasing the awareness of the citizens. Needless to say that some of these Member States (Ireland, Czech Republic, Greece, Hungary, Lithuania, Slovakia and Romania) have developed some policies for linking the energy communities to energy efficiency, but except for Ireland, none of these Member States has provided the details of these plans and policies.

In this subsection, the policies of each low activity Member State (identified in the PANTERA project) are analysed to track the gaps and barriers in these policies which hinder the effective engagement of empowered energy citizens in electricity markets, especially through the local energy markets, citizens' energy communities and renewable energy communities. The methodology taken to obtain the results was presented in this chapter. The dimensions introduced in Table 4.2 are tracked down in the national energy policies according to the criteria presented in Table 4.1.

In order to avoid verbosity, first the dimensions that are missing or are discussed inadequately or unclearly in all of these Member States, are presented here. These dimensions include 1.3, 2.1.5, 2.1.7, 3.1, 4.2, 4.3, 4.4, 5.1, 5.2, 6.7, 6.8.2. The other dimensions are further reviewed in the respective subsections. Note that some barriers and gaps in the policies of a certain issue might

overshadow the other barriers.

Therefore, only the main barriers and gaps are presented for each Member State. These are presented in detail in Chapter 6 together with related information about all Member States with low R&I activity.

5 Linking barriers with technology gaps (Customers and Market)

To relate to strategy objectives it is necessary to quantify the relation of identified gaps/barriers with technologies. For this reason it is important to review the R&I activities (technologies) that are related to the specific areas. Hence, an attempt has been made in this section to link the technology gaps with the policy gaps/barriers. This will help further the low activity countries to update their NECPs in meeting the national and EU targets by 2030.

5.1 Linking process

Figure 5.1 shows the linking process between the technology gaps and barriers in policy at national level. The approach is also applicable for the analysis of other proposed technology/systems groups at country and EU level.

PANTERA team has already developed a RICAP process to identify the technical gaps in the R&I activities at national and EU level (details are given in PANTERA deliverable D3.1. This process is then implemented here to understand the technological barriers to empower the energy citizens. Special focus has been given on the PANTERA proposed technology classification (Customers and Market group). Deliverable 3.1 has already discussed the RICAP process and also showed an example to identify the technology gaps and how to relate this with the NECP R&I priority at national level. The outcome of D3.1 shows the R&I Status (as shown in the following fig) in terms of technology and their linked functionality. The gaps/barriers analysis process in a NECP in relation to empowered energy citizens, energy communities and their active participation in energy market as discussed in the previous section is then merged with the technology gap (PANTERA RICAP process) to make a distinct recommendation at national level. Based on the outcome a specific recommendation can be made for further consideration in national energy policy and regulatory aspects.

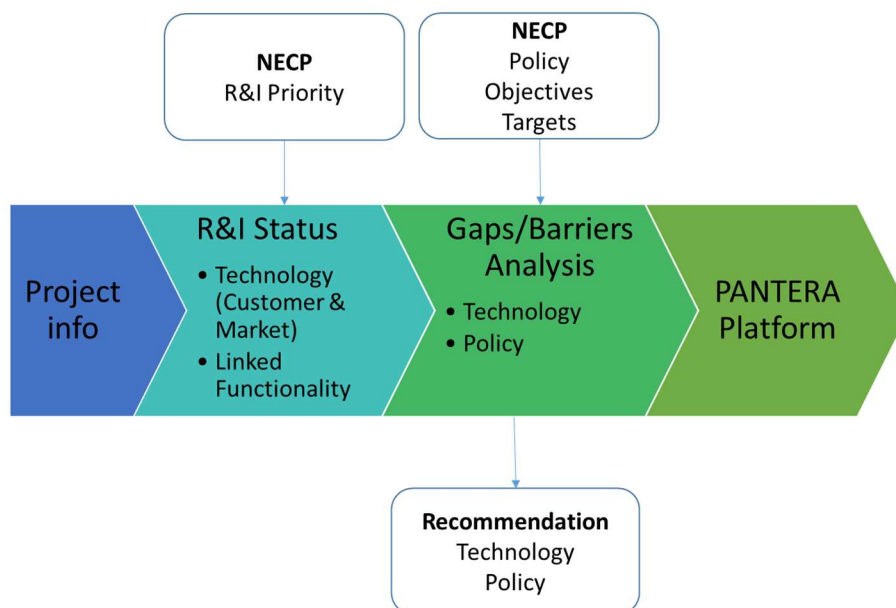


Figure 5.1 linking process between the technology gaps and barriers in energy policy

5.2 Case study Examples

As an example, project info has been collected from the ETIP SNET knowledge sharing platform⁵ and BRIDGE where most of the EU collaborative project details are available. It is to be noted that ETIP SNET has already adopted the PANTERA proposed technologies/systems classification. Hence, the project info for most of the low active countries has been collected and further analysis is being carried on. Malta (all sections are in red zone, as shown in Table 5) and Greece (most advance in caring NECP sections, within the low active countries, as shown in Table 5) have been chosen here first for further analysis and the distinct recommendation. Malta seems to have been left behind – based on the analysis of the previous section- regarding citizen empowerment whereas Greece seems to be proactive and have already in place related policies.

It is important to inform, that analysis for all countries will be completed and be presented in the next deliverable of WP3. The results of this planned further analysis will be made available on the EIRIE platform for wider utilization and complement the RICAP process as already indicated in the previous paragraphs.

5.2.1 Malta:

In total 6 EU projects have been found in relation to the technologies that fall under the “Customers and market” category where Malta is collaborating with other EU countries. Most of the projects focus on demand response (3 projects) and building control and automation technologies (2 projects), as shown in Figure 5.2. Only one project so far deals with energy communities and energy market. Overall, this figure indicates that Malta mostly concentrates on individual consumer/prosumer level to empower the citizen, but not much interested on energy community and market participation technologies.

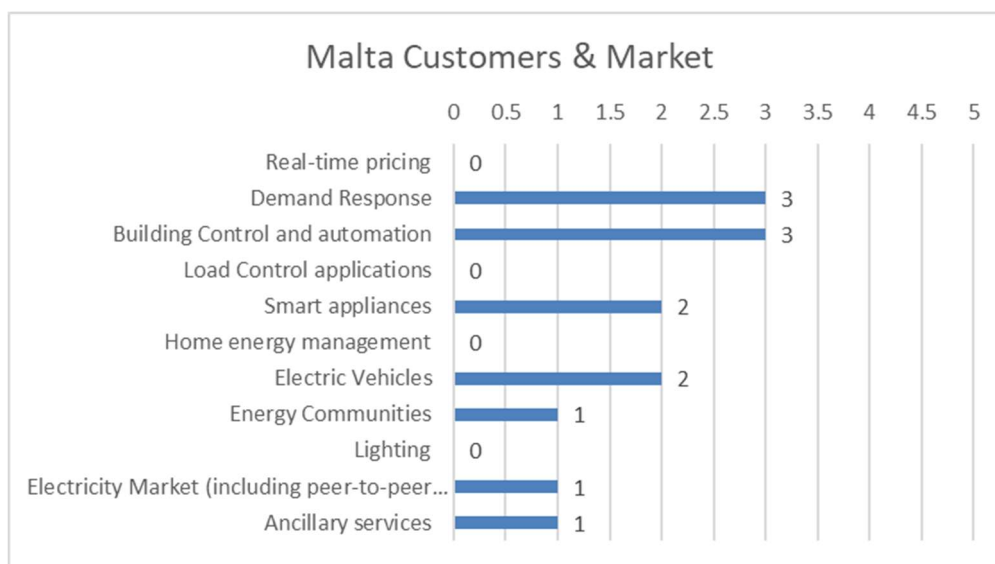


Figure 5.2 Focusing PANTERA proposed technologies (customers and market area) in Malta

Table 5.1 shows the analysis of R&I priorities at national level as discussed in the NECP and their possible link to the technologies for “consumer and market” category as well as ETIP SNET’s functionalities but focusing on empowering energy citizens, energy community and market participation and in this way the direct linking between the identified policy barriers and the functionalities can be achieved. It shows that from the selected priorities of countries in their NECPs,

⁵ <https://tools.etip-snet.eu/index.html>

only very few technologies can be linked to R&I priorities to empower energy citizens, but still the importance of energy community and end users' participation in energy market is missing.

