Interreg Danube Region

Co-funded by the European Union

NRGCOM

1.4 Assessment of possible low-cost infrastructure investments and developments

D1.4.1 Collection of development recommendations to optimise the functioning of energy communities

Joint Report

Content

(1) INTRODUCTION

Renewable Energy Communities (RECs) are critical in the transition towards a sustainable energy future. Optimizing RECs involves detailed strategic planning and the implementation of advanced technologies and infrastructures designed to maximize energy production, enhance efficiency, and ensure long-term sustainability.

This report delves into the essential strategies for optimizing the infrastructure of RECs. It highlights several critical areas: energy demand and production, energy storage and distribution, and community engagement. By addressing these aspects comprehensively, RECs can achieve higher levels of performance and contribute more effectively to the energy transition in the Danube region.

(2) METHODICAL GUIDE

The development and elaboration of the report D.1.4.1 "Collection of Development Recommendations to Optimize the Functioning of Energy Communities" is led by DIT, which acts as the activity leader. DIT is responsible for ensuring the comprehensive and timely completion of Deliverable D.1.4.1.

LEADERSHIP AND METHODOLOGY

DIT has elaborated the methodology to implement the activity A.1.4 “Assessment of possible low-cost infrastructure investments and developments”. The methodology was presented, discussed and agreed upon in the Launch Event in Budapest on 13 March 2024.

TECHNOLOGY WORKSHOP

A pivotal technology workshop was organized on 22 March 2024, which involved the participation of all project partners. The workshop included several key activities:

- **Interview Template Presentation:** An interview template was introduced to the participants. This template is designed to standardize data collection across all partners.
- **Technologies Discussion:** Various technologies relevant to energy communities were explained and discussed in detail.
- **Instructions for Filling In:** Clear instructions on how to complete the interview template were shared with all attendees, ensuring consistent and accurate data collection.

TEMPLATE FOR NATIONAL REPORTS

A standardized template for national reports was developed to serve as the primary input for Deliverable D1.4.1. This template includes:

- **Description of Load Profiles and Technologies:** Detailed descriptions of different load profiles and potential technologies to be implemented within energy communities.
- **Exemplary Answer:** An example answer was provided to illustrate how to complete the questionnaire accurately.
- **Questionnaire and Table:** The template contains a structured questionnaire and table that each partner is required to fill in, ensuring uniformity in data collection.

INVOLVEMENT OF EXPERTS AND STAKEHOLDERS

The elaboration of the reports involves active participation from experts and stakeholders. The process includes:

- **National Workshops:** Project partners (PPs) are encouraged to organize national workshops which can serve dual purposes:
  - ***Input Workshops:*** Participants provide input and support in completing the questionnaire.
  - ***Validation Workshops:*** PPs fill in the questionnaire first and then discuss the outcomes with workshop participants.
  - ***Combined Approach:*** A combination of input and validation workshops can also be employed for comprehensive feedback.
- **Direct Stakeholder Engagement:** In regions without established energy communities (e.g., Montenegro), relevant expertise can be gathered through direct stakeholder meetings or interviews.

JOINT WORKSHOP

A joint workshop was organized on 7 June 2024, with the participation of all partners. Key activities during this workshop included:

- **Presentation of National Reports:** Partners presented the outcomes of their national reports.
- **Presentation of Deliverable**: DIT presented the consolidated deliverable D1.4.1.
- **Discussion Opportunity:** The workshop provided a platform for discussing the outcomes, sharing insights, and addressing any queries or concerns.

INVOLVEMENT OF THE CONSORTIUM

The consortium's involvement is crucial for the successful completion of the national reports. The partners responsible for preparing national reports are:

- Hungary: STRIA & IMRO

- Czech Republic: JAIP
- Austria: FORSCHUNG
- Croatia: IRENA
- Slovenia: KSSENA
- Serbia: REDASP
- Romania: OER
- Montenegro: FORS Montenegro
- Germany: DIT
- Slovakia: NEK

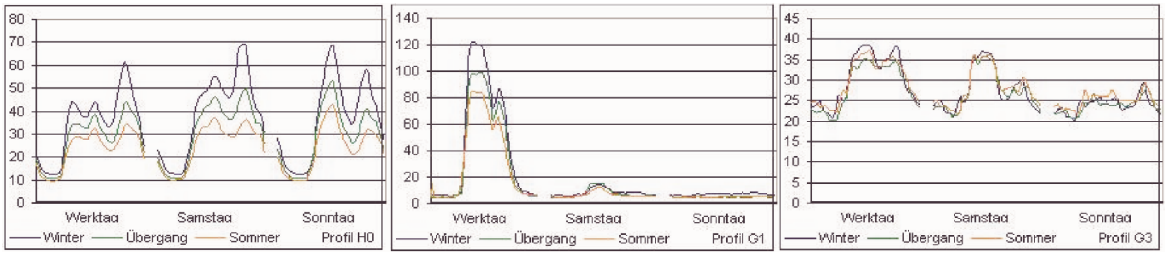
Additionally, the following partners are observers in the process:

- Bulgaria: PRA
- Moldova: AEER

This collaborative approach ensures a comprehensive and diversified collection of data and recommendations, facilitating the optimization of energy communities across different national contexts.

(3) ENERGY DEMAND

Understanding the energy consumption patterns of different consumers within the community is crucial for optimizing energy use and deploying appropriate power generation solutions. Energy consumers can be classified into three main load profiles: household, commercial, and industrial.



a) Household b) Commercial c) Industrial

Source: https://www.bdew.de/media/documents/1999_Repraesentative-VDEW-Lastprofile.pdf

HOUSEHOLD ENERGY LOAD PROFILES

Household energy consumption typically features daily peaks in the morning and evening, with more pronounced peaks on weekends. The average household power demand is between 2000 - 3000 kWh/year. Major energy consumers, such as heat pumps and electric cars, significantly

influence these profiles. Time-resolved recording meters are often not installed, but new metering equipment is introduced with the adoption of rooftop photovoltaic (PV) systems, allowing detailed production as well as consumption analysis.

COMMERCIAL ENERGY LOAD PROFILES

Commercial businesses generally operate from 08:00 to 16:00 on weekdays, resulting in energy peaks around midday. These businesses are often closed on weekends. Power demand may already be monitored with time resolution depending on the business and the energy demand. Heating provision via heat pumps or electromobility can amplify energy peaks.

INDUSTRIAL ENERGY LOAD PROFILES

Industrial profiles are highly specific and challenging to standardize. Power demand is typically high, often persistent even on weekends, and varies based on industry type. This demand impacts the grid, necessitating time-resolved analysis to ensure grid stability during peak loads.

(4) ENERGY PRODUCTION

In energy communities, a variety of technologies are employed to generate power and support heating networks, with Photovoltaic (PV) systems, wind power, and Combined Heat and Power (CHP) systems being the primary methods.

PHOTOVOLTAIC (PV) SYSTEMS

Photovoltaic (PV) systems convert sunlight directly into electricity using solar panels. These systems are a cornerstone of renewable energy in energy communities due to their numerous advantages. PV systems utilize sunlight, a renewable and abundant energy source, making them a sustainable choice. They are highly scalable, allowing for installation on various scales, from small rooftop systems on individual homes to large solar farms serving entire communities. Once installed, PV systems have relatively low maintenance and operating costs. Furthermore, they produce electricity without emitting greenhouse gases or pollutants, contributing to cleaner air and a reduced carbon footprint. In energy communities, PV systems are often integrated with energy storage solutions, such as batteries, to store excess energy generated during sunny periods for use during cloudy days or nighttime, ensuring a reliable power supply.

WIND POWER

Wind power harnesses the kinetic energy of wind through wind turbines to generate electricity. This technology is particularly beneficial in regions with strong and consistent wind patterns. Wind power is a clean, renewable resource that reduces dependence on fossil fuels. Modern wind turbines are highly efficient and capable of generating significant amounts of electricity with low operating and maintenance costs once installed. In energy communities, wind power can complement PV systems, providing electricity during times when solar generation is low, such as at night or during overcast conditions.

COMBINED HEAT AND POWER (CHP) SYSTEMS

Combined Heat and Power (CHP) systems, also known as cogeneration systems, simultaneously produce electricity and useful heat from the same energy source. These systems are particularly effective in supporting district heating networks, which distribute heat generated at a central location to residential and commercial buildings. CHP systems are highly efficient because they utilize the waste heat produced during electricity generation, which would otherwise be lost in conventional power plants. They can use various fuels, including natural gas, biomass, and biogas, making them adaptable to different energy sources. Additionally, CHP systems provide a reliable and continuous supply of heat and power, which is crucial for district heating networks. In energy communities, CHP systems play a vital role in reducing energy waste and improving overall energy efficiency. By providing both electricity and heat, they enhance the community's energy resilience and sustainability.

The integration of PV systems, wind power, and CHP systems in energy communities offers several benefits. Utilizing multiple renewable energy sources ensures a more stable and reliable energy supply. By generating power locally, energy communities reduce their dependence on external energy sources and improve energy security. These technologies collectively reduce greenhouse gas emissions and minimize the community's environmental impact. Additionally, local energy generation can lead to cost savings on energy bills and create local jobs in the renewable energy sector. By combining these technologies, energy communities can optimize their energy production, improve efficiency, and contribute to a more sustainable and resilient energy future.

Understanding the characteristics and optimization techniques for these systems is essential for aligning with the community's energy demand profiles.

(5) APPROACH TO OPTIMIZE OPERATION

Achieving optimal performance and sustainability in energy communities demands a comprehensive and multifaceted strategy. The NRGCOM partnership proposes an integrative approach that combines strategic planning, technological innovation, financial strategies, and community engagement.

Strategic planning forms the foundation of energy community optimization. It involves setting clear goals, identifying challenges, and developing a roadmap for achieving desired outcomes. Energy communities must assess current energy infrastructure, consumption patterns, and future needs through tools like energy audits and demand forecasting. Strategic planning ensures that optimization efforts are aligned with the community's objectives and resources, guiding decision-making processes and resource allocation effectively.

Technological innovation plays a pivotal role in enhancing the efficiency, reliability, and sustainability of energy communities. Advancements in renewable energy technologies, energy storage solutions, smart grid systems, and energy management software enable communities to harness clean energy sources more effectively, optimize energy distribution, and improve overall system performance. By embracing technological innovation, energy communities can reduce dependency on fossil fuels, minimize environmental impact, and adapt to evolving energy needs. This aspect is at heart of the current report and will be further detailed in the subsequent chapter called “Optimization recommendations”.

Financial strategies are essential for overcoming barriers to energy community optimization, such as high upfront costs and limited access to funding. Leveraging financial mechanisms like incentives, subsidies, grants, and community financing models can help offset initial investment expenses and improve the economic viability of renewable energy projects. Additionally, conducting cost-benefit analyses, exploring innovative financing options, and establishing partnerships with financial institutions can further support sustainability initiatives within energy communities.

Community Engagement is integral to the success and sustainability of energy community optimization efforts. Engaging community members fosters awareness, builds support, and generates momentum for renewable energy projects. Through participatory planning processes, educational initiatives, and collaborative decision-making, energy communities can empower residents to become active participants in shaping their energy future. Community engagement also promotes social cohesion, trust, and accountability, strengthening the resilience of energy communities in the face of challenges.

By integrating strategic planning, technological innovation, financial strategies, and community engagement, energy communities can optimize their infrastructure, enhance energy resilience, and accelerate the transition to a sustainable energy future. This multifaceted approach ensures that optimization efforts are holistic, inclusive, and aligned with the needs and aspirations of the community.

(6) OPTIMIZATION RECOMMENDATIONS

The transition to sustainable energy systems within energy communities requires not only the adoption of renewable energy technologies but also their continuous optimization to ensure maximum efficiency, reliability, and sustainability. This chapter provides detailed optimization recommendations for each major technology field utilized within energy communities. By addressing specific strategies for photovoltaic (PV) systems, wind power, and combined heat and power (CHP) systems, this chapter aims to guide stakeholders in enhancing the performance and integration of these technologies. The recommendations presented here are based on the latest research, industry best practices, and practical insights gathered from existing energy communities. Implementing these optimization strategies will enable energy communities to better manage their resources, reduce operational costs, and achieve greater energy security and environmental benefits.

PHOTOVOLTAIC (PV) SYSTEMS

Photovoltaic (PV) systems are a critical component of renewable energy communities, harnessing solar energy to generate electricity. There are two primary types of PV installations: rooftop PV systems and ground-mounted PV systems. Each type has distinct advantages and challenges that must be addressed to optimize their performance and integration within energy communities.

Types of PV Installations

Rooftop PV Systems:

Rooftop PV systems offer several advantages, making efficient use of existing roof space and reducing transmission losses. They provide a dual use of sealed surfaces found on residential or commercial building roofs, thus avoiding the need for additional land. However, these systems also face challenges, primarily stemming from the limited area available and potential suboptimal orientation due to roof design. The orientation of rooftop PV systems plays a crucial role in their performance. South-facing roofs are optimal for maximizing midday energy production, while east-west orientations can help cover energy needs in the morning and evening, ensuring more balanced energy generation throughout the day.

Ground-Mounted PV Systems:

Ground-mounted PV systems provide the advantage of optimized orientation and tilt, allowing for adjustments that maximize energy production. However, these systems face the challenge of requiring more land, which can be a significant obstacle to their implementation. Nonetheless, this challenge can be addressed through the use of Agri-PV systems, which combine solar panels with agricultural activities. By integrating solar panels with agricultural land use, Agri-PV systems enable dual land utilization, mitigating the land requirement issue and offering a more sustainable approach to land use.

Optimization Strategies

Panel Placement and Orientation:

To maximize sunlight exposure, panels should be oriented and tilted based on the location's latitude. Avoid shading to ensure optimal performance. Instead of a purely southern orientation, consider adjusting the tilt to shift peak energy production to the morning or evening, depending on energy demand patterns.

High-Efficiency Panels and Components:

Investing in high-efficiency panels and quality inverters is crucial. Over recent years, PV cell efficiency has surpassed 20%, significantly enhancing energy output.

System Sizing and Scaling:

The system should be sized according to energy needs and available roof space. It may be wise not to fully utilize all capacities immediately if investment costs are high due to market conditions or if the current energy requirement can be met with a smaller system.

Maintenance and Monitoring:

Regular cleaning and inspection of solar panels are essential maintenance tasks to ensure their optimal performance and longevity. It is crucial to regularly clean the panels and inspect them for any signs of physical damage. The frequency of cleaning depends on various factors, including the location of the panels, prevailing environmental conditions, and specific installation characteristics. Additionally, implementing real-time monitoring systems is highly recommended to continuously monitor the performance of the solar panels. These monitoring systems enable the timely detection of any issues or abnormalities, allowing for prompt intervention and maintenance to maintain optimal performance and maximize energy generation.

