Recommendations for a successful development of renewable energy communities based on the case studies of Austria and Denmark

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AUTHOR: IVONA PRAR

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URBAN ENERGY AND ENVIRONMENTAL PLANNING (CITIES AND SUSTAINABILITY)

DEPARTMENT OF PLANNING

AALBORG UNIVERSITY

Department of Planning
Study Board for Planning, Geography and Surveying
M.Sc. Urban Energy and Environmental Planning
Cities and Sustainability
Rendsburgade 14
9000 Aalborg

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Author:

Ivona Prar

Supervisor:

Karl Sperling,
Associate Professor
Department of Planning

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Abstract

Renewable energy communities (RECs) have the potential to raise acceptance of renewable energy technologies by promoting small-scale local developments, phase out energy poverty through energy sharing ,and contribute to lowering greenhouse gasses by using sustainable sources of energy. They are defined in the Renewable Energy Directive (RED II) as a part of the Clean Energy for All Europeans package. The aim of this research is to provide a set of recommendations to facilitate the development of RECs in the EU member states. The recommendations are done based on the two case studies, Austria and Denmark. Their transposition of RED II was analyzed and interviews with the members of the communities are conducted to investigate the current state in those countries. An example of innovative democracy in Denmark during the 70s was used for the analysis as well as the bottom-up approach. The recommendations are separated in the three categories aiming to the EU, national and local actions.

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Summary:

This master thesis addresses the problem of lack of inadequate regulation on the topic of renewable energy communities (RECs) in the EU member states. RECs provide a possibility for implementing renewable energy sources (RES) on a local level and contributing to reaching the climate goals. They are defined in the Renewable Energy Directive (RED II), and all EU member states are obliged to transpose it and create rules and regulations for RECs in their national legislation. Research showed that most of the member states failed to do so and the conditions for starting a REC in most of the member states aren't favorable, and most of them have a low count of energy communities. Two case studies are chosen for the research, to base the recommendations on their experiences.

Austria and Denmark are chosen as case studies because they both have a high number of communities, but Denmark has an insufficient transposition while Austria is a successful example of that. Both of their regulations on RECs are investigated and communities are investigated to get a better picture of the current state. Denmark also served as an example of the development of energy co-ops in the 70s. Since the concept is very similar it provided an example of how RECs could impact local innovation and acceptance of RES in the future.

A theoretical framework was developed by reviewing existing research on the topic of RECs in the EU. This gave a better understanding of the topic. Two theories, innovative democracy and bottom-up approach were also investigated and presented as a part of the theoretical framework. Regulatory background investigated the details of RED II and its implementation in the EU member states. It specifically focused on the transposition of the RECs framework and definition that is presented in Article 22 of RED II. This was investigated a bit deeper for two case studies Austria and Denmark in the section Case studies.

A deeper understanding of the state in the two case study countries was provided by conducting interviews with representatives of the communities from those countries. The interview is also conducted with the representative of REScoop.eu to get a better understanding of their transposition tracker and hear their perspective on the development of RECs in the EU.

Discussion and analysis provide answers to the research question and sub-research questions. It shows the impact of energy communities in Denmark and how they contribute to the larger acceptance of RES through promoting local development. Even though Austria and Denmark are two case studies there is something to learn from the other member states too. But Austrian and Danish experience served as an example based on which recommendations are presented for the EU, national and local levels. Among other things, what came up as important on all three levels is promoting the knowledge exchange between the countries.

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List of abbreviations:

Co-op	Cooperative
CSOP	Consumer Stock Ownership Plan
EU	European Union
GHG	Greenhouse gasses
NECP	National energy and climate plans
REC	Renewable energy community
RED II	Renewable Energy Directive (Directive 2018/2001/EU)
RES	Renewable energy sources
SDG	Sustainable Development Goals
UN	United Nations

1. Introduction

The consequences of anthropogenic climate change became very relevant already in 1968 when the United Nations (UN) finally acknowledged environmental issues during The Economic and Social Council and decided to organize the first UN Conference on the Human Environment. It led to the Paris Agreement, set in 2015 at COP 21 in Paris, and accepted by 196 Parties (United Nations, n.d.-b). It aims to respond to climate change in the context of sustainable development and stay well below 2°C compared to the pre-industrial level with the additional effort to limit the increase to 1,5°C to reduce the impacts of climate change by lowering the greenhouse gas (GHG) emissions. (*Paris Agreement*, 2015). Later in 2015, the UN's general assembly adopted *Transforming our world: the 2030 Agenda for Sustainable Development*. It is a set of 17 Sustainable Development Goals (SDG) and 169 targets whose aim is to balance the three dimensions of sustainable development: economic, social, and environmental while assuring that no one is left behind. The goals refer to all aspects of human life, including energy and climate (United Nations, 2015).

The UN acknowledges that a key to lowering GHG emissions is to move away from fossil fuels and utilize renewable energy sources (RES) for energy production (IRENA, 2019; United Nations, n.d.-a). Another benefit of renewable energy is that it is a cheaper, healthier, and more sustainable solution than fossil fuels and it is available everywhere in one form or another (United Nations, n.d.-a). International Renewable Energy Agency estimates that renewable energy will be able to provide 86% of global power demand and can reduce around 60% of energy-related CO_2 emissions (IRENA, 2019).

The European Union (EU) set additional targets for lowering GHG emissions in 2020, 2030, and 2050. Even with all the set targets, commitments, and action plans in place, it does not seem enough for some of the EU member states to reach their goals. Table 1 shows the share of renewable energy and progress towards the CO_2 emission reduction goals in the EU and all its member states. Red cells represent a failure in reaching the 2020 goal of having 20% of renewable energy and/or reduction of CO_2 emissions, yellow is for the ones who reached 2020 goals but are worse than the EU average, and green is for the ones whose progress is better than the EU average. Some countries have negative numbers and grey cells which means they had even more CO_2 emissions than in the baseline year.

Table 1: Progress toward the goals of EU member states

Country	Renewable energy share in 2021 [%]	Progress towards the emissions reduction goals [%]
EU	21,8	27,9
Austria	36,4	-4,0
Belgium	13,0	20,4
Bulgaria	17,0	44,5
Croatia	31,3	23,0
Cyprus	18,4	-63,4
Czechia	17,7	40,8
Denmark	34,7	44,8
Estonia	38,0	71,7
Finland	43,1	33,9
France	19,3	22,2
Germany	19,2	35,7
Greece	21,9	32,5
Hungary	14,1	33,8
Ireland	12,5	-14,0
Italy	19,0	25,2
Latvia	42,1	63,0
Lithuania	28,2	61,2
Luxembourg	11,7	29,4
Malta	12,2	28,0
Netherlands	12,3	12,8
Poland	15,6	12,8
Portugal	34,0	10,0
Romania	23,6	54,3
Slovakia	17,4	42,6
Slovenia	25,0	16,8
Spain	20,7	-1,0
Sweden	62,6	37,7

Half of the EU member states failed to reach a targeted share of energy sourced from renewable sources in 2020 (Eurostat, 2023). On average, the EU is on a good path to reaching the 2030 goals, but that's mainly due to the efforts of a few countries that are leading the progress towards the goals and implementing more renewable energy technologies than the others. If all the countries were as successful in implementation as those, the EU would be able to even exceed the goals and strengthen its role as a global renewable energy leader. Transitioning from fossil fuels to renewable energy sources is a crucial part of reaching sustainable development goals and lowering CO_2 emissions (Jørgensen et al., 2019).

To deliver the EU's commitments to reduce GHG as agreed in Paris Agreement, decarbonize the energy system, show global leadership in renewable energy, and achieve a long-term goal of being carbon-neutral in 2050, the EU adopted the Clean Energy for All Europeans package in 2019. The package consists of eight new laws about energy performance in buildings, renewable energy, energy efficiency, governance regulation, and electricity market design. EU member states had two years to adapt these new directives into national law (European Commission, 2019).

1.1. Thinking local

To reach or even exceed the set goals it is beneficial to look at an even smaller scale, into local planning. So far, most of the energy planning in EU member states seems to be done on a national level and there is still room to have more local projects and investments. Even though it is beneficial to set targets and recommendations on a national level, it might be even better to make more specific plans for smaller areas that are easier to implement when local citizens are included. National plans and regulations are insufficient to fit in the local context and tackle the challenges appearing on a local level (Westskog et al., 2022). Local energy planning is needed to connect national plans with relevant sector-specific goals in the long term (Sperling et al., 2011).

Recently EU also started recognizing the importance of developing local plans. The newest Fit for 55 package consists of eleven proposals, one of them being about social climate funding which recommends member states to implement plans on a local level as well as the regional and national (European Commission, 2021). In the Clean Energy for All Europeans package importance of local planning was addressed through the promotion of energy communities (European Parliament, 2018, 2019), and after the Russian attack on Ukraine, European Commission emphasized local solutions and innovation to enhance the energy independence of the EU in REPowerEU initiative (European Commission, 2022). It seems like local planning and decentralization of the energy system are becoming relevant in the EU right now and its benefits are more recognized.

For local planning to have a successful implementation of renewable energy technologies one of the most important factors that needs to be accounted for is the local community. Including citizens and local stakeholders, and collaborating with them on developing and implementing locally-based energy plans seems to bring a higher success rate (Berka & Creamer, 2018). Because of its small scale, local-level energy planning and implementation provide space for experimentation and development of feasible solutions that can then be enlarged and used in bigger communities (Smart Rural 21, 2022). One good example of the successful implementation of local climate plans is Samsø, an island in central Denmark. Through years of collaboration with citizens and local stakeholders, they managed to reach a net positive climate impact by 2007 and are now on their way to completely phase out fossil fuels by 2030. Through citizens' ownership and investments in renewable energy technologies, Samsø was able to become 100% self-sufficient (Energi Akademiet, n.d.). Community ownership, like the one on Samsø, influences the community's

acceptance of renewable energy sources (Berka & Creamer, 2018). There are other examples like this around the world, but it still seems like there is a lack of locally made climate plans and citizens' involvement.

The EU recognizes the importance of involving citizens. It is estimated that 50% of Europeans could be involved in producing 45% of overall electricity production. Citizens will play a crucial role in the decentralization and green transition of the energy systems by both producing and consuming energy (Hunkin & Krell, 2022).

1.1.1. Energy communities

As a part of the Clean Energy for All Europeans legislative package, a new concept of energy community is outlined. It aims to decarbonize the EU's energy system and keep the EU as a global leader in implementing RES (European Commission, 2019). More specifically, in Renewable Energy Directive (Directive 2018/2001/EU, RED II), and Internal Electricity Market Directive (REGULATION (EU) 2019/943), two types of energy communities were defined – 'Renewable Energy Community' (REC) (European Parliament, 2018) and 'citizen energy community' (European Parliament, 2019). The main difference between these two types of energy communities is that citizen energy communities can have activities in all the sectors of the electricity market, while RECs can have only renewable energy activities (Jørgensen et al., 2019). They do have some similarities and differences, and both are shown in Table 2, to get a better understanding between the two concepts. The idea of these two documents is to provide a framework that EU member states should base their Energy Community Policies to promote and facilitate the development of energy communities (European Parliament, 2019).

The concept of energy community emphasizes sustainable local planning and community involvement. Recently EU started supporting and promoting energy communities around Europe with projects and initiatives like LIFE Programme: Energy Communities – Local Ownership of Power, Rural Energy Community Advisory Hub, and Solar Energy Strategy where the European Commission makes it mandatory to set up at least one renewable energy community in municipalities with more than 10.000 inhabitants by 2025 (European Commission, n.d.-b, 2022, 2023b).

Contribution to the goals is not the only advantage that organizing energy communities has. Implementation of RES in the energy communities highly contributes to decentralization and provides flexibility to the overall energy system (Coenen & Hoppe, 2021b; Jørgensen et al., 2019). Small communities could also serve as a ground for experimenting with technical solutions and/or business models (Smart Rural 21, 2022).

Table 2: Similarities and differences between citizen energy communities and renewable energy communities (European Parliament, 2018, 2019)

	Citizen energy communities	Renewable energy communities
Similarities	Open and voluntary participation Controlled by members and shareholders Purpose: generate environmental, economic, and social benefits Not focusing on financial benefits Access to all electricity markets (directly or through aggregation) Communities and their members have the same obligations as other participants in the electricity market	
Differences	Don't have to be close to the energy source	Close to the renewable energy project owned by that community
	Operate in the electricity sector with different energy sources (renewables, fossil fuels)	A broad range of activities related to renewable energy
	Open for any actor	Restricted membership (natural persons, local authorities, small and medium-sized enterprises
	Decision-making limited to members that do not engage in large-scale commercial activity in the energy sector	Capable of remaining autonomous from individual members and market actors participating in the community
	Exclude medium-sized and large enterprises from the control	Can be controlled by small or medium-sized enterprises located close to the renewable energy project

1.2. Problem definition

The importance of decentralizing the energy system is inevitable, and the EU recognizes it (European Commission, 2022; European Council, n.d., p. 55; European Parliament, 2019). Local energy planning, involving the community, and developing energy communities are some of the solutions for faster implementation of renewable energy sources and tackling climate change. Still, there is a lack of citizen involvement even though it has the potential to bring more changes in the energy system (Hunkin & Krell, 2022). As a consequence of not involving citizens and local stakeholders in developing renewable energy systems, there is a

lack of knowledge about sustainable technologies, opposition towards these technologies, and therefore slow progress toward the goals. Energy communities have a potential to provide first-hand experience and involve community members in the adaptation of renewable energy technologies. They can help popularize the use of technologies amongst the communities resulting in a wider spread of renewable energy technologies (Coenen & Hoppe, 2021b). Local involvement through the RECs is crucial for increasing renewable energy capacities, acceptance of renewable energy technologies, and investment in these technologies (European Parliament, 2018).

Through the Clean Energy for All Europeans, the EU encourages member states to define RECs in their national laws and provide sufficient frameworks for the promotion and easier development of RECs. Still, most of the member states have inadequate frameworks on this topic (European Commission, 2022). Most EU member states do not have a proper regulatory framework that promotes and facilitates the development of RECs (REScoop.eu, n.d.). Even though renewable energy communities are becoming a hot topic in recent years there still seems to be a lack of successful frameworks that could benefit these communities.

1.3. Research questions

Short introductory research and the problem presented above show that renewable energy communities have the potential to speed up the transition to the renewable energy system in EU member states, but a lack of clear laws and directives are slowing the progress. Implementing a renewable energy community framework that promotes and facilitates the development of RECs will make setting them up easier. RECs contribute to national goals, bring independence and security to the community, and can have many other climate, health, and economic benefits. Still, there is a lack of adequate frameworks regarding this subject in most of the EU member states (REScoop.eu, n.d.).

This report will provide research on two case studies and their experience with RECs and RED II. It will investigate their implementation of RED II, look at their current and historical practice for developing RECs, and present recommendations based on their experience.

The aim of this report is to find out what did and did not work for two case studies, Austria and Denmark, and based on that present a set of recommendations for other member states and their communities. To do that the following research question will be answered:

How can the development of renewable energy communities in EU member states be improved based on lessons from Austrian and Danish examples?

Following the research question, three sub-research questions were formed to help carry out the research and get a deeper understanding of certain topics. Firstly, RED II will be reviewed, to get a better overview of the current framework proposed by the EU that

should provide easier development of RECs. To get an overview of it, the following question will be answered:

How does the implementation of RED II support the development of renewable energy communities across the EU?

The experiences of the communities in Austria and Denmark will be researched. To investigate the first-hand experience and challenges these communities are facing, the following sub-research question is asked:

What are the experiences of communities in Austria and Denmark when establishing renewable energy communities?

The historical approach to energy cooperatives (co-ops) in Denmark will be investigated. To see the impact of co-ops during the years and how it affected local energy transition, the following sub-research question will be asked:

What can be learned and interpreted to renewable energy communities from the historical example of energy co-ops in Denmark in the 70s?

Based on these sub-questions a set of recommendations for local and national authorities as well as EU will be developed to answer the main research question. The Austrian example will serve as a current example while Denmark has a long tradition of renewable energy co-ops that will be investigated. The Danish example will mostly serve as an example of the impact co-ops had during the years with a bit of investigation on how it is structured in the present.

1.4. Structure

After stating the problem and defining the research question and three sub-questions in this section relevant theories will be investigated in the Theoretical framework. That section will provide an overview of the research on RECs, and two relevant theories: innovative democracy and bottom-up approach. It will provide a better understanding of these theories, give a theoretical perspective on chosen topic, and provide a basis for analysis of the research later. Following the Theoretical framework is the Regulatory background where RED II and its transposition in the member states are reviewed.

According to REScoop.eu and DECIDE project, member states still have a long way to go in transposing RED II into national laws and regulations. RED II provided a framework for member states to work on and fit into their national law but based on the data they did not do so with regulations or definitions (REScoop.eu, n.d.; Tuerk et al., 2022).

Methods section describes the interview design and case study selection that was used for data collection that contributed to the later research. Two Case studies are presented as well as their implementation of RED II and experience from the communities. The experiences are the results of interviews conducted with the communities.

Collected data, RED II, and national policies of two case studies will be analyzed to answer the sub-research questions in the Discussion and analysis. This section will also present a set of recommendations as an answer to the main research question. Finally, the Conclusion will summarise and conclude the research, discuss possibilities for further research, and describe the limitations of this research. A graphic overview of the research design is shown in Figure 1.

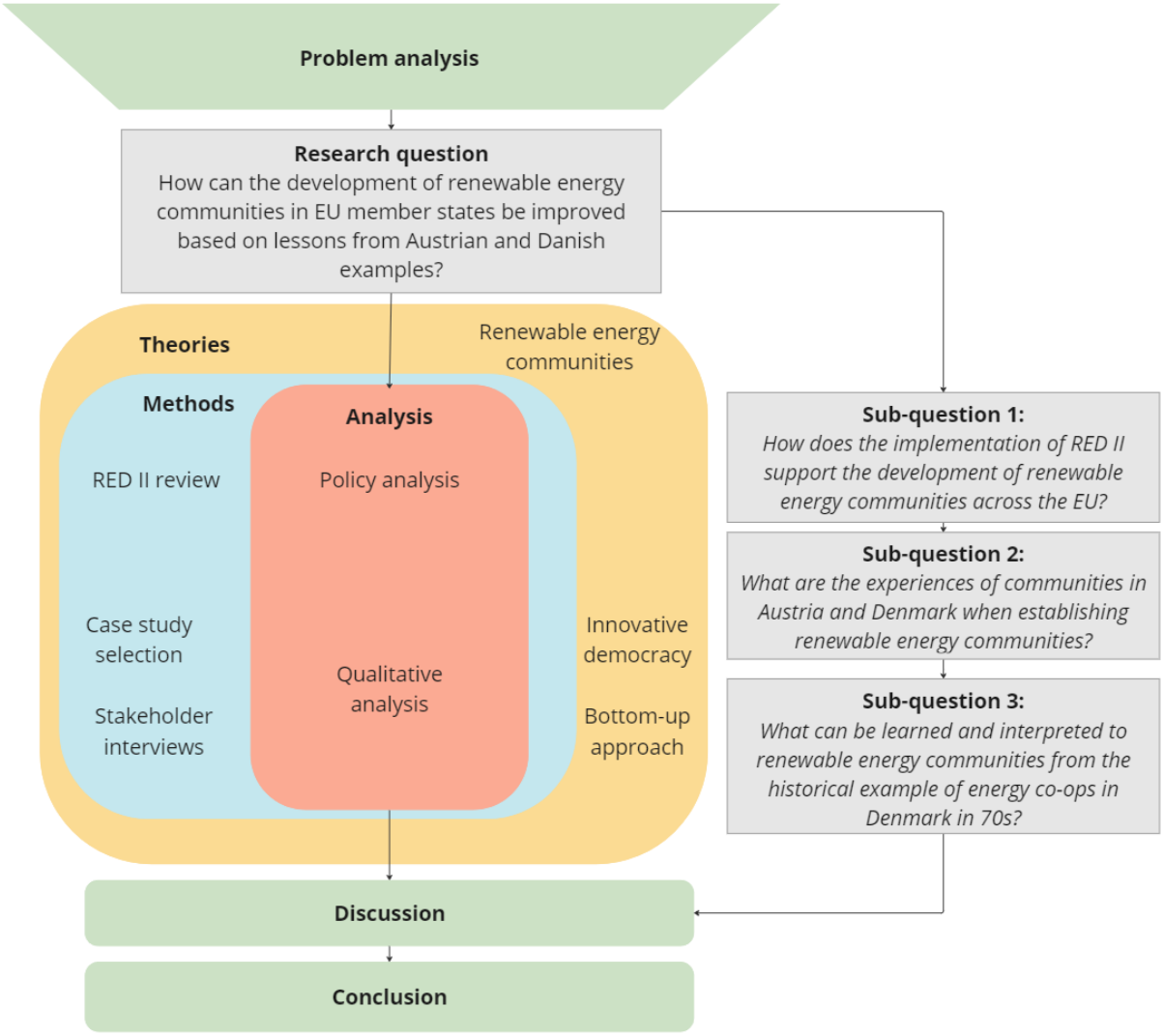

Figure 1: Research design

1.5. Delimitations

This report will focus on RECs specifically since their focus is on renewable energy and it is not restricted only by electricity production. They use technologies that do not further contribute to global warming and CO_2 emissions. Also, members are bound by the geographical area and are located in close proximity to the renewable energy source that is owned by the community, allowing them to use and share the energy produced.