Table 5.1 R&I status in Malta focusing on empowering energy citizens, energy community and market

R&I Priority in NECP	Barriers / gaps	Projects evaluation under PANTERA RICAP	
		PANTERA Technologies	ETIP SNET Functionality
Decarbonisation	Regarding section 3.1.2 in NECP template (Policies and measures for renewable energy): The existing policies for renewables self-consumption are described, but no new policies or measures are developed. 2.1 (targets and objectives of RESs): No clear targets observed.		
Wind energy resources utilization		Wind, Flexible Generation	F1, F3, F7, F10
Solar Energy exploitation (PV panels, solar water heaters)		Solar	F1, F3, F7, F10
Energy Efficiency	No role presented for energy communities in energy efficiency.		
Deployment of energy-saving lighting systems		Lighting	F7, F10
Deployment of energy efficient appliances		Smart appliances	F7, F10, F11
Deployment of heat pumps		Other Storage	F7, F10, F11
Energy Security	Support for storage is foreseen as a way to integrate small renewables for self-consumption.		
Development of energy storage, leading to increased photovoltaic capacity and optimization of the power system		Storage Electric	F1, F2, F3, F4, F5, F6, F7, F8, F10
Internal Energy Market	RECs and CECs are actually not foreseen because of the lack of an energy supply market, so no measures and policies (section 3.4.3) and targets (2.4.3) are foreseen for LEMs.		
Load profile management through demand response		Smart metering infrastructure, Digitalisation, ICT	F3, F4, F5, F6, F8, F9, F10

Energy policy and plan to reach the 2030 target shows that Malta is mostly concentrating on empowering prosumers for self-consumption and not considering energy communities and forming local energy market in its policy.

Recommendation:

- Malta needs to reconsider its approach towards energy community, at least, in relation to the formation of RECs.
- Considering the existing/update policies for renewables self-consumption, clear targets and objectives of self-consumption RESs should be made.

- At least, policies should be made to introduce LEMs.

5.2.2 Greece

In total 37 EU projects have been found in relation to the technologies that fall under the “Customers and market” category where Greece is collaborating with other EU countries. Most of the projects focus on electricity market (34 projects), ancillary services (27 projects) and demand response (27 projects) and followed by energy community (21 projects), as shown in Figure 5.3. Overall, this figure indicates that Greece is much more advanced in empowering energy citizen with special focus on energy community and market participation technologies. Hence, from the country activities it is anticipated that some good practice examples should exist to benefit other low-activity countries.

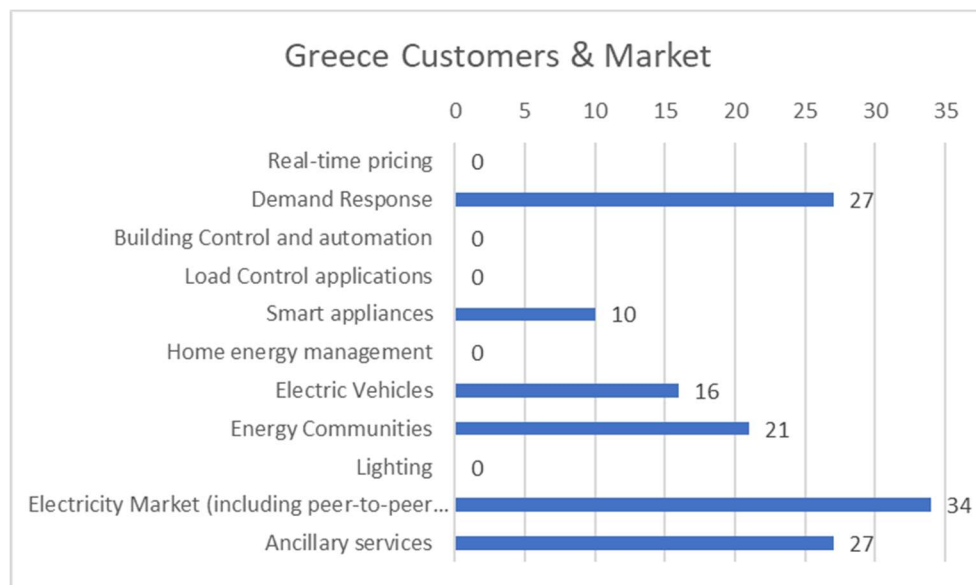


Figure 5.3 Focusing PANTERA proposed technologies (customers and market area) in Greece

Table 5.2 shows the analysis of R&I priorities at national level as discussed in the Greece NECP and their possible link to the technologies for “consumer and market” category as well as ETIP SNET functionalities but focusing on empowering energy citizens, energy community and market participation and in this way the direct linking between the identified policy barriers and the functionalities can be achieved. It shows that a very good plan has been adopted for energy efficiency, energy security and energy market sections and thus the relevant technologies have been linked to R&I priorities to empower energy citizens. In future, these will also help to link the technologies and solutions to the energy community and thus end users’ participation in the energy market.

Table 5.2 R&I status in Greece focusing on empowering energy citizens, energy community and market

R&I Priority in NECP	Barriers / gaps	Projects evaluation under PANTERA RICAP	
		PANTERA Technologies	ETIP SNET Functionality
Decarbonisation	The RES technologies, e.g., offshore/floating wind, and integrated RES schemes are undergoing substantial changes worldwide, for which a coherent regulatory and time and space planning frameworks are required. Such planning is missing in		

	Greece policies. The new auction-based Feed-in-Premium (FiP) system still requires significant enhancements in its design and operation. The details of this tariff system for RECs are not provided. On the other hand, no plan is provided for moving from this tariff system to fully competitive structure which is the ultimate goal for RESs in Europe.		
Development and deployment of marine wind parks (use of small wind turbines)		Wind, Flexible Generation	F1, F3, F7, F10
Increase in RES, hydrogen production		Power to gas, Hydrogen & sustainable gases	F7, F8, F10
Energy Efficiency			
Thermal insulation building systems with increased thermal performance			F10
Ventilated facades or roofs with PV and solar systems, thermal insulation,		Solar PV	F10, F11
Deployment of flexible and high-temperature heat pumps		Thermal Storage	F10, F11
Energy Security			
Load profile management through demand response		Distributed flexibility, load management & control and demand response including end devices, communication infrastructure and systems, Energy Community advance distributed load control	F3, F4, F5, F6, F8, F9, F10
Observability and controllability of medium and low voltage networks with high penetration of DER			F1, F2, F4, F7
Internal Energy Market	The application of the target model and the <i>regional</i> electricity market coupling has been constantly delayed. This hinders the full and equitable participation of new REC projects and integration of RES in the electricity market.		
Setup of storage systems with RES plants on smaller		Storage Electric, Electricity Market	F1, F2, F3, F4, F5, F6, F7, F8, F10

islands			
Digitalisation of the energy system, enabling the dynamic pricing of energy supply and demand through the processing and exploitation of consumer data, also ensuring secure handling of consumer data		Smart metering infrastructure, communication networks including devices and systems for signals and data connectivity and solutions, data and cyber security including repositories	F6

Energy policy and plan to reach the 2030 target shows that, compare to other low-activity countries, Greece is somehow advance in empowering energy citizens and implementing energy communities and forming a local energy market in its policy. Still some improvements are needed in the policy to achieve their defined target by 2030 with active participation of consumers in the energy market.

Recommendation:

- Relevant policy support measures are generally outlined in the NECP, priority has been given on wind energy, thus there is a need for more focus on solar PV and other RES to achieve the target 2030.
- Greece needs to enhance their Feed-in-Premium (FiP) system or develop other tariff system to promote energy communities and develop local energy market.
- Energy efficiency measures at energy community solutions should get some more attention.
- Integration of energy storage at consumer end and at community level should be prioritised
- Both the energy communities are already well adopted in the energy system but need a strong market coupling plan.

6 Summary of key findings with emphasis on gaps and barriers

This deliverable has analysed all low activity Member States in relation to the empowerment of end users, the plans for developing energy communities and the degree that empowered users are active in the electricity market. In the paragraphs below a summary of the key findings and recommendations are presented bringing together the related work for each of the 16 Member States for ease in access to the relevant information, findings and recommendations. The recommendations go for Malta and Greece only since the detailed analysis for linking barriers with deployment of required technologies using the developed RECAP process of the PANTERA project is limited for this deliverable to only the country that is best performing i.e Greece and the worst performing i.e. Malta.

It is important to inform, that analysis for all countries will be completed and be presented in the next deliverable of WP3. The results of this planned further analysis will be made available on the EIRIE platform for wider utilization and complement the RICAP process.

6.1 Bulgaria

The table below gives the approach adapted by Bulgaria in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Bulgaria	One of the key components to become an energy active citizen is to integrate RES for self-consumption.	There is no special legislative framework for prosumers, energy cooperatives or decentralised power generation.	The focus is given only on introducing smart metering devices as an incentive for the active and effective participation of consumers in the market

Based on the detailed evaluation of the published NECP of Bulgaria in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?.

