Interreg Danube Region

Co-funded by the European Union

NRGCOM

SYNOPSIS REPORT

A.T.3.3 Development of a technological solution for RECs involved in the project for a more resource and cost-effective operation

Project NRGCOM:
Creating appropriate operational conditions for renewable energy communities in the Danube Region

This project is supported by the Interreg Danube Region Programme, co-financed by the European Union and the Ministry of Investments, Regional Development and Informatization of the Slovak Republic

Document Content

1. Baseline data on task performance

Organizer and guarantor of activity processing: PP12 NEK – Slovakia

Objective of the activity: The submitted and solved activity falls into the SO3 task group in the NRGCOM project for the 2nd period from 01.07.2024 to 31.12.2024

SO3: Enhancing production and use of renewables through pilot testing in potential and existing RECs

A.T.3.3: Development of a technological solution for RECs involved in the project for a more resource and cost-effective operation

The authors named the proposed SW tool for management and decision-making of energy communities in the workplace as:

"Expert Tool for the Management of Energy Communities"

acronym:

ETMEC

The presented and solved activity falls into the group of tasks SO3 in the NRGCOM project for the period of the 2nd period from 01.07.2024 to 31.12.2024

A separate professional output of the project D.3.3.1 is a software tool developed by the authors of the activity and instructions for selected participants for testing in the upcoming period of the next project period.

2. Analysis of individual data and inputs from the countries of the project partners

2.1 Brief description of the solution according to the NRGCOM project assignment

In the framework of A1.2 and A1.4, the partners will seek solutions for sustainable energy savings and efficient energy management. PPs will design a software solution applicable to the target energy communities, in order to help them overcome their technical barriers and enhance their effective operation.

The ideas of the PPs will be further developed and transformed into a final, physical solution. NEK, having significant experience in software development for the enhancement of the energy efficiency of institutions, will be responsible to develop the innovative technological software and provide instructions to the solution to be tested in operating RECs.

The aim of the software tool will be mapping, data processing and monitoring of alternative and critical inputs to improve efficient energy management and simplify the everyday operation of RECs involved. The tool will function as a finished control expert module for monitoring and correcting the measured inputs and the related state of the energy economy of the given organisations/members within the energy community concerned.

In order to ensure a more effective operation, the software will provide solutions, such as a set of identification of simultaneously available technical, energy, environmental, social and economic data and their processing by analytical methods into the input database for the given environment, a comparative set of statistical and operational data of production, consumption and redistribution of energy resources based on the participation of energy records from the environment of large national and international administrators and distributors of energy networks and systems, a set of criteria for the internal operation of the software and comparative levels for evaluation, taking into account statistical significance and at the same time the probability of energy changes and fluctuations caused by the external environment.

The PPs will test the device while taking into account the specific circumstances, conditions and arising expenditures of the target countries/regions. In addition to the software, NEK will prepare a manual on the installation and use of the software as well. NEK will share the software with the respective partners STRIA, JAIP, KSSENA and FORSCHUNG will be involved in the activity who have a greater understanding of the operative operations of RECs and technological solutions that could be applicable for the improvement of their efficiency. The solution will be tested to contribute to increase resource- and cost efficiency of the RECs operating in: Luče, Slovenia, in Burgenland in Austria, in South Bohemia, the Czech Republic, with close cooperation with KS MAS (ASP6) and in the Bratislava region in Slovakia.

D3.3.1 Software solution with installation instructions for RECs NEK will develop a software solution and provide instructions to the PPs testing the solution in Slovenia, Austria, the Czech Republic and Slovakia, in the framework of A3.4.

2.2 Methodology of task processing A.T.3.3

The guarantor of activity A.T.1.2 – PP12 NEK chose the following approach for processing the task:

1. Detailed analysis of the starting points, the expected goal and the possibility of unifying the collected data and the opinions of individual partners in the task

2. Prepared a consultation table (Annex to this report) with markings

"Appendix to activity A.T.3.3 Table: **„Development of a technological solution for RECs involved in the project for a more resource and cost-effective operation**“

which assigned 10 questions and a final summarization with additional data and recommended information and publication sources to be developed for individual partners.

3. The partners uniformly filled in their fields in the table and answered the defined question for the reasons of ensuring the possible compatibility of the obtained data and expressions for mutual comparison and subsequent evaluation of the task.