Energy Storage Integration:

Integrating battery storage systems is crucial for maximizing the utilization of solar energy in energy communities. These systems allow excess energy generated during peak sunlight hours to be stored for later use during periods of low or no production, such as nighttime or cloudy days. By storing surplus energy in batteries, energy communities can enhance their energy resilience, reduce dependence on the grid, and ensure a continuous and reliable power supply, even when solar generation is limited.

Grid Interaction and Net Metering:

Energy communities can leverage net metering as a valuable strategy for managing their energy output. With net metering, excess energy generated by solar panels can be fed back into the grid, allowing community members to earn credits or share energy within the community. Additionally, it is essential to ensure the reliability and safety of grid-tied systems. These systems should be equipped with mechanisms to safely disconnect during grid outages while also having the capability to operate autonomously as an island solution

if necessary. By implementing these measures, energy communities can optimize their grid interaction, maximize energy utilization, and enhance overall energy resilience.

WIND POWER

Wind turbines generate power based on wind conditions and feed into larger grids as 110 kV or above, supplying regions or large consumers. Local physical use can be challenging if grid operators redirect power to distant areas. Wind power can provide rural communities with new sources of income and funding for social initiatives.

Optimization Strategies

Site Selection and Assessment:

Conducting thorough wind resource assessments is crucial to identify ideal locations with consistent and high wind speeds. These assessments help determine the suitability of potential sites for wind turbine installation, ensuring optimal energy production.

Turbine Selection and Technology:

Matching turbines to the wind profile of the site is essential for maximizing energy capture. Selecting appropriate turbine sizes and capacities, along with utilizing advanced designs such as variable pitch blades, ensures that the turbines can effectively harness available wind energy.

Maintenance and Monitoring:

Implementing predictive maintenance and real-time monitoring systems allows for the anticipation of issues and tracking of turbine performance. By scheduling maintenance intervals during periods of low wind activity, downtime can be minimized, thereby reducing production losses and maximizing energy output.

Grid Integration and Energy Storage:

Ensuring grid compatibility is vital for seamless integration of wind power into the local grid infrastructure. Wind turbines should be capable of being controlled by the local energy grid operator to help stabilize the grid during fluctuations in wind energy production. Additionally, incorporating energy storage solutions, such as batteries, enables the management of variability and ensures a more consistent and reliable energy supply.

Aerodynamic Optimization:

Optimizing blade design and angle adjustment is key to enhancing the aerodynamic efficiency of wind turbines. Utilizing advanced aerodynamic designs and pitch control systems enables turbines to operate more efficiently across a wider range of wind conditions, maximizing energy capture and output.

COMBINED HEAT AND POWER (CHP) SYSTEMS

When both power and heat are shared within an energy community, Combined Heat and Power (CHP) systems play a crucial role in optimizing energy utilization and enhancing overall efficiency.

Optimization Strategies

System Design and Sizing:

Conducting a thorough energy demand assessment is essential to ensure that the CHP system is appropriately sized to match the energy consumption profile of the community or the availability of fuel resources. By closely aligning system capacity with energy demand, energy communities can maximize the utilization of generated power and heat.

Fuel Selection:

Opting for cost-effective and environmentally sustainable fuels, such as biomass, biogas, or biomethane, is critical for the long-term viability of CHP systems. Assessing fuel availability and flexibility ensures that the chosen fuel source can reliably meet the community's energy needs while minimizing environmental impact.

Technology Selection:

Choosing appropriate prime movers and efficiency enhancements is key to maximizing the overall efficiency of CHP systems. Utilizing advanced technologies and combined cycle systems improves energy conversion efficiency, resulting in higher power and heat output for the same amount of fuel input.

Thermal Energy Utilization:

Implementing heat recovery systems and thermal storage solutions allows energy communities to capture and store excess heat generated by the CHP system for later use. This enhances overall energy efficiency and provides flexibility in meeting fluctuating heating demands.

Control and Monitoring Systems:

Implementing automated controls and performance monitoring systems enables energy communities to optimize CHP system operation in real-time. By tracking key performance indicators and adjusting system parameters as needed, communities can maximize energy production and minimize operating costs.

Maintenance and Reliability:

Prioritizing preventive maintenance and condition monitoring practices is essential for ensuring the long-term reliability and efficiency of CHP systems. By identifying and addressing potential issues proactively, communities can reduce the risk of downtime and optimize system performance over its operational lifespan.

Economic and Financial Optimization:

Conducting cost-benefit analyses and leveraging financial incentives are crucial steps in optimizing the economic and financial aspects of CHP system deployment. Communities should evaluate the economic feasibility of CHP projects, considering factors such as upfront capital costs, operational expenses, and potential revenue streams from electricity sales. Additionally, taking advantage of opportunities to produce electricity when market prices are high and during periods of low wind activity enhances the financial viability of CHP systems.

Environmental and Regulatory Considerations:

Implementing emission controls and adopting sustainability practices are essential for minimizing the environmental impact of CHP systems and ensuring compliance with regulatory requirements. By reducing emissions and implementing sustainable practices, energy communities can contribute to environmental conservation and meet regulatory standards for air quality and emissions.

OPTIMIZATION OF INFRASTRUCTURE

The optimization of REC infrastructure is a multifaceted endeavor that encompasses various aspects of energy planning, technology integration, storage solutions, grid management, energy efficiency measures, community engagement, and regulatory compliance.

Comprehensive Energy Planning:

Conducting energy audits and demand forecasting are essential components of comprehensive energy planning. Energy audits provide insights into current consumption patterns, identifying areas for improvement and efficiency gains. Demand forecasting allows for the anticipation of future energy needs, facilitating strategic capacity expansion and resource allocation.

Integration of Renewable Energy Sources:

REC infrastructure optimization relies on the integration of diverse renewable energy sources, including solar PV, wind turbines, biomass, and hydro power. This diverse energy mix helps stabilize the grid and cater to the specific energy requirements of different consumer segments. Site assessment and scalability considerations ensure the selection of suitable locations and the design of systems that can be easily expanded to meet growing demand.

Advanced Energy Storage Solutions:

Advanced energy storage solutions, such as battery, chemical, and thermal storage systems, play a crucial role in REC optimization. These systems store excess energy generated during periods of high production for use during low production periods, ensuring continuous energy supply. Hybrid storage systems, which combine different storage technologies, offer enhanced flexibility and efficiency in energy management and distribution.

Sector Coupling:

Sector coupling involves integrating different energy sectors, such as heat and mobility, to optimize energy utilization. Heat pump and power-to-heat technologies utilize renewable power for heat generation, particularly in regions with limited access to other heat sources. Similarly, electric mobility and alternative fuel options like hydrogen or green methane are leveraged for transportation purposes, reducing dependence on fossil fuels.

Smart Grid and Microgrid Technologies:

Smart grid and microgrid technologies enable real-time monitoring and control of energy flows within the REC infrastructure. These technologies facilitate demand response mechanisms, decentralized energy management, and the development of microgrids, thereby balancing supply and demand and enhancing grid resilience.

Energy Efficiency Measures:

Implementing energy efficiency measures, such as building retrofitting, deployment of smart appliances, and adoption of energy management systems, is crucial for optimizing energy consumption within the REC. These measures improve efficiency, reduce energy waste, and contribute to overall sustainability goals.

Community Engagement and Education:

Community engagement initiatives, including awareness campaigns, participatory planning processes, and training programs, are essential for fostering a culture of sustainability and building local expertise in renewable energy systems. Engaging community members in REC initiatives increases awareness, encourages participation, and fosters a sense of ownership and responsibility.

Financial and Regulatory Support:

Financial incentives, subsidies, and regulatory frameworks are instrumental in supporting REC infrastructure optimization efforts. Incentives and subsidies help reduce costs and enhance the financial viability of renewable energy projects, while regulatory frameworks ensure compliance with standards and regulations. Community financing mechanisms further facilitate REC development by providing access to funding and investment opportunities.

(7) CONCLUSION

The current report aims at providing development recommendations on optimizing Renewable Energy Communities and underscores the importance of a multifaceted approach encompassing strategic planning, technological innovation, financial strategies, and community engagement. By addressing these key areas, RECs have the opportunity to significantly enhance their energy resilience, reduce costs, and make substantial contributions to sustainable development goals.

Throughout the report, various chapters have delved into critical aspects of REC optimization, including the integration of renewable energy sources, advanced energy storage solutions, smart grid technologies, energy efficiency measures, and community engagement initiatives. These chapters have provided valuable insights into the diverse strategies and technologies available for improving the efficiency and reliability of REC infrastructure.

By leveraging diverse renewable energy sources and implementing advanced storage solutions, RECs can ensure a continuous and reliable energy supply while minimizing environmental impact. Smart grid technologies enable real-time monitoring and control of energy flows, enhancing grid stability and resilience. Energy efficiency measures, coupled with community engagement and education, promote a culture of sustainability and empower local communities to actively participate in REC initiatives.

Furthermore, the report highlights the importance of financial and regulatory support in facilitating REC optimization efforts. Incentives, subsidies, and regulatory frameworks play a crucial role in reducing costs, enhancing financial viability, and ensuring compliance with standards and regulations.

In essence, the strategies outlined in the report not only improve the efficiency and reliability of energy systems within RECs but also promote the development of more sustainable and resilient communities. By implementing these strategies, RECs can take significant strides towards achieving their sustainability goals and contributing to a cleaner, greener future for generations to come.

(8) ANNEXES

National reports in the following order:

1. Austria
2. Croatia
3. Check Republic
4. Germany
5. Hungary
6. Montenegro
7. Slovenia
8. Slovakia

Disclaimer:

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Interreg Danube Region

Co-funded by the European Union

NRGCOM

National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

Austria

Content

WORKSHOP PARTICIPANTS

The questionnaire is for the national workshop with experts, engineers and Renewable Energy Community (REC) operators and members to gather information about existing RECs and why they were established. Technology experts and Engineers can provide technical information on the technologies used and assess the current market situation regarding costs and incentives.

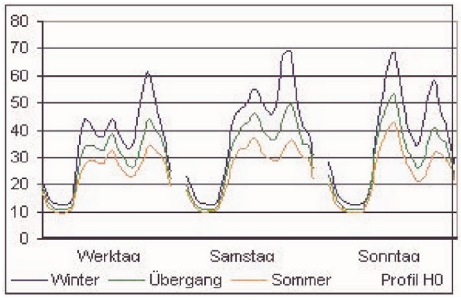
The questions can be interpreted freely and adapted to national circumstances and the audience. It should be kept in mind that the questions aim to fill the data catalogue of Activity 1.4 in order to optimize existing RECs via infrastructure investments and developments. The figure below shows an exemplary REC which contains consumer, producer and the combination, the prosumer. Also, potential energy producing technologies are shown.

The main interesting technologies (Tech) which are able to support REC are mainly wind power plants, PV, hydro power plants and Combined Heat and Power (CHP) systems. Wood or biogas fired CHP is able to generate renewable electricity but also heat. The heat is interesting for creating heat-based RECs.

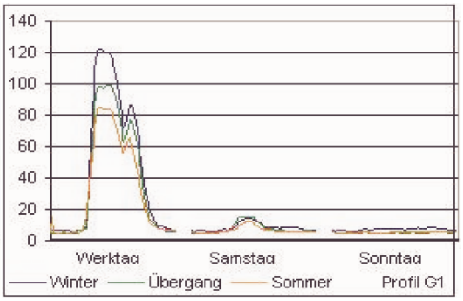
Source: https://energiegemeinschaften.gv.at/

LOAD PROFILES

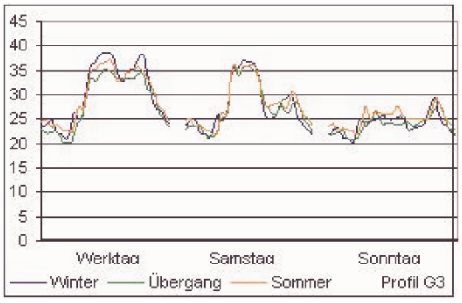
The energy demand of consumer can basically be described in specific load profiles. The most common ones are the three profiles below. The household has its energy consumption peaks mostly in the morning and in the evening, distributed over the whole week. The commercial has the energy peak between 0800-1800 and at the weekend nearly nothing. The Industry can hardly be described with a standard profile but often has daily peaks which can also occur at the weekend. For the comparison with energy generation technologies, the categorization of consumer in these profiles helps in optimizing the energy management.



A: Profile Household



B: Profile Commercial



C: Profile Industry

Source: https://www.bdew.de/media/documents/1999_Repraesentative-VDEW-Lastprofile.pdf

CATALOGUE WITH TECHNOLOGIES INVESTMENTS FOR REC

The catalogue shall have technology sheets that describe for the different consumer categories different technology aspects relevant for REC. In the workshop, the participants shall take one energy production technology or infrastructure investment, they think would fit for a REC operation and/or optimization. To make it easier in the workshop, participants could be asked to fill out only one consumer profile column. The questions on the left side shall provide a guidance for the different workshop participants and are sometimes needed to be rephrased depending on the audit. The additional line is to add an additional good question that comes up in the workshop.

The green experimental filling of the table 1 below gives the showcase of a commercial REC operator. It can be seen as an exemplary craft business that has installed a roof-top PV on its large halls to cover its own electricity demand and those of several other buildings in the vicinity.

Table 1: Experimental fill out in green of Catalogue sheet

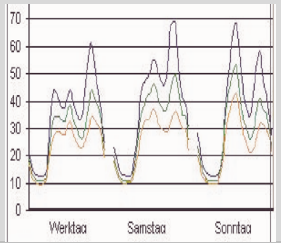
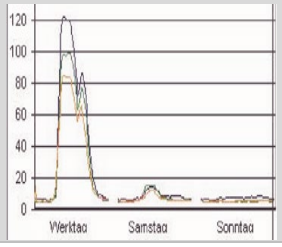
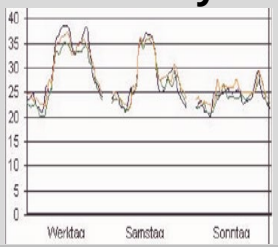
Consumer Profile and Energy Demand	**Household**	**Commercial**	**Industry**
Which consumer type describes you most and why?		Commercial Further Question Answer	
Which other consumer types and how many are active in your REC?	20	5	1
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not influenced in future
How much energy (electricity/heat) does your REC consume overall?		Around 100,000	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Old counter devises, no	
Technology / Infrastructure Description			
Which technology do you use in your REC?	**Rooftop PV**		

What does the Tech do for your REC and how well does it match your demand?	PV generates electricity but it happens when Consumer is not at home	PV generates electricity happens when Consumer is active	PV electricity is not sufficient for 100% energy covering
How much renewable energy do you generate with which capacity?		10 MW; 40000 MWh	
What other energy potentials exist in your region and what is necessary to exploit these?		Wood chips for heat production, no heating system suitable for them	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Web-application: PVscreen, yes	
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday	Yes, surplus during weekend	No
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	no	no
Which other Techs are useful to optimize energy management?		Battery storage	
Which software do you use for optimization?		Non-existent	
Which software addition or tool you would like to complement or optimize your REC?		unknown	
What data is in your point needed to optimize your REC further?		Better demand tracking	
Which other Techs are useful to optimize your REC further?		Renewable heating tech	
Do you share or need energy from other regions?		Energy demand is mostly satisfied with external energy.	