- 1) No targets and objectives are set for engagement of renewable energy communities and also for citizens' energy communities. Exploitation of the potentials of the integration of energy communities is not one of the targets in Bulgaria's NECP.
- 2) Currently, there is no successful case of the engagement of energy citizens (in form of citizens' or renewable energy communities). Some policies and plans are provided for the future. More details of implementation plans should be provided. Following a good engineering practice and especially, initiating a pilot project for analysing the local requirements of engaging CECs and RECs in LEMs is recommended.
- 3) Comparing to the provided NECP template, it can be said that REC objectives, the role of energy communities in energy efficiency and the objectives of LEMs are not applicable or are ignored.
- 4) Nothing found on dimension 1.2 (Establishment of suitable market trading platforms for LEMs). Without such a platform, the implementation of local energy markets is practically impossible.
- 5) Existing policies and measures for the tariff setting for small-scale RES are provided. The option for holding auctions to provide capacity for renewable electricity generation and the provision of a premium to the market price of electricity sold on the electricity market are

considered to be appropriate forms of support. However, no detailed technology-oriented plan is found for gradually removing this support towards a fully competitive market (see dimension 1.1)

- 6) Regarding dimensions 3.1: on the section policy measures related to decarbonization aspects of Renewable Energy, the relevant institutions and local authorities have been introduced as active participants in these processes and they will carry out combined information campaign initiatives, fora, awareness raising programmes and training programmes for citizens on the benefits of and opportunities for using renewable energy.
- 7) Regarding dimensions 2.3.3, 2.3.4 and 5.3, by introducing amendments to national law, Bulgaria plans to establish suitable conditions for creating active consumers, opportunities for associations through aggregators or energy communities and their active participation in demand response in different market segments. More details should be provided in this regard.
- 8) After analysing the Bulgaria's NECP, it can be said that among dimensions 6.1 to 6.9, the focus is only on introducing smart metering devices as an incentive for the active and effective participation of consumers in the market. The other aspects are neglected.
- 9) Some policies and measures are introduced to facilitate development of both self-consumption and RECs. More details should be provided for the plans.
- 10) The importance of local authorities in development of renewable energy communities and self-consumption is mentioned, but their roles are not determined.
- 11) The term "active consumer" is not clearly defined in current Bulgarian legislation which leads to a confusion about how prosumers differ from other producers of electricity.
- 12) Important barrier in the engagement of Empowered Energy Citizens in the Bulgarian Energy Market is bureaucracy. Prosumers have to go through numerous time-consuming and complex administrative procedures in order to build a RES facility. Moreover, the costs for the documents and certificates needed to obtain construction permission are very high [46].
- 13) Bulgarian laws do not distinguish between small and large RES producers, which gives advantage to multi-million investments in utility-scale RES capacities. In addition, there are no specific provisions in the national legislation for prosumers or energy cooperatives [47].
- 14) Consumption from the grid is still way more attractive than the investment in own generation because the economics of small RES investments is negatively affected by the existing cross-subsidies in the regulated electricity sector.

6.2 Croatia

The table below gives the approach adapted by Croatia in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Croatia	The current regulatory framework for the use of RES is covered by several laws. Specific measures to empower energy citizens have not been found in the NECP.	Even though there is no current specific definition and regulation with regard to energy communities there are some laws and standards concerning renewable energies generation.	Prosumers are defined as end-users whose main objective is the procurement of energy for their own use, but they also can have a production capacity installed that can be used to inject energy into the network and suppliers are obliged to

			purchase the surplus.
--	--	--	-----------------------

Based on the detailed evaluation of the published NECP of Croatia in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?.

- 1) On section 3.3 of the template of NECP (energy efficiency): Skipped section on role of energy communities in energy efficiency.
- 2) Dimension 1.2: Croatian Power Exchange was established in 2014 and commenced operation in 2016 as a platform for electricity trade. Competition in Croatia's electricity market is still very limited. As a new trade platform, this energy market still needs to become more mature before integrating the RECs and CECs. A platform should be defined for trades in LEMs. This platform then should be evolved as the market structure is revised to cope with the new trading paradigms.
- 3) Regarding dimension 1.1: Croatia uses feed-in-tariffs to financially incentivize the RECs. To elaborate, In Croatia, HROTE buys electricity from eligible renewable energy and combined heat and power producers under the feed-in tariff incentive system (about M€400 paid in 2020) and trades it on the electricity market. Using the funds collected from taxes, levies and by selling electricity, HROTE also pays a preferential price for electricity to the RES in accordance with actual production. Croatia must develop a system to gradually replace the feed-in-tariffs to avoid distorting the competitive market structure.
- 4) Croatia's energy intensity remains 55 percent higher than EU28 average (2018). Building up on the available experience on energy efficiency and active institutions, Croatia can leap forward and achieve a more ambitious energy efficiency targets by inspecting sub-sectoral energy efficiency targets as envisaged under Croatia's 4th EE Action Plan (residential, buildings, service and industrial, transport sectors).
- 5) Croatia must focus on energy efficiency in transport. The plan of Croatia for e-mobility is incomplete and vague.
- 6) Biomass (mostly in the form of firewood) is the leading fuel (47%) in Croatia in residential sector (for heating) followed by electricity 22%, natural gas 19%, and oil 6%. Low efficiency biomass requires more energy input, which damages energy efficiency and restricts citizens' engagement in energy markets.
- 7) On sections 2.4.3 (Objectives for the internal energy market integration) and 3.4.3 (Policies and measures for the internal energy market integration) of the template of NECP: No objectives, policies or measures for citizen's energy communities, but do mention active customers as way to promote flexibility services.
- 8) On section 2.1 of the template (targets or objectives for renewable energy): No specific target is defined for RECs.
- 9) Regarding dimension 6.1-6.9: "Analytical backgrounds developed for the purposes of adopting the Energy Development Strategy define the introduction of advanced metering systems by 2025 as priorities for investment in the distribution system". This means only dimension 6.1 is directly mentioned and other dimensions are ignored. "Also, pilot projects for advanced grids are envisaged, on the basis of which additional insights will be gained into the characteristics of grid users and possibilities of their active participation in the power system will be explored". The pilot project seems promising, but no details are provided on the technologies and mechanisms that are going to be implemented.

6.3 Cyprus

The table below gives the approach adapted by Cyprus in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Cyprus	Support schemes for the production of electricity from RES for own use such as Net-Metering for self-consumption have been implemented since 2013 as national policies. These are to evolve into net billing with the introduction of smart meters..	Currently, there is no policy framework for energy community establishment and operation.	The DSO has initiated the roll out of the Advanced Metering Infrastructure with 400.000 smart meters over 7 years together with a smart grid ready operation and control system for the Distribution grid of Cyprus..

Based on the detailed evaluation of the published NECP of Cyprus in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?.

1. Regarding dimension 2.1 and RECs, no regulation is in place for Cyprus yet.
2. Provision of information and mechanisms for more accurate metering and billing and improved access to energy consumption data is not in place. The roll out of smart meters is seen as instrumental in that regard and the first roll- out will be launched within 2020.
3. The lack of smart meters (dimension 6.1) has hindered the Demand Response Provision from the consumers, so regulation hasn't been in place.
4. Non-liberated market and monopolies exist that may hinder consumers' empowerment (dimension 3.1).
5. As a result, consumer switching as the means to pursue and trigger competition in retail energy markets is misplaced.
6. Changes in electricity supply structure is expected to shift from a centralized to a hybrid model between 2020 – 2025 but in Cyprus due to technical constraints and non-interconnected nature of the grid this is left behind. The more distributed energy system, the more customer is empowered.
7. Innovative market entrants such as energy service aggregators, rural entrepreneurs and consumers are driving forces for the increase of distributed energy resources penetration but there is no regulation in place for Cyprus yet.
8. Energy storage is becoming a key element of the grid of tomorrow and will allow customers to participate in the retail market and the provision of flexibility. Especially for Cyprus and the non-interconnected systems, storage can offer great support and ancillary services to the system (dimension 7.1).

6.4 Czech Republic

The table below gives the approach adapted by Czech Republic in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Czech Republic	It is planned to establish a framework to support and facilitate the development of the	No definition has been found concerning energy communities in the current Czech	The conditions for the implementation of smart metering are being prepared within the

	renewable energy communities through both legislative and non-legislative measures, but yet no detail plan is given.	Republic NECP	framework of the National Action Plan for Smart Grids (2019-2030), along with other measures related to the integration of RES such as demand-side response, energy storage or flexibility aggregation and prosumers.
--	--	---------------	---

Based on the detailed evaluation of the published NECP of Czech Republic in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding RECs, the cooperative ownership of RESs is not common in the Czech Republic. These are usually municipality-own (not community-own) decentralized renewable energy power plants. Among these RESs, most of them are biomass heating plants [48].
- 2) Regarding dimension 4.1: The municipalities mostly have limited possibilities to develop an energy project. It is also difficult for them to take a long-time loan.
- 3) Regarding dimension 1.1: The rejection of the feed-in-tariffs for incentivizing the production of renewable energy sources, further reduced the willingness of citizens for investing on energy community projects. Especially renewable electricity production is not financially viable for municipalities.
- 4) Regarding dimensions 6.1-6.9: It has been mentioned that the smart meters should be installed. Without providing any clear plan for electricity/gas smart metering systems. Other dimensions have been neglected.
- 5) Regarding Section 3.2 of NECP template (Policies and measures for energy efficiency): Energy efficiency objectives and policies have been linked to energy communities when it comes to fighting energy poverty and addressing vulnerable customers. No clear plan has been provided.
- 6) No targets/objectives and policies/measures have been provided for energy communities or self-consumers under the market design.