The research will not include the other type of energy communities defined by the EU, citizen energy communities even though they could have renewable energy as a source. The reason for that is the fact they do not use the energy they produced locally but can be geographically far away from the source. Because of its distance from the source, the member might not feel the same sense of ownership or care about the local community living close to the source. Still, the importance of citizen energy communities and further research about them is also needed to further develop these systems. Researching citizen energy communities could potentially contribute to further promotion and integration of energy communities in the electricity markets as well as enable people living in bigger cities to contribute to sustainable energy transition in this way.

Another obstacle that could appear in the development of RECs but is not considered in this research is the technical aspect. Some communities might have weaker grid connections which could limit the installation size. To implement renewable energy sources and sell the electricity to the grid an additional investment to upgrade the grid would be needed. This research does not focus on the technical limitations that renewable energy communities could face.

2. Theoretical framework

In this section, a review of the relevant theories is shown. This will provide information for further research and analysis later in the report. This section will frame the theories that will be used later in this research. They will be used for the analysis and to help design questions for the interview. It will also present relevant research on RECs that is important throughout this whole research. It will help understand and serve as a comparison of the results from the interviews and help shape the analysis.

First, it covers the topic of renewable energy communities and recent research on this topic and then provides an overview of two theories: innovative democracy and bottom-up approach.

2.1. Renewable energy communities

Renewable energy communities are defined by RED II as communities that are controlled by the shareholders or the members that are located close to the renewable energy project developed by that same community (European Parliament, 2018). Deeper research on the topic of renewable energy communities was conducted by reviewing the literature. To find relevant literature key words 'renewable energy community', 'Renewable Energy Directive', and 'European Union' were used. Only literature written from 2019 onwards was investigated since RED II is in place since the 31st of December 2018. The search came up with 42 resources. Some of the articles were outside of the European context or not based on the RED II so those were not relevant for the research. All the literature covered at least one out of three relevant topics: social, policy, and economy. Table 3 shows an overview of the literature and which category is covered in which paper.

Most of the research is focusing on technology, innovation, and technical solutions for renewable energy solutions. Papers that focus solely on that were not investigated since the purpose of this report is not to provide technical solutions. Still, when discussed in terms of economic feasibility, laws, social acceptance of them, or similar, technologies were considered, like in some of the papers.

Only a few of the papers mention the environmental benefits of renewable energy communities (Ceglia et al., 2021; Ceglia, Marrasso, et al., 2022; Chaudhry et al., 2022). This might be due to the well-known fact that renewable energy is beneficial for lowering CO_2 emissions and good for the environment in general.

Table 3: Overview of the literature on RECs

Social	Policy	Economy
(Hanke & Lowitzsch, 2020)	(Grignani et al., 2021)	(Petrichenko et al., 2022)
(Krug et al., 2022)	(Gerundo & Marra, 2022)	(Ceglia, Marrasso, et al., 2022)
(De Ruyck et al., 2021)	(Lowitzsch, 2019b)	(Moncecchi et al., 2020)
(Coenen & Hoppe, 2022)	(Coenen & Hoppe, 2022)	(Felice et al., 2021)
(Hoicka et al., 2021)	(Moncecchi et al., 2020)	(Radl et al., 2020)
(Botsaris et al., 2021)	(Cutore et al., 2023)	(Lowitzsch, 2019a)
(Coenen & Hoppe, 2021a)	(Di Silvestre et al., 2021)	(Botsaris et al., 2021)
	(Hoicka et al., 2021)	(Ceglia, Esposito, et al., 2022)
	(Chantrel et al., 2021)	(Chaudhry et al., 2022)
	(Botsaris et al., 2021)	(Coenen & Hoppe, 2021a)
	(Ceglia, Esposito, et al., 2022)	
	(Coenen & Hoppe, 2021a)	
	(Jørgensen et al., 2019)	

Renewable energy clusters such as RECs are crucial for the acceptance of renewable energy technologies by a broader public. Leading by example can trigger changes and lead to higher renewable energy and REC adaptation (Botsaris et al., 2021; Moncecchi et al., 2020). Even European Commission agrees with that, in RED II they stated that *"The participation of local citizens and local authorities in renewable energy projects through RECs has resulted in substantial added value in terms of local acceptance of renewable energy and access to additional private capital which results in local investment, more choice for consumers and greater participation by citizens in the energy transition."* (European Parliament, 2018, p. 92). EU recognizes the value of RECs in the acceptance of RES and further promotes it in Article 22 of RED II. Engaging citizens, easy access to data, clear communication of benefits, and ensuring financial awareness are some of the recommendations for promoting renewable energy for higher implementation (Botsaris et al., 2021; McCabe et al., 2018).

One of the big socio-economic problems that energy communities are addressing is energy poverty by ensuring vulnerable households have access to renewable energy, helping provide affordable energy, job creation, and improved public health (Cumo et al., 2022). Renewable energy communities seem to have the potential to reduce total electricity costs by offering flexibility to the system and reducing consumption (Botsaris et al., 2021; Simões et al., 2021). Some argue that RECs should also assure the inclusion of vulnerable and marginalized groups through business models and policy design that allows full participation and support for REC members in need (Hoicka et al., 2021).

It is beneficial to be an owner of renewable energy technologies, but some factors influence how beneficial it is. Some of them are capacity, location, technical capabilities, electricity prices, consumption schedule, the structure of energy tariff, etc (Petrichenko et al., 2022). One of the researches defined and analyzed three factors that impact the economic benefits of REC specifically: a combination of consumer/prosumer, type of electricity tariff implemented, and technologies included. The results showed that the key factor is the number of available technologies followed by the combination of flexible technologies, and the use of capacity tariffs that further exploit the possibility to flatten the peak in demand (Felice et al., 2021). While another one argues that complementarity, or using a variety of different RES for energy production is the optimal technical and economic solution (Hoicka et al., 2021).

Many argue that there is a need for a large initial investment which is a big obstacle in starting the energy community, especially for financially vulnerable members (Ceglia, Marrasso, et al., 2022; Petrichenko et al., 2022). The investment does pay off after a certain period (Chaudhry et al., 2022; Cumo et al., 2022; Petrichenko et al., 2022) with the best cost-benefit when utilizing capacity tariff (Felice et al., 2021). RED II does encourage member states to provide financial support to the RECs (European Parliament, 2018). Different payback methodologies of RECs are shown in multiple real-life case studies in Italy (Ceglia, et al., 2022; Cutore et al., 2023; Di Silvestre et al., 2021; Moncecchi et al., 2020), Germany (Chantrel et al., 2021), Belgium (Felice et al., 2021), Greece (Botsaris et al., 2021), and other countries (Petrichenko et al., 2022; Radl et al., 2020). Some of the research is specifically done on the case of social housing (Botsaris et al., 2021), proving that RECs are profitable long-term.

There are three main phases for developing RECs design, creation, and operation. In the design phase, it is first needed to identify interested citizens, the core of the project, and renewable energy potential. After that, it is needed to estimate maintenance costs, optimize the RECs technology's size, and develop a business plan. The creation process is all about establishing governance and legal entities, obtaining licenses and financial instruments, and setting up infrastructure and contracts. Lastly, the operation includes monitoring energy and economic fluxes, maintaining infrastructure, managing subscriptions, and distributing revenues among the members (Minuto et al., n.d.).

2.1.1. Models

RECs are becoming a preferred model of cooperation between citizens and other local stakeholders in implementing clean energy sources while developing a local community (Hunkin & Krell, 2022). The two most common models for the development of RECs are the cooperative model (co-op) and the Consumer Stock Ownership Plan (CSOP). Co-op models have shown to be successful in the development of RECs in the EU. The 'One member, one vote' principle of co-ops seems to bring economic and social benefits to the members and the community in general (Hoicka et al., 2021). Co-ops are beneficial because they lower the cost barrier for renewable energy adaptation (Viardot, 2013). The challenge of co-ops is

relying on the volunteer work of its members. They require upfront capital from new members which is a barrier in low-income communities and not providing equality and inclusivity (Hoicka et al., 2021). Another common ownership model is Consumer Stock Ownership Plan (CSOP). Here, consumers can use external financing and borrow money to invest in renewable energy. After selling the energy produced the revenue is used to repay the loan. Once the debt is paid, revenue is distributed to the consumer-beneficiaries. This model is beneficial for low-income communities or for citizens that lack upfront capital. In CSOP, voting rights are proportionate to shareholding with some limits to ensure no one actor can have a majority of decision-making power (Hoicka et al., 2021). Table xx shows a comparison of cooperatives and CSOP with regards to the RED II.

Table 4: Cooperative and CSOP comparison (Hoicka et al., 2021)

	Cooperative	**CSOP**
Eligibility as REC	Yes - prevalent in mid-size projects; lead by cooperative principles	Yes - designed for heterogeneous co-investors; voting rights proportional to shares; not suited for small projects
Involvement in decision making	Direct: "one member one vote"; general assembly is the highest decision-making body	Indirect/two-tier: the trustee exercises rights for consumer-shareholders for day-to-day decisions; only crucial decisions are voted on first and then represented by the trustee on the board
Inclusiveness	Members contribute commitment and capital. A low share price usually facilitates entry	Financing technique based on leverage; only symbolic capital contribution; no day-to-day personal involvement required
Transferability of shares	Transferable with restrictions; entry into the commercial register	Freely transferable; low transaction cost; only trusteeship agreement is altered
External management	Not possible; managers elected by and from the general assembly	The trustee controls the management board; can hire external expertise
Compatibility with existing municipal/conventional investment models	Emergent with challenges remaining	Full compatibility

2.1.2. Producing and sharing energy

REC consists of three types of actors – citizens, investors, and energy system actors. A group of citizens starts a REC and acts as prosumer or consumer, and co-owner of the community. A consumer is a member of the community that does not produce energy from RES but only buys it from the other members that are producing it. Prosumer, on the other hand, is both a producer and consumer of renewable energy and is a very common member of REC (Chaudhry et al., 2022). Smart prosumers both produce energy and provide more flexibility to the grid (Chaudhry et al., 2022; Simões et al., 2021). Grid operators can shape consumption to enhance flexibility by using dynamic pricing or designing local markets as a motivation for prosumers to reshape their consumption based on distribution system requirements. By using adequate meters and sensors, prosumers can follow certain goals like reducing electricity costs or maximizing profit from selling the produced energy (Simões et al., 2021). Prosumers seem to be an essential part of the clean energy transition and development of REC (Chaudhry et al., 2022).

Investors are actors that invest their money in setting up the REC, and they can be both financial institutions and individual investors. They do not consume any energy produced in the REC so they are non-prosumer co-owners of the community (Chaudhry et al., 2022). The last group of actors in the REC is Energy System Actors. They are in charge of the maintenance of the balance of the local energy system and its connection to the national energy system. This group can consist of energy suppliers and distribution system operators.

Since REC is consisting of two types of members, generators and users of energy, Moncecchi et al made a model where the energy consumed can be categorized into self-consumed, shared, and bought energy. Self-consumed energy is produced and consumed at the same point of delivery, which is mostly one member. The more energy is self-consumed the more money it will save. Shared energy is produced by a generator and consumed by different users. It also brings some savings, but not as much as self-consumption. Lastly, bought energy is the energy that is bought from the market when generators are not producing enough energy to satisfy the community's needs (Moncecchi et al., 2020). The energy produced but not shared within the community can be sold on the market generating additional revenues but at a lower cost. This type of model is good for defining the overall cash flow in the RECs (Moncecchi et al., 2020).

Blockchain technology provides full transparency and enables both production/consumption networks and management systems to be decentralized while ensuring privacy (Di Silvestre et al., 2021). All members connected to the grid have to be identified contractually and technically which prevents unknown participants from intervening and interrupting REC governance. Since the trust between the members is not necessarily high, smart contracts are then developed. The agreed rules are uploaded to the REC's blockchain and the smart contract accesses the consumption/production values to establish the price for electricity produced by the community therefore enabling the social and economic involvement of the members (Chantrel et al., 2021). *"In conclusion, the blockchain technology is suitable for automating the reconstruction (smart contract) as well*

as for finding a consensus within a community of participants (definitions of the rules within a smart contract) without having to publish individual consumption values." (Chantrel et al., 2021, p. 480).

2.1.3. Challenges

Even though RECs have many positive sides, sometimes they can raise some issues. Small entities like RECs are governed mostly by people who are not experts in electrical systems and have limited knowledge about it. This can cause obstacles in controlling and predicting the market dynamics (Di Silvestre et al., 2021). It can also create barriers when connecting to the grid. Connecting RES and therefore RECs to the grid can be complex and require coordination with utility companies and regulators (Chantrel et al., 2021). Members of RECs are usually connected to low or medium-voltage grids so problems may come up when the grid operator changes the structure of the grid after the establishment of REC (Fina & Fechner, 2021).

RES like solar and wind are not consistent, and their output can vary from day to day or even one hour to another depending on weather conditions. Since RECs use renewable energy for energy production, this can make it difficult to ensure a consistent and reliable energy supply for its members. There is a need for additional investment to implement energy storage which could ensure a reliable supply. Those technologies can often be expensive and require technical expertise to maintain (Krug et al., 2022; Lowitzsch, 2019a; Micallef et al., 2022).

Renewable energy projects are also often opposed by some citizens due to different concerns like noise, visual impacts, or others. RECs do promote and help with the acceptance of RES but there always might be members that are opposing them. Also, as already mentioned above, one of the disadvantages of RECs is a high investment cost which could discourage some of the members from investing in sustainable technologies (Ceglia, Esposito, et al., 2022; Petrichenko et al., 2022).

In conclusion, RECs can be crucial for the acceptance of RES by the public (Botsaris et al., 2021; Moncecchi et al., 2020). They could also be a solution to energy poverty by providing affordable energy, offering energy savings, and creating new jobs in the community (Botsaris et al., 2021; Cumo et al., 2022). However, they do have high initial investment that can create a barrier but multiple researches show that it does pay off (Ceglia, Esposito, et al., 2022; Cumo et al., 2022; Petrichenko et al., 2022). RECs can be set up in different ways (Hoicka et al., 2021), and energy can be consumed, shared, and bought (Moncecchi et al., 2020) by multiple different actors (Chaudhry et al., 2022). To keep everything running smoothly, blockchain technology provides transparency, and with the help of smart contracts it keeps everything regulated (Chantrel et al., 2021; Di Silvestre et al., 2021). The biggest challenge of RECs is the fact that it is mostly governed by people who are not experts which can create some barriers in connection to the grid and market regulations (Chantrel et al., 2021; Di Silvestre et al., 2021).

2.2. Innovative democracy

Innovative Democracy, Political Economy, and the Transition to Renewable Energy, a paper by Frede Hvelplund, describes innovative democracy in the example of Danish technology change from fossil fuels to renewable energy. Innovative democracy is a political economy paradigm that appreciates that market rules currently in place are designed in political processes but recognizes the need for redesign to move away from fossil fuels. It exists when alternative goals and technical possibilities are established in an unbiased way (Hvelplund, 2014).

Figure 2 shows how different components interact in innovative democracy. Different lobby groups and political processes have the same weight when putting pressure on and influencing the system. In the Danish example, these were (i) old lobbyists dependent on the energy market who promoted and used fossil fuels; (ii) new lobbyists dependent on the energy market who promoted renewable energy sources; and (iii) lobbyists who were independent of the energy market. Both old and new lobbyists were dependent on the energy market because they did have an economic interest in the discussed technologies. Lobbyist independent from the energy market are NGOs, the public, and the public that provides research on the technologies, suggest policies, and make energy plans.

Hvelplund argued that: *'if parliamentarians aspire to have different political scenarios to choose between, they must establish a resource and information balance between the dependent and the independent lobbyists.'* (Hvelplund, 2014, p. 13). For such a balance it is necessary to have independent research units like universities which should have the freedom and resources to do independent research on technical scenarios. Access to public plans, cost, and capacity should be easily accessible to the public, and offices and test centers for advising the public should be established. Lastly, a fair distribution of public funds to independent institutions is necessary to achieve the balance between dependent and independent lobbyists. This could also spark the interest of both the public and organizations (Hvelplund, 2014).

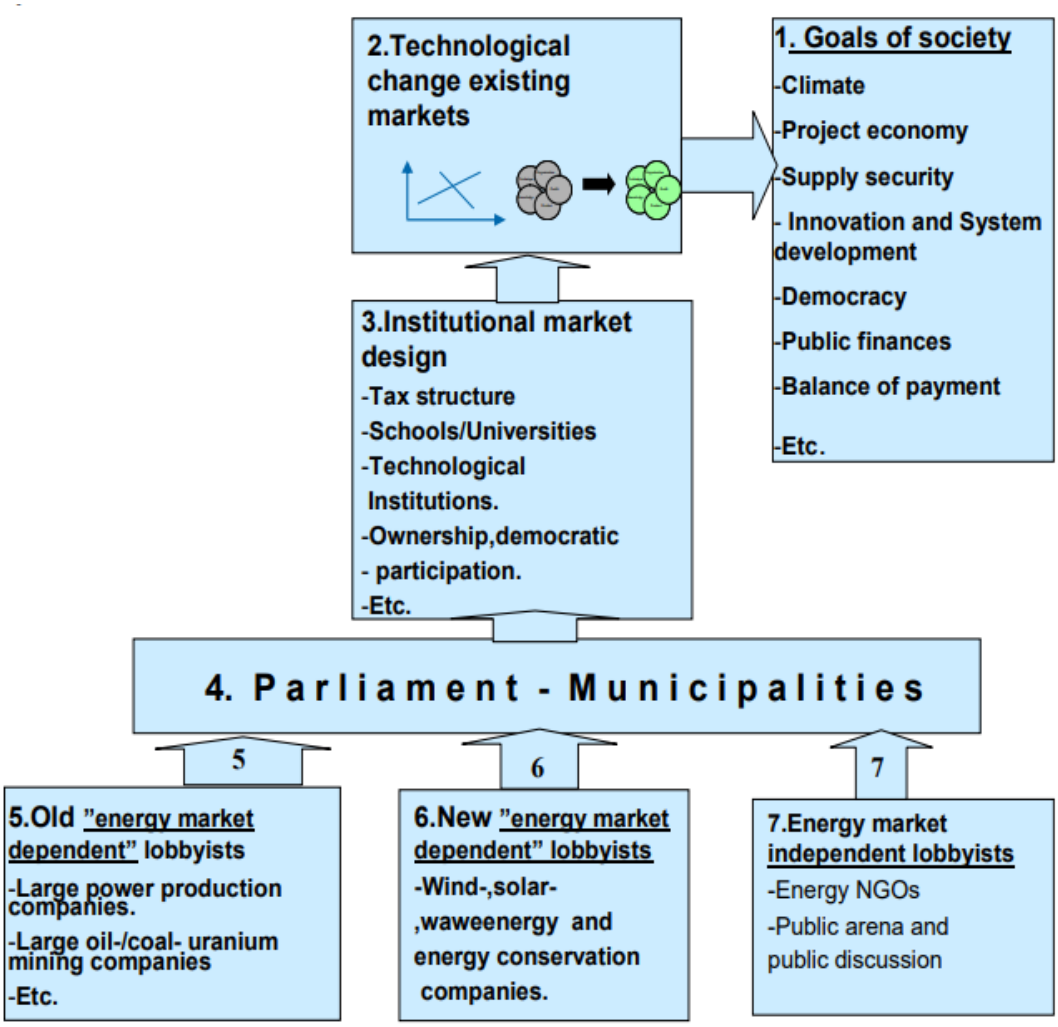

Figure 2: Innovative democracy interactions (Hvelplund, 2014, p. 13)

Both dependent and independent lobbyist and their research have the same influence on the municipalities and parliament in deciding on institutional market conditions and technical changes. In this case, it is a reform of the renewable energy market through the changes in taxes, technological institutions, ownership, and schools/universities leading to the discourse regarding realistic technical scenarios. Finally, this leads to alternative goals and norms of the society that are based on the research from both dependent and independent, as well as 'old' and 'new' lobbyists (Hvelplund, 2014).

Because it is considering all relevant stakeholders, innovative democracy is a theory that could support governments around Europe in the decentralizing energy system by developing and promoting RECs. It also allows new actors to enter the scene and influence the decisions made, and it considers the input of neutral actors like universities which can be crucial for having fair decision-making (Hvelplund, 2014). This report uses innovative democracy to analyze how the Danish system changed since the initial move from fossil fuels in the 70s, to more sustainable energy production, but it also compares the current Austrian approach to this theory.

2.3. Bottom-up approach

Based on Rayner's research, bottom-up approach to climate policy should be implemented at the lowest possible level of the organization. For example, making climate plans on a local level instead of regional or national is more beneficial for a faster sustainable transition. It is also easier to implement sustainable solutions on a local level. However, this does not mean that absolutely everything should be done on a local level, it is beneficial to have national or international goals and agreements that will motivate countries and communities to reach them (Rayner, 2011).