Do you track the shared or needed energy from other regions?		no	
REC Costs			
Did you get incentive or help for creating the REC?		No	
Did you get incentive for installing the technology or infrastructure?		30%	
In which range was the investment cost?		10,000,000	
In which range is the operation and maintenance cost?		0,5%	
In which cost range would you invest further in optimization?		non	
How was the cost shared between the REC members?		Same portion on all members	
REC Advantages			
What is the biggest advantage for your REC members?		Cheaper electricity	
What is the biggest advantage for your REC energy provider?		Non	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		Non	
Is there a disadvantage for REC members?		Non	
REC Creation			
Do you have a national legal framework for creating REC?		Unknown	
In your opinion, which change of the legal framework could improve the creation of REC?		Unknown	
What was the reason for creating the REC?		Low electricity costs	
Which main parameters where considered in the feasibility for the REC?		Electricity costs, roof size, grid connection	

What was the biggest hinderance for creating your REC until now?		REC member interest	
What is the actual entrance barrier for new REC members?		Joining the REC association	
Which kind of promotion for the REC was done?		Questionnaire in the neighboring area	
How was the social acceptance regarding the REC creation?		Good, nobody was bothered by the roof PV	
What was done to improve the social acceptance?		non	

WORKSHOP QUESTIONNAIRE TEMPLATE

Consumer Profile and Energy Demand	Household	Commercial	Industry
			
Which consumer type describes you most and why?	Multi-family house		
Which other consumer types and how many are active in your REC?	70	7	0
Which consumer is the largest and will this change with electric cars or heat pumps?		Municipality - no	
How much energy (electricity/heat) does your REC consume overall?		~ 400 MWh electricity (rising due to signing in of new members)	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Smart Meter and Smart Meter Portal Data from EDA Powerquartier Exnaton (day after data) Real Time Data Visualisation is planned	

Technology / Infrastructure Description			
Which technology do you use in your REC?	Rooftop-PV Surplus-Feed-In	Rooftop-PV Surplus-Feed-In	
What does the Tech do for your REC and how well does it match your demand?	Generations electricity mostly depending on solar irradiation	Generations electricity mostly depending on solar irradiation	
How much renewable energy do you generate with which capacity?	250 kW / 250 MWh (rising due to signing in of new members)	50 kW / 50 MWh (rising due to signing in of new members)	
What other energy potentials exist in your region and what is necessary to exploit these?	Existing heating grid using waste heat Biomass Wind Business cases and investors	Existing heating grid using waste heat Biomass Wind Business cases and investors	Industrial production of electricity based on wood waste (not allowed do be included in REC due to legal terms) Existing heating grid using waste heat Biomass Wind Business cases and investors
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Smart Meter and Smart Meter Portal Data from EDA Powerquartier Exnaton (day after data) Real Time Data Visualisation is planned	

REC Optimization			
Does an energy surplus exist?	Time-dependent but yes	Time-dependent but yes	Time-dependent but yes
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	30 kWh LI-Ion in fire station will be installed to be managed for optimization of REC	
Which other Techs are useful to optimize energy management?	Flexibilities (heat pumps, heat water production, Wallboxes) user driven	Flexibilities (heat pumps, heat water production, Wallboxes) user driven	
Which software do you use for optimization?			
Which software addition or tool you would like to complement or optimize your REC?		Fi-Ware Open API is planned	

What data is in your point needed to optimize your REC further?	Real time data for Grid feed-in and grid purchase	Real time data for Grid feed-in and grid purchase	
Which other Techs are useful to optimize your REC further?	Flexibilities (heat pumps, heat water production, Wallboxes) automatically managed Sector Coupling	Flexibilities (heat pumps, heat water production, Wallboxes) automatically managed Sector Coupling	Flexibilities (heat pumps, heat water production, Wallboxes) automatically managed Sector Coupling
Do you share or need energy from other regions?	Yes, surpluses are sold by the members, members have power purchase agreements. Free choice of supplier must be maintained.	Yes, surpluses are sold by the members, members have power purchase agreements. Free choice of supplier must be maintained.	
Do you track the shared or needed energy from other regions?	Is part of the energy report of EDA for electricity (only for members of the REC)	Is part of the energy report of EDA for electricity (only for members of the REC)	Is part of the energy report of EDA for electricity (only for members of the REC)
REC Costs			
Did you get incentive or help for creating the REC?	Yes, a national research project concerning the design and the local communication	Yes, a national research project concerning the design and the local communication	Yes, a national research project concerning the design and the local communication

Did you get incentive for installing the technology or infrastructure?	National subsidies for photovoltaics	National subsidies for photovoltaics	
In which range was the investment cost?	900 – 1700 € / kWp	900 – 1700 € / kWp	
In which range is the operation and maintenance cost?	0,5%	0,5%	
In which cost range would you invest further in optimization?	150 € per metering point	150 € per metering point	
How was the REC cost shared between the members?	Price spread (eg. 11,5 ct/kWh for feed in, 14,5 cent/kWh for purchase)		
REC Advantages			
What is the biggest advantage for your REC members?	Cheaper electricity, higher feed in tariffs	Cheaper electricity, higher feed in tariffs	Cheaper electricity, higher feed in tariffs

What is the biggest advantage for your REC energy provider?	New service for energy supplier	New service for energy supplier	New service for energy supplier
REC Disadvantages			
What was the biggest disadvantage for your REC until now?	Technology-related limits in self-supply	Technology-related limits in self-supply	
Is there a disadvantage for REC members?	Technology-related limits in self-supply	Technology-related limits in self-supply	
REC Creation			
Do you have a national legal framework for creating REC?	Yes, EAG and ELWOG (the second one should be replaced by ELWG soon) EAG: RIS - Erneuerbaren-Ausbau-Gesetz - Bundesrecht konsolidiert, Fassung vom 22.06.2022 (bka.gv.at)	Yes, EAG and ELWOG (the second one should be replaced by ELWG soon) EAG: RIS - Erneuerbaren-Ausbau-Gesetz - Bundesrecht konsolidiert, Fassung vom 22.06.2022 (bka.gv.at)	Yes, EAG and ELWOG (the second one should be replaced by ELWG soon) EAG: RIS - Erneuerbaren-Ausbau-Gesetz - Bundesrecht konsolidiert, Fassung vom 22.06.2022 (bka.gv.at)

	ELWOG: RIS - Elektrizitätswirtschafts- und - organisationsgesetz 2010 - Bundesrecht konsolidiert, Fassung vom 06.08.2013 (bka.gv.at)	ELWOG: RIS - Elektrizitätswirtschafts- und - organisationsgesetz 2010 - Bundesrecht konsolidiert, Fassung vom 06.08.2013 (bka.gv.at)	ELWOG: RIS - Elektrizitätswirtschafts- und - organisationsgesetz 2010 - Bundesrecht konsolidiert, Fassung vom 06.08.2013 (bka.gv.at)
In your opinion, which change of the legal framework could improve the creation of REC?	Participation of large companies Change proximity criterion Simpler organisational handling	Participation of large companies Change proximity criterion Simpler organisational handling	Participation of large companies Change proximity criterion Simpler organisational handling
What was the reason for creating the REC?	Security of supply at affordable prices	Security of supply at affordable prices	
Which main parameters where considered in the feasibility for the REC?	Cost, member structure, natural resources		
What was the biggest hinderance for creating your REC until now?	High administrative effort	High administrative effort	
What is the actual entrance barrier for new REC members?	Information events Articles in the community newspaper	Information events Articles in the community newspaper	
Which kind of promotion for the REC was done?	Declaration of accession, fill in contracts, activate metering point	Declaration of accession, fill in contracts, activate metering point	

How was the social acceptance regarding the REC creation?	Very good, initiative began during energy crisis	Very good, initiative began during energy crisis	
What was done to improve the social acceptance?	Extensive participation process for the design of the REC	Extensive participation process for the design of the REC	

Interreg Danube Region

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National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

Croatia

Content

WORKSHOP PARTICIPANTS

The questionnaire is for the national workshop with experts, engineers and Renewable Energy Community (REC) operators and members to gather information about existing RECs and why they were established. Technology experts and Engineers can provide technical information on the technologies used and assess the current market situation regarding costs and incentives.

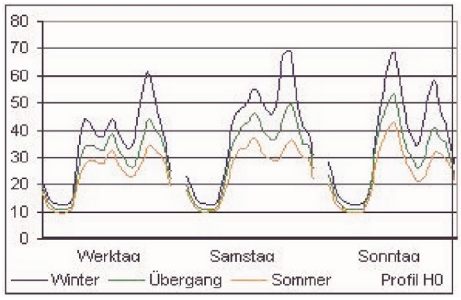
The questions can be interpreted freely and adapted to national circumstances and the audience. It should be kept in mind that the questions aim to fill the data catalogue of Activity 1.4 in order to optimize existing RECs via infrastructure investments and developments. The figure below shows an exemplary REC which contains consumer, producer and the combination, the prosumer. Also, potential energy producing technologies are shown.

The main interesting technologies (Tech) which are able to support REC are mainly wind power plants, PV, hydro power plants and Combined Heat and Power (CHP) systems. Wood or biogas fired CHP is able to generate renewable electricity but also heat. The heat is interesting for creating heat-based RECs.

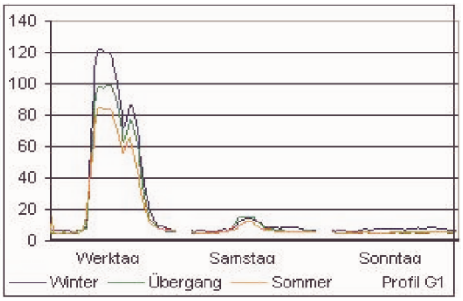
Source: https://energiegemeinschaften.gv.at/

LOAD PROFILES

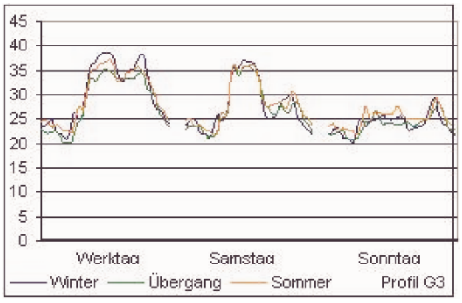
The energy demand of consumer can basically be described in specific load profiles. The most common ones are the three profiles below. The household has its energy consumption peaks mostly in the morning and in the evening, distributed over the whole week. The commercial has the energy peak between 0800-1800 and at the weekend nearly nothing. The Industry can hardly be described with a standard profile but often has daily peaks which can also occur at the weekend. For the comparison with energy generation technologies, the categorization of consumer in these profiles helps in optimizing the energy management.



A: Profile Household



B: Profile Commercial



C: Profile Industry

Source: https://www.bdew.de/media/documents/1999_Repraesentative-VDEW-Lastprofile.pdf

CATALOGUE WITH TECHNOLOGIES INVESTMENTS FOR REC

The catalogue shall have technology sheets that describe for the different consumer categories different technology aspects relevant for REC. In the workshop, the participants shall take one energy production technology or infrastructure investment, they think would fit for a REC operation and/or optimization. To make it easier in the workshop, participants could be asked to fill out only one consumer profile column. The questions on the left side shall provide a guidance for the different workshop participants and are sometimes needed to be rephrased depending on the audit. The additional line is to add an additional good question that comes up in the workshop.

The green experimental filling of the table 1 below gives the showcase of a commercial REC operator. It can be seen as an exemplary craft business that has installed a roof-top PV on its large halls to cover its own electricity demand and those of several other buildings in the vicinity.

Table 1: Experimental fill out in green of Catalogue sheet

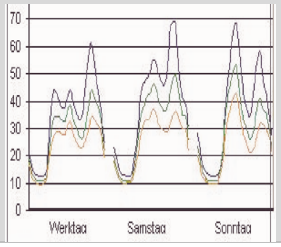
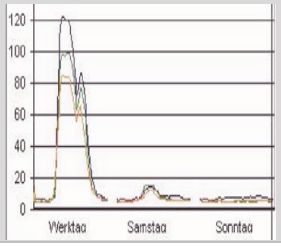
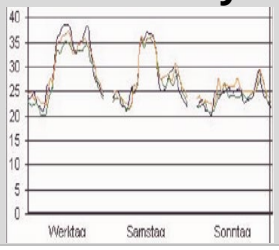
Consumer Profile and Energy Demand	**Household**	**Commercial**	**Industry**
Which consumer type describes you most and why?		Commercial Further Question Answer	
Which other consumer types and how many are active in your REC?	20	5	1
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not influenced in future
How much energy (electricity/heat) does your REC consume overall?		Around 100,000	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Old counter devises, no	
Technology / Infrastructure Description			
Which technology do you use in your REC?	**Rooftop PV**		

What does the Tech do for your REC and how well does it match your demand?	PV generates electricity but it happens when Consumer is not at home	PV generates electricity happens when Consumer is active	PV electricity is not sufficient for 100% energy covering
How much renewable energy do you generate with which capacity?		10 MW; 40000 MWh	
What other energy potentials exist in your region and what is necessary to exploit these?		Wood chips for heat production, no heating system suitable for them	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Web-application: PVscreen, yes	
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday	Yes, surplus during weekend	No
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	no	no
Which other Techs are useful to optimize energy management?		Battery storage	
Which software do you use for optimization?		Non-existent	
Which software addition or tool you would like to complement or optimize your REC?		unknown	
What data is in your point needed to optimize your REC further?		Better demand tracking	
Which other Techs are useful to optimize your REC further?		Renewable heating tech	
Do you share or need energy from other regions?		Energy demand is mostly satisfied with external energy.	