6.5 Estonia

The table below gives the approach adapted by Estonia in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Estonia	The creation of renewable energy communities is enabled legally, conveniently and easily and the production of RES energy for own consumption. Cooperative	Estonia has adopted the practice of the European Renewable Energies Federation as the basis for determining the role of energy communities and their designation as energy associations.	Since 1 January 2017, all Estonian electricity customers have smart readers that record and transmit at least the hourly data to the central database. Consumers have free access to their data, and

	collaboration is widespread in Estonia and can be appreciated in apartment, consumer, forestry or agricultural associations.		they may also enable data access for the freely selected service provider. The Electricity Market Act prohibits discrimination of market participants.
--	--	--	--

Based on the detailed evaluation of the published NECP of Estonia in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) No objectives/targets or policies/measures on energy communities or self-consumption in Sections 2.1 and 3.1.2 of NECP template.
- 2) Regarding Section 3.2 of NECP template (Policies and measures for energy efficiency): No mention of role of energy communities in energy efficiency. The policies for dynamic tariffs are also under development. This also hinders energy efficiency related activities of future energy communities. A pilot project is in progress to develop the policies and measures to enable and develop demand response programs, especially, for addressing tariffs to support dynamic pricing.
- 3) In terms of the policies related to internal energy markets and CECs, no objectives, policies or measures is provided under market design relating energy communities even for self-consumption. Also, one aggregator is operating in Estonia as part of one of the pilot projects. This aggregator has been able to enter into the contractual relations required for providing the service with both consumers and the transmission system operator. Even though the idea of pilot projects is promising and these projects best show the gaps and barriers of energy communities, more policies and measures were expected by the time of submitting the NECP.
- 4) In terms dimensions 6.1: Since 1 Jan. 2017, all electricity customers have been enabled with smart readers that record and transmit all data (with the resolution of at least one hour) to the central database (data storage - e.elering.ee). The consumers also have free access to their data.
- 5) Estonia's policies and measures regarding energy transition and also the regarding legislations are still under development. This hinders the engagement of energy citizens in energy markets. The assessment of these policies should be postponed until they provide their full plan for energy transition.

6.6 Greece

The table below gives the approach adapted by Greece in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Greece	Smart meters and smart networks will form a key part of the future planned smart and sustainable cities. Making a substantial contribution to the rational use of energy	The creation of an energy communities' scheme is planned, which is deemed to be an indispensable tool for strengthening the role of local communities and	Plans are going ahead to allow the participation of decentralised energy schemes. Hence, the possibility of establishing Aggregators and Energy Communities

	by final consumers at a city level. In conjunction with the new regulatory framework for the demand response mechanism and energy communities, it is expected to strengthen significantly the role of cities and people in the energy transition.	consumers. An innovating net metering scheme for energy generation and consumption will be developed to support decentralised energy production and management. These are to be supported and strengthened by specific tools.	has been instituted, enabling electricity consumers to operate in the electricity market, either as consumers or as producers, and through dynamic electricity tariffs, to contribute to the day to day operation.
--	---	---	--

Based on the detailed evaluation of the published NECP of Greece in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

The Greek NECP is very clear about the very large scale of the required energy transformation that has to take place in the country, for the road map 2030. The legislations also seem up-to-date and comprehensive. In fact, among the Member States, one country that has taken a rational approach to the acknowledgment of RECs and CECs is Greece. In 2018, Greece passed two pieces of legislation. The first one focuses solely on energy communities. The second one explains virtual net metering (collective energy sharing). However, the current situation and the workload needed to achieve the objective and targets provided in Greece's NECP may hinder the progress towards energy transition. To elaborate, in order for Greece to contribute its share to the European energy and climate 2030 targets, as laid down by the "Clean Energy for all Europeans" Package, a true energy renaissance has to take place in the coming decade.

- 1) In terms of dimension 1.1: The new auction-based Feed-in-Premium (FiP) system still requires significant enhancements in its design and operation. The details of this tariff system for RECs are not provided. On the other hand, no plan is provided for moving from this tariff system to fully competitive structure which is the ultimate goal for RESs in Europe.
- 2) The application of the target model and the *regional* electricity market coupling has been delayed continuously. This hinders the full and equitable participation of new REC projects and integration of RES in the electricity market.
- 3) The RES technologies, e.g., offshore/floating wind, and integrated RES schemes are undergoing substantial changes worldwide, for which a coherent regulatory and time and space planning frameworks are required. Such planning is missing in Greece policies.
- 4) If renewables are to have a chance for substantial development, the relevant policy support measures, which are only roughly sketched in Greece's NECP, need to be clearly defined and more importantly prioritized and quantified (from both content and time point of views).

From Chapter 5 it is noted that the energy policy and plan to reach the 2030 target in Greece shows that, compare to other low-activity countries, Greece is somehow advance in empowering energy citizens and implementing energy communities and forming a local energy market in its policy. Still some improvements are needed in the policy to achieve their defined target by 2030 with active participation of consumers in the energy market.

Recommendation:

- Relevant policy support measures are generally outlined in the NECP, priority has been given on wind energy, thus there is a need for more focus on solar PV and other RES to achieve the target 2030.
- Greece needs to enhance their Feed-in-Premium (FiP) system or develop other tariff system to promote energy communities and develop local energy market.

- Energy efficiency measures at energy community solutions should get some more attention.
- Integration of energy storage at consumer end and at community level should be prioritised
- Both the energy communities are already well adopted in the energy system but need a strong market coupling plan.

6.7 Hungary

The table below gives the approach adapted by Hungary in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Hungary	The spread of household-sized PV panels has allowed that a growing number of consumers can generate their own energy, which not only offers the option of a more active presence on the market beyond the conscious regulation of consumption, but also strengthens energy independence on a household scale.	No definition has been found concerning energy communities and their corresponding benefits for end users in Hungary.	1 million smart consumption electricity meters are being installed in these days. This installation also comprises part of the programme aimed at establishing innovative system balancing. In this manner, other related demand-side regulation and funding of smart metering promoting network flexibility are planned to be implemented under the relevant operational programmes of the 2021-2027 period.

Based on the detailed evaluation of the published NECP of Hungary in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding dimension 5.3: there are some issues arising from the complexity and inconsistency of the available regulation. The regulations related to RES and energy efficiency in the Electricity Act (VET) and in Government Decree are general and usually refer to specific legislations which do not comply with other legislations or which haven't been adopted.
- 2) The excessive complexity of the permitting and connection procedures hamper energy community investments.
- 3) Regarding dimension 1.3 and also the national general policies: the tendencies of the national energy policy seem to be inconsistent with energy community and energy efficiency objectives, since they promote the nuclear energy and cutting utility prices through legislative acts.
- 4) Regarding dimension 3.1: The involvement of local municipalities in energy community investments can be significant. However, the interviews directed by MTVSZ shows that the

existing local initiatives have to deal with the failures in legislation and more importantly the lack of adequate financing mechanisms.

- 5) Regarding dimension 5.4: Outdated taxation policies. Tax exemptions related to renewable energy projects apply only if the energy produced from these sources is for self-consumption applications. The extension of these exemptions to the renewable energy sold to energy markets and avoiding double taxation are recommended.
- 6) Generally, Hungary has provided a nearly comprehensive NECP, but in terms of clarity, it is hard to distinguish between the policies provided for different dimensions presented in Table 2.
- 7) In terms of energy efficiency, no clear objectives/targets and policies/measures related to energy communities are directly mentioned.
- 8) Regarding dimensions 6.1-6.9: With respect to smart metering, the importance of smart metering systems for electrical energy and gas has been acknowledged. Some new smart meters are being installed. However, no plan is provided for replacing the old metering systems with smart metering systems. Other dimensions (6.2-6.9) are almost neglected.

6.8 Ireland

The table below gives the approach adapted by Ireland in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Ireland	Empowering energy citizen is the very first priority which is followed by the Markets, Regulation and Prices as outlined in the green paper on energy policy in Ireland. This encourages passive consumers to become active and prosumers. The very latest initiative by the government is that a new Renewable Electricity Support Scheme (RESS) has been placed to support the renewable electricity projects in Ireland.	No specific definition has been found concerning energy communities in the Ireland current NECP. Two examples of promoting the role of local energy communities in Ireland are constituted by the Better Energy Communities (BEC) grant scheme and the Sustainable Energy Communities network which are both active in Ireland.	Ireland has a range of policy measures in place aimed at fostering the generation through renewable energy as well as their corresponding integration to the electricity market.

Based on the detailed evaluation of the published NECP of Ireland in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

With the targets broken into different sectors, clearly mentioned for different technologies and policies covering all the sections of the proposed template for NECP, Ireland's NECP was one of the most comprehensive national plans (among these 16 Member States) in terms of engagement of energy citizens in energy markets. However, the following barriers and challenges yet need to be addressed.

- 1) Regarding dimension 4.1: the first challenge for RECs and CECs in Ireland is securing access to funding (insufficient grants) and regarding 4.3: the main barrier is lack of access to advice at initial project development stages, both leading to considerable uncertainty and risk [18].
- 2) The planning permission and the process of connecting to grid are extremely burdensome and costly for small investors. Long waiting times (sometimes up to 5 years) and difficulties in obtaining the required licenses to sell electricity to the grid can be insurmountable for communities, without a secure funding stream in place. The “Templederry project” is going to be used as a template for the future to mitigate the issues and remove these barriers. Some kind of priority grid access should be defined for community projects.
- 3) Like most European countries, there is no ownership framework in place (see dimension 4.3 of Table 2).
- 4) Regarding dimension 1.1: Lack of a fed-in-tariff plan for microgeneration (there are some for larger generations), which gives no incentive to over produce and export is the other challenge.
- 5) Little or no experience in the cooperative models for energy generation as a viable model for engagement of energy citizens in energy transition.
- 6) Regarding dimension 5.4: Complicated tax rules and no tax exemptions for RECs and CECs (generally no tax incentives for RES projects) is the other barrier in engagement of energy citizens and energy communities to energy markets.