The bottom-up approach starts with adaptation and it fully abandons the idea that climate change policy needs a universal framework (Rayner, 2011). In that way, a lot of attention is given to analyzing climate change, and defining and making global agreements instead of focusing on the action (Bhave et al., 2013) Since not all nations are equally responsible for emissions of GHG, not all of them should do the same things. The richness of the area also plays a big role in both the amount of pollution and possibilities for the solutions which is the biggest argument for not having a universal framework and working at solutions for different local adaptation strategies. This approach first characterizes social vulnerability to then identify adaptation options by using participatory processes (Bhave et al., 2013; Rayner, 2011).

RECs are a bottom-up initiative driving an energy transition in the EU. The EU's and national frameworks that define RECs are posed from the top-down, but local investment and development are the core of the RECs. The bottom-up theory is a necessary part of investigating how these local sustainable initiatives can drive change on a higher level and how they can be combined with the current model. This approach is used in analyzing the current and past approaches of the two case studies to investigate the influence of a local level on a higher political scene. It also partially guided the recommendations to give more space for local influence and local projects.

3. Regulatory background

3.1. Renewable Energy Directive (RED II)

As a part of the Clean Energy for All Europeans package adopted in the 2019 Renewable Energy Directive (2018/2001/EU), RED II was revised. It aims to show that the EU is a global leader in renewable energy sources development, and it contains a commitment to reach the target of having 32% of renewable energy in the mix by 2030 (European Commission, 2019). Among all the other things, RED II defines renewable energy communities and provides member states with recommendations for developing a framework to promote and facilitate the development of renewable energy communities (European Parliament, 2018). Article 22 is the one specifically addressing renewable energy communities in RED II:

> *"Member States shall ensure that final customers, in particular household customers, are entitled to participate in a renewable energy community while maintaining their rights or obligations as final customers, and without being subject to unjustified or discriminatory conditions or procedures that would prevent their participation in a renewable energy community, provided that for private undertakings, their participation does not constitute their primary commercial or professional activity."* (European Parliament, 2018, p121)

Based on Article 22, RECs should be entitled to producing, consuming, storing, and selling renewable energy, they should be able to share the produced renewable energy within the REC and have access to all suitable energy markets. In their framework, member states should also ensure: (i) the removal of unjustified barriers for RECs; (ii) RECs that provide energy services are subject to relevant provisions (iii) that relevant operators of distribution system cooperate with RECs; (iv) that procedures are fair, transparent and proportionate so that RECs can contribute to the system in a fair and balanced way; (v) that RECs are not discriminated regarding their activities, rights, and obligations; (vi) that all consumers have access to participating in RECs no matter the income level; (vii) access to finance and information tools; (viii) regulatory and capacity building support in enabling and setting up RECs; (ix) equal and non-discriminatory treatment of consumers in RECs. Additionally, they could enable RECs to be open to cross-border participation (European Parliament, 2018).

To provide adequate frameworks, remove current barriers, and use the full potential of RECs member states had to assess their frameworks in place, or lack of them by June 2021 (European Commission, n.d.-a). By then every member state should have developed address RECs in their national frameworks. RECs should also be a part of the updated member states' NECPs (European Parliament, 2018). RED II does not include a full set of rules for defining and regulating RECs but rather provides a minimum of what should be addressed in the national framework. Member states are encouraged to develop a set of additional rules whose aim is promoting and facilitating RECs as fit for specific countries (REScoop.eu, 2022).

3.2. Implementation of RED II in the laws of EU member states

REScoop.eu developed a transposition tracker to assess the level of transposition of national frameworks and support schemes for renewable energy communities in EU member states. Each country's frameworks and support schemes were evaluated based on 12 different indicators: (i) Assessment of obstacles and potential for development; (ii) Removal of unjustified regulatory & administrative barriers; (iii) DSO duties around cooperation with ECs and facilitation of energy sharing; (iv) Fair, proportionate, and transparent registration & licensing procedures; (v) Incentives connected to network tariffs based on a CBA; (vi) Non-discriminatory treatment as a market participant; (vii) Accessibility to low-income & vulnerable households; (viii) Tools to access finance; (ix) Tools to access information; (x) Regulatory capacity building for public authorities; (xi) NECP reporting on enabling frameworks; (xii) Support Scheme adapted for RECs (REScoop.eu, n.d.). The tracker is frequently updated when new developments in national legislation occur. The data presented further in this report represent the state of national frameworks in December 2022, which is the last time the tracker was updated. The next update is coming during the fall of 2023 (S. Pappa, personal communication, 15 May 2023).

All the indicators separately and overall assessment are graded as bad transposition, substantial deficiencies, average progress, good practice, or best practice (REScoop.eu, n.d.). As it seems from the grading system on REScoop.eu websites, 'bad transposition' mostly means that the indicator was not even mentioned in the national framework, and 'substantial deficiencies' usually indicate that the point is only mentioned and not explained. 'Average progress' provides a little bit more explanation on the topic, and 'good practice' and 'best practice' provide a clear and detailed explanation of RECs and their framework.

Graded as a 'good practice' are Austria, Ireland, Italy, and the Netherlands. They are the leaders in energy community frameworks and support schemes transposition since no country is selected as the 'best practice'. On the other end, seven countries, Bulgaria, Czechia, Estonia, Finland, Lithuania, Poland, and Sweden, made 'bad transposition' based on the REScoop.eu data. More than half of the member states had either substantial deficiencies or bad transposition of RED II regarding the topic of RECs. Progress and updates in the national laws are updated on the REScoop.eu's websites too as they come (REScoop.eu, n.d.). A full overview of transposition based on all twelve indicators in all member states can be found in Annex, Transposition of RECs framework in all EU member states.

Several research organizations from the EU have collaborated on a DECIDE project (Developing energy communities through informative and collective actions). The project aims to gain an understanding of how energy communities are established, and which kind of interaction is the best for encouraging participation in them. DECIDE focuses only on five pilot countries – Austria, Belgium, Estonia, Germany, and Greece, but gives information on the transposition of other EU member states too. The data of this research is from May 2022 and the new, updated report is coming in late May 2023 (F. Pichler & R. Rosegger,

personal communication, 13 May 2023). DECIDE's transposition tracker only shows if the member state implemented frameworks or not, as shown in the third column of Table 5. They do note that implemented framework can differ between the member states and be more or less elaborated (Tuerk et al., 2022).

On the other hand, European Commission made an Energy Communities Repository where an inventory of all Energy Communities in the EU and their specific data is presented (Directorate-General for Energy, 2023). Countries with the most communities in the EU are Germany, Netherlands, and Denmark, both when considering just the number of communities and a number of communities in comparison to the population of the whole country. On the other hand, Cyprus does not have any energy communities, while Bulgaria, Hungary, Malta, and Romania have only one each. Table 5 presents several communities in each of the member states, REScoop.eu transposition evaluation, and the transposition data from DECIDE project. Data from REScoop.eu is more current since they updated their tracker in December 2022, compared to DECIDE's data from May 2022. Therefore, there might be slight differences, for example, DECIDE says Germany did not transpose the framework but REScoop.eu says they do have average progress.

Table 5: Transposition of RECs framework and number of communities in the EU member states (Directorate-General for Energy, 2023; REScoop.eu, n.d.; Tuerk et al., 2022)

Country	Number of communities	Implementation of RECs framework (REScoop)	Implementation of RESs framework (DECIDE)
Austria	384	Good practice	Implemented
Belgium	106	Average progress	Implemented
Bulgaria	1	Bad transpostition	Not implemented
Croatia	12	Substantial deficiencies	Draft
Cyprus		Substantial deficiencies	Draft
Czechia	35	Bad transposition	Not implemented
Denmark	633	Substantial deficiencies	Implemented
Estonia	129	Bad transposition	Implemented
Finland	83	Bad transposition	Not implemented
France	343	Average progress	Implemented
Germany	4848	Average progress	Not implemented
Greece	159	Average progress	Implemented
Hungary	1	Substantial deficiencies	Draft
Ireland	541	Good progress	Implemented
Italy	198	Good progress	Implemented
Latvia	4	Average progress	Not implemented
Lithuania	19	Bad transposition	Implemented
Luxembourg	66	Average progress	Implemented
Malta	1	Substantial deficiencies	Not implemented
Netherlands	987	Good progress	Draft
Poland	82	Bad transposition	Draft
Portugal	11	Average progress	Implemented
Romania	1	Substantial deficiencies	Draft
Slovakia	23	Substantial deficiencies	Not implemented
Slovenia	8	Substantial deficiencies	Implemented
Spain	235	Average progress	Implemented
Sweden	329	Bad transposition	Draft

3.2.1. Defining RECs in national legislation

REScoop.eu also reviewed how well the definition of RECs and CECs is transposed in the EU member states. The same grading system was used for the transposition of the framework, and the results can be seen in Table xx. The assessment of definition was done through nine different indicators (i) criteria of EU definition reflected in national definition; (ii) level of detail in the elaboration of principles contained in EU criteria; (iii) clearly defined purpose; (iv) ICA cooperative governance principles reflected; (v) legal entities allowed; (vi) citizen participation is ensured; (vii) designed authority to oversee; (viii) number of definitions; (iv) coherency between definitions (REScoop.eu, n.d.). A full comparison of all

member states' definition through all the indicators can be found in Annex, Definition of RECs in all EU member states.

More member states, to be exact six of them, are graded as good practice for defining RECs than they are for transposing RECs framework where only four member states were graded as 'Good practice'. In general member states did a much better job in defining RECs than transposing the RECs framework. Only Bulgaria, Czechia, Poland, and Sweden did bad transposition of the definition (REScoop.eu, n.d.).

Table 6: Transposition of the REC definition

Country	Definition of RECs (REScoop)
Austria	Substantial deficiencies
Belgium	Good progress
Bulgaria	Bad transposition
Croatia	Substantial deficiencies
Cyprus	Average progress
Czechia	Bad transposition
Denmark	Good progress
Estonia	Substantial deficiencies
Finland	Substantial deficiencies
France	Good progress
Germany	Good progress
Greece	Average progress
Hungary	Substantial deficiencies
Ireland	Good progress
Italy	Good progress
Latvia	Average progress
Lithuania	Average progress
Luxembourg	Substantial deficiencies
Malta	Substantial deficiencies
Netherlands	Average progress
Poland	Bad transposition
Portugal	Substantial deficiencies
Romania	Substantial deficiencies
Slovakia	Substantial deficiencies
Slovenia	Average progress
Spain	Average progress
Sweden	Bad transposition

According to REScoop.eu and DECIDE project, member states still have a long way to go in transposing RED II into national laws and regulations. RED II provided a framework for member states to work on and fit into their national law but based on the data they did not do so with regulations or definitions (REScoop.eu, n.d.; Tuerk et al., 2022).

4. Methods

4.1. Case study selection

Data from Table 5 was used to make a categorization as shown in Figure 3. All the member states are categorized based on how well RED II is implemented in their national laws and the number of communities they have in comparison to their population. Four categories represent countries with a high number of communities and good RED II implementation, a high number of communities and bad RED II transposition, a low number of communities and good RED II implementation, and a low number of communities and bad RED II transposition. Additionally, there is one more category with the countries that are average in both aspects.

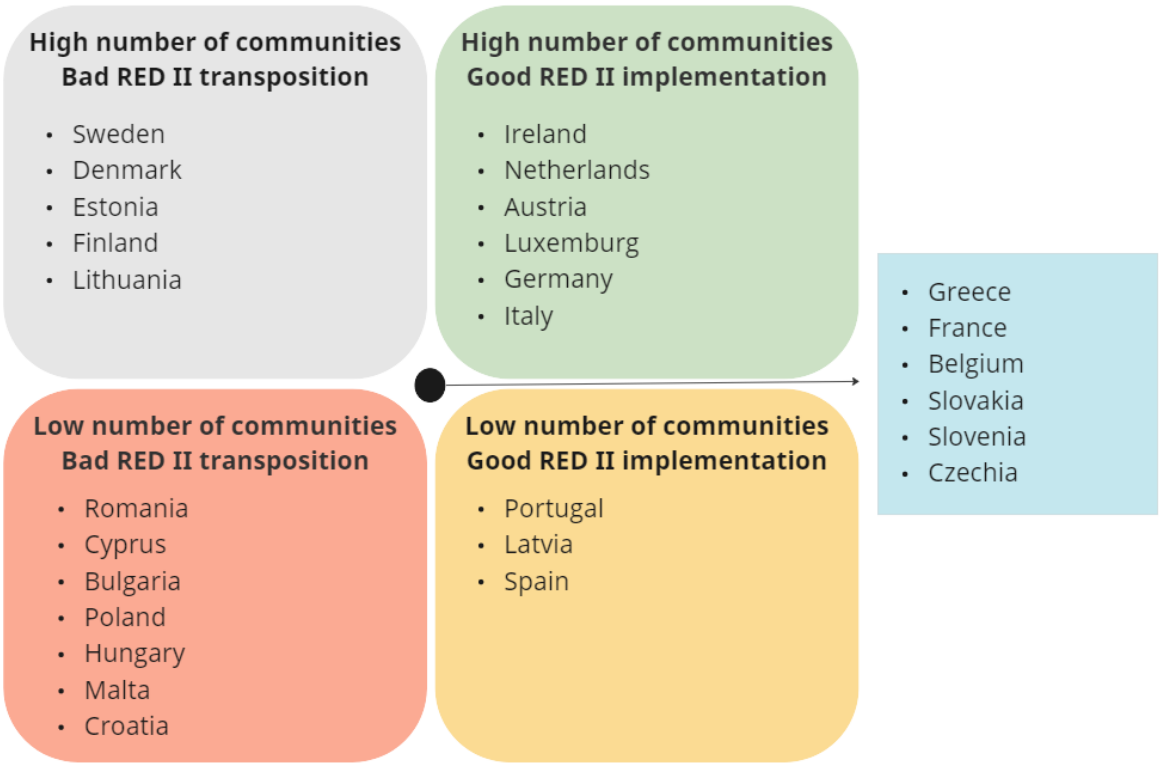

Figure 3: Categorisation of member states based on the number of communities and transposition of RED II

Since this research aims to provide recommendations for better facilitation and development of RECs based on good examples, it is decided to look into the two categories that have a high number of communities. A high number of communities indicates that they are doing something good for the development of communities. One member state from bad and one from good RED II implementation are taken as case studies.

It is interesting that all the countries in the 'High number of communities; Bad RED II transposition' category are Nordic or Baltic countries. Those countries usually have a long tradition of co-ops and promoting the development of community-owned projects (Di Silvestre et al., 2021). One of the most popular examples with a long tradition of energy co-

ops and citizen-owned energy productions is Denmark and therefore it is chosen to be a case study representing this section.

Even though Denmark did not do the best job in implementing the RECs framework in their national legislation it is one of the case studies because of its long tradition of energy co-ops. Since co-ops reached their peak popularity in the 70s and 80s when Denmark was in the middle of a transition from fossil fuels to renewable energy sources due to the energy crisis, they mostly invested in renewable energy sources. Often, citizens involved in co-op live in close proximity to the production unit, and they do participate in different renewable energy actions, not just electricity production (Chittum & Østergaard, 2014; Wierling et al., 2018). Because of the reasons listed, they are similar to RECs as the EU defines them today.

Since the concept of REC is new in the EU, we still cannot see its full impact. Therefore, because of their similarity to RECs, Danish energy co-ops can, through their impact and development so far, show what we can expect from RECs in other member states. The impact of Danish energy co-ops on the public, acceptance of renewable energy sources, and the interest it brought could be indicators of how RECs will be accepted by the citizens of other member states. This will provide a bit deeper understanding of RECs and how they could influence the development of RES, and citizen participation in renewable energy projects. There is something to learn from this example and its success, but also some mistakes were made that others could avoid. It will be interesting to investigate what happened in Denmark after that and why are RECs not promoted nowadays.

All of the countries in the 'High number of communities; Good RED II implementation' category are Western European countries. The case study chosen to represent this category is Austria. In comparison to, for example, Netherlands and Germany, Austria does not have a tradition of community projects and co-ops, but its government is successfully doing all the right steps for the successful development of RECs. On top of that, REScoop.eu claims that Austria has one of the best transpositions of RED II and best-defined RECs among the member states (REScoop.eu, n.d.). Because of its implementation of RED II and a high number of communities, Austria could be further investigated. It could be an inspiration for other communities and countries on a similar journey.

These two examples of Austria and Denmark will help highlight some disadvantages and advantages of RECs and energy co-ops both in the past and present. While Denmark had a successful past with some difficulties in current days, Austria is current a successful example with less traditional locally owned renewable energy projects. This is also reflected in the research design where the Danish example is researched more through the already published papers and research about the energy co-ops in the past while the research of the Austrian example is based on the interviews to investigate the current state.

4.2. Interviews

Interviews are conducted with members representing the Danish and Austrian communities, and a representative of REScoop.eu. They will provide qualitative data for the research. Danish and Austrian interviews will help investigate the experiences of RECs in these countries. REScoop.eu interview will provide a better understanding of one of the European federations that closely work with RECs and their view on this topic.

The interviews were guided with 6-10 questions to lead the course of the interview and give the interviewees the freedom to tell their stories. Guided interviews are a part of the subset of unstructured interviews, and they can provide qualitative results (Gubrium et al., 2012). Guiding questions vary for different interviews since each of them has a different context and background but some of the questions are common in all of them.

The questions are molded with the help of the two theories the bottom-up approach and innovative democracy as well as the theoretical background on RECs. Innovative democracy and bottom-up approach both triggered the questions on collaboration with authorities to investigate the involvement of small local groups in the decision-making and their influence. All the questions for the interviews can be found in Annex, Questions for interviews.

4.2.1. Austrian and Danish stakeholders

The Danish stakeholder that is interviewed for this research is a representative of a group of people who want to start a REC on Samsø island in Denmark. The person interviewed was one of the initiators of this project and an active member of the community. The development of the community is still ongoing.

From the Austrian side, two stakeholders were interviewed. A mayor of the village Stanz is currently working on starting a REC in Austria, and an expert helping in the process. Mayor was the one who initiated the process of sustainable development and engaged locals. The interview was conducted during a stay in Stanz, Austria where I had an opportunity to talk to the locals. This was a personal conversation documented with notes taken during and/or after the interview and it gave an understanding of the interest of people in investing in RES and joining a REC.

The purpose of these interviews was to hear the experience of groups of people in Austria and Denmark that wanted to start a community. Questions aimed to discover the motivation for starting a community, what are the current challenges in trying to start a REC in two case study countries, how was their collaboration with authorities during the process, and what can be improved to enhance further development of RECs.

Interviews were conducted with only one community from Austria and one from Denmark, the results and views may differ for other communities in those countries. Also, these communities are still in the process of starting which might be beneficial for seeing the most current problems appearing, but they also might not have a full picture since they

are not finished with the development. Therefore, the research could be further built on to investigate other communities' experiences.

4.2.2. REScoop.eu representative

A representative from the European federation of citizen energy cooperatives – REScoop.eu was interviewed. Since they did research on RECs policies in all EU member states and developed a tracker on the level of transposition of RED II regarding the RECs in the national legislations, an interview with them will highly contribute to the research.

This interview aims to investigate the details of transposition in the member states and REScoop.eu's perspective on failed transpositions. It also served for getting a better understanding of the transposition tracker and hear about the possible improvements and recommendations from their perspective. REScoop.eu could also highlight the common mistakes and some of the, in their opinion, best practices on transposing certain points of the Article 22 of RED II.

5. Case studies

Two countries are chosen to be case studies for this project – Austria and Denmark. The methodology for choosing them is described in the Methods, Case study selection. Both have a high number of energy communities but achieve that differently. These two countries can serve as an example of a successful development of energy communities from two different approaches and we can learn from both their success and mistakes.

5.1. Austria

Austria had well-defined electricity market regulations since the early 2010s. Their main electricity law, the Federal Act Providing New Rules for the Organization of the Electricity Sector (Electricity Act 2010), provides regulations for the generation, transmission, distribution, supply, and billing of electricity, as well as regulations for organizing the electricity industry. Even before RED II implementation and defining RECs, Austrian citizens were able to produce electricity for their consumption and sell the excess to the electricity supplier who would then sell it to others (Biresselioglu et al., 2021).

The first process of drafting the framework for RECs in Austria started in 2017. Before that, it was hard to establish energy communities in Austria, especially with electricity production as a main business. The new framework allowed energy sharing within the borders of one property with the main intention of energy sharing and the development of energy communities within one building consisting of multiple apartments and families. However, this framework did not live up to expectations, energy communities within the multi-apartment buildings were rarely developed due to unawareness, lack of support, and legal uncertainties (Fina & Fechner, 2021).

Later, due to the enforcement of RED II, Austria was obliged to change its regulation on RECs and develop one that better supports establishment of RECs. The government recognized the potential of RES and decided to increase the production of renewable energy by 50% in comparison to 2020 to reach the goal of having electricity generated 100% from renewable energy by 2030. They also saw an opportunity to use this new concept of energy communities to reach their ambitious goals and allow citizens to participate in Austria's green energy transition.

After that, the development of RECs has been driven more by grassroots initiatives. RECs became very popular and successful in Austria with many communities forming their energy cooperatives and investing in renewable energy sources. The success of RECs came very quickly. In March 2022, only 14 RECs were in operation, 34 were in the process of implementation, and 88 were in the process of planning. At that time it was also estimated that 1.000 energy communities could emerge in Austria in the next few years (Schober, 2022). Today Austria has more than 1400 communities, most of them being RECs (EDA, 2023).