Do you track the shared or needed energy from other regions?		no	
REC Costs			
Did you get incentive or help for creating the REC?		No	
Did you get incentive for installing the technology or infrastructure?		30%	
In which range was the investment cost?		10,000,000	
In which range is the operation and maintenance cost?		0,5%	
In which cost range would you invest further in optimization?		non	
How was the cost shared between the REC members?		Same portion on all members	
REC Advantages			
What is the biggest advantage for your REC members?		Cheaper electricity	
What is the biggest advantage for your REC energy provider?		Non	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		Non	
Is there a disadvantage for REC members?		Non	
REC Creation			
Do you have a national legal framework for creating REC?		Unknown	
In your opinion, which change of the legal framework could improve the creation of REC?		Unknown	
What was the reason for creating the REC?		Low electricity costs	
Which main parameters where considered in the feasibility for the REC?		Electricity costs, roof size, grid connection	

What was the biggest hinderance for creating your REC until now?		REC member interest	
What is the actual entrance barrier for new REC members?		Joining the REC association	
Which kind of promotion for the REC was done?		Questionnaire in the neighboring area	
How was the social acceptance regarding the REC creation?		Good, nobody was bothered by the roof PV	
What was done to improve the social acceptance?		non	

WORKSHOP QUESTIONNAIRE TEMPLATE

Consumer Profile and Energy Demand	**Household** 	**Commercial** 	**Industry** 
Which consumer type describes you most and why?	Family houses		
Which other consumer types and how many are active in your REC?	4	0	0
Which consumer is the largest and will this change with electric cars or heat pumps?	No essential difference between consumers.		
How much energy (electricity/heat) does your REC consume overall?	14.400 kWh		
Which Software or Tech do you use to track the demand and is it able to measure time-depended?	The development of **the Smart Meter WIFI reader** for retrieving measurement data in real time, the		

	development of the management interface for users and the development of the dynamic energy sharing model are in progress.		
Technology / Infrastructure Description			
Which technology do you use in your REC?	Rooftop PV		
What does the Tech do for your REC and how well does it match your demand?	PV generates most of electricity in periods when consumers are not at home.		
How much renewable energy do you generate with which capacity?	3,6 kW; 4000 kWh		
What other energy potentials exist in your region and what is necessary to exploit these?	Potential in wind and geothermal energy, but the obstacle is the high investment cost.		
Which Software or Tech do you use to track the generation and is it able to measure time-depended?	The development of **the Smart Meter WIFI reader** for retrieving measurement data in real time, the development of the management interface for users and the development of the dynamic energy sharing model are in progress.		
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday		
Which energy storage technology exist with which capacity and for what reason?	Battery system does not exist		
Which other Techs are useful to optimize energy management?	unknown		

Which software do you use for optimization?	**Smart Meter WIFI reader** is under development		
Which software addition or tool you would like to complement or optimize your REC?	unknown		
What data is in your point needed to optimize your REC further?	unknown		
Which other Techs are useful to optimize your REC further?	unknown		
Do you share or need energy from other regions?	No		
Do you track the shared or needed energy from other regions?	No		
REC Costs			
Did you get incentive or help for creating the REC?	REC called My Energy Community is a development and research project founded in 2022 and co-financed by Innovation Norway.		
Did you get incentive for installing the technology or infrastructure?	Incentives were used for setting up the REC and development of the smart meter system.		
In which range was the investment cost?	770.000,00 EUR		
In which range is the operation and maintenance cost?	Up till now just staff cost for one person employed was calculated, approximately 5.000 EUR		
In which cost range would you invest further in optimization?	unknown		
How was the cost shared between the REC members?	Up till now the cost was financed by the donators (Legal entities - companies that have established energy		

	community with the interest to promote such forms of association), not REC members.		
REC Advantages			
What is the biggest advantage for your REC members?	Energy sharing, cheaper energy		
What is the biggest advantage for your REC energy provider?	Unknown.		
REC Disadvantages			
What was the biggest disadvantage for your REC until now?	Unknown.		
Is there a disadvantage for REC members?	Electricity is mostly produced when it is not being used, which does not significantly reduce the price of electricity that users secure by joining the energy community.		
REC Creation			
Do you have a national legal framework for creating REC?	Yes		
In your opinion, which change of the legal framework could improve the creation of REC?	Legal framework needs to be adapted and simplified, for smaller energy communities that will not participate in the market, thus encouraging the participation of a larger number of citizens in the energy transition.		
What was the reason for creating the REC?	The association was founded with the desire to break the ice regarding the establishment of energy communities, to define and optimize the administrative, technical and procedural steps in		

	the management of energy communities. The goal was to establish the first pilot community that will serve as a pilot environment for defining procedural steps and operational testing with all participants in the operational work of the communities.		
Which main parameters where considered in the feasibility for the REC?	Roof size, grid connection		
What was the biggest hinderance for creating your REC until now?	Difficult, complex and expensive registration procedure.		
What is the actual entrance barrier for new REC members?	Considering that REC was set up as a demonstration community, no significant expansion of the number of members is foreseen.		
Which kind of promotion for the REC was done?	The following web page was set up: https://www.myenergycommunity.eu/en/		
How was the social acceptance regarding the REC creation?	Positive public attitude towards REC.		
What was done to improve the social acceptance?	The association is available to support all those interested in establishing REC.		

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National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

Recorded on the 3.5. 2024 in Budweis, Czech Republic

WORKSHOP QUESTIONNAIRE TEMPLATE

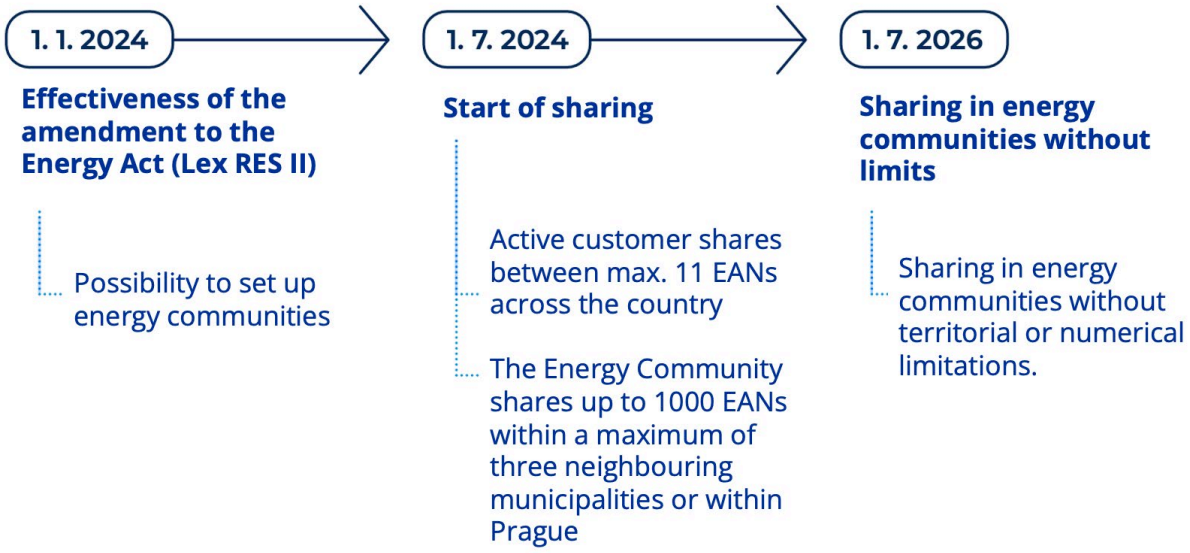
Date: **3.5. 2024, České Budějovice**

Participants: **3 recently established REC** (Enerkom Růže, Enerkom Šumavsko and Enerkom Krajina srdce) in the phase of planning the investment and others (further see attendance list)

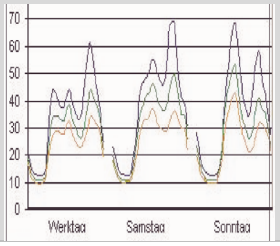
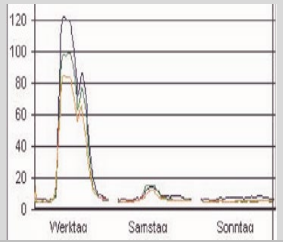
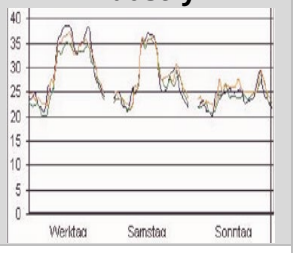
Initial comments

As part of the agenda of the national workshop held on 3 May 2024 in České Budějovice (Czech Republic), the A1.4 questionnaire was developed with the participants, which included three newly established energy communities.

- the communities mentioned are at the very beginning of building an energy community, however they have been actively engaged in this for more than 2 years, when it became clear that legislative barriers would be removed.
- they are currently in the process of applying for a grant (July 2024) for a comprehensive energy community design, which will include an extensive feasibility study, an investment plan and a sustainable energy community development strategy
- The legislative framework of the Czech Republic allows for electricity sharing for the first time from 1 July 2024, however, it is expected that the full removal of all legal and administrative barriers will not take place until 2025 when the energy data centre should be operational, until then electricity sharing will still have some limitations



- in the Czech Republic, there have been a few isolated cases of energy communities for several years, but they are based on specific conditions of the localities and their own infrastructure, which has been implemented as a pilot project, but without legislative support it serves for the time being more as an illustrative case or inspiration

Consumer Profile and Energy Demand	Household	Commercial	Industry
			
Which consumer type describes you most and why?		Our energy community is mainly composed of local businesses and public facilities that utilize shared renewable energy resources.	
Which other consumer types and how many are active in your REC?		Still in the process of establishment.	
Which consumer is the largest and will this change with electric cars or heat pumps?		The industry sector is currently the largest consumer, and this is not expected to change significantly even with the introduction of electric cars or heat pumps.	
How much energy (electricity/heat) does your REC consume overall?		Not known so far, still in planning.	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		We're assessing the options at the moment, the most advanced seems to be ECM Marfy ©.	
Technology / Infrastructure Description			
Which technology do you use in your REC?		Primarily, rooftop photovoltaic (PV) systems are planned.	

What does the Tech do for your REC and how well does it match your demand?		The PV systems generate electricity, which mostly aligns with the daytime operational hours of the commercial users, matching their demand quite effectively.	
How much renewable energy do you generate with which capacity?		Not known so far, still in planning.	
What other energy potentials exist in your region and what is necessary to exploit these?		Biogas production, wood biomass utilization.	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		We're assessing the options at the moment, the most advanced seems to be ECM Marfy ©.	
REC Optimization			
Does an energy surplus exist?		Yes, according to our preliminary assesment there is a surplus particularly around midday.	
Which energy storage technology exist with which capacity and for what reason?		Capacity details are not known so far, still in planning, used to balance generation with consumption.	
Which other Techs are useful to optimize energy management?		Battery storage systems and heat accumulation water storages.	
Which software do you use for optimization?		Currently, there is no specific optimization software in use.	

Which software addition or tool you would like to complement or optimize your REC?		n.a.	
What data is in your point needed to optimize your REC further?		More detailed and accurate demand tracking data.	
Which other Techs are useful to optimize your REC further?		n.a.	
Do you share or need energy from other regions?		Most energy needs are met with external energy sources.	
Do you track the shared or needed energy from other regions?		Currently, no tracking is in place.	
REC Costs			
Did you get incentive or help for creating the REC?		Just in the process of applying for subsidy.	
Did you get incentive for installing the technology or infrastructure?		Not yet.	
In which range was the investment cost?		The plans are in the range of 1 – 3 mil. EUR	
In which range is the operation and maintenance cost?		Not known so far, still in planning.	
In which cost range would you invest further in optimization?		Not known so far, still in planning.	
How was the REC cost shared between the members?		The costs are expected to be equally distributed among all members.	

REC Advantages			
What is the biggest advantage for your REC members?		Lower electricity rates.	
What is the biggest advantage for your REC energy provider?		Local and immediate consumption	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		No major disadvantages have been noted sofar.	
Is there a disadvantage for REC members?		No significant disadvantages for members.	
REC Creation			
Do you have a national legal framework for creating REC?		Yes, since 1.1.2024 but practically feasible only from 1.7.2024 and on.	
In your opinion, which change of the legal framework could improve the creation of REC?		It's now all ongoing and the legal framework for deployment of the future potential is well prepared.	
What was the reason for creating the REC?		To reduce electricity costs and promote the use of renewable energy.	
Which main parameters where considered in the feasibility for the REC?		Factors like electricity costs, available roof space for PV installations, and grid connection feasibility are being considered.	

What was the biggest hinderance for creating your REC until now?		Initial lack of interest and participation from potential members and unclear legal conditions prior to 1.1.2024.	
What is the actual entrance barrier for new REC members?		Requirement to join the REC association.	
Which kind of promotion for the REC was done?		Questionnaires were distributed in the neighboring area to gauge interest and promote the REC.	
How was the social acceptance regarding the REC creation?		Generally positive, with no significant objections from the community.	
What was done to improve the social acceptance?		No specific actions beyond initial promotion efforts were undertaken.	

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National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

Germany

WORKSHOP RESULTS

Date: 23.4.2024, Online-Workshop

Participants: 2 REC/CEC showing their cases and 8 others

BÜRGERENERGIE BAYERN (DE)

https://www.wogeno-paf.de/

Idea:

Construction of a KFW 40+ house in Heißmanning near Paffenhofen, Germany, rooftop PV 29.6 kWp, rooftop electricity to be made available to tenants in an experiment. Cooperation with municipal utilities to bypass a tenant electricity provider in anticipation of self-supply. Car sharing with charging points at the building included for tenants, car is charged with rooftop PV.

Tenant electricity (PV production is sold to the energy grid operator for a “low” price (7-8 ct/kWh), grid operator returns its electricity mix at a lower price) Provider in Paffenhofen 2023 in the specific case 28 ct/kWh for tenants, 10% lower than without tenant electricity model (30-35 ct/kWh)

Energy price in the building for tenants 18 ct/kWh, PV system depreciation included in the rent, monthly energy reports, sensitization of tenants to time-based electricity consumption, e.g. through time-based programming of household appliances, e.g. washing machine. Can be further optimized with additional technology for smart devices via WLAN or other interfaces.

High social acceptance through personal monetary advantage.

Problem:

However, with every technical component, the administrative and maintenance costs increase. Risk of cost shifting. Energy savings could be cannibalized by additional technical effort. Danger of becoming too dependent on technology and IT, loss of social acceptance, as people cannot mentally get through this.

The aim must also be to keep administrative costs to a minimum.

Implementation of the experiment with metering equipment and with the help of tenants who provide their meter readings for electricity, heat and water. Monitoring with consideration of energy coupling and competition for use, e.g. hot water preparation has priority over heating, as heating is an inert system.

Optimization:

Car sharing or charging stations in the building could also have a sustainable impact on mobility.

Car sharing can also be made available outside the tenants. Decision by the building community

Electricity surplus between 80-120 kWh per day for approx. 7 ct/kWh into the grid. Surplus can be used for charging stations or car sharing. Requires intelligent wallbox for billing different users with different types of electricity and electricity prices. Billing would again have to be done by the landlord/energy community, which would lead to a large amount of unnecessary administrative work. Solution with cell phone and app developed by TU Munich, person logs in and pays with their electricity mix. Legal concerns aside, it would also be possible for anyone to connect to this system and be billed on their consumption.