6.9 Italy

The table below gives the approach adapted by Italy in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Italy	In 2020 the Italian regulatory authority (ARERA) has published the rules for the application of grid and system fees for energy communities and self-consumption, while the Ministry of Economic Development has defined the incentives for the “shared energy” within collective self-consumption schemes and energy communities	Italian NECP is more focusing on formation of energy communities (REC and CEC). This is to establish a regulatory framework for the development of citizens energy communities that would be active in the generation, supply, distribution, storage, sharing and sale of electricity and the supply of energy services, including energy efficiency and electric vehicle recharging services	End uses have access to the Italian electricity market through multiplicity ways singly or aggregated. This covers dynamic tariffs for self-consumption options, participation in flexibility trading and ancillary services to the operators.

Based on the detailed evaluation of the published NECP of Italy in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

Second generation smart meters (2G) allows to collect hourly consumption/production data on a

daily basis, thus promoting customer awareness, development of advanced tariff schemes, participation to the ancillary service markets, and participation to collective self-consumption schemes/energy communities. Currently, rollout of 2G meters has reached approx. 18 million out of 32 LV customers, therefore in some areas customers cannot fully exploit the evolutions set by CE4AE (however, not validated data can be used).

Regarding collective self-consumption schemes, barriers derive mostly from the following issues:

- 1) Difficulties in reaching an agreement about the investment in the shared PV plant between apartment owners. Civil law does not require a unanimous decision but it is;
- 2) Investment is done mainly by the house owner, but benefits from energy sharing is granted to the tenants;
- 3) Not clear how to allocate savings from physical self-consumption to apartments not participating in the scheme.
- 4) With respect to Energy Community, given the significant level of complexity (especially if the energy community participates to the ancillary service markets), energy communities could involve companies that have energy as their main activity (ESCo, engineering study), but these companies should not have an active role in the community's decisions.
- 5) Authorization process for RES based power plant could be also a barrier in some cases since, depending on the actual situation, it could be a complex and long process.
- 6) Customer behaviour and habits could be seen as a barrier. Traditionally users had a passive role in the electric system and the customer empowerment is often seen as a burden for the users instead of real opportunity.

6.10Latvia

The table below gives the approach adapted by Latvia in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Latvia	Renewable electricity generation in Latvia is stimulated through a complex support system based on a feed-in tariff, which also includes elements of a quota system and tenders. Moreover, since 1 st January 2014 electricity coming from renewable energy sources is promoted also through net-metering.	Energy community, especially renewable energy community, movement in Latvia is in the early development stage. Some of the initiatives, both by municipalities and by individual citizens, have been taken to form the energy communities or RES projects. Latvian NECP includes a plan by 2021 to develop a regulation on energy communities and regulation on including these in RES support schemes.	The state aid mechanism for renewable energy and cogeneration power plants will shape the free energy market of the future. The increase of energy poverty as well as lack of clarity about the most appropriate tools to prevent consumer vulnerability is a barrier. The energy communities' framework can alleviate energy poverty and support regional cooperation in the shaping of a well-functioning market for the end users.

Based on the detailed evaluation of the published NECP of Latvia in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding dimension 1.1, based on the experience of the other Member States, feed-in-tariffs proved to be almost the strongest driver for development of renewable energy community projects. In Latvia, there was strong political opposition in the past for supporting renewable producers through feed-in-tariffs. However, several support schemes for new renewable projects have been suspended before 2014. The aforementioned uncertainties and lack of feed-in-tariffs for renewable energy production hinder the participation of renewable communities in energy markets. No other supporting schemes of this kind are available for supporting the future renewable projects and no plans exist for integration of renewables into a fully competitive energy market in future.
- 2) Regarding dimensions 2.1, there are no clear dynamic tariffs to support price-based demand response programs and therefore, complete participation of energy citizens in energy market.
- 3) In terms of dimensions 4.1 and 5.3, there are constant changes done to the conditions of support for existing renewable producers [20]. This situation is not favorable for developing new renewable projects. The high variations of renewable legislation deteriorates the low investor confidence. More importantly, these variations are detrimental to the access to funding for these projects. As an example, banks would not provide loans for these projects. The lack of access to secure finance is a hurdle for these projects.
- 4) Regarding dimension 5.4, the support for already existing renewable producers has also been limited. For instance, the introduction of a new type of tax from 2014 that have been applied on the payments received from feed-in-tariffs is further detrimental to the citizens' willingness for participating in renewable projects.
- 5) The current situation is not suitable for developing new energy communities in Latvia. Energy production for self-consumption might be the most feasible option in remote areas where current voltage is not sufficient to meet demand. Therefore, EU funds in promoting energy communities and government grants for (partially) covering the initial investment costs may play an important role in remote places to at least alleviate the technical problems such as under-voltage.
- 6) Lack of pilot projects in Latvia is the other obstacle. Experts have shown that when some pilot projects are implemented, the stakeholders can be convinced about benefits of community type of energy projects. The available funding can be also dedicated to support pilot projects.
- 7) In terms of dimensions 6.1-6.9, only 6.1 has been discussed in Latvia's NECP. Under the electricity metering modernization plan in Latvia, at least 99 % of customers will be enabled with smart meters by 2022. Multi-layer access principles are designed for the data readout system of smart meters to protect consumers' data. All its layers use data encryption methods, thus excluding the chance of expositing consumers' data in the data exchange process. A detailed plan is required to clarify how these meters can be used to achieve the higher levels of citizens' participation in energy markets. Smart meters have not been planned for gas. Dimensions 6.2-6.9 have not been well covered in Latvia's NECP.

6.11Lithuania

The table below gives the approach adapted by Lithuania in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Lithuania	To promote active participation of electricity consumers in the market, a scheme for generating	A renewable energy community is defined as a legal status accorded to a public body which fulfils the	Prosumers may establish their own power plants or purchase them on the basis of bilateral

	<p>electricity was created in 2015. In order to ensure that the electricity generating scheme is available to all electricity consumers, the acquisition of the power plant is funded from European Union Structural Funds and the National Climate Change Program. By the end of 2023, DSO plans to install smart meters for its customers. In addition to smart meters, there are plans to implement a smart metering system for meter management and reliable data collection, storage and analysis.</p>	<p>specified criteria and which owns and develops installations for the production of energy from renewables in a defined area and has the right to use them to produce energy, to consume and store it in energy storage facilities and sell it. Participants in the renewable energy community may be natural persons, small or medium-sized businesses and/or municipalities.</p>	<p>contracts from third parties, thus making it possible for the occupants of multi-apartment buildings to become prosumers. Moreover, the power plant of the prosumer may be remote from the electricity consumption point. In this case, the power plant must be owned or managed by the prosumer.</p>
--	---	--	--

Based on the detailed evaluation of the published NECP of Lithuania in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding section 2.1 in NECP template (targets and objectives of RESs): Electricity self-generating consumers will be gradually increased. By 2020, after creating a favorable investment environment (presented with enough details), there will be at least 34000 consumers using a prosumer scheme. The target has set for self-generation. However, RECs are not mentioned.
- 2) In general, no objectives are provided for energy communities, but have expected trajectory for district heating and identify need to increase number of self-consumers (share of DHS RES will be 70% by 2020 and 90% by 2030).
- 3) Plans are provided to implement a number of measures to promote self-consumption and renewable energy communities (including through participation in auctions). More accurately, in the policies provided by Lithuania in NECP, increasing the self-consumers by applying financial support for individual households and for multi-apartment buildings are acknowledged. It has also mentioned that it is necessary to reduce administrative procedures for self-consumers (dimension 4.3), to apply financial measures for small-scale power plants (dimension 4.1) and to prepare and confirm of plans for municipalities to promote the use of renewable energy sources. However, no details are provided for contribution of energy citizens in energy markets via RECs and CECs.
- 4) Envisions contribution towards energy efficiency by active customers and energy communities.
- 5) In the market design, active consumers and energy local energy communities will need to be promoted, providing numbers for expected development to 2030 and 2050. No measures or policies found in this regard.

- 6) It has been mentioned that empowered customers will be able to “participate in the market through service providers in the energy sector. The active participation of local energy communities in investing in co-owned RES (RECs) equipment will be encouraged”. No details are provided on the mechanisms (dimensions 2.1.3, 2.1.4, 2.1.1 and more importantly 1.3). No policies regarding CECs.
- 7) By the end of 2023, ESO plans to install smart meters for its customers who consume about 90% of the electricity distributed. Smart metering systems are also to be installed for natural gas and heating if the studies suggest so. Almost no other targets and policies related to dimensions 6.2-6.9.
- 8) Installation of the Distribution Network Management System (DMS) has been proposed for distribution systems. The aggregators cannot directly buy and sell energy to DNOs. However, they should keep up with the standards related to steady state voltage regulations and thermal limits of lines. Aggregators usually do not have the data assure these standards and limits hold. State-of-the-art mechanisms needs to be designed for the effective aggregation of demand response and engagement in energy market. Installing DMS might help the DNO for network optimization and control. However, the operation of distribution systems will change and require state of the art mechanism for decentralized control and management techniques. Network codes should also be revisited (dimensions).