The Austrian government has provided some support for these initiatives. Feed-in tariffs and investment grants helped, but the development of RECs has been largely driven by the initiative of citizens and local communities (Fina & Fechner, 2021). Another reason for the high success of RECs in Austria is the coordination office for energy communities. The Ministry of Climate Protection set up the Austrian Coordination Office for Energy Communities (Österreichischen Koordinationsstelle für Energiegemeinschaften) whose aim is to optimize framework conditions to ensure the successful implementation of energy communities around the whole of Austria. The coordination office also provides support in setting up communities and helps keep them fast, efficient, transparent, and at the same time ensuring quality. The coordination office website provides citizens with an overview of funding programs, guides, examples of contracts, online calculation tools, external support, and many other things (Klima- und Energiefonds, 2023).

5.1.1. Implementation of RED II

Austria presented a draft that covers the provision of RED II and regulations for establishing and operating RECs in early 2021 and published the final version in July of the same year (Biresselioglu et al., 2021; Fina & Monsberger, 2022). With the new regulations presented in Renewables Expansion Law (Erneuerbaren-Ausbau-Gesetz, EAG), Austria made it possible for the communities to be established and operate in the energy market as equal actors (Biresselioglu et al., 2021).

Based on the REScoop.eu data and classification, Austria is one of the countries that is furthest along in the process of transposing RED II rules on RECs (REScoop.eu, n.d.). Their transposition seems to be effective and it enables easy and efficient development of RECs (Directorate-General for Energy, 2023). The reasons why their transposition is effective are presented later in this chapter.

Table 7 shows how well the RECs framework is implemented based on all REScoop.eu's indicators. Most of the indicators are marked as a good practice and only one, 'Accessibility to low-income & vulnerable households' is marked as a bad transposition. The reason for that is that this aspect is not addressed (REScoop.eu, n.d.).

The Austrian government regulated RECs in even more detail than recommended in RED II, especially about who can participate in REC, tariffs, and collaboration between grid operators and RECs. Additionally, Austrian RECs can own and operate distribution networks (Fina & Fechner, 2021). Two types of RECs are defined, local energy communities, and regional energy communities. Local energy communities are operating on the low voltage grids, while regional energy communities operate on the medium voltage grids (Tuerk et al., 2022). On top of generating, consuming, storing, and selling energy from RES, Austrian RECs are also entitled to be active in aggregation and to provide other services. As they did before, RECs do have the right to choose the supplier they prefer (Biresselioglu et al., 2021).

Table 7: Transposition of RECs framework in Austria and Denmark (REScoop.eu, n.d.)

	Austria	Denmark
Implemented renewable energy communities framework	Good practice	Substantial deficiencies
Assessment of obstacles and potential for development of ECs	Average progress	Bad transposition
Removal of unjustified regulatory & administrative barriers	Good practice	Average progress
DSO duties around cooperation with ECs and facilitation of energy sharing	Good practice	Average progress
Fair, proportionate, and transparent registration & licensing procedures	Good practice	Bad transposition
Incentives connected to network tariffs based on a CBA	Good practice	Average progress
Non-discriminatory treatment as market participant	Average progress	Average progress
Accessibility to low-income & vulnerable households	Bad transposition	Good practice
Tools to access finance	Good practice	Good practice
Tools to access information	Best practice	Bad transposition
Regulatory capacity building for public authorities	Good practice	Bad transposition
NECP reporting on enabling frameworks	Average progress	Average progress
Support Scheme adapted for RECs	Average progress	Bad transposition

When the REC is established, it can be organized as an association, cooperative, business partnership, corporation, or similar, and the grid operator has to be notified about it and the criteria are met, and the community can be registered. The national legal framework for electricity suppliers does not apply to internal energy sharing. When the electricity is shared between the members, grid tariffs are reduced to incentivize RECs. The amount of reduction depends on the type of grid used. Grid fees are reduced more when a low voltage grid is used, by 57% in total. For the communities operating on the medium voltage grid tariffs are reduced but only by 28% (Fina & Fechner, 2021; REScoop.eu, n.d.; Tuerk et al., 2022). This differs from the Danish example where there are no reductions.

Interaction between grid operators and energy communities is clearly defined which is crucial for the successful development of RECs. When the community decides to sell the surplus of energy to the grid or provide other energy services, it must respect the rights and

obligations of the said framework. Regulations regarding cooperation between distribution system operators and RECs are better defined to have better opportunities and quick access to the grid after the RECs apply but also define clear duties of both parties (Nationalrat, 2023; REScoop.eu, n.d.).

Even though RECs in general do focus mainly on electricity production, they are not restricted only to the electricity sector therefore the transposition has to be clear for all the energy sectors where RECs can be a part of. Austrian transposition was focused mostly on the electricity sector and should be better tailored (Fina & Fechner, 2021).

Even though it is not explicitly mentioned in the legislation, a Coordination Office for Energy Communities was established to provide information for an easy setup and operation of RECs. This will also enable communities to be active in the energy market by making administrative procedures more efficient, faster, and transparent. It coordinates between the communities, ministry, regulatory authority, and regional governments to make sure everything is transparent and that all the parties are well informed. Next to that, to keep authorities informed a program to engage them and guide them in the energy transition was set up (Klima- und Energiefonds, 2023).

To enhance the development of RECs Austrian government is set to provide up to four million euros for support in setting up RECs. Projects covering the production of renewable electricity and gas are eligible to apply for this support. To further support RECs in producing and selling energy, a maximum of 50% of the energy generated can be supported when fed into the grid (Nationalrat, 2023; REScoop.eu, n.d.).

From 2022 onward generation units will be allowed to participate in multiple energy communities (REScoop.eu, n.d.). This might cause some administrative barriers and require multiple contracts with both communities and grid operators, therefore Fina & Fechner recommend withdrawal of this option for now.

The only thing that has not been properly addressed in the transposition is accessibility to low-income and vulnerable communities. Even though this was mentioned and highlighted multiple times in RED II, this indicator was not mentioned in the Austrian law and still has to be improved (Fina & Fechner, 2021; REScoop.eu, n.d.). By the end of 2024, a cost-benefit analysis will be published to determine if appropriate and balanced participation of RECs is ensured (Biresselioglu et al., 2021; Fina & Fechner, 2021).

Even if not all the points from RED II are adequately transposed in Austrian rules and regulations and some administrative processes are still complicated, they do provide incentives to participants. This allows activity in energy sharing and leaves room for improvement in the future.

5.1.2. Community's experience

A mayor of the Austrian village Stanz, that is on their way to set up a REC, and his expert advisor were interviewed for this research. Stanz is a village with 1855 inhabitants in Austrian Alps (Smart Rural 27, n.d.). They have been working on sustainable development for a few years now and right now they are in the process of setting up a REC. Once the Austrian government brought a new, Renewable expansion law, they recognized an opportunity to share energy with the neighbors and small local businesses that do not have their own production.

Local people recognized energy as one of the five things they wanted to improve. Even though this was back in 2016 way before the energy crisis, citizens recognized the importance of becoming independent and resilient. Through public meetings and conversations with the inhabitants, they concluded that '*To be resilient in terms of electricity means to produce our electricity in Stanz.*' and that they *'…should use as much as possible in our ecosystem'* (F. Pichler & R. Rosegger, personal communication, 13 May 2023). What the mayor was surprised with himself was the citizens' motivation. Their main motivation was not the price and money they could earn, the main motivation was to get more independent. This showed that *'Costs are important but not the most important thing. That's a good thing in terms of motivating people to step into this process*.' (F. Pichler & R. Rosegger, personal communication, 13 May 2023)

The village has two hydropower plants, three wind parks with 23 wind turbines total owned by outside investors, a district heating system based on biomass, and multiple privately owned photovoltaic systems on private houses. This will provide more flexibility and security to the system. Just like one of the researches suggested, to achieve optimal technical and economic benefits, a variety of different sources are needed (Hoicka et al., 2021). To implement those sources, they are relying on both funding and private investments from inhabitants. The issue they are facing is the lack of knowledge for applying to national and European funding projects which is one of the challenges highlighted in the literature too (Di Silvestre et al., 2021).

In the development process so far, they saw a problem with the grid system and smart meters in Austria. They experienced that the system is not synchronized, and it is very slow, providing the data only the day after, and sometimes even inaccurate. They also saw how others were making money on their investments: '*You get six cents per kilowatt, and it comes immediately back for 25 cents. So, the problem is there are 19 cents between, that's their business, but that should be my business because it was my money that I invested*.' (F. Pichler & R. Rosegger, personal communication, 13 May 2023). This creates distrust amongst the citizens, and it makes it complicated to know the exact amount of energy shared between the community members. Soon the project took a different turn and the community decided to take a slow step to make sure they are doing it sustainably in a long run. What started as the development of an energy community and improvement of village life now came to the question of a democratic energy market.

The mayor and his team saw an opportunity for being in control of their data and developing a better system. Based on blockchain technology and with the smart meters the members of the community will be able to see their production and consumption in real time. This created a good base for the development of a token system that will be used when sharing the energy within the community and ensuring the local economy is still supported (Pichler, 2023).

The token system will allow consumers to buy excess energy from prosumers with virtual tokens. Once the prosumer gets a token, they can use it in a local grocery shop or a bar to pay with it. The shop/bar can then use the tokens to buy energy from prosumers again. One token will be worth one kWh and the value in euros will be defined in the contract. Tokens can at any point be exchanged for euros. A test system is in place since mid-May 2023 and the plan is to completely implement it by the end of the year. So far, around 60-65 people are interested in being a part of this energy community, some as prosumers and some as consumers (Pichler, 2023).

5.2. Denmark

Denmark, along with some other Nordic countries has a long tradition of co-ops and promoting the development of community-owned projects (Di Silvestre et al., 2021). After the oil crisis in the 1970s, Denmark was one of the first countries to give the responsibility to engage in local heat planning to municipal and regional authorities through their *Heat supply act* in 1979. Through that, they got the responsibility to assess the needs and supply (Chittum & Østergaard, 2014). Around the same time, Denmark also pioneered the development of energy cooperatives to have greater independence from fossil fuels. Co-ops around Denmark invested in wind turbines, solar parks (Wierling et al., 2018), and district heating systems (Chittum & Østergaard, 2014).

To develop a district heating network and promote decentralized cogeneration and utilization of energy from biomass state support was granted when a network was completed. It was highly encouraged to use straw and wood chips for a heating system (State of Green, 2021). By using the district heating services, citizens are automatically considered a part of a district heating co-op.

The wind industry in Denmark highly benefited from having co-ops invest in this technology. It got a lot of support and acceptance from the broader society. Approximately 150.000 households participated in wind power co-ops. Additional support was provided with the feed-in tariffs, which guaranteed purchase at a fair price, and a refund from the carbon and energy tax. In 2002, the new Danish parliament announced the end of feed-in tariffs. The reasoning behind it was that wind technology was mature enough and did not need further support from the government (State of Green, 2021; Wierling et al., 2018). This, and the promotion of bigger and more expensive wind turbines slowed down the development of co-ops investing in wind power and started a ‘fall’ of wind power co-ops in Denmark. Most of the investments in wind turbines were made at a time when there was a

feed-in tariff, and that is when around 40% of the wind power was owned by citizens. Citizens were happy to invest in sustainable solutions and take ownership of their local energy production. The changes in the subsidies for this technology discouraged further investments in the technology that needed higher investment. Wind turbines got bigger and more expensive, and legislative and market changes favored them in comparison to small wind parks. The big investment needed for buying those new, bigger wind turbines was in most cases too much for a small local co-op so it influenced the amount of investments (Wierling et al., 2018). Both, more expensive technology, and lack of subsidies to invest in it, show that even these bottom-up investments are influenced by top-down decisions made by the government and the influence of the big companies on the market.

This approach can be seen as both a bottom-up and top-down approach. In the example of decentralized district heating systems, the EU required member states to have an assessment of district heating and develop a national heat plan. This directive was modelled on existing Danish energy efficiency efforts so it was an influence from a lower national level to the EU level that then made top-down policy for others. The Danish government has a role in establishing frameworks, guidelines, and economic support which heavily influences the development of local projects (Chittum & Østergaard, 2014; Sperling et al., 2011). Municipalities were the regulators for district heating companies and their activities even though they are often independent. Even in situations where the heat companies are fully consumer-owned, cities still do sit on the boards of those companies and city councils have the power to approve or reject projects. Municipalities in Denmark do have a direct influence on the activities and plans of district heating companies imposing top-down decisions. Both national and municipal authorities can require forming a heating company to do certain projects to collect the needed information. DH companies are one step lower than the municipality and they are in charge of spreading fixed costs among all relevant users and assigning prices to different consumers depending on their type and location. Individual users can influence the decisions by voting for the majority of representatives in DH companies which makes a great bottom-up influence. Their needs are well represented in decision-making and cost-benefit analysis (Chittum & Østergaard, 2014). Figure 4 shows the power structure of the five above-mentioned actors in district heating systems in Denmark and their responsibilities.

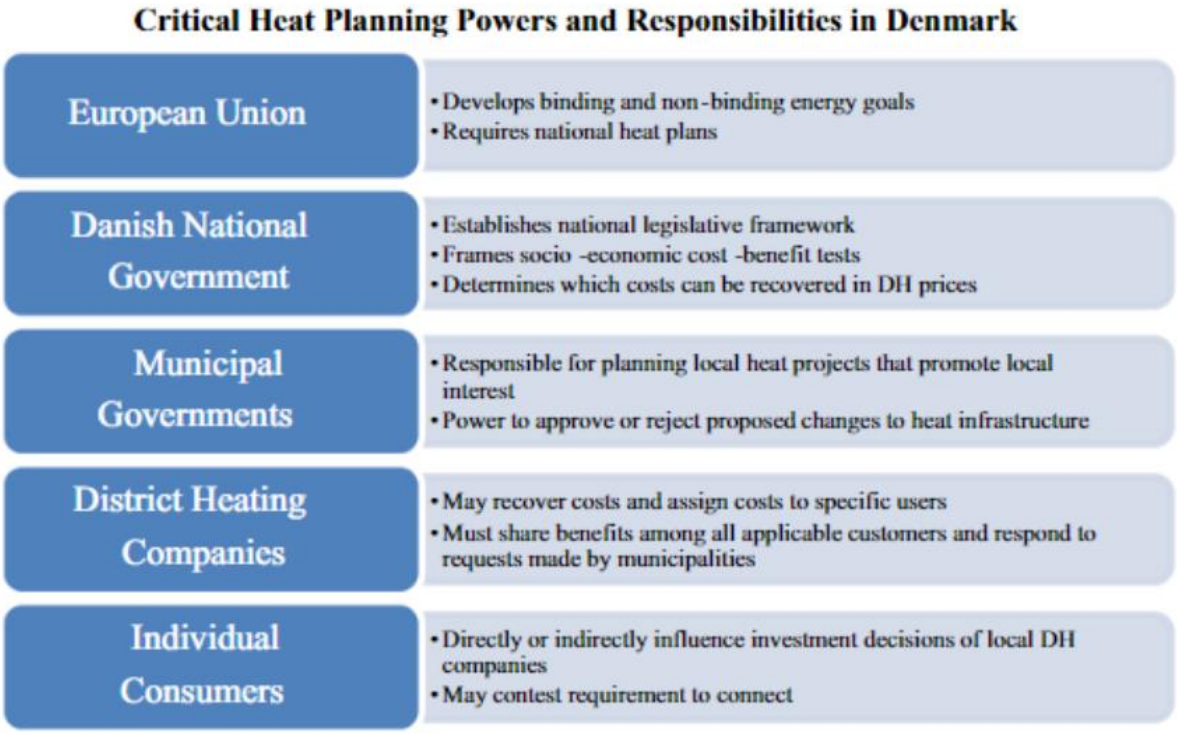

Figure 4: Power structure in Denmark (Chittum & Østergaard, 2014)

Such energy cooperatives and planning strategies helped a community to spread costs and risks coming with different technologies. It offers an opportunity for communities to be more flexible if long environmentally and economically sustainable long-term solutions are developed (Chittum & Østergaard, 2014).

5.2.1. Implementation of RED II

Denmark defined RECs when they revised Law on the Promotion of Renewables in 2021. Based on the REScoop.eu's Transposition tracker, Denmark created a good definition of RECs. The definition provides a set of regulations to avoid abuse or control from other companies or individual members. It mentions the autonomy of the communities, openness, and the voluntary participation of the members (REScoop.eu, n.d.).

Based on the REScoop.eu, one of the best elaborations on effective control amongst all member states is provided as it provides a complete description of who and how can participate in the decision-making processes of RECs. Members who are engaged in commercial and energy sector activities as a main economic activity cannot decide on behalf of the community or have a decisive influence in the community. The type of entities that a community can be are also described, they can be association, partnership, cooperative, or capital company. What the Danish definition still lacks in the definition of RECs is a clearly

defined purpose of the communities and ensuring that citizens can participate in them (Klima-, Energi- og Forsyningsministeriet, 2021; REScoop.eu, n.d.).

In autumn 2022 a new Executive Order to provide grants for renewable energy projects in local communities has been passed. This made it possible for communities to get funding for disseminating information, planning, establishing, and organizing projects around production, supply, storage, and energy efficiency.

Conditions for sharing electricity are legally well defined, but the fees for sharing energy are stopping people from doing so. If one member of the community wants to share the excess electricity with their neighbor, they have to pay high fees. The member of the Danish community says it does not pay off for them to share energy like that since the energy bought by other members of the community comes out to be the same price as electricity bought from the grid (J.Ø., personal communication, 2 May 2023). When sharing the energy, Danish communities have to pay the connection to the collective grid, tariff for the transport of energy within the community, tariff for transport between the community and other producers and consumers, and costs for metering (Jørgensen et al., 2019). Also, production and supply are required to be charged separately which prevents communities from exercising their full rights of sharing energy within the community and maintaining the rights and obligations of members as consumers.

Pre-existing legislation on Tenants Democracy has been used as a basis for community projects and it addresses accessibility to low-income and vulnerable households, particularly about heat energy. The legislation also states that RECs must be treated in a non-discriminatory and proportionate manner but it is not further explained how that can be achieved (Klima-, Energi- og Forsyningsministeriet, 2021; REScoop.eu, n.d.).

In Table 5 it is visible that Denmark has an insufficient transposition of five out of twelve indicators based on the REScoop.eu grading. This means that those five aspects were not addressed at all in the Danish law. Those five indicators are assessment of obstacles and potential for the development of energy communities; solutions for fair, proportionate, and transparent registration and licensing procedures; tools to access information; regulatory capacity building for public authorities; and support schemes for RECs (REScoop.eu, n.d.)

Danish transposition has not been successful so far. Current regulations support the monopoly rights of the common grid and restrict the rights of RECs. On top of that opening up wind projects to local citizens has recently been abolished (REScoop.eu, n.d.). Even though Denmark has a long tradition of engaging local communities in energy production through co-ops (Chittum & Østergaard, 2014; Wierling et al., 2018), regulations for sharing energy within the community have been restrictive.

5.2.2. Community's experience

A member of the community on Danish island, Samsø was interviewed to get a better understanding of the current state of REC development in Denmark, barriers faced when starting a community, and positive experiences in the process so far. The interview was done with one community only and the experience of the other communities in Denmark might differ slightly. Still, it gave this community's perspective and its experience gained along the way. It will add a layer of experience from a real-life example that was not found in the reviewed literature and highlight the things that may not be the same in practice as it is in theory.

It all started a few years ago when the interviewee got the idea to start an energy community in his village and share the electricity produced between the neighbors. About 10% of the village that initially agreed, started working on this idea. At that time RED II was just developed and the community had high hopes for transposition in Denmark. '*There was this law from the parliament and that was supposed to turn into law in Denmark so we were quite ambitious saying: 'Well this will soon be available here in Denmark so we can share in the energy community these types of resources between production and utilization''* (J.Ø., personal communication, 2 May 2023).

The reason behind starting a community was of course to have savings on energy but also to help other members, especially the elderly '*…the process of figuring out what to buy, where to buy, pricing, and how to install it*.' (J.Ø., personal communication, 2 May 2023). This will aim to help people that do not know a lot about renewable energy to make the most out of this technology, optimize their energy system, and generally '*…just getting people in the right direction.'* (J.Ø., personal communication, 2 May 2023).

Soon they realized they had one problem – if they wanted to share the produced energy with the neighbours, they have to pay fees. This makes the price of shared energy the same as just buying the electricity from the grid. This was a setback for the community, so they decided to take another path. The community will start an energy cooperative where everyone interested can buy shares in a solar power plant located near the village. This will not bring energy savings and energy sharing as they planned, but it will enable them to earn money by selling renewable electricity. To make extra profit they even decided to implement a fast charger for electric cars and a battery system. Battery system will enable them to sell energy when the price is better, and they can set a higher price for charging the cars than it is to sell to the grid. That will provide a better income than just selling produced electricity to the grid.

So far, they still did not start implementing the solar park. Right now, the community is in the process of collecting all the necessary documentation and agreements with the municipality, grid operator, and other relevant stakeholders. This is taking some time since the municipality is slowing things down.