Another idea for implementation:

Sell surplus electricity to municipal utilities to operate a heat pump for a heating network or heat storage facility. The surplus electricity is sold back to the municipal utility for 12 ct/kWh.

The compulsory connection for district heating means that the building is supplied via district heating. This represents a monopoly position with prices to be tolerated. Optimization either by reducing heat consumption or by selling electricity to municipal utilities to operate the heat pump. This would further reduce costs for the residents. Valid regulation?

Problem:

Fiscal implementation, who pays how and for what tax, etc...; topic energy trade tax, rent corporation tax

Cooperation with municipal utilities:

Municipal utilities had promised to be able to tap generated PV electricity surplus elsewhere without grid charges.

Next optimization:

Further charging points with this app will be set up across the city of Pfaffenhofen, anyone can participate and charge with the shared electricity from the participating electricity producers. App not yet available for purchase, still in development and testing.

Another idea:

Column charging structure with 2000-5000 €/h relatively expensive, street lamps could serve as simpler connection points with a simple socket with single-phase charging. Here, nearby parking spaces could be supplied with slow charging. Good for residents' parking or overnight parking. This could accelerate the expansion of e-charging. The only prerequisite is a closed customer base or an energy community for energy sharing, which can either be the municipal utility customers or via app owners or the energy cooperative.

Theoretical structure:

Buildings with energy generation, municipal utilities for control over low and medium voltage grids.

Problems with grid areas, a village or industrial park can be located in two different grid areas.

The energy cooperative's wind farm is ready, but is not connected to the grid because the energy grid operator cannot complete the grid connection in time.

Biomethanization

Stadtwerke Pfaffenhofen invests in biomethanization for seasonal shift. Dark doldrums only last between 2-5 days for Germany (Source: Li, B.; Basu, S.; Watson, S.J.; Russchenberg, H.W.J. A Brief Climatology of Dunkelflaute Events over and Surrounding the North and Baltic Sea Areas. Energies 2021, 14, 6508. https://doi.org/10.3390/en14206508). In Pfaffenhofen 3 days in 2023. Biomethanization should therefore have a storage capacity of 5 days for Pfaffenhofen. Cooperation with OTH Regensburg. Construction in the sewage treatment plant. Biogas/sewage gas from wastewater, electricity for electrolysis from wind power and PV surplus, hydrogen for biomethane, oxygen is used within the sewage treatment plant. Biomethane is to be fed into the natural gas grid. Gas grid belongs to the city of Pfaffenhofen.

Problem:

Grid charges and taxes make surplus electricity from remote locations more expensive, so exchange electricity is also too expensive.

Technical and regulatory tricks necessary. E.g. for subsidies separation electrolysis of methanation. Own power cables or agreements with energy grid operators

European sandbox regulation allows certain rules to be overridden for projects in order to make a project feasible.

SMART REGION AUF (DE)

http://www.bwk-fuchstal.de/

The Smart Region AUF, consisting of the municipalities of Apfeldorf, Unterdießen and Fuchstal, is actively involved in various renewable energy projects.

One of them ist he Bürgerwindkraft Fuchstal GmbH & Co. KG with 4 wind turbines (Enercon E115 3MW 150m HH, producing 24 million kWh/a) in the municipality of Fuchstal, connection to the 110 kV grid, municipal ownership, planning and project development by the municipality itself in 2015, connection in 2016, after completion sale of the project rights to a self-founded GmbH & CO KG, investment 20 million, 30% municipal equity, 3.185 million held by the municipality of Fuchstal, the rest is private free float, citizen participation generated little interest, of 120 interested parties, 25 were from Fuchstal, plant approved by Bafin and project prospectus advertised with conservative yield of 4.5%, payout never below 9% so far and 13-15% in 2024,

Project was criticized, citizens' petition against, result was close with 51% pro wind,

A regional electricity offer was created with an electricity marketer to market the wind power, was offered at a slightly lower price and was well received. Problem: with the Ukraine crisis, the electricity price was increased sharply by the marketer, which was incomprehensible for citizens and therefore many canceled again.

3 new planned in 2019 (5.6MW 166m hub height) and 2022 capital raising, 20m investment, 30% equity, 3m city, 3m private, private Fuchstal residents wanted to provide 6m, max participation 50k €/person, approx. 230 interested parties from the municipality of Fuchstal, connection to the 110 kV grid, line specially laid to Fuchstal to physically use electricity directly in the region, industry in the neighboring village, demand 120 million kWh/a, connection to its transformer, sale of wind power for 11.3 ct/kWh, currently industry buys cheaper, but for the future industry can be supplied directly via ppa

Project is criticized by VLAB (Association for Landscape Conservation, Species Protection and Biodiversity e.V.), citizens' initiative against it

Fuchstal has battery storage, district heating network and heat storage with 5000 m³, connection with power-to-heat

Municipality of Apfeldorf, 1200 inhabitants, 14 MW on 14 hectares of PV system, south-facing

Optimization:

Project for waste heat and electricity from PV for heating network, 500 kW air heat pump could be fed in winter,

Problem:

Electricity should not be used for own use, keyword owner identity,

Dependence on direct marketer, who can prohibit own use on this scale (perhaps because he needs the electricity elsewhere?)

Village district supply of public buildings for self-sufficient supply via PV in Apfeldorf with school, gymnasium, fire station, village community center, heat via water-to-water heat pump, receive state funding

The challenge:

Long project duration,

Many opponents

Citizens need to be brought on board and the benefits for private individuals and the region need to be presented

Suitable project partner important

Regional grid operators work against it

Combine voting with elections so that more people vote

Conclusion:

Municipality has little business, no industry, wind turbine amortized after 10 years, municipality has a secure source of income, which gives the region prospects for the future

Energy Communities discussed in the workshop

Energy Community Starting Date	**Bürgerenergie Bayern** **Residential House in Heißmanning, Pfaffenhofen, Germany** **2023**	**Smart Region AUF (Apfeldorf, Unterdießen, Fuchstal)** **Wind Park in Fuchstal** **2016**	**District Apfeldorf** **Public Quartier in Apfeldorf** **2025**
Which consumer type describes you most and why?	Residential house for 15 apartments	Municipality	Commercial, School
Which other consumer types and how many are active in your REC?	Only residential	2000 households Some commercial No industry	2 public buildings with demand at evening
Which consumer is the largest and will this change with electric cars or heat pumps?	Residential House, Demand will change with EC, Heat is provided with district heat	Unknown, but Industry in the next district	School, no
How much energy (electricity/heat) does your REC consume overall?	unknown	13.965 MWh/a (2021)	unknown
Which Software or Tech do you use to track the demand and is it able to measure time-dependent?	Smart device for time-dependent tracking, App developed with Technical University Munich	Mixed, depend on consumer, in the hand of local energy supplier	Building management system, yes
Technology / Infrastructure Description			
Which technology do you use in your REC?	Roof-PV	4 Windmills exist 3 additional going to be active soon	Roof-PV Heat Pump
What does the Tech do for your REC and how well does it match your demand?	Providing cheap green power, creating a surplus	Creates a lot of renewable energy, which brings tax money into the district, power is mostly sold off to other regions	Green energy, well with a potential need for storage to level demand and generation further

How much renewable energy do you generate with which capacity?	Capacity 29,6 kWp Production ~37 MWh/a	Capacity 3 MW Production ~24 GWh/a	In planning
What other energy potentials exist in your region and what is necessary to exploit these?	Non, fixed to district heat	PV, roof and free-standing District Heat Both is used	unknown
Which Software or Tech do you use to track the generation and is it able to measure time-dependent?	App developed with Technical University Munich	From windmill supplier	PV supplier
REC Optimization			
Does an energy surplus exist?	Summer 80-120 kWh/a	Yes, it is sold off to other regions.	Probably, mostly at weekend
Which energy storage technology exist with which capacity and for what reason?	Non	Non	In planning
Which other Techs are useful to optimize energy management?	Battery Storage	Energy Storage Systems	Battery Storage
Which software do you use for optimization?	App developed with Technical University Munich	Non	Building management system
Which software addition or tool you would like to complement or optimize your REC?	Open it to public for using the surplus for mobility	n.a.	n.a.
Which data is in your point needed to optimize your REC further?	Time dependent energy tracking	Potential analysis of the region to find more suitable places for renewable energy production	n.a.
Which other Techs are useful to optimize your REC further?	Smart house devices for tenant, otherwise to much administrative expenses	Renewable Heat with Heat-Pump for district heat PV	n.a.

Do you share or need energy from other regions?	Both, time-dependent	Both, time-dependent	n.a.
Do you track the shared or needed energy from other regions?	Yes, with software	Only by energy supplier	n.a.
REC Costs			
Did you get incentive or help for creating the REC?	Non	Non	Non
Did you get incentive for installing the technology or infrastructure?	The building was subsidized by the german credit bank KFW for holding the energy standard of 60% lower energy demand.	Yes	Yes
In which range was the investment cost?	The depreciation cost is implemented in the living cost of the house cooperative.	20 Mio. € for the first 4 and 20 Mio. € for the 3 new one.	In planning
In which range is the operation and maintenance cost?	The cost is covered with 18 ct/kWh	n.a.	n.a.
In which cost range would you invest further in optimization?	n.a.	20 mio. € new investment	n.a.
How was the REC cost shared between the members?	Electricity Price 18 ct/kWh for members, 7 ct/kWh for feeding into the grid	30% is from the city, 3 mio. € directly, the other 3 mio. € in private diversified holdings, rest is lent from bank	Up to now only the municipality will be the REC member, but can open later for more
REC Advantages			
What is the biggest advantage for your REC members?	Cheap green electricity Cheap living	Revenue for there investment of around 9-13 %	Reduce cost for sustaining public buildings
What is the biggest advantage for your REC energy provider?	Producer is Consumer, therefore low green energy cost	Lots of green energy, new offer for local green wind power for citizens	n.a.

REC Disadvantages			
What was the biggest disadvantage for your REC until now?	Non	non	n.a.
Is there a disadvantage for REC members?	no	no	n.a.
REC Creation			
Do you have a national legal framework for creating REC?	Yes, EEG2023	Yes, EEG2023	Yes, EEG2023
In your opinion, which change of the legal framework could improve the creation of REC?	Better legal frame for sharing own energy with tenant or neighbors without interference of energy provider/trader	Improve the rules for setting up larger energy generation that is (partly-)owned by communities	n.a.
What was the reason for creating the REC?	Cheaper living Cheaper energy price	Giving rural district/ municipality without industry a source of money and a future perspective	Reduce cost for sustaining public buildings
Which main parameters were considered in the feasibility for the REC?	Economics Interested tenants	Economics Influence on environment Influence on Region Appearance	Economics Carbon footprint
What was the biggest hinderance for creating your REC until now?	Issues with local energy provider/trader, not a lot of legal room to set up	Citizens' petition which was just closely won in favor of the project, but the project was so good that the new ones weren't opposed	No budget for investing in the infrastructure
What is the actual entrance barrier for new REC members?	An open apartment	The new mills where so interesting, the money deposit was limited, so more people were able to participate (max. 50k€/p)	Not yet open for more members

Which kind of promotion for the REC was done?	Presentation and Brochure	Presentation and Brochure	In planning
How was the social acceptance regarding the REC creation?	Good, but people had to be informed	Mediocre, just barely won the Citizens' petition	n.a.
What was done to improve the social acceptance?	Nothing	The constant positive revenue over time was showing the benefit for participants and resulted in more pro wind mindsets.	n.a.

Interreg Danube Region

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National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

KESZ non-profit Ltd, Hungary

Content

WORKSHOP PARTICIPANTS

The questionnaire is for the national workshop with experts, engineers and Renewable Energy Community (REC) operators and members to gather information about existing RECs and why they were established. Technology experts and Engineers can provide technical information on the technologies used and assess the current market situation regarding costs and incentives.

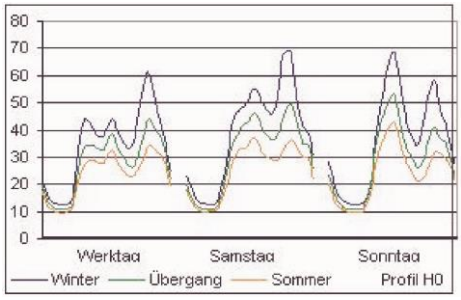
The questions can be interpreted freely and adapted to national circumstances and the audience. It should be kept in mind that the questions aim to fill the data catalogue of Activity 1.4 in order to optimize existing RECs via infrastructure investments and developments. The figure below shows an exemplary REC which contains consumer, producer and the combination, the prosumer. Also, potential energy producing technologies are shown.

The main interesting technologies (Tech) which are able to support REC are mainly wind power plants, PV, hydro power plants and Combined Heat and Power (CHP) systems. Wood or biogas fired CHP is able to generate renewable electricity but also heat. The heat is interesting for creating heat-based RECs.

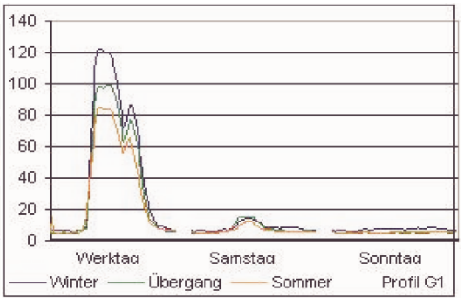
Source: https://energiegemeinschaften.gv.at/

LOAD PROFILES

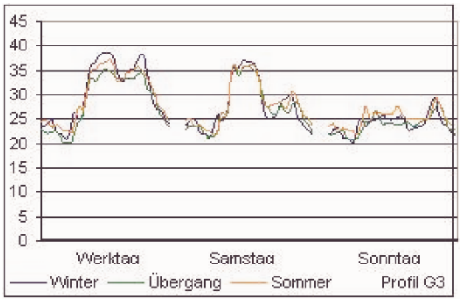
The energy demand of consumer can basically be described in specific load profiles. The most common ones are the three profiles below. The household has its energy consumption peaks mostly in the morning and in the evening, distributed over the whole week. The commercial has the energy peak between 0800-1800 and at the weekend nearly nothing. The Industry can hardly be described with a standard profile but often has daily peaks which can also occur at the weekend. For the comparison with energy generation technologies, the categorization of consumer in these profiles helps in optimizing the energy management.



A: Profile Household



B: Profile Commercial



C: Profile Industry

Source: https://www.bdew.de/media/documents/1999_Repraesentative-VDEW-Lastprofile.pdf

CATALOGUE WITH TECHNOLOGIES INVESTMENTS FOR REC

The catalogue shall have technology sheets that describe for the different consumer categories different technology aspects relevant for REC. In the workshop, the participants shall take one energy production technology or infrastructure investment, they think would fit for a REC operation and/or optimization. To make it easier in the workshop, participants could be asked to fill out only one consumer profile column. The questions on the left side shall provide a guidance for the different workshop participants and are sometimes needed to be rephrased depending on the audit. The additional line is to add an additional good question that comes up in the workshop.