6.12Malta

The table below gives the approach adapted by Malta in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Malta	In line with its programme to ensure an efficient distribution system, Enemalta has equipped 99.6% of its consumers with smart meters and has adopted a tariff system that favours the prudent use of energy. Additionally, a second generation of smart meters are being installed which will allow the consumer to be more aware of their energy consumption. This will be done through the consumer energy management system where in-house display systems, smart phones and other devices will provide the consumer with real-time information on their consumption.	No definition has been found concerning energy communities and their corresponding benefits for end users in Malta NECP.	It is important to underline that there is no liquid wholesale market in Malta. Malta is also eligible to derogate from the application of a number of provisions of Directive. Existing schemes supporting the installation of PV systems cater for the option of self-consumption of renewable electricity in both the residential and non-residential sector. The applicant may opt to sell all electricity generated by the PV system to the DSO (full export) or export only the surplus electricity (partial export). In the case where the installation operator does not apply for

	Through this readily accessible information, the consumer has the opportunity to better understand their consumption patterns, resulting in increased energy conservation.		support, Regulation 4A of SL 545.27 ensures that solar PV may be installed primarily for self-consumption and that any surplus electricity supplied to the DSO through the grid will be bought at the proxy for the market price. The option for self-consumption is not applicable for PV installations owned by third parties, with full export to the grid being the only option.
--	--	--	--

Based on the detailed evaluation of the published NECP of Malta in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding section 3.1.2 in NECP template (Policies and measures for renewable energy): The existing policies for renewables self-consumption are described, but no new policies or measures are developed. 2.1 (targets and objectives of RESs): No clear targets observed.
- 2) RECs and CECs are actually not foreseen because of the lack of an energy supply market, so no measures and policies (section 3.4.3) and targets (2.4.3) are foreseen for LEMs.
- 3) No role presented for energy communities in energy efficiency.
- 4) Support for storage is foreseen as a way to integrate small renewables for self-consumption.
- 5) Regarding energy efficiency, in line with Malta's programme to ensure an efficient distribution system, "Enemalta" has equipped 99.6% of its consumers. The expected increased share of renewable self-consumption by consumers with an installed PV system would provide additional benefits in the form of reduced stress on the electricity grid, in particular during peak hours in the summer months. Additionally, a second generation of smart meters are being installed which will allow the consumer to be more aware of his energy consumption. No other policy, measure, target and objective related to dimensions 6.2-6.9.
- 6) "Enemalta" has also adopted a tariff mechanism that favours the wise use of energy. This further improve the energy efficiency. This might also incentivize the installation of small scale RESs. However, this tariff mechanism does not improve the engagement of citizens in energy markets, as a market should be first designed and implemented.

From Chapter 5 it is noted that the energy policy and plan to reach the 2030 target in Malta, shows that Malta is mostly concentrating on empowering prosumers for self-consumption and not considering energy communities and forming local energy market in its policy.

Recommendation:

- Malta needs to reconsider its approach towards energy community, at least, in relation to the formation of RECs.
- Considering the existing/update policies for renewables self-consumption, clear targets and objectives of self-consumption RESs should be made.
- At least, policies should be made to introduce LEMs.

6.13 Poland

The table below gives the approach adapted by Poland in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Poland	The prosumer photovoltaic (PV) market has started growing. At the end of 2018 there were more than 36,000 individual prosumers in Poland (almost exclusively in photovoltaic technology) owning small-scale PV systems. Nowadays there is an increasing number of renewable energy prosumers in the heating sector too, especially in solar thermal energy	No definition has been found concerning energy communities and their corresponding benefits for end users in Poland's NECP. The NECP includes measures to support prosumers and energy communities and the promotion of smart grids.	In 2016 Poland introduced net metering for non-commercial prosumers. Currently the net metering scheme covers RES micro-installations with installed capacity of up to 50 kW. Local communities do not actively participate in the energy market in Poland, even though the government seems to support the idea of energy cooperatives and energy clusters.

Based on the detailed evaluation of the published NECP of Poland in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding section 2.1 in NECP template (targets and objectives of RESs): No objectives for energy communities or self-consumption.
- 2) Regarding section 3.1.2 in NECP template (Policies and measures for renewable energy): Some measures can be identified for supporting renewables. Development of distributed generation through energy communities was just mentioned (investment aid for energy clusters and cooperatives: 300 areas by 2030) without presenting the details. No clear policies specifically related to RECs.
- 3) On internal market design: Intended to support individual and collective schemes as well as energy communities. No detailed plan presented.
- 4) Regarding dimension 1.1 (market instruments for incentivizing energy citizens): Feed-in tariff system and feed-in premium system are targeted on sources with a relatively low capacity and applied to utilize energy which is not consumed by small producers.
- 5) Regarding dimension 3.1 (raising the awareness of consumers and encouraging them to play a more active role in the energy market): Measures to enhance end consumer knowledge are planned to be continued in the period 2021-2030, with a focus on consumer rights (relating to the conclusion of contracts, supplier switching, alternative dispute resolution methods) and playing an active role in the energy market (prosumer, use of aggregation services, smart meters, dynamic price contracts). The policy seems promising. Targets and objectives should be better presented.
- 6) Regarding dimensions 6.1-6.9: With respect to smart metering, a legal framework will be created concerning the technical, legal and economic aspects of bringing smart meters into universal use. It is expected that 80% of consumers will be equipped with smart meters by

2028. A more ambitious target is inevitable to keep up with Clean energy for all Europeans” package. Other dimensions (6.2-6.9) are almost neglected or are identified inapplicable.
- 7) Outdated cooperative legislation more than 30 years old (cooperatives legal act was introduced in 1982), unstable energy law and lack of political support for small renewable energy sources are the most important barriers in engaging the Poland is not the ideal incubator for community energy projects. Updating the regulations to increase the activity of household consumers and proposing new legal solutions are necessary for Poland. According to NICP, it is expected that new mechanisms will be introduced and the existing ones will be expanded in the period 2021-2030 as part of work on strengthening the legal environment encouraging household consumers to take a more active role in the electricity market. However, a detailed plan is not yet available.
 - 8) Regarding energy efficiency: The first solution to be applied will be the introduction of regulations encouraging suppliers to offer dynamic price contracts. The availability of these services will be linked to the popularization of smart meters which is yet questionable. Other aspects of energy efficiency, e.g., dimensions 6.2 and 6.4, have not been discussed in NECP.
 - 9) Regarding dimension 4.1: Local investment aid and grants are mentioned in NECP. Repayable aid as a mechanism depending on local needs, mainly distributed in regions. However, as for political limitations, there are limited chances that small and medium RES will develop in Poland with the current approach for subsidizing RES (which favors big sources and energy companies) and plans to limit as much as “it would be acceptable in Europe”.

6.14Portugal

The table below gives the approach adapted by Portugal in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Portugal	<p>This promotion of self-consumption of renewable energy, whether individually or collectively or through energy communities, will in the short-term, be accompanied by an information and support programme for implementing self-consumption projects.</p> <p>It is crucial to promote energy literacy for consumers through more transparent information and to ensure greater knowledge on energy and climate, allowing citizens to make more informed choices and promote more and better information for consumers,</p>	<p>Portugal has one of the most comprehensive and clear NECP which shows that they are in advance in adopting the CEC and REC in their policy and legal framework. The hindering legislations are updated to ease the engagement of REC. Even CECs are well discussed in the NECP. The link between energy citizens, REC and CEC and energy saving could have been better planned and explained.</p>	<p>To promote distributed production and self-consumption of power from renewable sources, a new legal framework was developed in Portugal, Decree-Law No 162/2019 of 25 October 2019, which allows and promotes individual self-consumption, collective self-consumption and the forming of energy communities. The legal establishing of these activities will allow individuals, companies and other public and private entities to produce, consume, share, store and sell energy produced from renewable sources,</p>

	contributing toward transparency and competition in the energy market.		thus actively participating in energy transition.
--	--	--	---

Based on the detailed evaluation of the published NECP of Portugal in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

Among the Member States analyzed in this chapter, Portugal has one of the most comprehensive and clear NECPs in terms of both policies and objectives. The required changes in the legal definitions and frameworks have also been presented. The policies are usually demonstrated by quantitative measures.