The community thinks that politicians on both national and local levels lost their power over the lobbyists from big energy companies. They feel like *'Politicians are too stressed, too*

unwilling to fight big lobby organizations.' (J.Ø., personal communication, 2 May 2023). This is also influencing the speed of their development which is one of the reasons why this has been in process for almost two years already. The community hopes for better conditions for them and other communities in the future as well as the implementation of RED II. On a national level, they expressed their need for *'…visionary politicians that will enable the vision from the European Parliament and the EU legislation into national law.'* (J.Ø., personal communication, 2 May 2023). On the municipal level, they are hoping for more engagement.

6. Discussion and analysis

6.1. Energy co-ops in Denmark

The Danish example shows very well how influence from the top can, in some cases be crucial for development on the local level. Danish examples from the 70s supported both heat and electricity with feed-ins and gave responsibility for energy planning to regional and municipal levels contributed to local action. This early promotion of co-ownership of RES and government support for it created an environment for the growth of energy co-ops and citizen-owned solutions. Hoicka et al. highlighted co-ops as one of the best models for starting energy communities and by this example, it is proven that it is a successful practice. The development of co-ops in Denmark had a high influence on the acceptance of RES. Subsidies can motivate communities, especially pioneers, to invest in sustainable solutions. Government investing in RES and local projects in this way shows that it is a path that a country is heading to and supporting. The acceptance of RES is higher when citizens can see what is in it for them and how they can benefit from investing in renewable technologies.

Once subsidizing of renewable energy projects stopped, their development died down too, and big companies took over renewable energy projects. Even though the fame of renewable energy sources has risen during the energy coops era in Denmark, once big companies started developing these projects, citizens were very much against having big production units in their neighborhoods (Wierling et al., 2018). This shows how important it is to include local citizens in renewable energy projects and how important it is to them to feel a sense of ownership of what is in their backyard.

Both existing research on the Danish system and an interview with the community showed that what was once an example of a new, successful approach called innovative democracy is now collapsed. Based on the experience of people invested in this topic, the Danish government gave too much power to big lobbyists who are developing big renewable energy production systems (S. Hermansen, personal communication, 22 May 2023; J.Ø., personal communication, 2 May 2023). From having equal influence between different lobbyists as shown in Figure 2, it all changed to one of them having more power than the others. Figure 5 shows how this relation changes. Now, so-called, ‘old energy market dependent’ lobbyists almost don’t even exist. Energy market independent lobbyists have very little or no influence on the parliament and municipalities. On the other side, ‘new lobbyist dependent on the energy market’ represented by, mainly, big renewable energy companies hold more power over the government and its decisions on certain topics. Those decisions create an environment where citizens and citizen-led innovation have a hard time doing small-scale, local changes.

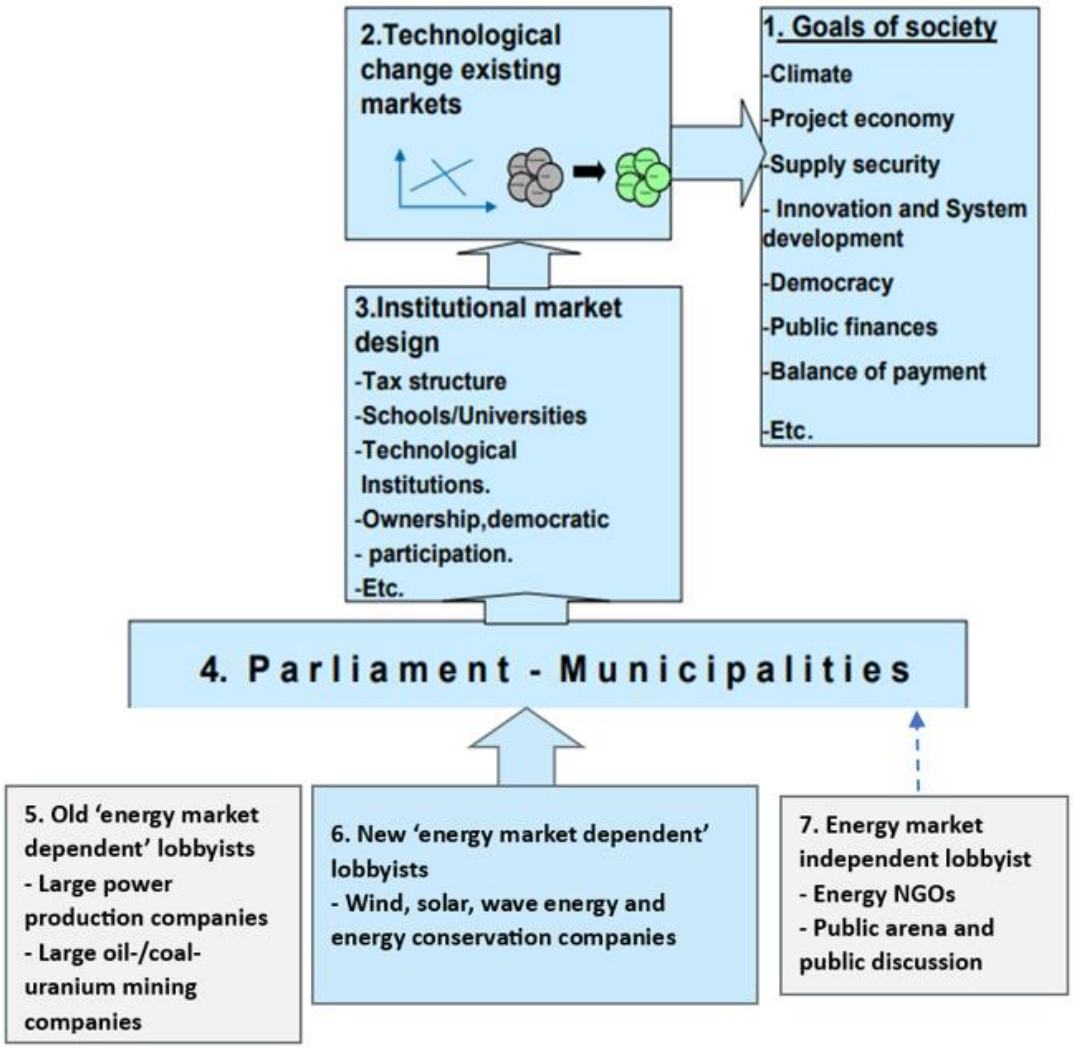

Figure 5: Current interaction in Danish political processes

Even though it has its cons, there is something to learn from the Danish example and its approach to local sustainable development through energy co-ops. Danish energy cooperatives can be seen as both a bottom-up and top-down approach. On one hand, citizens were the ones who initiated the co-ops because they were concerned for their energy future. They were worried about the security of the energy supply and saw an opportunity to save, or even earn some money. On the other hand, the Danish government supported the formation of energy cooperatives through legislation and subsidies by providing a successful top-down framework for their development.

6.2. Analysis of regulatory framework

RED II does highlight some key principles that RECs frameworks should be based on to provide support for setting up RECs, it keeps the recommendations very vague. The reason for that is to give freedom to member states to easily incorporate it in their laws and fit it to their specific case. It is a good idea but based on DECIDE project and REScoop.eu's data,

most of the member states did not transpose it or they did not do it properly. It is important to keep in mind these are the results mostly from one source (REScoop.eu), and it might not provide a perfectly clear picture of the state of the art.

As REScoop.eu representative highlighted during the interview, it is not enough just to translate Article 22 of RED II into national law. This still creates barriers and unclearness during the development of RECs, but the Commission recognizes it as an implemented framework. This shows the EU is looking more into quantity instead of the quality of the implementation and if the requirement for quality is low some member states will do just a bare minimum required. The reason for it could be not knowing how to properly transpose it, thinking this is not relevant for their own countries, or just not giving too much attention to energy transition in general. The high rate of badly transposed RECs framework and definitions indicated the need for higher engagement of the EU in the transposition.

Proper transposition of RED II with detailed regulation and definition of RECs is useful for the development of RECs in the EU member states. Using the framework that RED II provides and transposing it into national laws while keeping in mind the national context and already existing laws is a powerful tool. Most of the countries that did make detailed regulations on RECs also had a successful development of energy communities. By fully implementing the proposed framework into the national law, a fertile environment for the development of RECs is created. If successfully implemented, the regulation should remove the administrative barriers and make it easier for interested citizens to start an energy community without being the experts on the topic.

6.2.1. Case studies' experience

After a successful history of citizen-led projects in Denmark, it seems like it started going down the hill in the latest years. Denmark did not adequately transpose RED II and define RECs. Even though some points are successfully implemented in general it is an incomplete transposition with substantial deficiencies (REScoop.eu, n.d.). The reasons for it are unknown but the government is fully responsible and no matter what the reason behind it is, it is not a valid excuse since it looks like Danish citizens are interested in setting up RECs and sharing the produced energy with each other.

On the other hand, transposing RED II in Austria helped successfully develop RECs. Providing grid fee reductions, having a Coordination Office to support the development of communities and other regulations made by the Austrian government helped develop more energy communities in Austria. It is an example where the implementation of RED II and regulation of RECs helped the development of many RECs in just two years that the regulation has been in place. Interviewed community in Austria has a very good collaboration with the ministry. As a chosen pilot community, they are providing the ministry with data and feedback, but they also feel like the ministry is listening and working on improving the regulations. The ministry is also showing that this is an important project

for them by showing up at the meetings and conferences that are focusing on this topic. By doing so they are creating trust.

A problem when developing RECs in Austria is cooperation with grid operators. Based on the experience of the interviewed community, grid operators do not provide a service that they are supposed to. Old grid systems and delayed and incorrect data are some of the issues that Stanz inhabitants faced so far. Grid operators will have to adapt to the new path in which the electricity market is heading. As the EU is confident that RECs will help to enhance sustainable transition and they are promoting further development of energy communities' adaptation will be needed from all sides included in this transition, including grid operators. Their collaboration is necessary for an easier development of RECs.

Some of the similarities between the Danish approach in the 70s and the Austrian approach now is the role of citizen participation and high local ownership in driving the renewable energy projects. Also, already mentioned innovative democracy approach is a connection between the Austrian system now and the past Danish system where both proved to be successful.

However, there are some differences too. The key difference is the regulatory framework on RECs, where Austria has more clearly defined regulations than Denmark. Austria put a lot of effort into promoting RECs by having a coordination office that can support the development of energy communities, providing subsidies to start them, creating favorable market conditions for RECs to participate in it, and many others. Denmark on the other side, did not define regulations on RECs very well. Also, Denmark is currently focused on developing bigger energy production systems while Austria is promoting small local solutions like RECs.

While Austria has a bottom-up approach to local development, Denmark shows an example of more of a top-down approach with a centralized system. A middle ground between those two approaches could have a potential for a successful transition. If the government provides support for renewable energy communities and creates a fertile environment for their development while allowing local control over energy systems, it could result in the successful development of RECs.

6.2.2. Other good examples

Austria and Denmark are not the only countries showing good progress. Something can be learned from other examples too. The Netherlands allows communities to supply without a license if over one year they do not supply more than they import, if they supply it to the members of the community and it has fewer members than the regulation allows. They also made a good rule to prevent disadvantaging energy communities. Brussels region in Belgium on the other hand does not require licenses but the community is responsible for balancing the system. Similarly to Austria, Estonia and Slovenia established authority in charge of assessing the barriers and facilitating the development of RECs. Slovenia requires an update of the assessment every three years. The French government decided to lower

the grid connection fee for all installations under 500 kW. Italy and Latvia are ensuring that RECs can participate in all electricity markets in a non-discriminatory way and are trying to develop a good relationship between the communities, energy suppliers, and the DSO. These examples present multiple different, successful practices for ensuring that RECs get fair treatment from other member states. Some countries also decided to set a tariff structure to support energy sharing of energy produced from renewable energy sources. The Netherlands additionally set up Development Fund for energy cooperatives, Latvia plans on establishing financial instruments, and in Italy ministry provides the information on how to access finance (REScoop.eu, 2022).

As seen in the interview with the case studies, most of the obstacles are created by the DSO, even though the regulation on it in Austria seems to be good. In Luxemburg, the DSO oversees collecting the data and sharing it with RECs and suppliers through an IT platform. In Wallonia, Belgium, and Italy the DSO must enable energy sharing in a non-discriminatory way. In Croatia, the DSO is obliged to provide services to the RECs and to communicate the data with the community and supplier.

Even though one of the main roles of RECs is to tackle energy poverty in the EU member states, most of the countries did not address it properly in the national frameworks. But there are some countries that could serve as an example on this front too. Greece allows energy communities to provide electricity for free to vulnerable households even if they are not members of the community. Spain set aside a budget of 40 million euros for RECs that are fighting against energy poverty.

Other than setting up a perfect framework to facilitate the development of RECs, it is also important to promote them to the citizens. Some of the best examples in doing so are Ireland, Belgium, and Slovakia. All of them appointed authority in charge of supporting community members in administrative, technical, legal, and economic matters. France Latvia, Spain, and Belgium provided similar support to public authorities (REScoop.eu, 2022).

The successful examples of this and other regulations connected to RECs can be drawn from other member states too. It shows a diversity of approaches and could serve as an inspiration to other member states that are struggling with applying some of the points from Article 22 in RED II.

6.3. Recommendations

This section presents a set of recommendations for the European, national, and local levels regarding improving the development of RECs. The recommendations are based on the analysis of Danish and Austrian examples as well as the review of relevant literature and theories. They will provide an answer to the main research question ‘How can the development of renewable energy communities in the EU member states be improved based on lessons from Austrian and Danish examples.

6.3.1. EU level

Defining and providing a supporting framework on RECs in RED II was key for the development of RECs in some of the member states who did properly transpose the framework into national laws and regulations. But still, most of the member states seem to have done it insufficiently and they do not have a high number of RECs. This indicates that it is not necessarily enough to just create a framework and say to member states that they have to transpose it into their national laws. Some countries might have difficulties in doing so or do not even know how to do it properly which results in just translating the RED II into the national law like Croatia, Cyprus, and Malta did (S. Pappa, personal communication, 15 May 2023). The EU is checking if each Member State transposed RED II but there seems to be a lack of quality check for it. Right now, it is important to define RECs and implement the regulations for them into national law, and this is what the European Commission is checking. Looking deeper into the quality could be one of the solutions to motivate member states to do a better transposition of the RECs framework. This could push them to do the assessment of obstacles and possibilities for their own country and then adapt the regulations on RECs based on that.

As mentioned before, some countries are struggling with the transposition of the RECs framework. In those cases, the EU could provide support for countries who need help with transposition. This could result in more countries having a supportive framework for the development of RECs with clear rules and regulations. The support could take many different forms. It could be a national expert working closely with the government on creating the new law, knowledge exchange between the member states, materials with more detailed support, or many other ways of capacity building.

The interviewed communities in both countries, as well as REScoop.eu representative expressed there are common problems with grid operators. REScoop.eu specifically highlighted the lack of transparency on their procedures in some member states (S. Pappa, personal communication, 15 May 2023; F. Pichler & R. Rosegger, personal communication, 13 May 2023). Therefore, it is necessary to better define and regulate the part of the law referring to the grid and energy market. Currently, the member states are in charge of doing so, with RED II saying they should ensure that "*the relevant distribution system operator cooperates with renewable energy communities to facilitate energy transfers within renewable energy communities*" and that "*renewable energy communities are not subject to discriminatory treatment with regard to their activities, rights, and obligations as final customers, producers, suppliers, distribution system operators, or as other market participants*" (European Parliament, 2018, p. 122). Since the member states seem to have a problem with making regulations regarding this and collaborating with grid operators, it will be beneficial to have an EU-wide framework as a guidance for this. The EU is revising Electricity Market Directive where a new framework on grid connection and the electricity market for RECs will be presented. It will include a so-called 'bike lane' that will ensure that RECs have easy access to the grid and that there is transparency from the grid operators (S. Pappa, personal communication, 15 May 2023). A proposal for revision describes rights for sharing renewable energy in the REC, asks for better information on offers before signing

up, and proposes to further increase transparency and monitoring capacities (European Commission, 2023a). This will ensure it is easier for RECs to collaborate with grid operators since they still mostly depend on volunteers who might not be experienced.

6.3.2. National level

Having EU directives leading the way for the development of energy communities is important and beneficial, but the biggest changes can be made when having clear national regulation. Each country has its pre-existing regulations that might, to some extent, cover energy sharing or energy communities. Therefore, every Member State must create its own national laws and regulations that will enhance the development of RECs. As REScoop.eu also mentioned, it is important to consider existing laws and build on them. Some member states did not do that, i.e. even before RED II Greece already defined RECs in their national legislation which they completely changed and presented two completely new definitions for RECs and CECs and took out the old one (S. Pappa, personal communication, 15 May 2023). Examples like this could create confusion amongst the citizens because of the frequent changes in definition.

Before making new regulations, it is necessary to assess the potentials and barriers. It will provide them with a better picture of what to focus on, which are their weaknesses and strengths. The assessment should also consider different impacts that could be different for every country like weather or geographical conditions to provide the best possible solutions for that area. For example, some countries might have a high hydropower potential which will provide RECs with a more secure source of energy while others might have to rely on solar and/or wind energy or something else.

Following the assessment, a regulation on RECs should be made based on RED II. The regulation should be clear and detailed, covering all the points mentioned in Article 22 of RED II. It should create a fertile environment for the growth of RECs whit defining their rights and obligations. To do so it might be useful to use the experience of other member states, especially the ones in a similar position, geographically, economically, politically, or other. Collaboration between the countries might be beneficial for both sides. Exchanging knowledge and experience might help avoid future mistakes and get inspired by other examples. Projects like REScoop.eu's transposition tracker and DECIDE project can provide information to national governments on how certain countries solved some problems and transposed the RED II.

After ensuring that RECs are well defined and regulated it is important to promote them to the citizens. If citizens do not know about the possibility to have an energy community where they can produce energy from RES and share it with other members of the community, there will be no development of them. Therefore, it is important to provide all the necessary information to the citizens. A good example of that is Austrian Coordination Office which provides communities with support and necessary information to start producing and sharing energy. Having support like that makes it easier to go through the

process of starting an energy community and makes it accessible to more people. This could be a great support at the beginning to the communities that do not have an expert who can help them with all the paperwork needed.

Another way for the government to support and promote RECs is by providing them funding, especially to the low-income communities with a higher risk of energy poverty. The funding could take feed-in tariffs, subsidies, loans, or any other form. It will help communities to implement their energy production systems and have an easier start to producing and sharing energy. It will especially help low-income communities to avoid energy poverty and insecurity of energy supply. Having access to the funding will make RECs more attractive to the citizens as they will then need lower starting investment and see an opportunity to save more money.

The national regulation must define rights and obligations or RECs regarding connecting to the grid and administrative processes that go with it. Since grid operators seem to be one of the biggest obstacles in many countries therefore it is necessary to have a discussion with them and come to a common agreement. To develop a REC, it is necessary to have a sufficient grid capacity and smart meters to have accurate data on consumption and production. This is a foundation for starting an energy community. It is also important to make the administrative process for connecting to the grid as easy as possible and to remove all unnecessary barriers. Revision of the Electricity Market Directive will provide a better framework for this, but the government needs to regulate it in the national context too. Putting pressure on grid operators is necessary to make favourable conditions for the development of RECs.

Lastly, all member states need to ensure the prevention of misuse of set regulations by the big companies who want to 'trick the law' and save some money. REScoop.eu noticed this happening in some member states including Portugal (S. Pappa, personal communication, 15 May 2023). This is another reason to have clear and detailed definitions and regulations on RECs. If the regulation is not clear, someone whom this is not intended for might use it for personal benefit.

6.3.3. Local level

Since the local level is the one that is the most active in developing RECs, a set of recommendations for easier development is presented below. Ideally, it should be built on top of a successful national framework, but it could also be used to pioneer and promote the idea of RECs in the member states that did not have successful implementation of the regulations. In that case, it is important to take a first step and not to wait for someone else to start. Doing whatever is possible and being a successful example might inspire other communities and push the government to start the change.

Energy communities are consisting of multiple local citizens, so it is important to communicate the plans and engage the local community. Not everyone will be interested at first but explaining the idea and leaving space for others might help attract more people to

join the community. It is also important to include vulnerable households which could in this way have access to cheaper (or free) energy.

When starting a new REC, it is important to investigate what are the best possibilities for that specific area. Just like a national assessment, a local one could be very beneficial for the optimal use of the resources in the area while keeping in mind sustainable growth.

Lastly, connecting to the other communities and exchanging knowledge and experience with them could be highly beneficial. Understanding the process and learning from people who had first have first-hand experience in it can help avoiding some mistakes or understanding some administrative procedures better. European Commission has made an Energy Communities Repository, where everyone can easily see the communities from each of the member states on an interactive map. Soon, the map will also highlight some best practices from around Europe that can inspire other groups for their projects and activities (Directorate-General for Energy, 2023). There are many more similar community tracking tools available, aimed at specific areas or solutions and they could be used as an inspiration or to connect and learn from others.

6.4. Limitations

Although confident that this research is relevant and that it represents a real-life problem with its potential solutions, there are some factors that might not have been considered. Following are the limitations that I am aware of after completing this research to the best of my ability.

Because of the time frame of this project, the research was limited to two case studies only. To have a complete picture of state of the art regarding the RECs regulation in the EU it would have been beneficial to investigate other countries too. A brief review of literature and sources on the regulations in other member states was investigated but it did not provide a deep understanding, more of an overview. The research could have been even richer and more compete if I spoke the national language of the case study countries since there would be no language barrier.