The green experimental filling of the table 1 below gives the showcase of a commercial REC operator. It can be seen as an exemplary craft business that has installed a roof-top PV on its large halls to cover its own electricity demand and those of several other buildings in the vicinity.

Table 1: Experimental fill out in green of Catalogue sheet

Consumer Profile and Energy Demand	**Household**	**Commercial**	**Industry**
Which consumer type describes you most and why?		Commercial Further Question Answer	
Which other consumer types and how many are active in your REC?	20	5	1
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not influenced in future
How much energy (electricity/heat) does your REC consume overall?		Around 100,000	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Old counter devises, no	
Technology / Infrastructure Description			
Which technology do you use in your REC?	**Rooftop PV**		

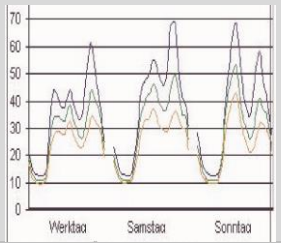
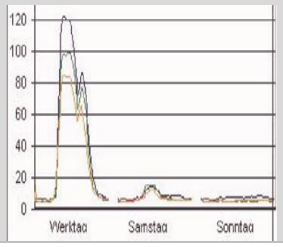
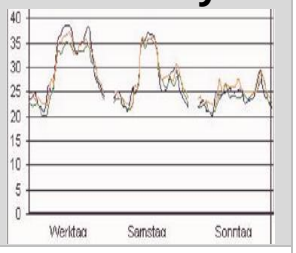
What does the Tech do for your REC and how well does it match your demand?	PV generates electricity but it happens when Consumer is not at home	PV generates electricity happens when Consumer is active	PV electricity is not sufficient for 100% energy covering
How much renewable energy do you generate with which capacity?		10 MW; 40000 MWh	
What other energy potentials exist in your region and what is necessary to exploit these?		Wood chips for heat production, no heating system suitable for them	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Web-application: PVscreen, yes	
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday	Yes, surplus during weekend	No
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	no	no
Which other Techs are useful to optimize energy management?		Battery storage	
Which software do you use for optimization?		Non-existent	
Which software addition or tool you would like to complement or optimize your REC?		unknown	
What data is in your point needed to optimize your REC further?		Better demand tracking	
Which other Techs are useful to optimize your REC further?		Renewable heating tech	
Do you share or need energy from other regions?		Energy demand is mostly satisfied with external energy.	

Do you track the shared or needed energy from other regions?		no	
REC Costs			
Did you get incentive or help for creating the REC?		No	
Did you get incentive for installing the technology or infrastructure?		30%	
In which range was the investment cost?		10,000,000	
In which range is the operation and maintenance cost?		0,5%	
In which cost range would you invest further in optimization?		non	
How was the cost shared between the REC members?		Same portion on all members	
REC Advantages			
What is the biggest advantage for your REC members?		Cheaper electricity	
What is the biggest advantage for your REC energy provider?		Non	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		Non	
Is there a disadvantage for REC members?		Non	
REC Creation			
Do you have a national legal framework for creating REC?		Unknown	
In your opinion, which change of the legal framework could improve the creation of REC?		Unknown	
What was the reason for creating the REC?		Low electricity costs	
Which main parameters where considered in the feasibility for the REC?		Electricity costs, roof size, grid connection	

What was the biggest hinderance for creating your REC until now?		REC member interest	
What is the actual entrance barrier for new REC members?		Joining the REC association	
Which kind of promotion for the REC was done?		Questionnaire in the neighboring area	
How was the social acceptance regarding the REC creation?		Good, nobody was bothered by the roof PV	
What was done to improve the social acceptance?		non	

WORKSHOP QUESTIONNAIRE
KESZ NON-PROFIT LTD

Remark: KESZ non-profit Ltd is a citizen energy community (CEC) and not a renewable energy community (REC). All our answer should be considered in this regard.

Consumer Profile and Energy Demand	Household	Commercial	Industry
			
Which consumer type describes you most and why?		KESZ implements PV-systems on buildings of entities (SMEs and institutes) with large consumption to provide self-consumable green energy when it's much needed	
Which other consumer types and how many are active in your REC?	after enabling energy sharing, we'd like to invite households and citizens to broaden our construction sites	5	
Which consumer is the largest and will this change with electric cars or heat pumps?		we have three construction sites with over 100 MWh yearly consumption, a health care center, a theatre, and a house of culture – is not influenced in the future	
How much energy (electricity/heat) does your REC consume overall?		overall, around 500 MWh/year	

Which Software or Tech do you use to track the demand and is it able to measure time-depended?		smart meters with 15 Mins recording intervals	
Technology / Infrastructure Description			
Which technology do you use in your REC?		rooftop-PV, optional façade-PV	
What does the Tech do for your REC and how well does it match your demand?		PV generates electricity when Partner is active	
How much renewable energy do you generate with which capacity?		210 kWp; around 239,4 MWh/year	
What other energy potentials exist in your region and what is necessary to exploit these?		geothermal or air-based heat pumps; expensive to switch to, need more PVs to the energy needs	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		the inverters; yes, in 15 Mins intervals	

REC Optimization			
Does an energy surplus exist?		barely	
Which energy storage technology exist with which capacity and for what reason?		500 l electric boiler to shave the peaks and to warm up the domestic hot water with the surplus	
Which other Techs are useful to optimize energy management?		awareness raising to demand site management	
Which software do you use for optimization?		nothing	
Which software addition or tool you would like to complement or optimize your REC?		Fronius Ohmpilot	
What data is in your point needed to optimize your REC further?		no data needed; it works connected to the inverter	

Which other Techs are useful to optimize your REC further?		non-existent; we believe our consumption behavior is enough to the better usage of RE	
Do you share or need energy from other regions?		not yet; the legal framework is not existing at the moment	
Do you track the shared or needed energy from other regions?		no	
REC Costs			
Did you get incentive or help for creating the REC?		no	
Did you get incentive for installing the technology or infrastructure?		partly, we are one of the winners of the first state application for establishing energy communities	
In which range was the investment cost?		around 55%	
In which range is the operation and maintenance cost?		none	

In which cost range would you invest further in optimization?		we'd like to plan our new constructions in the future that no big investments for optimalization is needed	
How was the REC cost shared between the members?		we construct our investments with local crowdfunding campaign to link the local citizens to the activity of our partners	
REC Advantages			
What is the biggest advantage for your REC members?		decarbonizing the local energy production, community feeling, local green investments	
What is the biggest advantage for your REC energy provider?		in Hungary REC/CEC are not allowed to be an energy provider, so this question is not relevant for us	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		the lack of intention of the interested parties except the initiator communities	
Is there a disadvantage for REC members?	we cannot give value-offers for citizens to join to our energy community as a customer because of the state-funded, very low electricity prices	not for SMEs, for entities with municipal ownership the joint decision making can be disadvantageous because they have their own rules	

REC Creation			
Do you have a national legal framework for creating REC?	yes	yes	
In your opinion, which change of the legal framework could improve the creation of REC?		not the legal framework should be changed in my opinion but the regulation of the energy traders and the monopoly electricity provider	
What was the reason for creating the REC?		to gain experience during the making our own CEC	
Which main parameters where considered in the feasibility for the REC?		all the cost (installing, maintenance, insurance, administration) should be covered in 5 years run (this is not to be confused with return of the costs of the PV-system)	
What was the biggest hinderance for creating your REC until now?		maneuvering between authorities, traders, and electricity providers, finding the one who intends to discuss with us about the hindrances and the needed changes to enable	

What is the actual entrance barrier for new REC members?	value offer for citizens	much effort to find a responsible person in municipalities who has connections to all the offices in the local authority	
Which kind of promotion for the REC was done?		through the network of the owners and colleagues; press releases, media activities: podcasts, articles, social media posts/advertisements	
How was the social acceptance regarding the REC creation?		really good	
What was done to improve the social acceptance?		we held presentations at national and international conferences, workshops, wrote posts about activities and open events on our social media platforms	

Interreg Danube Region

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National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

Montenegro

Content

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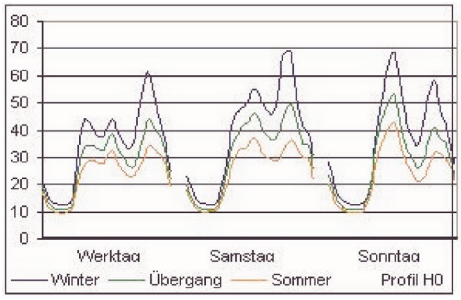
Source: https://energiegemeinschaften.gv.at/

LOAD PROFILES

The energy demand of consumer can basically be described in specific load profiles. The most common ones are the three profiles below. The household has its energy consumption peaks mostly in the morning and in the evening, distributed over the whole week. The commercial has the energy peak between 0800-1800 and at the weekend nearly nothing. The Industry can hardly be described with a standard profile but often has daily peaks which can also occur at the weekend. For the comparison with energy generation technologies, the categorization of consumer in these profiles helps in optimizing the energy management.



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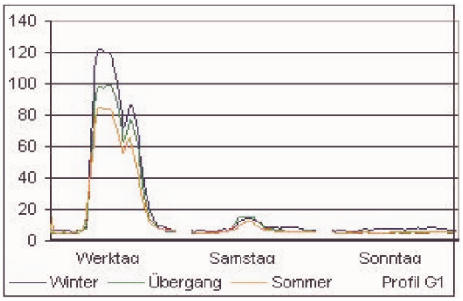
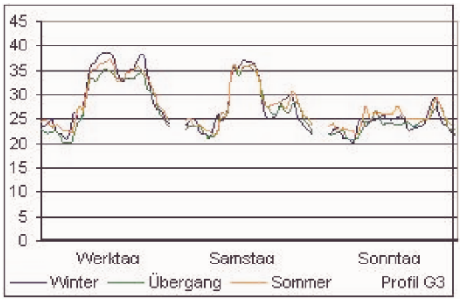


B: Profile Commercial



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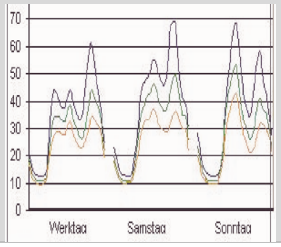
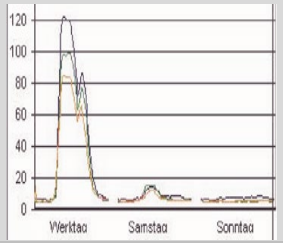
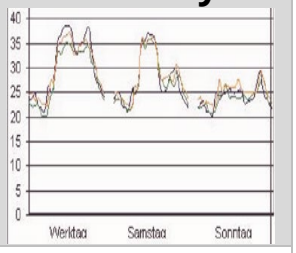
Which other consumer types and how many are active in your REC?	20	5	1
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not influenced in future
How much energy (electricity/heat) does your REC consume overall?		Around 100,000	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Old counter devises, no	
Technology / Infrastructure Description			
Which technology do you use in your REC?	**Rooftop PV**		

What does the Tech do for your REC and how well does it match your demand?	PV generates electricity but it happens when Consumer is not at home	PV generates electricity happens when Consumer is active	PV electricity is not sufficient for 100% energy covering
How much renewable energy do you generate with which capacity?		10 MW; 40000 MWh	
What other energy potentials exist in your region and what is necessary to exploit these?		Wood chips for heat production, no heating system suitable for them	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Web-application: PVscreen, yes	
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday	Yes, surplus during weekend	No
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	no	no
Which other Techs are useful to optimize energy management?		Battery storage	
Which software do you use for optimization?		Non-existent	
Which software addition or tool you would like to complement or optimize your REC?		unknown	
What data is in your point needed to optimize your REC further?		Better demand tracking	
Which other Techs are useful to optimize your REC further?		Renewable heating tech	
Do you share or need energy from other regions?		Energy demand is mostly satisfied with external energy.	

Do you track the shared or needed energy from other regions?		no	
REC Costs			
Did you get incentive or help for creating the REC?		No	
Did you get incentive for installing the technology or infrastructure?		30%	
In which range was the investment cost?		10,000,000	
In which range is the operation and maintenance cost?		0,5%	
In which cost range would you invest further in optimization?		non	
How was the cost shared between the REC members?		Same portion on all members	
REC Advantages			
What is the biggest advantage for your REC members?		Cheaper electricity	
What is the biggest advantage for your REC energy provider?		Non	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		Non	
Is there a disadvantage for REC members?		Non	
REC Creation			
Do you have a national legal framework for creating REC?		Unknown	
In your opinion, which change of the legal framework could improve the creation of REC?		Unknown	
What was the reason for creating the REC?		Low electricity costs	
Which main parameters where considered in the feasibility for the REC?		Electricity costs, roof size, grid connection	

What was the biggest hinderance for creating your REC until now?		REC member interest	
What is the actual entrance barrier for new REC members?		Joining the REC association	
Which kind of promotion for the REC was done?		Questionnaire in the neighboring area	
How was the social acceptance regarding the REC creation?		Good, nobody was bothered by the roof PV	
What was done to improve the social acceptance?		non	

WORKSHOP QUESTIONNAIRE TEMPLATE

Consumer Profile and Energy Demand	Household	Commercial	Industry
			
Which consumer type describes you most and why?			
Which other consumer types and how many are active in your REC?			
Which consumer is the largest and will this change with electric cars or heat pumps?			
How much energy (electricity/heat) does your REC consume overall?			
Which Software or Tech do you use to track the demand and is it able to measure time-depended?			

Technology / Infrastructure Description			
Which technology do you use in your REC?			
What does the Tech do for your REC and how well does it match your demand?			
How much renewable energy do you generate with which capacity?			
What other energy potentials exist in your region and what is necessary to exploit these?			
Which Software or Tech do you use to track the generation and is it able to measure time-depended?			

REC Optimization			
Does an energy surplus exist?			
Which energy storage technology exist with which capacity and for what reason?			
Which other Techs are useful to optimize energy management?			
Which software do you use for optimization?			
Which software addition or tool you would like to complement or optimize your REC?			
What data is in your point needed to optimize your REC further?			

Which other Techs are useful to optimize your REC further?			
Do you share or need energy from other regions?			
Do you track the shared or needed energy from other regions?			
REC Costs			
Did you get incentive or help for creating the REC?			
Did you get incentive for installing the technology or infrastructure?			
In which range was the investment cost?			

In which range is the operation and maintenance cost?			
In which cost range would you invest further in optimization?			
How was the REC cost shared between the members?			
REC Advantages			
What is the biggest advantage for your REC members?			
What is the biggest advantage for your REC energy provider?			