- 1) In Portugal, renewables have been mainly owned by large utility companies, and residential and small-scale projects are exceptions.
- 2) Regarding dimension 2.1.1 and 2.1.2: Legal definitions and legal feasibility (as it appears in RED II) for RECs is provided and demonstrated in 2019. A new definition of jointly acting self-consumption is also provided in the same year. The legal definition also exists for CECs but no known legal framework exists.
- 3) Regarding dimension 1.1: No clear tariff scheme. Self-consumption regime with remuneration for surplus energy at 90% of market price. This is an option for simplifying the procedure and promoting competitive market structure, but might not incentivize further investment on CECs. A more detailed plan is required.
- 4) Regarding dimensions 6.1-6.9: While the focus is on bidirectional smart metering systems under the objectives of digitalization, the role of other technologies is also acknowledged. Some pilot projects are designed to test the local requirements of digitalized energy systems. The role this digitalization in the engagement of energy communities could be better explained and planned.
- 5) It is promising that quantitative targets are set for different technologies of RESs in the roadmaps 2030 and 2050. The share of citizens in these targets are however unclear.
- 6) The lack of clear local market trading platform is one of the gaps in the policies provided by Portugal.

6.15Romania

The table below gives the approach adapted by Romania in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Romania	Romania revisited the related legal definitions and framework. This allows for the engagement of empowered energy citizens in energy markets by producing renewable energy. In order to achieve the RES-E share, Romania plans to encourage household, industrial and agricultural active	The NECP mentions prosumers. However, it is not clear how these prosumers contribute to energy market. RECs and CECs have not received enough attention in the policies and targets.	From 2020 onward, the day-ahead and intra-day markets are organised in a way to ensure that all market participants can have access to the market individually or by aggregation. Final consumers may thus participate in organised electricity markets either directly or by aggregation if they

	consumers (prosumers) to be involved in measures such as the development and implementation of smart metering solutions and smart networks, for which a clear and adequate regulations should be put in place.		have power above 500 kW approved in the connection certificate. The implementation of demand response measures will contribute to the integration of RES into the national electricity system by reducing / moving consumption at peak hours and providing for the final consumer's possibility to participate in the electricity market.
--	--	--	---

Based on the detailed evaluation of the published NECP of Romania in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) The objective of Romania up to 2030 is to install a power of at least 750 MW, made in the form of production capacities owned by prosumers. However, no plan on the mixture of these capacity and no plan for energy communities or self-consumption, but does include estimation of renewable energy owned by prosumers by 2030. Even this targeted level needs to be significantly raised to keep up with the Union's 2030 target for renewable energy.
- 2) The importance of dynamic consumption tariff has been acknowledged for incentivizing time of use demand response. However, no market instrument is defined for incentivizing the empowered citizens to sell energy.
- 3) No policies regarding dimension 4.1.
- 4) Regarding energy efficiency, only building renovation is included in the policies, no policies and targets are provided for incentivizing the application of building energy management systems. The other roles of RECs and CECs (such as cooperative district heating) have been ignored.
- 5) The role of smart metering for dynamic pricing and energy efficiency is acknowledged, but no plan is provided to link this to CECs and the engagement of energy citizens in energy markets.
- 6) Regarding dimension 3.1: Increasing the awareness of consumers of the benefits of decarbonization has been included in the targets, but increasing the citizens' awareness of the benefits of RECs and CECs is not planned. The level of details on how they are planning to improve the awareness of citizens is not sufficient.
- 7) Regarding dimension 1.2 (Establishment of suitable market trading platforms for LEMs): Nothing found. Without such a platform, the implementation of local energy markets is practically impossible.
- 8) Regarding dimension 6.4: Romania needs to put in place adequate measures to meet the transport target. Tax reduction and exemption have been proposed in Romania's NECP for companies' electrical and hybrid vehicle. No plan for energy citizens in this regard.
- 9) Regarding dimension 5.3 and 5.4: Romania needs to put in place measures to simplify the licensing and permitting procedures and provide additional details on the enabling frameworks for renewable self-consumption and renewable energy communities.
- 10) The role of energy communities as relevant for energy efficiency has been acknowledged. However, no targets are set and no clear policies are provided in this regard.

6.16 Slovakia

The table below gives the approach adapted by Slovakia in their published NECP:

Country	Empowering energy citizens	Energy community	End user's participation
Slovakia	Current energy policy in Slovakia encourages the installation of small-scale RES for self-consumption of electricity as much as possible and to minimise their supply to the grid. This approach addresses their energy self-sufficiency and reduces the impact of variable RES on the electricity grid. As part of support for small sources, support for the installation of heat generation facilities using RES will continue.	No definition has been found yet concerning energy communities in Slovakia NECP	The Slovak Republic has implemented legislation promoting own electricity generation by introducing the "local source" institute on the promotion of renewable energy sources and high-efficiency cogeneration. The amended act provided a guaranteed purchase price for 15 years as well as guidelines for generating electricity using RES, which favoured the construction of small and decentralised installations.

Based on the detailed evaluation of the published NECP of Slovakia in Chapters 3 and 4 of this deliverable, what are the identified gaps and shortcomings of the policies reported that hinder the engagement of energy citizens in energy markets and the development of energy communities?

- 1) Regarding dimension 5.1-5.3: Lack of supportive local authorities and/or local energy agencies is the other challenge that the empowered energy citizens are facing for contributing in the energy markets.
- 2) Slovakia has included some measures to improve the energy efficiency based on RECs in its NECP. The other dimensions of Table 2 should be better linked to the roles of RECs.
- 3) Emphasis on empowering customers is through smart grids/intelligent networks. The models and mechanisms of participation of energy citizens in energy markets should be presented. CECs should be promoted and demand response aggregators should receive more attention in the policies provided in NECPs.
- 4) Among the chief barriers of community owned energy projects are the lack of capital by municipalities. The households do not have enough saving to effectively contribute. Together with aversion to invest and risk, bad experience with investment schemes in 90's and still prevailing lack of trust create a problematic environment for development of community energy sector. These barriers relate to both dimensions 4.1 and 3.1. Community-based energy project financing especially in rural area helps expediting the engagement of citizens in energy markets. Awareness of citizens of CECs also needs to be improved. Local authorities need to be more active to improve the awareness of citizens in this regard. The focus of policymakers must be placed not only on energy issues in general or on RESs, but also on community building and development of active civil society.
- 5) Regarding section 3.4.3 of NECP template: Existing measures for self-consumers are summarized. Self-consumption is promoted by introducing the "local source" institute through

an amendment to Act No 309/2009 on the promotion of renewable energy sources and high-efficiency cogeneration (Act No 309/2018). However, the role of CECs in providing energy and ancillary services to energy markets is almost overlooked.

- 6) The policies presented to deal with dimensions 6.1-6.9 lack of enough clarity and fail to distinguish between individual dimensions. In Slovakia's NECP, smart metering systems are introduced as the main measure in the development and modernizing the distribution systems. The regarding policies are summarized in the Energy Policy of the Slovak Republic, 2014 (section 3.5.10). The introduction of smart measuring systems is in the mandatory selective implementation phase. In June 2019, a total of 273862 smart metering system out of 390849 devices that should be installed by the end of December 2020 were installed. Other than the installation of smart metering systems, which is well planned with a quantitative objective, the policies and objectives regarding other dimensions (6.2-6.9) are not individually presented.
- 7) In Slovakia's NECP, even though different measures are provided for moving towards modernizing distribution systems (introduced by "smart grids" in Slovakia's NECP), it is hard to link the policies with the participation of energy citizens in energy markets through local energy markets.
- 8) Regarding dimension 3.1: No specific policy and measure for improving the citizens' awareness and no plan for educating citizens for boost their willingness.
- 9) In the policies provided, there is no platform introduced for LEMs (see dimension 1.3 in Table 4.2).

7 Conclusions

This deliverable focuses on identifying the key policies for consumers' empowerment and the missing links/barriers in related policies of the low spending countries as found in their NECP. This main outcome of this deliverable is of high importance for providing recommendations, build a profile of the countries and contribute to the PANTERA RICAP process. Below is a summary of gaps identified with recommendations.

Summary of gaps and barriers in low activity Member States' policies reported in their NECPs:

- 1) It seems that the awareness of policy makers in these Member States is moderate and sometimes acceptable, but the actual planning is not sufficient.
- 2) Lack of supportive local authorities and/or local energy agencies is the other challenge that the empowered energy citizens are facing for contributing in the energy markets.
- 3) The policies presented in most of NECPs suffer from lack of clarity on the dimensions presented for the better engagement of energy citizens and also from failure to distinguish between individual dimensions.
- 4) Renewable energy communities and self-consumption overshadow other dimensions where empowered energy citizens can contribute, e.g., energy community, flexible demand response, energy efficiency, consumers' awareness, etc.
- 5) Lack of an effective mechanism in order to adjust the tariffs for different RES technologies is the other barrier which can be seen in the policies of most of these Member States. The financial incentives are of highest importance to solve the barriers related to the resistance of the consumers against the change and transition.
- 6) Important roles that energy citizens and energy communities can play in energy transition are overlooked. Among these overlooked roles, are those related to grid stability, power quality and how technical issues can mitigate intermittent behaviour of RES. For instance, using an effective active voltage management algorithm, the RECs and CECs can be able to contribute to reactive power support [59].
- 7) It was also noted in this study that almost none of the low-activity member states for which the energy policies are analyzed, have targets directly related to the engagement of

empowered energy citizens in energy markets and energy transition or to the LEM mechanisms.