Conducting interviews with more than one community and conducting them with already established communities would also have bene beneficial for the research. It would result in a clearer overview of the conditions in selected country. The contacts acquired were only for one community in development for each member state.

6.5. Further research

In the process of writing this report and conducting a research, different ideas emerged that could lead the research in the different directions or expand it. Those idea turned up to either be outside of the scope of this project or would not fit into the given timeframe. Nevertheless, they would provide interesting further research.

Firstly, it would be interesting to investigate rules and regulations for RECs in other member states. This research just scratched a surface of experiences of RECs in the two case study countries, and a further investigation of these two member states as well as the others could be beneficial. It would provide a clearer picture and even result in a country specific recommendation that address a special opportunities and challenges that the country is facing. The research in this paper opened new questions:

What are the successes and challenges faced during the development of RECs in all EU member states?

The research could also take a more technical turn. Because of, what it seems like a common issue with the grid operators, it would be interesting to do research on limitations for connecting RECs to the grid, and the flexibility services that they could provide. With smart planning and development, RECs could provide flexibility services to the grid. A research question that fits this research could be:

How can RECs provide flexibility services and contribute to balancing the grid system?

There are many other possibilities that this research could lead to. RECs are fairly new and interesting topic in the EU so deeper investigation on it is needed.

7. Conclusion

Renewable energy communities can range from small-scale citizen-led initiatives to large-scale cooperatives or even community-owned utilities. They have different motivations, goals, and challenges that they face, but one thing is sure – they are crucial for future of sustainable energy production. They could contribute to more sustainable energy system since local production in Europe has a capacity to produce 45% of overall electricity needs (Hunkin & Krell, 2022).

The purpose of this report has been to answer the research question '*How can the development of renewable energy communities in EU member states be improved based on lessons from Austrian and Danish examples?*' by developing a set of recommendations for the EU, national, and local level for more successful development of RECs. It was based on the analysis that showed the state of the art in two case studies, Austria and Denmark. It highlighted their good practices, possibilities for improvement and challenges they are facing. Policies and regulations at the local, national, and European levels have a high impact on the growth and development of RECs in the EU member states. Providing a supportive policy and regulatory environment is necessary for the success of these communities. Providing them with simple and justified licensing procedures and fair regulatory system can be crucial for unlocking their full potential. Engaging with stakeholders at different levels is important, from local community members to national policymakers and EU representatives. By listening to different perspectives and experiences, a better understanding of the challenges and opportunities facing renewable energy communities can be gained.

Analyzing historical example of energy co-ops provided an overview of benefits that citizens owned projects can have on a local community. It showed the success and the raise of RES in Denmark during that period that could be expected in the member states that implement RECs framework successfully. The framework presented in the Article 22 of RED II does provide sufficient starting point for the member states to implement their regulations for RECs. But the analysis did show that there is a need for better monitoring system to check the quality of the implemented framework instead of just checking if it is implemented or not.

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Appendix

1. Questions for interviews

1.1. Danish stakeholder

What is your experience so far with setting up RECs in Denmark?

Do you face any challenges while setting up a REC in Denmark?

Main motivation to start community?

How is your collaboration with local/regional/national authorities?

How are you able to secure favorable terms for financing and grid connection?

What lessons do you think other countries could learn from the experience of renewable energy communities in Denmark?

How do you see the role of renewable energy communities evolving in Denmark in the future, and what challenges and opportunities do you see on the horizon?

What do you think are the most important factors in driving the transition to a more sustainable energy system, and how can renewable energy communities contribute to this transition?

1.2. Austrian stakeholders

Can you tell me about how this whole energy transition and idea for the energy community started? What was the motivation behind it?

How do you plan to finance renewable energy project and how did you finance it so far?

What are some challenges that you faced so far?

How is your collaboration with regional/national authorities?

What impact has your energy community had on the local community so far?

What are your plans for the future? Do you see more people getting involved?

What lessons do you think other countries could learn from the experience of renewable energy communities in Austria?

How do you see the role of renewable energy communities evolving in the future, and what challenges and opportunities do you see on the horizon?

1.3. REScoop.eu representative

What role do you see for renewable energy communities in driving future sustainable transition?

What specific policy initiatives or incentives could support the growth of these communities? (Other than what is already in place)

How can the concept of energy communities be better promoted to citizens?

What should be a priority for member states when making a framework on RECs?

What should member states be aware of not to make any mistakes?

What challenges do renewable energy communities in Europe face in terms of access to financing, grid connection, and regulatory frameworks, and how can these challenges be overcome?

Is there any regulations from a specific countries that you would like to highlight?

The transposition tracker grades some of the countries as having good practices but they still have a low count of communities (based on the EU data). What do you think is the reason behind that and how could it be solved?

What role can the EU play in supporting the growth of renewable energy communities?

Why do you think so many countries failed in transposing RED II regarding RECs? How can that be changed?

2. Transposition of RECs framework in all EU member states

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czechia	Denmark	Estonia	Finland
Implemented renewable energy communities framework	Good practice	Average progress	Bad transpostition	Substantial deficiencies	Substantial deficiencies	Bad transposition	Substantial deficiencies	Bad transposition	Bad transposition
Assessment of obstacles and potential for development of ECs	Average progress	Average progress	Bad transposition	Average progress	Substantial deficiencies	Bad transposition	Bad transposition	Bad transposition	Average progress
Removal of unjustified regulatory & administrative barriers	Good practice	Average progress	Bad transposition	Bad transposition	Substantial deficiencies	Bad transposition	Average progress	Average progress	Bad transposition
DSO duties around cooperation with ECs and facilitation of energy sharing	Good practice	Average progress	Bad transposition	Good practice	Substantial deficiencies	Bad transposition	Average progress	Substantial deficiencies	Average progress
Fair, proportionate, and transparent registration & licensing procedures	Good practice	Best practice	Bad transposition	Bad transposition	Substantial deficiencies	Bad transposition	Bad transposition	Bad transposition	Average progress
Incentives connected to network tariffs based on a CBA	Good practice	Average progress	Bad transposition	Average progress	Substantial deficiencies	Bad transposition	Average progress	Bad transposition	Bad transposition
Non-discriminatory treatment as market participant	Average progress	Average progress	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Average progress	Bad transposition	Bad transposition
Accessibility to low-income & vulnerable households	Bad transposition	Average progress	Bad transposition	Bad transposition	Substantial deficiencies	Bad transposition	Good practice	Bad transposition	Bad transposition
Tools to access finance	Good practice	Good practice	Bad transposition	Bad transposition	Substantial deficiencies	Bad transposition	Good practice	Bad transposition	Bad transposition
Tools to access information	Best practice	Good practice	Bad transposition	Bad transposition	Average progress	Bad transposition	Bad transposition	Bad transposition	Bad transposition
Regulatory capacity building for public authorities	Good practice	Good practice	Bad transposition	Bad transposition	Substantial deficiencies	Bad transposition	Bad transposition	Bad transposition	Bad transposition
NECP reporting on enabling frameworks	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress
Support Scheme adapted for RECs	Average progress	Good practice	Bad transposition	Substantial deficiencies	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition

	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg
Implemented renewable energy communities framework	Average progress	Average progress	Average progress	Substantial deficiencies	Good practice	Good practice	Average progress	Bad transposition	Average progress
Assessment of obstacles and potential for development of ECs	Average progress	Bad transposition	Bad transposition	Average progress	Average progress	Average progress	Substantial deficiencies	Bad transposition	Bad transposition
Removal of unjustified regulatory & administrative barriers	Average progress	Average progress	Bad transposition	Bad transposition	Good practice	Average progress	Bad transposition	Average progress	Good practice
DSO duties around cooperation with ECs and facilitation of energy sharing	Good practice	Bad transposition	Substantial deficiencies	Average progress	Bad transposition	Good practice	Substantial deficiencies	Bad transposition	Good practice
Fair, proportionate, and transparent registration & licensing procedures	Average progress	Bad transposition	Average progress	Good practice	Bad transposition	Average progress	Substantial deficiencies	Bad transposition	Good practice
Incentives connected to network tariffs based on a CBA	Good practice	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Good practice	Substantial deficiencies	Bad transposition	Bad transposition
Non-discriminatory treatment as market participant	Average progress	Bad transposition	Bad transposition	Substantial deficiencies	Bad transposition	Average progress	Good practice	Bad transposition	Substantial deficiencies
Accessibility to low-income & vulnerable households	Bad transposition	Bad transposition	Best practice	Substantial deficiencies	Bad transposition	Good practice	Bad transposition	Bad transposition	Bad transposition
Tools to access finance	Average progress	Average progress	Bad transposition	Bad transposition	Good practice	Good practice	Average progress	Bad transposition	Average progress
Tools to access information	Average progress	Average progress	Bad transposition	Bad transposition	Good practice	Good practice	Average progress	Average progress	Good practice
Regulatory capacity building for public authorities	Average progress	Average progress	Bad transposition	Bad transposition	Bad transposition	Good practice	Substantial deficiencies	Bad transposition	Bad transposition
NECP reporting on enabling frameworks	Average progress	Average progress	Average progress	Bad transposition	Average progress	Average progress	Average progress	Average progress	Average progress
Support Scheme adapted for RECs	Average progress	Best practice	Average progress	Substantial deficiencies	Good practice	Good practice	Bad transposition	Bad transposition	Good practice

	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden
Implemented renewable energy communities framework	Substantial deficiencies	Good practice	Bad transposition	Average progress	Substantial deficiencies	Substantial deficiencies	Substantial deficiencies	Average progress	Bad transposition
Assessment of obstacles and potential for development of ECs	Substantial deficiencies	Average progress	Bad transposition	Substantial deficiencies	Average progress	Substantial deficiencies	Substantial deficiencies	Average progress	Bad transposition
Removal of unjustified regulatory & administrative barriers	Bad transposition	Good practice	Bad transposition	Substantial deficiencies	Average progress	Substantial deficiencies	Substantial deficiencies	Bad transposition	Bad transposition
DSO duties around cooperation with ECs and facilitation of energy sharing	Substantial deficiencies	Bad transposition	Bad transposition	Average progress	Substantial deficiencies	Substantial deficiencies	Average progress	Average progress	Bad transposition
Fair, proportionate, and transparent registration & licensing procedures	Substantial deficiencies	Bad transposition	Bad transposition	Good practice	Average progress	Substantial deficiencies	Substantial deficiencies	Average progress	Bad transposition
Incentives connected to network tariffs based on a CBA	Substantial deficiencies	Bad transposition	Bad transposition	Average progress	Average progress	Substantial deficiencies	Average progress	Best practice	Bad transposition
Non-discriminatory treatment as market participant	Substantial deficiencies	Good practice	Bad transposition	Average progress	Substantial deficiencies	Substantial deficiencies	Substantial deficiencies	Bad transposition	Bad transposition
Accessibility to low-income & vulnerable households	Substantial deficiencies	Bad transposition	Bad transposition	Average progress	Substantial deficiencies	Substantial deficiencies	Average progress	Good practice	Bad transposition
Tools to access finance	Substantial deficiencies	Good practice	Bad transposition	Good practice	Substantial deficiencies	Substantial deficiencies	Substantial deficiencies	Average progress	Bad transposition
Tools to access information	Average progress	Bad transposition	Bad transposition	Average progress	Average progress	Average progress	Substantial deficiencies	Average progress	Bad transposition
Regulatory capacity building for public authorities	Substantial deficiencies	Bad transposition	Bad transposition	Bad transposition	Substantial deficiencies	Substantial deficiencies	Average progress	Average progress	Bad transposition
NECP reporting on enabling frameworks	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress	Average progress	Bad transposition
Support Scheme adapted for RECs	Bad transposition	Good practice	Bad transposition	Bad transposition	Substantial deficiencies	Substantial deficiencies	Substantial deficiencies	Good practice	Bad transposition

2.1. Definition of RECs in all EU member states

Country	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czechia	Denmark	Estonia	Finland
Definition of RECs (REScoop)	**Substantial deficiencies**	**Good progress**	**Bad transposition**	**Substantial deficiencies**	**Average progress**	**Bad transposition**	**Good progress**	**Substantial deficiencies**	**Substantial deficiencies**
Criteria of EU definition reflected in national definition	Substantial deficiencies	Good progress	N/A	Good progress	Average progress	Bad transposition	Good progress	Substantial deficiencies	Average progress
Level of detail in the elaboration of principles contained in EU criteria	Substantial deficiencies	Good progress	N/A	Substantial deficiencies	Bad transposition	Bad transposition	Best practice	Substantial deficiencies	Average progress
Clearly defined purpose	Average progress	Average progress	N/A	Average progress	Substantial deficiencies	Bad transposition	Bad transposition	Average progress	Substantial deficiencies
ICA cooperative governance principles reflected	Bad transposition	Average progress	N/A	Good progress	Substantial deficiencies	Bad transposition	Average progress	Substantial deficiencies	Substantial deficiencies
Legal entities allowed	Good progress	Good progress	N/A	Average progress	Bad transposition	Bad transposition	Good progress	Substantial deficiencies	Bad transposition
Citizen participation is ensured	Bad transposition	Bad transposition	N/A	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition
Designated authority to oversee	Good progress	Best practice	N/A	Good progress	Substantial deficiencies	Bad transposition	Average progress	Average progress	Bad transposition
Number of definitions	Good progress	Best practice	N/A	Good progress	Good progress	Bad transposition	Good progress	Average progress	Substantial deficiencies
Coherency between both definitions	Average progress	Best practice	N/A	Substantial deficiencies	Average progress	Bad transposition	Average progress	Average progress	Bad transposition

Country	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg
Definition of RECs (REScoop)	**Good progress**	**Good progress**	**Average progress**	**Substantial deficiencies**	**Good progress**	**Good progress**	**Average progress**	**Average progress**	**Substantial deficiencies**
Criteria of EU definition reflected in national definition	Good progress	Average progress	Good progress	Bad transposition	Best practice	Good progress	Substantial deficiencies	Good progress	Substantial deficiencies
Level of detail in the elaboration of principles contained in EU criteria	Good progress	Good progress	Good progress	Average progress	Good progress	Good progress	Substantial deficiencies	Good progress	Bad transposition
Clearly defined purpose	Average progress	Substantial deficiencies	Good progress	Substantial deficiencies	Good progress	Average progress	Average progress	Average progress	Average progress
ICA cooperative governance principles reflected	Average progress	Good progress	Good progress	Substantial deficiencies	Average progress	Good progress	Average progress	Average progress	Bad transposition
Legal entities allowed	Good progress	Good progress	Good progress	Substantial deficiencies	Good progress	Good progress	Good progress	Average progress	Good progress
Citizen participation is ensured	Bad transposition	Best practice	Average progress	Bad transposition	Average progress	Average progress	Bad transposition	Good progress	Average progress
Designated authority to oversee	Bad transposition	Good progress	Average progress	Good progress	Best practice	Average progress	Good progress	Good progress	Good progress
Number of definitions	Good progress	Average progress	Average progress	Good progress	Best practice	Good progress	Good progress	Average progress	Average progress
Coherency between both definitions	Average progress	Average progress	Average progress	Bad transposition	Best practice	Average progress	Good progress	Average progress	Average progress

Country	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden
Definition of RECs (REScoop)	**Substantial deficiencies**	**Average progress**	**Bad transposition**	**Substantial deficiencies**	**Substantial deficiencies**	**Substantial deficiencies**	**Average progress**	**Average progress**	**Bad transposition**
Criteria of EU definition reflected in national definition	Average progress	Average progress	Average progress	Substantial deficiencies	Average progress	Substantial deficiencies	Good progress	Average progress	Average progress
Level of detail in the elaboration of principles contained in EU criteria	Bad transposition	Substantial deficiencies	Substantial deficiencies	Substantial deficiencies	Bad transposition	Average progress	Average progress	Bad transposition	Average progress
Clearly defined purpose	Substantial deficiencies	Average progress	Average progress	Average progress	Average progress	Substantial deficiencies	Substantial deficiencies	Average progress	Substantial deficiencies
ICA cooperative governance principles reflected	Substantial deficiencies	Average progress	Average progress	Substantial deficiencies	Average progress	Average progress	Average progress	Average progress	Good progress
Legal entities allowed	Bad transposition	Good progress	Substantial deficiencies	Substantial deficiencies	Substantial deficiencies	Bad transposition	Average progress	Substantial deficiencies	Good progress
Citizen participation is ensured	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Bad transposition
Designated authority to oversee	Bad transposition	Bad transposition	Bad transposition	Bad transposition	Substantial deficiencies	Good progress	Bad transposition	Bad transposition	Good progress
Number of definitions	Substantial deficiencies	Best practice	Average progress	Good progress	Average progress	Bad transposition	Good progress	Average progress	Good progress
Coherency between both definitions	Bad transposition	Best practice	Average progress	Average progress	Average progress	Bad transposition	Substantial deficiencies	Average progress	Good progress

3. Transcription of interviews

3.1. Danish stakeholder

Interviewer: I wanted to hear your experience – how was it so far setting up the renewable energy community in Pillemark. So, can you tell me about that?

Representative: So basically, the general idea is that Pillemark is a small village with 70-80 houses and outside of the district heating area. It's not feasible, or economically feasible to have a district heating in Pillemark. So, it's down to individual households and people living there to figure out how to switch from oil or so, or whatever they use for heating. I have a very old house from 1782 with a straw on the on the roof and I put in the heat pump, and I wanted to be able to produce more electricity by myself, but I don't want to put solar panels on my roof. Then I looked around in the city (village Pillemark) and can see that there are some, some farms some big stable buildings that could have some solar panels easily. So, the good thing would be that there was a production from where that would be feasible and those that need the power can use that. That's kind of the main thinking in the first place – if these solar panels fit better here and I could use the electricity there. But then we have in Denmark a law the Danish law that tells us that if you are moving electricity from one place to another you have to pay a fee, a tariff, a tax. So that's kind of the thing that we are still struggling with. At the time, we are now two and a half years into this actually from when we started this thinking. There was this law from the parliament and that was supposed to turn into law in Denmark so we were quite ambitious saying: 'well this will soon be available here in Denmark so we can kind of share in the energy community these, these type of resources between production and utilization'. So that's why we then set up eight people. There was a local carpenter and I invited local expert to come and speak and he stood up and said about the energy communities and that it's gonna be a law and so on. So, we've got some good people that were interested and we set up a Facebook group. That was sort of the beginning of it and then we started discussing whether to… And, actually on that very meeting one of the people that joined suggested: 'Well we have this facility where there used to be a dump for trash that is not used anymore' and said well we could also maybe use that because it's two hectares, and we could use that sort of a bigger one instead of putting up on everybody's roof that could be another solution. We kind of liked that idea and that's kind of where the idea about the solar park came about on that very meeting. So that's how we then been working on for quite some time now and you may have heard a bit about it so that is hopefully being established. The other thing that came to mind and why I also called it an energy community was the thing that one thing is production of electricity and other thing is then switching to the heat pumps or other sources. There's a thing called termonet. So I thought that could be another thing instead of putting up heat pumps. I put up an air to liquid heat pump but if you use ground source pumps and then share in the termonet as we're building out here as well, people could then have a more effective system altogether where you share and you get a better economy all together. So that's kind of why we say that there can be more activities than just the solar park. And basically, maybe also help people in the process in applying and if we are like five or ten people buying and installing we might be getting better prices. You know this thing of helping out in

the community in different areas it was kind of the thinking. Because there are also elderly people and there just you know don't know what to do.

Innterviewer: So, helping in financial situation or…

Representative: It's probably,… yeah it could be but maybe even down to the process of figuring out what to buy, where to buy pricing, and install it. So it's just getting people in the right direction. I, myself, spend a lot of time just getting the right configuration and the right price. So that's a lot of easy money if people don't know what they buy and just talk to people that it's nice. So yeah, I saved like 25,000 dkk just on my little installation. So you know just guiding people a bit can help.

Interviewer: Okay, and you mentioned the problem with selling from one place to another and the taxes.

Representative: Yes, that is the main issue we're still struggling with. Local expert just told me, I wasn't aware, but actually in two weeks time there's gonna be a national community or union or whatever you call it, for energy community to establish in Denmark. That is simply to look into this big issue that there aren't energy communities where you, even though that you take power from one parcel to another, you have to pay the tariff. That spoils everything.

Interviewer: So it's the same as just buying from the grid?

Representative: Yeah.

Interviewer: Okay and is there any other challenges - major challenges that you faced so far?

Representative: I think, I have to talk to a local politician because that is a very internal thing I would guess. But we have very inefficient kommune. That is maybe why we can't really force it either. We can spend a lot of time on this if we have to fight with commune about everything. If this things are to be successful it's supposed to be other way around – that commune should go out and say 'hey we can help, we can support, we can…anything' but the opposite is a situation.

Interviewer: What about regional and national authorities?

Representative: On the national level we need the visionary politicians that will enable the vision from the European Parliament and the EU legislation into national law. They don't do that. They are lobbyists and the Danish energy market is controlled by I don't know 1500 people that are in big energy organizations, and that's the situation. So citizen driven energy communities and people that want to engage cannot. Because it's down to the big money, big capital.