REC Disadvantages			
What was the biggest disadvantage for your REC until now?			
Is there a disadvantage for REC members?			
REC Creation			
Do you have a national legal framework for creating REC?	Draft RES Law has transposed main provisions from the Renewable Energy Directive (2018/2001/EU) creating general conditions for introduction of REC. It is expected the Law will be adopted in next 2-3 months.		
In your opinion, which change of the legal framework could improve the creation of REC?	The elements of the framework for enabling REC have to be defined, including the rights and obligations of REC, obligation of the DSO, categories of the end consumers of all categories etc. The Ministry will prepare relevant bylaws which shall be adopted by the Government.		
What was the reason for creating the REC?	There are 2 main reasons: 1. Obligation to implement EU RES framework in accordance with Energy Community Treaty; 2. Concept of "energy prosumers" which is defined under existing Law on Energy and widely implemented into practice especially in the sectors of the households and SMEs. It is expected that REC concept is also accepted with appropriate supporting mechanisms which could significantly contribute to the achievement of the RES targets by 2030.		

Which main parameters where considered in the feasibility for the REC?	To be defined in the forthcoming period by the relevant bylaws.
What was the biggest hinderance for creating your REC until now?	Currently it is finalization of the legal framework. Additional barriers to be recognized and properly addressed.
What is the actual entrance barrier for new REC members?	See previous answer.
Which kind of promotion for the REC was done?	So far only for energy prosumers. National electricity supplier (EPCG) has successfully implemented two schemes for installation of the photovoltaic systems on the roofs "Solari 3000+" aimed at households and "Solari 500+" aimed at SMEs. In total, photovoltaic systems are installed for 3,210 final consumers with total capacity of 28.5 MW. The next phase of the program for installation of the photovoltaic systems "Solari 5000+" is under preparation and implementation is expected to start in 2024.
How was the social acceptance regarding the REC creation?	It is expected to be high, especially if it is supported by the Government or power supply companies - EPCG.
What was done to improve the social acceptance?	To be defined depending on the initial acceptance.

Interreg Danube Region

Co-funded by the European Union

NRGCOM

National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

Slovenia

Content

WORKSHOP PARTICIPANTS

The questionnaire is for the national workshop with experts, engineers and Renewable Energy Community (REC) operators and members to gather information about existing RECs and why they were established. Technology experts and Engineers can provide technical information on the technologies used and assess the current market situation regarding costs and incentives.

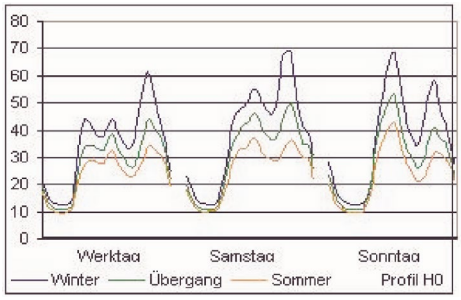
The questions can be interpreted freely and adapted to national circumstances and the audience. It should be kept in mind that the questions aim to fill the data catalogue of Activity 1.4 in order to optimize existing RECs via infrastructure investments and developments. The figure below shows an exemplary REC which contains consumer, producer and the combination, the prosumer. Also, potential energy producing technologies are shown.

The main interesting technologies (Tech) which are able to support REC are mainly wind power plants, PV, hydro power plants and Combined Heat and Power (CHP) systems. Wood or biogas fired CHP is able to generate renewable electricity but also heat. The heat is interesting for creating heat-based RECs.

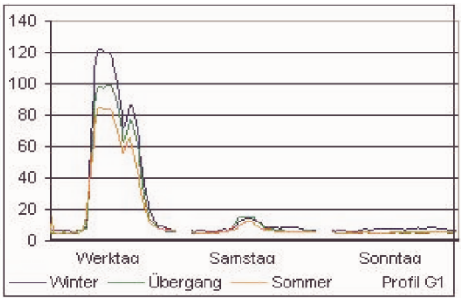
Source: https://energiegemeinschaften.gv.at/

LOAD PROFILES

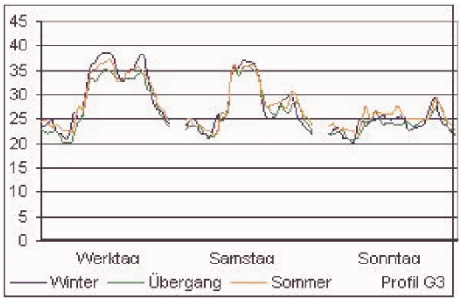
The energy demand of consumer can basically be described in specific load profiles. The most common ones are the three profiles below. The household has its energy consumption peaks mostly in the morning and in the evening, distributed over the whole week. The commercial has the energy peak between 0800-1800 and at the weekend nearly nothing. The Industry can hardly be described with a standard profile but often has daily peaks which can also occur at the weekend. For the comparison with energy generation technologies, the categorization of consumer in these profiles helps in optimizing the energy management.



A: Profile Household



B: Profile Commercial



C: Profile Industry

Source: https://www.bdew.de/media/documents/1999_Repraesentative-VDEW-Lastprofile.pdf

CATALOGUE WITH TECHNOLOGIES INVESTMENTS FOR REC

The catalogue shall have technology sheets that describe for the different consumer categories different technology aspects relevant for REC. In the workshop, the participants shall take one energy production technology or infrastructure investment, they think would fit for a REC operation and/or optimization. To make it easier in the workshop, participants could be asked to fill out only one consumer profile column. The questions on the left side shall provide a guidance for the different workshop participants and are sometimes needed to be rephrased depending on the audit. The additional line is to add an additional good question that comes up in the workshop.

The green experimental filling of the table 1 below gives the showcase of a commercial REC operator. It can be seen as an exemplary craft business that has installed a roof-top PV on its large halls to cover its own electricity demand and those of several other buildings in the vicinity.

Table 1: Experimental fill out in green of Catalogue sheet

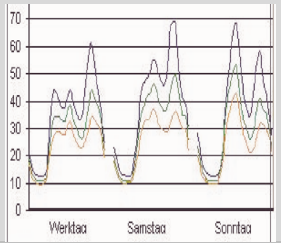
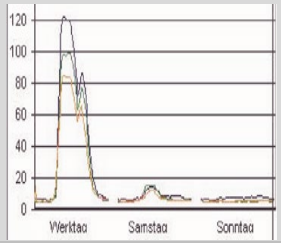
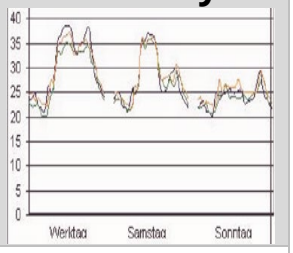
Consumer Profile and Energy Demand	**Household**	**Commercial**	**Industry**
Which consumer type describes you most and why?		Commercial Further Question Answer	
Which other consumer types and how many are active in your REC?	20	5	1
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not influenced in future
How much energy (electricity/heat) does your REC consume overall?		Around 100,000	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Old counter devises, no	
Technology / Infrastructure Description			
Which technology do you use in your REC?	**Rooftop PV**		

What does the Tech do for your REC and how well does it match your demand?	PV generates electricity but it happens when Consumer is not at home	PV generates electricity happens when Consumer is active	PV electricity is not sufficient for 100% energy covering
How much renewable energy do you generate with which capacity?		10 MW; 40000 MWh	
What other energy potentials exist in your region and what is necessary to exploit these?		Wood chips for heat production, no heating system suitable for them	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Web-application: PVscreen, yes	
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday	Yes, surplus during weekend	No
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	no	no
Which other Techs are useful to optimize energy management?		Battery storage	
Which software do you use for optimization?		Non-existent	
Which software addition or tool you would like to complement or optimize your REC?		unknown	
What data is in your point needed to optimize your REC further?		Better demand tracking	
Which other Techs are useful to optimize your REC further?		Renewable heating tech	
Do you share or need energy from other regions?		Energy demand is mostly satisfied with external energy.	

Do you track the shared or needed energy from other regions?		no	
REC Costs			
Did you get incentive or help for creating the REC?		No	
Did you get incentive for installing the technology or infrastructure?		30%	
In which range was the investment cost?		10,000,000	
In which range is the operation and maintenance cost?		0,5%	
In which cost range would you invest further in optimization?		non	
How was the cost shared between the REC members?		Same portion on all members	
REC Advantages			
What is the biggest advantage for your REC members?		Cheaper electricity	
What is the biggest advantage for your REC energy provider?		Non	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		Non	
Is there a disadvantage for REC members?		Non	
REC Creation			
Do you have a national legal framework for creating REC?		Unknown	
In your opinion, which change of the legal framework could improve the creation of REC?		Unknown	
What was the reason for creating the REC?		Low electricity costs	
Which main parameters where considered in the feasibility for the REC?		Electricity costs, roof size, grid connection	

What was the biggest hinderance for creating your REC until now?		REC member interest	
What is the actual entrance barrier for new REC members?		Joining the REC association	
Which kind of promotion for the REC was done?		Questionnaire in the neighboring area	
How was the social acceptance regarding the REC creation?		Good, nobody was bothered by the roof PV	
What was done to improve the social acceptance?		non	

WORKSHOP QUESTIONNAIRE TEMPLATE

Consumer Profile and Energy Demand	Household	Commercial	Industry
			
Which consumer type describes you most and why?	All Energy Community (EC) member are prosumers and are households.	All EC members are public institutions (school kindergarten, Health centre).	SME for wood manufacturing.
Which other consumer types and how many are active in your REC?	• Small farms • Public buildings	• There are office buildings, museum and sports facilities. • households	
Which consumer is the largest and will this change with electric cars or heat pumps?	• Household • The largest consumer (prosumer) already owns an EV. EC Members are unlikely to use heat pumps.	• The largest is Health care centre.	-
How much energy (electricity/heat) does your REC consume overall?	• **Different in different projects** • Electricity consumption in 2021 was 104 MWh.	• **Different in different projects** • 2.812 MWh	• **Different in different projects** • 100 MWh
Which Software or Tech do you use to track the demand and is it able to measure time-depended?	• EC members are equipped with HEMS (Home energy management system that constantly monitors energy	• EC members are equipped with EMS (energy management system that constantly monitors energy consumption.	Smart management system and online trading platform based on block chain technology.

	consumption and production. • The data is held by a private partner.	• The data is held by a private partner.and production.	
Technology / Infrastructure Description			
Which technology do you use in your REC?	PV – solar power plant, Battery energy storage systems (BESS), EV chargers, EVs	PV - solar power plant and EV chargers	PV - solar power plant
What does the Tech do for your REC and how well does it match your demand?	It optimizes the self-consumption of energy produced within the EC.	Optimizing the consumption.	Trading platform based on block chain technology.
How much renewable energy do you generate with which capacity?	• PV capacity 102 kW Wind generation 3.5 kW Production in 2021 (year of installation): 56 MWh. • 40 %	• 1.913 MWh • 40 %	130 MWh
What other energy potentials exist in your region and what is necessary to exploit these?	• Wood biomass • The use of wind • Solar energy	• Geothermal when technology become more cost effective • Biomass	n/a
Which Software or Tech do you use to track the generation and is it able to measure time-depended?	• EC members are equipped with HEMS (Home energy management system) that constantly monitors energy consumption and production.	• EMS with smart meters (like Reduxi) • /	n/a

	• /		
REC Optimization			
Does an energy surplus exist?	• In general no, in some time intervals yes. • Yes	Yes	Yes
Which energy storage technology exist with which capacity and for what reason?	• Battery energy storage systems (BESS): 5 individual – 5x20 kWh, one system/community BESS 333kWh/150kW. To enhance the reliability of power supply and to increase self-consumption. • The storage is not currently being used.	• It is planned to invest in the BESS. • The storage is not currently being used.	n/a

Which other Techs are useful to optimize energy management?	Smart devices, smart sockets	Smart management system (like Reduxi) for larger consumers (like EC, Air conditioning, etc)	Through inverter
Which software do you use for optimization?	• Software developed within the COMPILE project • /	• n/a • /	Just smart meters and EMS
Which software addition or tool you would like to complement or optimize your REC?	/	Ones that will include AI.	n/a
What data is in your point needed to optimize your REC further?	• All the needed data is already gathered. • Energy consumption at the 15-minute level for an individual building included in the energy community.	All data is available (consumption, production)	Production and consumption is monitored.
Which other Techs are useful to optimize your REC further?	Looking at other forms of cogeneration would make sense.	Ones that include AI.	Using online trading platform to distribute production on different location. Not physically but through balance sheme – Suncontract).
Do you share or need energy from other regions?	• The energy surplus is injected into the grid, energy shortage is supplied from the grid. • Yes	Yes	n/a

Do you track the shared or needed energy from other regions?	No	• No • This is followed by the regional/national and international level.	n/a
REC Costs			
Did you get incentive or help for creating the REC?	Yes, the EC was established as part of the COMPILE project that was funded by EU Horizon 2020 - Research and innovation program.	• Yes – Ministry of environment, climate, and energy • Additional specific tenders for the acquisition of dedicated funds at the national level are planned according to the announcements of the competent Ministry for the field of energy.	yes
Did you get incentive for installing the technology or infrastructure?	Yes, as part of the COMPILE project	• Yes, Ministry of environment, climate, and energy • Yes.	Yes, it was around 10% of total investment which was 120.000 EUR
In which range was the investment cost?	Total costs were in a range between 500.000-1.000.000.	1.000-1.200 EUR per kWp.	

In which range is the operation and maintenance cost?	• Operation and maintenance cost are in a range bellow 1.000 EUR annually. • 30 - 40 EUR per kWp annually.	• Around 130.000 EUR p.a. • 30 - 40 EUR per kWp annually.	1.000 EUR p.a.
In which cost range would you invest further in optimization?	No further investment is foreseen. If any investments are made, they will be made solely by individual members of EC in their private premises.	• In BESS, roughly 50.000 p.a. • It is not planned so far.	Not planned
How was the REC cost shared between the members?	A large share of the cost was borne by the company, which is both the EC manager and the supplier of electricity to EC members. Each member of EC governs the relationship with the EC manager.	A higher financial input at the beginning means a higher participation in the production of electricity. Of course, a larger contribution is made by larger energy consumers.	The investment was financed by SME.
REC Advantages			
What is the biggest advantage for your REC members?	• Increased self-sufficiency and reduced costs of electricity. • More reliable and stable power supply. • Production of RES.	• Fixed energy cost for large part of consumed energy. • Fixed electricity price for a long period of time. • Increasing the level of self-sufficiency. • Production of RES.	Loower cost of electricity.