- 8) An important weakness is the lack of clarity in the usage of consistent terminology across the NECPs provided by Member States.

General recommendations for low activity Member States, based on the discussions provided in this deliverable.

- 1) Introduce **quantitative** policy targets for evaluating the effective contribution of empowered energy citizens in energy markets.
- 2) Countries need to develop a roadmap to achieve the targets introduced in Table 4.2 as dimensions. It is important to take a wide range of factors into account. These factors include but are not limited to the importance of each dimension, maturity of technologies, market resistance, citizens' awareness and budget limitation. They need to clearly distinguish among different dimensions introduced in Table 4.2 for the effective engagement of the energy citizens in energy markets.
- 3) To include more detailed measures for enabling energy communities; as a key for energy transition with customers' in the centre of this transition.
- 4) To emphasize more on energy efficiency, energy storage, devising market instruments and new models and mechanisms to ease the contribution of energy citizens in energy transition and to achieve the targets presented in "Clean Energy for all Europeans" package.
- 5) Best practice examples from other member states should be pursued.
- 6) Regarding the market and for providing a competitive market structure, the Member States should provide an effective tariff mechanism with a plan to gradually move from a supportive tariff plan, e.g., feed-in-premium, to a competitive tariff mechanism, as the respective renewable technologies are becoming more mature and economically more viable. Distinct plans should be provided for each separate renewable energy technology.

The above recommendations will form the basis of the approach of the PANTERA consortium towards the policy makers and stakeholders of the targeted low activity countries for the remaining period of the PANTERA project.

8 Reference

- [1] "<https://pantera-platform.eu/wp-content/uploads/2020/07/D3.1-Report-on-current-status-and-progress-in-RI-activities-Technology.pdf>".
- [2] "EU COM/2015/080; <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN>".
- [3] E. CEP, "<https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1582103368596&uri=CELEX:52016DC0860#footnote10>".
- [4] "EU Renewable Energy Directive, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018L2001>".
- [5] "EU Internal market of electricity, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944>".
- [6] "Regulation IME, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0943>".
- [7] "Regulation Risk preparedness, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.158.01.0001.01.ENG".
- [8] "Regulation ACER, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0942>".
- [9] C. a. S. B. Kunze, "Energy Democracy in Europe: A Survey and Outlook, Rosa Luxemburg Foundation, No. January 2014, 2014, p. 63".
- [10] R. Hanna, "'Community Renewables Innovation Lab. Energy Transition Platform Policy Briefing', Spiral.Imperial.Ac.Uk, Vol. 22, No. November, 2017".
- [11] JRC, "Energy Community Report, https://publications.jrc.ec.europa.eu/repository/bitstream/JRC119433/energy_communities_report_final.pdf," 2020.
- [12] "Compile Project, <https://www.compile-project.eu/wp-content/uploads/Explanatory-note-on-energy-community-definitions.pdf>".
- [13] "LOCAL ENERGY MARKETS: OPPORTUNITIES, BENEFITS, AND BARRIERS, [http://www.cired.net/publications/workshop2018/pdfs/Submission%200272%20-%20Paper%20\(ID-21042\).pdf](http://www.cired.net/publications/workshop2018/pdfs/Submission%200272%20-%20Paper%20(ID-21042).pdf)".
- [14] "EU Electricity Market Factsheet, https://ec.europa.eu/energy/sites/ener/files/documents/electricity_market_factsheet.pdf".
- [15] "CERRE report, https://cerre.eu/wp-content/uploads/2020/06/170309_CERRE_EnergyConsumers_Final.pdf".
- [16] "CSD. Development of Small-Scale Renewable Energy Sources in Bulgaria: Legislative and Administrative Challenges. Sofia: CSD, 2018".
- [17] "NECP, Bulgaria, https://ec.europa.eu/energy/sites/ener/files/documents/bg_final_necp_main_en.pdf".
- [18] "NECP, Croatia, https://ec.europa.eu/energy/sites/ener/files/documents/hr_final_necp_main_en.pdf".
- [19] M. P. I. Š. I. C. T. & P. H. Beus, "Electricity market design in Croatia within the european electricity market-recommendations for further development. Energies, 11(2)," 2018.
- [20] "NECP, Check Republic, https://ec.europa.eu/energy/sites/ener/files/documents/cs_final_necp_main_en.pdf".
- [21] "NECP, Estonia, https://ec.europa.eu/energy/sites/ener/files/documents/ee_final_necp_main_en.pdf".
- [22] "NECP, Greece, https://ec.europa.eu/energy/sites/ener/files/el_final_necp_main_en.pdf".
- [23] "Vadovics, E. (2019). Vadovics2019_Chapter_TheEnergyChallengeInHungaryANe.pdf".

- [24 “Ministerstwo Energii. (2019). National Energy and Climate Plan for Hungary. Ministerstwo Energii, 1(4), 154”.
- [25 “NECP, Hungary,
] https://ec.europa.eu/energy/sites/ener/files/documents/hu_final_necp_main_en.pdf”.
- [26 “https://www.teagasc.ie/media/website/crops/crops/May_2014_Green_Paper_on_Energy_Policy_in_Ireland.pdf”.
- [27 “NECP, Ireland,
] https://ec.europa.eu/energy/sites/ener/files/documents/ie_final_necp_main_en.pdf”.
- [28 “Community Power. (2017). Community Energy in Ireland. Intelligent Energy Europe Programme of European Union.
] https://www.foe.ie/download/pdf/executive_summary_community_energy_leaflet.pdf”.
- [29 “<https://www.cru.ie/wp-content/uploads/2020/08/CRU20099-Call-for-Evidence-on-Energy-Communities-under-the-Clean-Energy-Package-002.pdf>”.
- [30 “NECP, Italy,
] https://ec.europa.eu/energy/sites/ener/files/documents/it_final_necp_main_en.pdf”.
- [31 “RES-Legal, Latvia, <http://www.res-legal.eu/search-by-country/latvia/>”.
- [32 “NECP, Latvia,
] https://ec.europa.eu/energy/sites/ener/files/documents/bg_final_necp_main_en.pdf”.
- [33 “NECP, Lithuania,
] https://ec.europa.eu/energy/sites/ener/files/documents/bg_final_necp_main_en.pdf”.
- [34 “NECP, Malta,
] https://ec.europa.eu/energy/sites/ener/files/documents/mt_final_necp_main_en.pdf”.
- [35 “Kukula, law-and-ambition-in-polands-energy-transition-ce-en.pdf”.
- [36 “NECP, Poland,
] https://ec.europa.eu/energy/sites/ener/files/documents/pl_final_necp_main_en.pdf”.
- [37 C. Rădulescu, “Renewable energies: positive new regulations especially for small producers,
] <https://www.lexology.com/library/detail.aspx?g=10e1a8f8-87c6-4f2d-893b-40630bac7403>,” 2018.
- [38 C. G. J. Roberts, “Energy communities in the draft National Energy and Climate Plans: encouraging but room for improvements, REScoop Project, 2019,
] <https://www.rescoop.eu/blog/necps>”.
- [39 “C. Inês, P. L. Guilherme, M. Esther, G. Swantje, H. Stephen, H. Lars, “Regulatory challenges and opportunities for collective renewable energy prosumers in the EU,” Energy Policy, V. 138, 2020”.
- [40 “http://leco.interreg-npa.eu/subsites/leco/PESTLE_Analysis_LECO_A4_180927-singlepages-final.pdf”.
- [41 “I. H. Anchustegui, A. Formosa, “Regulation of Electricity Markets in Europe in Light of the Clean Energy Package: Prosumers and Demand Response,” SSRN, 2019”.
- [42 “DOMINOES – DELIVERABLE 1.1, “Local market reference architecture and business requirements,” available online: http://dominoesproject.eu/wp-content/uploads/2020/01/D1.1_DOMINOES_LocalMarketReferenceArchitecture_v1.3_final.pdf”.
- [43 “G. Mendes, J. Nylund, S. Annala, S. Honkapuro, O. Kilkki, J. Segerstam, “Local energy markets: Opportunities, benefits, and barriers,” CIRED 2018 Ljubljana Workshop on Microgrids and Local Energy Communities, 2018.”.
- [44 “Koirala, B. P., Koliou, E., Friege, J., Hakvoort, R. A., Herder, P. M. 2016. Energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems. Renewable and Sustainable Energy Reviews 2016, Vol. 56,”.

- [45 “Wouters, C. 2015. Towards a regulatory framework for microgrids – The Singapore experience.
] Sustainable Cities and Society, Vol. 15, pp. 22-32”.
- [46 “<https://energy-democracy.org/clean-energy-package-magna-charta-of-prosumer-rights/>”.
]
- [47 “<https://energy-democracy.org/achieving-a-secure-competitive-and-sustainable-energy-system-in-bulgaria-the-emergence-of-active-customers-on-electricity-markets/>”.
- [48 “C. Inês, P. L. Guilherme, M. Esther, G. Swantje, H. Stephen, H. Lars, “Regulatory challenges
] and opportunities for collective renewable energy prosumers in the EU,” Energy Policy, V. 138, 2020”.