Interviewer: Before Denmark was known for the energy cooperatives which are not necessarily energy communities. What do you think it happened between then - 70s, 80s when this was popular and now?

Representative: Well I think that the lobbyist have taken over a lot of the agenda at the political level. The politicians are to stressed, to unwilling to fight big lobby organizations, to… I don't know. But fighting for the small man is not a big winner, so yeah it may be something in the society all together. It may also be that they don't understand how big the issue is, that you don't see the big potential in getting the population more actively engaged as opposed to have big financial institutions, big farmers, big venture capital funds, plaster big solar farms and everything in the areas where they're not very nice, to be honest. But what we're doing here with a small solar park, is that it's quite small. We put it in place where you can look into a dump yard or solar panel, what do you think. And if we can have this small type of solar parks, we can find many areas and on Samsø where that can be atraction and wouldn't be harmful for the environment. Yeah, it won't be visually bad. And it's really a discussion because when I talk about the windmill, I acctually like the view of it and feel positive about it, some people don't like it. And it's probably the same with the solar panels. Some think: 'I don't like them I like to look at the green field as opposed to black solar panels' but some may think of it in another way. It may be individual thing.

Interviewer: How could financing opportunities be improved?

Representative: So for the financing, I think it's a really good case. I mean what we put together now is not going to be the energy community type of thing. It is going to be solar park that we invite everybody to invest in. We put down the share price or the share size to 10,000 dkk so everybody can buy and it's a good return on investment - some maybe around 10% return on investment which is quite decent actually. And you have this - it's a very good and attractive investment. So actually, when we presented, we presented last year here then there were people from other places on Samsø that asked 'can we also do that here and there?'. But when we then presented in Pilemark about this project they said 'well we want to have right to buy first'. So they found it very attractive. I have no concern. It will be easy to sell the shares because it is a good investment and an investment you want to be a co-owner of this of course. So investment side it's not a problem at all.

Interviewer: But you don't have support from government?

Representative: No, no. Not at all. Nothing. I mean like electricity generated from solar and wind is by far the cheapest of all. What we also are doing. In the agreement that we get when we sign up with energy net is five years contract with a fixed price so we know what we're going to get for this period. Then it's going to be another price it is certainly going to be lower, we don't know how much but it will be lower because the production is going up. So what we are also buying in the same project is a battery that we will put there so we can also do our arbitrage - sell at times when the electricity is more expensive and store it when the prices are low. And this is also going to be attached to that a charger, a supercharger, very fast charger so it's going to be by far the fastes on Samsø . You can charge a Tesla Model y in 15 minutes so it's like that. And then we'll sell the electricity for.. Yeah I mean we get 0,58 dkk on the five year contract and we can sell it, I don't know 3 dkk or something like that so it's very good. That's also a good investment and that's a long more long-term investment because we don't know what's going to happen after five years with the

agreement, but the battery will stay for much longer, and the charger. Yeah, so that's sort of reassurance that we have more control of things over the years.

Interviewer: What about the grid connection? Do you have any problems when connecting to grid and the regulations about it?

Representative: Not at this point. Of course, if there's gonna be huge solar parks here it will completely ruin the market because we only have so much. We have a cable to the to the mainland and it can take so much, we could only use so much here on Samsø and at this point, maybe pointing a bit back to the kommune - I'm trying to get them engaged at very different levels but there don't seem to be any real plan for electrification. How do we build out sustainable energy and we have a ferry, electric ferry coming in one and a half years. And kommune's il like 'oh nice that's a ferry we didn't think it could be electric, so we suggested another type'. But the thing is that the company that then puts in the ferry they don't have anything. They just contacted the electricity, the net operator Constant (??) and say we need this power at this place at this time. And then that's going to be like a huge cable down to the harbour. So, whenever the very docks it will be plugged in with the 8 MW for 25 minutes then it's gonna be plugged out and the cable will be used for nothing for the next four hours. Which is a little….

Interviewer: How do you see renewable energy communities evolving in the future in Denmark? Do you see the future?

Representative: We'll see after the next election, or the next, or the next. I don't know. Umm… it doesn't seem to be... We can hope that that these types of organizations that are being now set up with some very good people that are connected across the Europe. They will have the power to engage in a more qualified dialogue so that they make the politicians understand this is important this is a totally unused resource that is there. To do something.

Interviewer: And what do you think are the most important factors in driving the sustainable transition and how can energy communities contribute to that?

Representative: I think actually enabling energy communities is a huge enabler. So you take the question around then you have the answer so to speak. Because it's a huge resource if everybody takes or… I mean in this small village we were eight people out of 80 so it's 10% that can drive a lot of, not innovation, but transition and help in many ways. Because obviously there are always people that can drive and will drive and have the resources and there are those that don't have. So, in these communities it will support each other in the strong way if made possible.

3.2. Austrian stakeholder

Interviewer: Can you tell me about the whole thought process behind deciding to start an energy community and how did you come to the idea of having a renewable energy community? What was the motivation?

Fritz: The motivation was that we started the classification process in 2016. We talked to all our people, and they said there are five very important things for which we want to have someone answers, and one of these five things was energy. Nobody was talking there about the energy crisis because the crisis was not here, but we talked about when we talk about energy and what does it mean to us, to our community as a society in the village. The outcome was more or less to be resilient. So, to get more independent to order things which have a global scale. Normally in Austria, we say if there is something happening in China that doesn't affect us but the energy crisis has shown us that the opposite is more or less the truth. So, we are very woven between the orders and interests in all of the world, and to get a little bit more resilient to that is important to our people, to our local people. That was more or less the starting point. We were talking about okay what does that mean to be more resilient. To be resilient in terms of electricity means to produce our electricity in Stanz. That was the starting point, I think.

Interviewer: Okay, and what sources would you use?

Fritz: When you begin a process like this you think a little bit like you did when you started your thesis. So, you want to have an umbrella of what's going on what could be possible. In Austria, and especially in Stanz it could be possible to get energy from small hydropower plants. We actually have two, a small one, a very small one, you can get electricity out of windmills, you can get electricity out of PV panels on the roof and that's more or less the three possibilities to get out electricity. Then you get energy out of biomass for example. That's more or less the only source we want to use in terms of heat because we have a lot of forests in Stanz, 85% of our land is covered by forest. So we have a lot of residual wood and we can use it for energy. Just one thing – we've got 750 households in Stanz and we have residual wood, that's wood which is not needed for furniture and that stuff for 1500 households so we can feed twice as much. That was the main reason to decide okay biomass is a good source for us because we don't waste it, it is sustainable, and we could convince one farmer to invest money. So, the whole city center, as I mentioned yesterday, we had gas, natural gas more than oil but that's wiped out. So, every household and this building they are heated by the central heating system fired by biomass.

Reiner: But maybe, coming back to the question of how we started. There is a parallel issue with the wind turbines in the municipality. We started in 2010 and we had meanwhile 24-25 wind turbines here in the municipality, and of course, this is also a question of ownership. Because these are, as Fritz also mentioned yesterday, these are investors, not local investors one is regional but as Fritz mentioned in one case of one wind farm it was an investment from Switzerland. So, this is of course interesting because people here are not really benefiting directly from these windmills. But it's also interesting there's not a huge protest against it, but we did a referendum and maybe this is also interesting in this context.

Fritz: I wanted to know what's on the mind of our people in terms of another new wind park. Now we have about 23 windmills and they are divided into three different wind parks. The first and the second one have the same owner and the last one, I told you yesterday, they sold it to an investment fund from Switzerland. People didn't like that, and we did the

referendum and 72% were against but only around 30% percent of all people went to the referendum.

Reiner: You formulated a weird question. What was the question exactly? It was not just ‘Are you against or pro?’ It was ‘Should there comes a limitation at a certain point when talking about windmills?’ Not just we are against it or pro, so should we regulate it at some point?

Fritz: And we learned that only people who are against go to the voting. But overall, they think it's enough. So, we have 23 – that’s enough. But they're not against them. Overall, they are not against them. We signed a lot of intent in terms of windmills in terms of this little hydropower plant – they want to renew it, to renovate it. But it is stopped this year, and it will quadruple its power. Now it’s 20 kW and in future it’ll be 80 kW. That’s interesting for our energy community because you have this type of electricity 365 days a year so it’s a good basis because it’s not fluctuating, just a little bit. That's important and deciding, and we are happy to have that. It makes it much more easier to combine all these different sources when you have a good basis. So, the problems are getting a little bit smaller. These are our sources, and we try to combine them, there is this thing we told you yesterday, with this blockchain stuff because we are convinced, we should use as much as possible in your ecosystem. There is some regular energy that comes from both directions, and it's needed in the future as well, that’s clear. So, we've paid for the grid and the grid is not in good shape, but we pay for it and we want to renovate it, as I mentioned before, in our own ecosystem, the electric ecosystem. And people are very interested in that. So, the main motivation was, that was a little bit surprising to me, that not the price and safe money is the main reason to step into this energy community. The main reason was to get more independent. That’s interesting because a lot of problems you have on our municipality level always come down to costs, as it is maybe all-around Europe. This especially, the feeling that costs are important but not the most important thing. That's a good thing in terms of motivating people to step into this process. And as Reiner showed yesterday, we have 65 members, so they are installing their PV panels and all this stuff, they are very active. To keep this process alive is our main work because people are not… People are very curious and when they get bored, they go to another ‘festival’ and then we lose them and that's a problem because it’s hard to get them back. To keep them motivated it's a lot of work.

Reiner: As I mentioned yesterday, we are not sharing energy, we didn’t start to share energy yet. But we founded an organizational body for the energy community, and they very actively exchange knowledge in common gatherings. So, I think this is also a very important part of the energy community. There is this shared identity that we are part of this movement, and this is really working already. But maybe coming back to how it started, an important point was this national funding, and we tried the first application there in 2018 to get campus. It was in the direction of energy but not that sharp, so we didn’t get the funding the first time. Then in 2019, there was another funding round called the City of the Future funding program and others made an application to get this funding for central heating and we got it. It was quite interesting. As Fritz mentioned about 700.000 euros was our budget

for 3-4 years and a big part of this funding program is that you can invest in technical infrastructure. Normally because it's obligated, you have also a little part besides and it's called social innovation at this funding program you have to do it. And normally it looks like you did an evaluation of a smart city funding project in Austria, so normally this social innovation means you send out a questionnaire to people and ask them if they like this context and then you can say you did a social innovation part. Here we also had this social innovation part, and it was called, as Armin mentioned yesterday, Rural Pioneer Community. There we sorted out what we can do in rural areas in the context of energy transition. Then this is a project that really came in the period when the implementation of the Renewable Energy Directive was in progress, so we knew that it would come in Austria. We started to introduce the project in 2020 and we really prepared in this context for this implementation. Then it was implemented in June 2021, and we were ready to start to take the possibilities that have been given. That is the Renewable Expansion act, so it gives a possibility to fund this renewable energy community, and this was quite an interesting time. So having the central heating project and having this transition in the energy market. And for me, it's interesting because normally as I said, the social innovation part in these projects is boring but here it got a real, own dynamic and it is very interesting what we have been able to do in this context.

Fritz: We are moving slowly, and the reason is a lot of energy communities are already exchanging energy. But the problem is they are doing it in a very fragile way because data security is not clear, the data availability is not clear, and so on. They are running into a lot of problems. And when you run into a lot of problems there is a group who wants to step up and pick them up you get discussions about whether this is the right way. Then this discussion gets a bad shape, people lose their motivation. That's the reason why we step forward slowly. Because we think that we do have electricity, we have no problem in terms of we have a good provider, we don't have blackouts, and everything is okay. The question is how we should take risks in this process. So we move forward slowly and step by step to make sure we have all the technical stuff and to make sure that we don't lose the motivation of our group of 65 members. I think that's the real value we have. All the technical stuff will be more or less functional in the future, it's a matter of work. But to motivate 65 people who have different social backgrounds and a lot of daily problems and other stuff. To have them motivated over a longer period that's a real challenge. And that's a reason we move forward slowly and think it works out pretty well. You have to communicate that we don't have a big solution for all the problems of our world tomorrow. And yeah, that's our way. Not to overstress people.

Interviewer: Okay. How are you financing or how do you plan on financing this project?

Fritz: Well, we try to get funding from official sources. We have a lack of knowledge to do that, to be honest. It would be nice to have one person who is into this funding science. But you know we are a municipality we are not a big research organization. We get a lot of motivation to get some voluntary work so people believe in what we do. That's another reason to step forward slowly. Official resources, people take their own money. When they install PV panels in their own house, they take their own money. That's another reason to

make sure not to fail because when people get funding from another source they say ‘Okay that’s not my money’. But if they invest their own money people think twice.

Rainer: And there is an investment program for instance for photovoltaic for private households there is around 20% that they get subsidies for investments from the government.

Interviewer: How is your collaboration with the regional and national authorities?

Fritz: Well now I have to be polite. Well, they do support us but we are now in charge for more or less 10 years. The problem is I'm not personally convinced that they like what we are doing. Because from their perspective this produces a lot of problems. When you try to motivate people and democratize that stuff – how the decisions are made, that's a threat to politicians. And that motivates them to say ‘Yes that's a good project that's very interesting’ but they are just sitting there talking. There are no active…. They are not really convinced about that. They know this problem and there are sitting there like ‘they are producing the problem we don’t need’, that’s their thinking. That’s a type of special relationship. They have a lot of money, you know. So, it’s a diplomatic expedition to convince them that this one that we do is a good job. What motivates me is that we are not the only one who thinks so. They pop up now, you know. And many little villages and citizens – people realize that to get independent is a good thing. And what people, do not really know, but what they feel is that big companies like Google and Apple and all that stuff. They are mentioned now, and they own all our data. That’s nice when everything is convenient on your iPhone but there are a lot of problems we are running into and people feel that. The message in our community is to have our data in our own hands – people understand that. Because we could be part of the business. When you invest 20.000 euros for PV on your roof and you get out 20 kW peak for example and the grid operator says, ‘Okay you can produce 20 but I only accept 10’. So, you are losing money because you have to give them 10 kW for free. You get six cents per kilowatt, and it comes immediately back for 25 cents. So, the problem is there are 19 cents between, that's their business, but that should be my business because it was my money that I invested. That’s the problem and people realize that. That's one of the motivations because people say independency is one factor that motivates them to spend their leisure time on this project. That's a threat to big grid operators, that’s a threat to politicians because it's a type of self-empowerment of people. In the end, when you make a conclusion of all the last 10 years it’s an approach of redemocratising.

Rainer: We started this as the village life but now it came to the question of energy and democratic energy market, and, as you saw yesterday, coming to the question of money. I mean, we don’t make it big now but discussing issues about the economy and money and where does the money come from and where does it go. And how can we strengthen our local context. But maybe coming back to the question about the relationship. I think it's interesting because Stanz was more or less white point of a landscape before we started our work. I would say meanwhile everybody in the scene, so regional authority, mayors in Styria but also in other federal states in Australia so everybody knows Stanz.

Interviewer: Can you tell me about your collaboration with the ministry? You mentioned it in one of the previous online meetings.

Fritz: That's part of our research project with FFG, with the Austrian research funding organization. There are different parts we are working on and one is on legal framework. They are interested that we give them feedback, we are a pilot community. The government looked for the communities that are on the edge and thinking about this transformation process. We got selected and they funded us two times with 25.000 euros, and we had to tell them what was going on, what are our problems and which things we are good with. So, they wanted to get into communication and that's a good thing I think because they are on a high level and we are down where the life gets complicated.

Rainer: There was a very interesting conference two months ago in Vienna, conference on renewable energy communities. Because now it's one year more or less since it's possible to really start with the renewable energy community. So, the electronic data administration on the national level, they have been ready last year in autumn. So, this was the moment that was possible to practically start with renewable energy communities and now five months later we had a big conference in Vienna. It was great in the sense that they really discussed what the problems are in the practical life of energy communities. This is the reason that Fritz mentioned, we didn't want to be the first ones to run into the problems, maybe to watch a little bit first. But it showed that for instance, Leonore Gewessler is the responsible minister for this issue. She was there the whole time at the conference, so she showed that it is an important project for her. It's also an interesting political landscape in Austria because since 2020 we have had this green government and it's the first time they are in charge. And it was a really hard project for them to implement this issue of renewable energy communities and make it happen. It's interesting this concept in Austria.

Interviewer: What are the challenges that you faced and could they be improved?

Fritz: There is a long list, you should stay three more days in Stanz for this. There are a lot of things that do not work well now either. That's not…. That is a problem but for me, it's not a real problem because it forces us to think step by step and there is no big solution that solves every problem because things are very complex, and they have a lot of social impact. All the technical stuff you regulate produces a lot of social impacts, so you have to be careful about that. I think it's a wise way to do it to make a challenging framework and then you adapt it to the real situation. When there is a conference where the ministry is there, you ask people from the communities to come to tell her (the minister) what are our main problems. She has the power to regulate it so that's a good way to iterate this process in a good way.

Rainer: There are three main problems in Austria at the moment. So, the first one is the problem of smart meters. I mean it's unbelievable that this is a problem in 2022. We had a delegation from Estonia here in autumn, so we also talked to them about what the problems are, and we said about the problem of smart meters. They didn't understand what we mean. Half an hour later we realized that it was built there 15 years ago so they don't

know the burden anymore. So, they have been curious about what's going on. So, this is a big point in the rollout.

Fritz: And I got installed my smart meter two weeks ago, but the technology is from 20 years ago. That's the problem. And they don't just install one type, we have five different ones. But that's the way it is you have to live with that. And they wanted to make it as much complicated as they can.

Rainer: But you get it very fast when you install photovoltaic.

Fritz: Yes, but it's a prerequisite, you need it.

Rainer: Yeah, otherwise they lose money. That is the first issue, second big issue is the grid and the limitation on how much you can feed in as a private household. That's very limited and it's not understandable for the people because it's like a game because the neighbor got a 15 kW possibility to feed in, and the other one got 4 kW. Nobody knows how it's decided how much you get. So, there is a process when you install the photovoltaic. Before you have to give registration to the grid operator and then they tell you how much you can feed in and people don't understand what's the logic there. There is no logic there.

Fritz: Not, it's like they have a random generator. I'm joking. And they press the button, and it gives out a number between 1 and 20.

Interviewer: I read during my research that people can feed into the grid as much as they used themselves, because if they sell more to the grid then it's their main business.

Rainer: That's the argument.

Fritz: Yes, but that's…. Yeah, they say that because you have to pay for it. If you need four kW, that means 4kW multiplied by the number of hours in a year so that's about 35,000 kWh for example. You can get that, and you can feed in that. But the problem is that it's not always at the same time, so there's a time-sharing problem. There is a big group in Austria who say that's not legal. We as an energy community first wanted a regulation service to step in with the process but we don't believe them because it costs a lot of money, and you need lawyers and all of that stuff. I prefer that a big city will do that. It's a nice question but we don't waste money, it will be solved.

Rainer: This is really interesting, and they talked to the grid operators, and they also talked to this guy, Florian, from ministry but also to another guy that is longer in this business. Somehow you have the feeling that you have to discuss about energy transition in the year 2017. The grid operators and power electricity companies say 'Yeah, yeah, we can talk about it but this is our business'. They have been surprised that suddenly we did this implementation, and they really haven't been prepared and now they are struggling with this issue, trying to somehow fight against it with their methods. This is their method, these limitations. So, they are really surprised because the Austrian law that was implemented in, I guess it was implemented in 1992 or 1993. Someone said that because it was seen in the '90s that photovoltaics will become a factor. Then the law said that operators have to

prepare for this transition, of course, they already know how it will change. Except they didn't really invest in the grid like they had to.

Fritz: This year I'm 60 years old and I paid grid fees for 40 years or more. So where is all this money gone? People are asking that.

Rainer: Because there was no extension of the grid, it was just keeping it going.

Fritz: This is not a very good question for them because they have no answers.

Rainer: So, the boss of the grid system said we cannot do it for every last farmer in the last month, we cannot do it.

Fritz: They invite you to invest. For example, we want to establish two charging stations for cars, and we need a new transformation station because we need a lot of power. They said it's possible but for this type of transformator, you need about 220.000 euros. That's not our business, it's their business to supply this, to deliver the service so that's a problem.

Interviewer: So, what I hear, the biggest problem is the great operators

Fritz: Yes, they are just sitting and waiting. They have not realized that this type of transformation that is going on now is a chance for them to make a new business model. Because as Kai mentioned yesterday when you have good data availability and it's clear who is the possible user, and we have good interfaces everyone can step in with different apps to make those servers. It's not our business to program all these apps with good services because the grid operators can do that. But we want to have our data in our own garden.

Rainer: This is the third big threat we have at the moment – data management. It introduces a new authority, it's called Electronic Data Exchange and they are responsible that energy communities can get their data about how much was produced in certain communities and how much was shared, what is the share of each member of the energy community. We have two different types of how to distribute possibilities. There is a fixed distribution, so each member has a fixed share of produced energy in the community, or you have variable shares that depend on how big are...how much energy they consume so that the share is adapted to that. As Kai also mentioned yesterday, the first possible moment to get this data is on the next day, 24 hours afterward. So low possibility to have a smart grid and automate the processes. And they are facing still the big problem that the data is not valid, so they have failed. But still, there is a regulation that they can correct the data within three months so you have three months for instance that you can bill the members. The idea is for instance that members can be billed easily. You can't do it easily with this now. They give it to you, but you get a CSV file, and you have to make complicated calculations so that you can bill the members. But if you can automate this process like it's our intention with Kai then the idea is to bill the members each month. Then you have a really good feeling about how much you spend on electricity, you can adapt your behavior, etc. But the authority says that we can correct the data that we gave you in a period of three months. This is at the moment also a big problem we are facing in Austria.