What is the biggest advantage for your REC energy provider?	Participating in a pilot project and gaining experience in the field.	• Better demand and production forecasts • Guaranteed long-term business.	To maximize the profit of the produced energy.
REC Disadvantages			
What was the biggest disadvantage for your REC until now?	Vaguely defined legislation and consequently inability to share energy outside the community.	• Changes in regulation with regard to grid fees and connected load fees. • Uncertain prediction of future legislative and other changes that could affect project.	Negative market prices
Is there a disadvantage for REC members?	• No. • Uncertain prediction of future legislative and other changes that could affect project.	The price of energy which needed to be purchased outside the EC.	The price of energy which needed to be purchased outside the EC
REC Creation			

Do you have a national legal framework for creating REC?	At the time of EC creation, the legal framework was not yet defined, now it is.	• Yes. • Legislative amendments are necessary for the proper launch of community projects.	Yes
In your opinion, which change of the legal framework could improve the creation of REC?	• The legal framework is now defined and there are no legal obstacles to the creation of the EC. • Legislation that will encourage the generation of projects from the bottom up. The local community must also have part of the benefits in the case of implemented biger RES	• Legislation that will encourage the generation of projects from the bottom up. The local community must also have part of the benefits in the case of implemented bigger RES projects. • It is relatively new and not sufficiently tested. • The grid connection scheme is only one and does not apply to direct self-consumption (all energy must pass through official distribution meters).	New energy billing (shorter intervals, previous net-metering scheme was more favourable)
What was the reason for creating the REC?	• Unreliable power supply and members' desire to produce and consume their own green energy. • Cost reduction.	• Energy independence, using the roofs of public buildings, co-financing. • Cost reduction.	Lower energy prices.

Which main parameters where considered in the feasibility for the REC?	Technical limitations of the grid, financial feasibility, and payback period	• Technical parameters, to synchronise consumption and production, • Finances • Energy consumption at the 15-minute level. • Existing costs, • etc.	Financial and technical limitations
What was the biggest hinderance for creating your REC until now?	• Unclear legislation, weak network. • Legislative obstacles, vague legislative requirements, stakeholders' doubts regarding the justification of the investment.	• Legal form of EC and organizational • Legislative obstacles, vague legislative requirements, stakeholders' doubts regarding the justification of the investment.	Meeting technical requirements for connecting and installing
What is the actual entrance barrier for new REC members?	• Need to be located in the area/network covered by the same transformer. • If there is no trust, the greatest fear of community members is that what was promised will not happen.	They need to see clear benefits. They are not usually keen to adopt better management of their consumption.	Availability of spare capacity in the energy network.
Which kind of promotion for the REC was done?	Organizing and participating in several events and workshops promoting the EC. Publishing scientific and non-scientific articles. Publishing promotion material such as videos and brochures.	• n/a • Workshops and various presentations including the presentation of the framework inputs and benefits for the participants.	Building trust through bilateral meetings

How was the social acceptance regarding the REC creation?	• In was positively accepted and has attracted a lot of attention from the public. • The main social obstacle for the successful introduction of community energy projects, community projects of renewable energy sources is mainly the lack of reliable information and mutual trust. • There is also lack of existing examples of good practice that already demonstrate benefits to all stakeholders (win-win).	• The main stakeholders didn't know what to expect. • There is also lack of existing examples of good practice that already demonstrate benefits to all stakeholders (win-win).	Good
What was done to improve the social acceptance?	• Organizing workshop for EC member and broader public. • It is important to show the benefits transparently.	Workshops, Explaining the users to adapt, etc....	Presenting examples of good practice

Interreg Danube Region

Co-funded by the European Union

NRGCOM

National Workshop Questionnaire

A1.4 Assessment of possible low-cost infrastructure investments and developments

SLOVAKIA

Content

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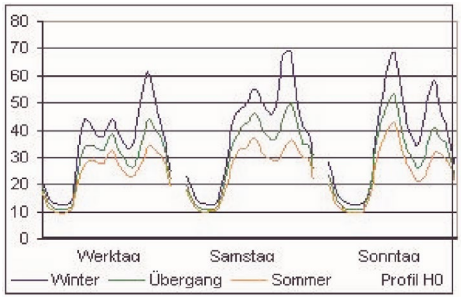
The questions can be interpreted freely and adapted to national circumstances and the audience. It should be kept in mind that the questions aim to fill the data catalogue of Activity 1.4 in order to optimize existing RECs via infrastructure investments and developments. The figure below shows an exemplary REC which contains consumer, producer and the combination, the prosumer. Also, potential energy producing technologies are shown.

The main interesting technologies (Tech) which are able to support REC are mainly wind power plants, PV, hydro power plants and Combined Heat and Power (CHP) systems. Wood or biogas fired CHP is able to generate renewable electricity but also heat. The heat is interesting for creating heat-based RECs.

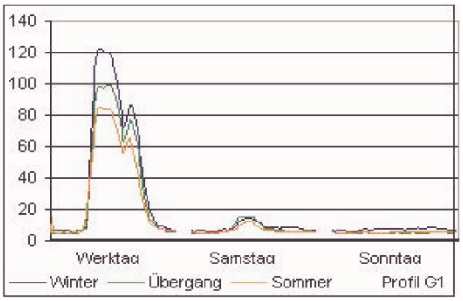
Source: https://energiegemeinschaften.gv.at/

LOAD PROFILES

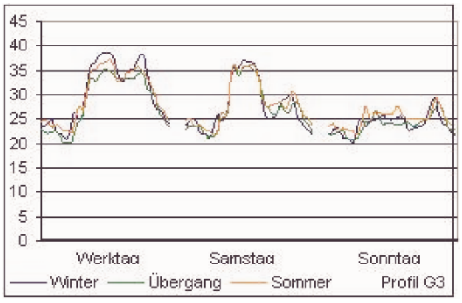
The energy demand of consumer can basically be described in specific load profiles. The most common ones are the three profiles below. The household has its energy consumption peaks mostly in the morning and in the evening, distributed over the whole week. The commercial has the energy peak between 0800-1800 and at the weekend nearly nothing. The Industry can hardly be described with a standard profile but often has daily peaks which can also occur at the weekend. For the comparison with energy generation technologies, the categorization of consumer in these profiles helps in optimizing the energy management.



A: Profile Household



B: Profile Commercial



C: Profile Industry

Source: https://www.bdew.de/media/documents/1999_Repraesentative-VDEW-Lastprofile.pdf

CATALOGUE WITH TECHNOLOGIES INVESTMENTS FOR REC

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The green experimental filling of the table 1 below gives the showcase of a commercial REC operator. It can be seen as an exemplary craft business that has installed a roof-top PV on its large halls to cover its own electricity demand and those of several other buildings in the vicinity.

Table 1: Experimental fill out in green of Catalogue sheet

Consumer Profile and Energy Demand	**Household**	**Commercial**	**Industry**
Which consumer type describes you most and why?		Commercial Further Question Answer	
Which other consumer types and how many are active in your REC?	20	5	1
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not influenced in future
How much energy (electricity/heat) does your REC consume overall?		Around 100,000	
Which Software or Tech do you use to track the demand and is it able to measure time-depended?		Old counter devises, no	
Technology / Infrastructure Description			
Which technology do you use in your REC?	**Rooftop PV**		

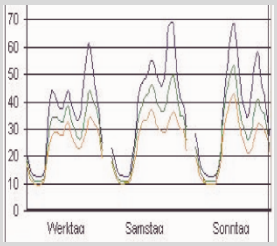
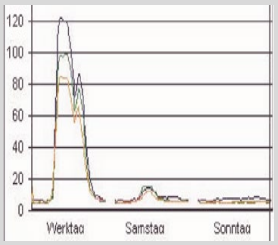
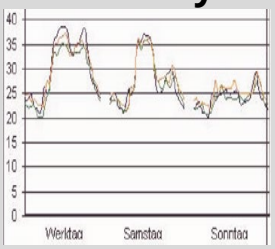
What does the Tech do for your REC and how well does it match your demand?	PV generates electricity but it happens when Consumer is not at home	PV generates electricity happens when Consumer is active	PV electricity is not sufficient for 100% energy covering
How much renewable energy do you generate with which capacity?		10 MW; 40000 MWh	
What other energy potentials exist in your region and what is necessary to exploit these?		Wood chips for heat production, no heating system suitable for them	
Which Software or Tech do you use to track the generation and is it able to measure time-depended?		Web-application: PVscreen, yes	
REC Optimization			
Does an energy surplus exist?	Yes, surplus during midday	Yes, surplus during weekend	No
Which energy storage technology exist with which capacity and for what reason?	Electricity Home Storage to level Generation to Demand Capacity unknown	no	no
Which other Techs are useful to optimize energy management?		Battery storage	
Which software do you use for optimization?		Non-existent	
Which software addition or tool you would like to complement or optimize your REC?		unknown	
What data is in your point needed to optimize your REC further?		Better demand tracking	
Which other Techs are useful to optimize your REC further?		Renewable heating tech	
Do you share or need energy from other regions?		Energy demand is mostly satisfied with external energy.	
Do you track the shared or needed energy from		no	

other regions?			
REC Costs			
Did you get incentive or help for creating the REC?		No	
Did you get incentive for installing the technology or infrastructure?		30%	
In which range was the investment cost?		10,000,000	
In which range is the operation and maintenance cost?		0,5%	
In which cost range would you invest further in optimization?		non	
How was the cost shared between the REC members?		Same portion on all members	
REC Advantages			
What is the biggest advantage for your REC members?		Cheaper electricity	
What is the biggest advantage for your REC energy provider?		Non	
REC Disadvantages			
What was the biggest disadvantage for your REC until now?		Non	
Is there a disadvantage for REC members?		Non	
REC Creation			
Do you have a national legal framework for creating REC?		Unknown	
In your opinion, which change of the legal framework could improve the creation of REC?		Unknown	
What was the reason for creating the REC?		Low electricity costs	
Which main parameters where considered in the feasibility for the REC?		Electricity costs, roof size, grid connection	
What was the biggest hinderance for creating		REC member interest	

your REC until now?			
What is the actual entrance barrier for new REC members?		Joining the REC association	
Which kind of promotion for the REC was done?		Questionnaire in the neighboring area	
How was the social acceptance regarding the REC creation?		Good, nobody was bothered by the roof PV	
What was done to improve the social acceptance?		non	

WORKSHOP QUESTIONNAIRE TEMPLATE

PP12 NEK – Slovak Republic

Consumer Profile and Energy Demand	Household	Commercial	Industry
			
Which consumer type describes you most and why?			Industrial enterprises and institutions mainly from the SME portfolio
Which other consumer types and how many are active in your REC?	0	1	8
Which consumer is the largest and will this change with electric cars or heat pumps?			Industry, is not affected by electromobility in the future
How much energy (electricity/heat) does your REC consume overall?			We cannot define, estimate about 150,000 MWh

Which Software or Tech do you use to track the demand and is it able to measure time-depended?			Measuring systems of automatic remote measurement of the ISTA type, including inspection software
Technology / Infrastructure Description			
Which technology do you use in your REC?			Photovoltaic energy sources, installed on separate areas in the rural areas of municipalities.
What does the Tech do for your REC and how well does it match your demand?			PV electricity is not enough for 100% energy coverage, and due to the need to ensure the technological stability of the operation of machines and equipment in companies, a connection with conventional energy sources from the central state distribution networks is necessary.

How much renewable energy do you generate with which capacity?			Approximately up to 55,000 MWh
What other energy potentials exist in your region and what is necessary to exploit these?			The situation is relatively good with biofuels based on energetically active wood chips. An appropriate heating system is also being built in EC conditions
Which Software or Tech do you use to track the generation and is it able to measure time-depended?			Web-application: PV screen, Yes

REC Optimization			
Does an energy surplus exist?			No
Which energy storage technology exist with which capacity and for what reason?			The mentioned problem is in the process of being solved, as there are currently no affordable storage resources.
Which other Techs are useful to optimize energy management?			Battery storage, but with a relatively limited capacity, due to the large energy needs.
Which software do you use for optimization?			Non-existent
Which software addition or tool you would like to complement or optimize your REC?			We are currently in the stage of researching possibilities and HW + SW equipment for this issue
What data is in your point needed to optimize your REC further?			Better demand tracking, Stability of state economic and energy policy,

			Absence of turbulence on the relevant local market
Which other Techs are useful to optimize your REC further?			Renewable heating technology
Do you share or need energy from other regions?			The need for energy is mostly satisfied by external energy from central energy distribution networks.
Do you track the shared or needed energy from other regions?			No
REC Costs			
Did you get incentive or help for creating the REC?			No
Did you get incentive for installing the technology or infrastructure?			Some members of the EC received subsidies for the construction of energy infrastructure within the competence of their own energy management, in

			the amount of approximately 50% of the non-refundable subsidy
In which range was the investment cost?			About 5 mil €
In which range is the operation and maintenance cost?			About 20%
In which cost range would you invest further in optimization?			About 30%
How was the REC cost shared between the members?			Breakdown of costs according to the ratio of consumption and planned cm potential consumption in the given monitoring period of one year.
REC Advantages			
What is the biggest advantage for your REC members?			Cheaper electricity, A contribution to environmental progressiveness

What is the biggest advantage for your REC energy provider?			The possibility of individual combination and a relatively high degree of independence from networks, Excellent presentation and acquisition of customers due to the implementation of RES as a form of future energy supply, which has a significant educational and promotional impact on the market.
REC Disadvantages			
What was the biggest disadvantage for your REC until now?			Ambiguity of state policy, Big fluctuations in energy consumption from a price point of view
Is there a disadvantage for REC members?			The need to have your own stable operating financial resources and professional staff at the beginning

			of the start-up.
REC Creation			
Do you have a national legal framework for creating REC?			Yes, there is relatively extensive and well-processed legislation and a separate state institute for monitoring and supporting EC development - Slovak Innovation and Energy Agency – SIEA (Slovenská inovačná a energetická agentúra)
In your opinion, which change of the legal framework could improve the creation of REC?			There is no need to change anything at the moment
What was the reason for creating the REC?			Unification of needs and expectations regarding energy efficiency in the regions of Slovakia, education and

			awareness, involvement of energy management systems and, in the finale, low costs of electricity.
Which main parameters where considered in the feasibility for the REC?			Electricity costs, network connection. Investment incentives, distribution distances, Personnel and technical security, Selection of appropriate and especially long-term operating RES devices.
What was the biggest hinderance for creating your REC until now?			Lack of professional and managerial knowledge and the need to overcome inertial negative opinions in the social circle of the EC.
What is the actual entrance barrier for new REC members?			Adoption of EC policy and concept. Entry conditions and participation fees.

Which kind of promotion for the REC was done?			Regular conferences and workshops Professional presentations and promotion of really feasible projects in the region.
How was the social acceptance regarding the REC creation?			At the beginning, the idea was started, later stabilized, and the satisfaction and success of the functioning of the EC in the framework of the application of REC
What was done to improve the social acceptance?			Continuous communication is maintained with all concerned partners, customers and potential candidates for participation in EC