Fritz: And when they are losing data they have to estimate that. So you are looking at your bill and say: 'Aha! Yesterday they charged me one peak for putting on my coffee machine but yesterday I wasn't at home. So, you run into problems and arguments, and that is not good. People have to pay for things that didn't happen, so they get angry. They know about the hardest problems and that's the good way that there are conferences where you can speak freely about these problems to iterate the next good step to optimize it. When the minister is there herself that's a good sign for all the people who are trying to get the system forward.

Rainer: I think this is an issue we had an interesting discussion about in Austria, at least in our project. Because normally it's just legal to bill data from a certified smart meter that went to the grid operator, that went to the electronic data authority. This must be the basis of billing. But we are facing these problems so our idea is to use our data that we got directly out of the smart meter as a basis for billing which can be a legal discussion of what is the real data.

Fritz: I expect that it will not be long in the future that we get a telephone call from our grid operator, and we discuss if they can use our data. And because they have a lot of problems to bill all this stuff. When there is a source when the data availability is okay, and the quality of data is okay. What's the reason not to use them? It's a trusted gateway, it's not just the electronic device, it's trusted. So, there is a process where they get sure that the data is valid so there is no reason not to trust them and not to use them. So, we talked about it yesterday with Kai. I expect when this works out very well, they will give us a call, I'm sure. They can eliminate a big problem for them because now there are two guys who just try to get stuff done and I know from internal sources that it is a big problem.

Rainer: I have a funny story about limitations, feed in limitations. There is a working group of the energy community and one week ago we had a working group about photovoltaics. So, it's mainly sharing knowledge about experiences as I told you yesterday, about the tools you are buying for your own home and how to combine different tools, modules, and all this stuff. So this is the main issue, which company is good to install it etc. Then the guy from the gas station was coming to the working group so he asked because he got his letter from the grid providers about his possibility to feed in. And he asks to bring this letter because he doesn't understand it and cannot read it because it's so complicated and technical. So, he brought it and we discussed other stuff and then we came back to this issue. Everybody was curious about what will be in. And this guy was reading it and it was 100 kW which was a shock. This was never heard of. Others had a limitation of 5-6 kW, this was really like winning a lottery. The guy brought beer for everyone.

Fritz: So, it's like playing the lotto. You don't really know what are the reasons for limitations.

Interviewer: What are some lessons that you think other countries could learn from Austria?

Fritz: One good thing is I think that we have the framework now alive. So they put a lot of pressure to push it and I think they are… The second possibility could have been to wait a little bit. To wait to see how Denmark is doing that or how the other countries are doing

that. I think they did it the other way around. They said 'Okay we'll try to be one of the first ones and we are aware that we might run maybe into a lot of problems, but we will make iteration processes to shape it in a good way. I think that's a good thing because everyone who is in this process can learn from it. And the pattern on the high level is the same as the low level. So, we can learn from them, and they can learn from our problems. That's a good thing, I think. And the decision from the Austrian government to make plants for the delivery of electricity. These very high and very big modern gas plants that you can switch on and off in two hours, for cole plants it's one week or two weeks. This is the basic thing, the foundation of our future system, and everything that's needed besides our power plants, the big ones, it should be produced on the regional level because it takes off a lot of pressure from our grid. Take the situation in Germany. They're not able to transfer all the electricity from the offshore power plants from the North Sea to the South. They urgently need power for example, but they are not able to transport it. So, to produce this stuff they need power to x cells. It takes out a lot of pressure in terms of grid operation and investment in the grid. Because to invest in the grid is a very expensive thing and it takes a very long time because there are a lot of NGOs and private companies and people and so on who don't want all these big things in their landscape. For example, there is a ring of 380 km – power circle in Austria. There was a little bit left in Salzburg. And this little that is just about 120 kilometers I think, it took 28 years to get permission to build it. So that's a problem. And this circle is needed. Now it's done but it took 28 years, and the problem is that time is running out you know, the transformation should be faster.

Rainer: And this was really interesting that the green minister was able to fix this after 28 years. The other parties did nothing in 28 years. They discussed it but no decision making.

Fritz: It's a good thing to discuss 28 years about that – that we really have a problem. That's the way it is.

Rainer: Coming back to this learning processes. As Fritz mentioned before, we got a budget of 25.00 euros to collect some of these learning lessons and to report it back.

Interviewer: How do you see the role of renewable energy communities evolving in the future? What do you think will be challenges and the opportunities?

Fritz: Well, I see one practical and one political impact. About political we talked already, so redemocratisation, to give people the possibility to act in their own environment. I think it's good for trust and belief in the political processes. That's one of the products, I think. And to produce electricity and to exchange it on a regional level I think it's a smart idea. Because as I mentioned before, it puts a lot of pressure to do it in this way, so it pushes our transformation process and I think it's a good idea. What I appreciate is that this directive comes from the EU level. There is a lot of discussions is about were we right to be as deep as we are in all this EU stuff. And I think it's the right way because the Austrian politicians wouldn't have been solving it this way. Nowadays, not only in terms of electricity but on many other things EU makes a lot of pressure. And they don't just say you have to do this, they fine it. That's a good way because this forces our politicians to think that we should do something. And I appreciate this way very much to have this EU level that is a little bit more

independent from all this political stuff here on the national level. I like that because it's a good positive motivation. They had to find how many million euros when we failed these targets, Austria had to pay 90 billion euros. It's a lot of money and I think they should've invested in the grid or whatever.

Rainer: I think on the question of what could be the impact of energy communities. One limitation we have at the moment is of course that it's just on a voluntary basis. So yeah, you are doing it but it's voluntary, so people don't have that much time. Normally you really need one expert or manager who is doing this. Energy communities on a technical level can become really relevant when you do this coupling of sectors, then you have the possibility to integrate hydropower, then you have to possibility to make co-investments of the members in large plants for instance. Then it gets really relevant. Just the basic level with exchanging on the private household from the roof systems – yeah, it's okay but it could have more impact when we push this. What I see, in my experience is, what is a really relevant impact is the mindset. Because people who are part of the energy community and get into this discourse and knowledge sharing you completely change your mindset in the way how you deal with energy and how you consume energy. This is really great.

3.3. REScoop.eu representative

Interviewer: What role do you see for renewable energy communities in future sustainable transition?

REScoop.eu: Well actually the energy communities, renewable energy communities, and citizen energy communities have been introduced for the first time in the Clean Energy Package officially at EU legislation. However, a lot of energy cooperatives already existed beforehand in different countries like Germany or the Netherlands as a more historical approach. With regards to the potential they have may be interesting for you and for your literature that is a very useful study that has been done by the University of Delft and some other organizations, that tried to measure the potential of renewables and participation but also through communities in the energy markets and the main finding – they have data for all the different countries and different technology I think – but the main finding is that by 2050 at least half of the European demand for electricity could be produced by citizen initiatives, and energy communities and active consumers. So we are talking about huge potential in contributing concretely to renewable energy production but also local security of supply. It's interesting to see now some new developments on market design and market design revision also that the commission issued some time ago now it's in the process of negotiations with the European Parliament and the council. But they also are recognizing the importance of empowerment of consumers, and they also have new articles specifically, for instance on energy sharing to make sure that more and more citizens participate. And we for instance at REScoop.eu definitely promotes a more decentralized model but also a democratic model. So yeah, I think they have a great role to play. We've seen already that from 2018-2019 with Clean Energy Package there has been a huge increase in the number of energy communities that have been developed around Europe. For instance, in Greece, for

the first time they introduce legislation in 2018, and now we have more than 1400 energy communities being developed at the national level. So there is demand for it from the citizens that are trying to find a way to reduce their bills but actively participate in energy markets. What we need more and more is for concrete legislation to happen at the national level to enable those initiatives to flourish and participate in the market without discrimination. And maybe also what is part of the actual obligation of member states, the reduction of administrative and regulatory barriers that citizens are facing at the national level. I took your question a bit more broader but maybe I replied to some other questions that you have.

Interviewer: Actually, I wanted to ask what you think at the REScoop.eu that countries should specifically. They should implement this legislation but some countries did that and they still have a low count of communities so do you know where is this barrier in these countries? And is there something more they can do?

REScoop.eu: So first of all, European Directives that include provisions for energy communities have to be transposed at the national level so that's an obligation for member states to comply with it. But we always say that a transposition in a sense of a copy-pasting of the European provisions or literally translating them at the national law is not a complete transposition. The European provisions have some general terms that have to be transposed and interpret in what it means in its national context. For instance, the requirement of proximity for renewable energy communities or open and voluntary participation what this concretely means at the national level is something that the member states have to design and put it in the national law. If you just say that the energy community should be open and voluntary or that energy communities are legal entities without specifying which legal form they can choose to set up an energy community we see a phenomenon like what you explained. So there is legislation but citizens cannot use it. Like it's the case in Croatia, there's legislation for one year now there are so many barriers and so many things missing but there's no energy community being developed because people cannot use it. Also, in the case of Malta and Cyprus so legislation is just a copy-paste so they do not even know what legal form they should choose, what the requirement of proximity concretely means and how they can comply with it, and what a complete enabling framework for them, to be able to participate in the market without discrimination, means. Because the enabling framework for instance, for renewable energy communities is specified in paragraph 2 of article 22, so it has all the literal bullet points of what the complete enabling framework should include. For example, access to finance or access to information. But if you just copy-paste that to the national legislation and you say that renewable energy communities should have access to finance without implementing it – what does it mean? Is it loans, is it that you will include specific support measures on the supporting for renewables – how? How are you going to allow energy communities to have finance? This is what is still missing in a lot of member states. Some of them try to start with putting some flesh on the bone for the definitions but have not progressed with enabling frameworks that much. But also, if you see on our tracker, we have two different trackers let's say. The first one has a different map on the two definitions and then if you click on the different countries you can see the analysis based on specific criteria. And here we see that there is some progress around

Europe. More and more countries have included the two definitions in their legislation. And then we have the second map which has the analysis of the enabling frameworks and the support schemes and another map, with different colors. There we see that there is less progress in some cases and a lot of things still missing. So that could be one of the reasons why there are not that many initiatives being developed at the national levels. For instance, in Greece now the national government transposed the two directives but completely disregarded what existed beforehand. Because Greece included legislation in 2018 on energy communities but it was before the Clean Energy Package. This means that these energy communities had similarities and a lot of elements of RECs and CECs but they didn't fully comply with it. The government now transposed those provisions and created two new definitions. So in Greece now there are three definitions of energy communities in parallel. It's creating a lot more confusion for people to understand why there are three and which one to choose and how to navigate with this complex legislation. So that was another reason I would say that might contribute less development of energy communities – complex legislations, administrative procedures, and barriers that they are facing.

Interviewer: I was wondering about the countries that, based on your tracker, did a good transposition. I think Portugal is one of them, but they have a low count of communities. So how can they promote it better? Because they have a good framework but there still aren't a lot of communities in Portugal.

REScoop.eu: In Portugal and in a lot of other countries there is another issue which we call hijacking or corporate capture. So there are some in the case in Greece as well. There are some companies that hijack the concept of energy communities to reach the benefits that were given to energy communities. They develop energy communities of five members only, for instance, with the company and three of the people working there just to reach the benefits. Because initially the legislation provided some priority access to the grid and these kinds of incentives that private investors thought 'Oh yeah, that's a great idea, let's develop an energy community' and we call this corporation capture because this concept of energy communities was not developed for them but was developed for citizen environment and citizens motivation to participate in the energy market. Because, of course, companies can already participate in the energy markets without the need to set up an energy community. In Portugal we see the phenomenon that there are some companies that they falsely say that they are setting up energy communities while what they are actually doing is developing collective self-consumption business models and initiatives. So there is this hijacking being developed there but maybe if you are interested in Portuguese I would say that you could have a chat with one of our members Copernico that's already established there and really active as well.

Interviewer: That was just an example that first popped into my mind. What do you think member states should be aware of not to make any mistakes? Of course, not just to translate the framework but are there any other things that should help?

REScoop.eu: Well, first of all, I think it's very important for member states to develop a complete legal framework and transposition because it's not enough to only have two definitions or three definitions there for what energy community is. The renewables

directive also specifies that member states should develop an assessment of barriers and potential for the development of their energy communities at the national level. We always say that then the third element is a development of a complete enabling framework as it's highlighted in the directives and finally specifically for renewable energy communities, they should also take the specificities of such initiatives into account when they are designing the national support schemes for renewables. So what we find very useful and what is a logical flow I would say of a process of designing legislation on the national level is that member states start with this assessment of barriers and potential to be able to see what is the status quo in the national context. What are the concrete barriers that initiatives face in the access to the market and try to deal with those barriers in the development of the legal framework. This is a step that has been omitted I would say by most of the member states. We also have criteria for this assessment of barriers and potentials on the tracker so you can have a look. But I think only five member states actually conducted such an assessment on barriers and potential, and in some cases, it's not even public. Some other member states mentioned because they copy-pasted the legislation, they mentioned that the ministry or another entity will develop such an assessment of barriers and potential but it's still not there. So we see a lot that some member states they've just tried to tick the box for transposition because the Commission will check, it will do the confirmatory check of the transposition. Rather than trying to completely include a new market actor, because that's what energy communities are, they are a new market actor, to participate in the market without discrimination from larger market actors. So yeah, that's definitely something to keep in mind.

Interviewer: And is there any specific regulation from different member states that you would highlight as really good practice?

REScoop.eu: For that, I would suggest... I wouldn't say that there is one perfect framework that we use as a super great example that all members should go for it and specifically taking into account how many differences there are in the energy markets and the legislation from country to country. However, we have found some good examples on different elements of the legislation that we highlighted and we actually conducted and brought a report on that. That focuses on enabling framework and highlights some good examples around Europe. So we normally have like an explanation of each element in enabling framework and then a table with good examples around Europe. So I could send you that if you are interested in this report. But also, a good example with regards to support schemes I would say is the case of Ireland. They have designed in their support schemes for renewables-specific enabling processes only for renewables energy communities. So they are literally keeping the capacity for them to keep participating in tenders and not having to compete with larger market actors. Also the case of Germany that they actually excluded those initiatives from tenders up to a specific threshold. I think it's 6 MW for all technologies and 18 MW for wind. So these are two examples. Of course, member states don't have to do it like that but these are two examples that member states followed taking the specificities of renewable energy communities into account. For instance, because there's also the requirement for member states to make sure that also vulnerable households can participate in energy communities. An example in this case is the

Greek legislation with specifically mentioned the elevation of energy poverty as one of the objectives of energy communities, at least their previous legislation, to be honest, I have to still check if this is there on the latest legislation. It actually also allows in energy-sharing projects like the collective self-consumption projects for the energy community to provide part of this electricity that they produce for free to vulnerable households and energy-poor households it's a good example of how energy communities can eliminate energy poverty. And in general, if you are interested in our policy papers you can go on our website and we have a tab policy and then papers and you can find a lot of things actually relevant to the transposition.

Interviewer: When I was talking with the Danish communities and Austrian communities. They both have the biggest problem with the grid operators and in the research I read it seems like a lot of countries have problems with that. Do you have some ideas on how to approach them?

REScoop.eu: It depends also on what kind of problems you refer to. In some cases, we do observe a lack of transparency on their procedures for instance some energy communities submit an application for access to the grid for the project and then they don't even know if in the area that they did the application, there is even available grid capacity. So there is no information available on the website of the DSO in this regard or the processes are very burdened and it takes a lot of time for them to reply. Or because also we shouldn't forget that a lot of energy communities still depend on volunteers, not professionals so all these bureaucratic paperwork that they have to go back and forth with different papers, submit an application, it's really challenging for a lot of initiatives. So I would frame them more like some issues that energy communities are facing and with the access to the grid. In this regard especially now, for instance, the amendments to the electricity market design proposal the commission published recently. We proposed that there should be for energy sharing, specifically collective self-consumption, there should be a bike lane as we call it. So special treatment for energy community initiatives to make sure that those administrative proposals pass and make sure they have access to the grid and in general make sure that there is transparency from the side of system operators. Transparency and ability for specific energy communities to take into account their processes and make sure that it's easier to collaborate with them. Not to be pushed out because larger companies are more professionalized and they know the processes and they go for it and there is all this that the energy community doesn't get any access to the grid after all. But it depends also from member state to member state in some cases it's a lot better than others.

Interviewer: For example, in Denmark, it is easy access to the grid but there is a high fee for sharing between community members so it's the same price as just buying from the grid. While in Austria that wasn't a problem but just the lack of data sharing in general, and sometimes they just estimate the consumed energy, so it creates distrust amongst people.

REScoop.eu: Oh okay, that's also interesting. And then the requirement would be to make sure that the introduction actually from these IT infrastructures is able to support those types of activities like energy sharing. The introduction of smart meters is still a big issue around Europe. I don't know which country is more forward with that but in most of the

countries, consumers still don't have access to smart meters. So yeah, indeed, some more work on this regard is still needed.

Interviewer: What role do you think can EU institutions play to further support development of RECs?

REScoop-eu: Well in general we try to promote especially learning from this situation now that we're in with invasion of Russia to Ukraine and this energy crisis that it's created or increased. All this situation with high energy prices, the fact that Europe really depends on imports of energy, heavily depends also on the gas from Russia. Those are the general phenomenon and there is a lot of policy-making at the moment to try to become more independent and make sure there is a security of supply. What we always say, and this is a huge role that energy communities can play, is that in a decentralized future, it's very important to exploit renewable energy sources at the local level. Of course, we need big projects, of course, we need to shift from fossil fuels to renewable sources, but we should also exploit the roofs, we should also exploit more renewables at the local level. This is most of the time something big companies are not really interested in this small-scale projects and local projects. This is a huge potential for citizens, a huge potential of energy communities to contribute to the local security of supply instead of spending all the money on fossil fuels and throwing money away. Then there are also the benefits that can be felt by the local community, and we are talking of course about the environmental benefit of lower CO2 emissions. But we're also talking about financial, economic benefits. Those initiatives whose legal entities grow can get more professionalized; more jobs are being created at the local level. We see this huge shift in for instance coal regions or lignite regions – energy communities are being developed and when they shift to more renewable sources jobs are being created in these areas. And also, social benefits. So there is a huge issue where we need huge investments in renewables and then there is still a huge issue of public acceptance. So people do not want wind turbines in their backyard. Then we have research that shows that when participants actually participate in these projects and develop them themselves and have ownership over those projects, then they tend to want wind turbines in their backyards and be proud of the winter turbines in their backyards. So of course, it's a huge contribution that energy communities can contribute to the energy transition and make sure that renewables are more accepted at the local level. And this is why we try to, now in this revision of electricity market design, we try to promote the prioritization of local ownership of production and supply as a principle of the electricity market. And we are not only talking about energy communities but we are talking about citizens, about municipalities, and all the local actors that are small and medium enterprises that can heavily contribute to local energy transition. Of course we expect from the EU institutions that are now negotiating this package to make sure that this goes through in the final text, these kind of measures like I mentioned before, the bike lane for instance for energy sharing, that is based on this principle of local ownership stays in there and contributes to the future development of the electricity market. So this is definitely something that we expect from European level and European institutions. And of course, the Commission should definitely follow up with the membership transposition, should make sure that they completely and correctly transpose those provisions to allow citizens to set up energy

community. Because as you already said and as we can see copying the legislation is not enough, it will not allow them to participate. If legislation is not in place or is not correct, there are barriers and there is not a huge progress that we want and we expect.

Interviewer: This bike lane that you mentioned did you think of any ways to avoid misuse of it? I can see big companies misusing it in some countries. Do you have any idea what to do about that?

REScoop.eu: Yea, that's a good point and it's indeed what we have in mind because, as I told you, there is so much corporate capture happening around Europe with regard to energy communities. So our proposal is for this special treatment to be directed only to citizen-driven initiatives and then member states can think of different ways to safeguard that only the initiatives that need this special treatment get this special treatment. There is an example of Germany for instance that included a quota of natural persons to participate in order for that initiative to get an exception from tenders. I think it's a high quota, 70-something percent of natural persons. At the same time in Greece, I think they thought of a specific number like at least 60 natural persons should participate in order to get financial support. So these kinds of measures and regulations to make sure that indeed only the initiatives that need priority access to the grid participate in these. Because, of course, grid capacities are becoming more and more of an issue and a lot more actors will try to get capacity to the grid.

Interviewer: Those were all my questions. Do you have anything else to add?

REScoop.eu: Just to clarify for the tracker only that we are trying, because there are a lot of new policy developments and legal developments in all the member states. So we try to update the information, we take note of these changes and will try to make all these changes as we go but probably the next revision and update of the tracker will be after the summer. But just keep this in mind that in some cases indeed there is a need for an update that is still not there because we need to make the changes.

Interviewer: And when was the last update?

REScoop.eU: I think we so we published the complete tracker at the end of last year (2022), so literally the last day of the year. So let's say in January 2023 we had the most updated version. Now we are trying to see what changes need to be made to progress with it.