4. Realization of domestic national workshops, respectively consultations on the topic with partners.

5. The aim of the software tool will be to map, process data and monitor alternative and critical inputs to improve efficient energy management and simplify the daily operation of the involved RECs. The tool will function as a ready-made management and control expert module for monitoring and correcting measured/detected inputs and the related energy efficiency status of the given organization/members within the concerned energy community

6. The software will provide solutions such as a set of identification of currently available technical, energy, environmental, social and economic data and their processing by analytical methods into an input database for the given environment and a comparative set of statistical and operational data on production, consumption and redistribution of energy resources based on the participation of energy records from the environment of large national and international administrators and distributors of energy networks and systems.

7. It will be a set of criteria for the internal operation of the software and the benchmark levels for evaluation, taking into account the statistical significance and at the same time the probability of energy changes and fluctuations caused by the external environment.

8. PPs will test the device, taking into account the specific circumstances, conditions and incurred expenses of the target enterprise/country/region.

In addition to the software, PP12 - NEK is also preparing a manual for installing and using the software.

9. NEK shares the designed expert SW tool *ETMEC* - software with relevant partners. The following partners will be involved in the activity at the stage of preparation and testing for data generation and subsequent pilot verification: JAIP, NEK, KSSENA and FORSCHUNG.

10. They are involved in the activity of data generation and subsequent pilot testing. In order to obtain broader information, however, NEK also appealed to other partners to cooperate in data collection (for example, when solving activity A.T.1.2, there was excellent communication between all partners)

11. The above task is in the stage of development in the system part, but it is a difficult matter and, in particular, data on general available comparative data within individual countries on consumption and energy mix from large energy network administrators and producers is still missing.

12. Furthermore, when implementing the actual final state of the SW tool, it is necessary to wait for the completion of the outputs from the currently resolved activities, especially those whose data will be determined in the SW system for comparison and alternative selections for management, such as legal and legislative restrictions (A.T.1.1), possible organizational and operational models implemented in individual countries (A.T. 1.2, A.T.3.1), motivational systems for EC support in society (A.T.2.2), administration, management and EC management techniques, and others.

13. It follows that this is a fairly comprehensive problem and at this stage PP12-NEK as the guarantor of the activity must proceed gradually. It is realistic that in this period no. 2, the entire basic input knowledge base of data and expert opinions on the functioning of energy communities will be built, and testing will begin, but the actual outputs for real practice will only be finalized sometime at the end of the 4th period of the project after completing many other activities and obtaining their results for corrections in the SW system design for the EC.

14. NEK has gradually processed all relevant steps and created a working flowchart that serves to describe and understand the basic steps and decision-making in the implementation of the programming itself for energy community managers.

A flowchart is a type of diagram used to graphically represent the steps of an algorithm, workflow, or process. A flowchart consists of shapes of various shapes (rectangles, diamonds, etc.) connected by arrows. The shapes represent each step, and the arrows represent the flow of control. Flowcharts do not show the flow of data by default, which is shown using data flow diagrams. Flowcharts are often used in computer science during programming to analyze, design, document, or control processes.

For the SW tool solution, it was necessary to adopt the so-called an open application model, with the possibility of gradually adding new and updated data and parameters to it according to further findings from partners and their energy communities, in connection with the expected further results from the 3rd and 4th periods of the NRGCOM project, mainly in connection with the future activity A.T.3.4.

Selected collaborating partner of the NRGCOM project for activity A.T.3.3. The following questionnaire was submitted for completion. A questionnaire was prepared for software development within the framework of activity A.T.3.3:

"Development of a technological solution for RECs involved in the project for more efficient and cost-effective operation of economic communities", with a request for detailed study and clear, concise answers that will serve as the basis for the database of the flowchart and SW scheme.

The answers were especially important for the partners identified as a priority in the task, namely: PP: STRIA, JAIP, KSSENA and FORSCHUNG, but we would welcome cooperation and data on individual points of the questionnaire from all partners of the NRGCOM project, where the KSSENA partner was also actively involved in the process.

The deadline for sending completed questionnaires was set no later than November 25, 2024, and all participants met it in an exemplary and timely manner and responsibly filled in their own available domestic data from the individual regions addressed by the project.

Subsequently, the questionnaire was processed by PP-NEK and re-sending the obtained data and answers from all partners to individual points (questions) to all participating partners who filled out the questionnaires for the purpose of mutual comparison of data and possible corrections.

The processing methodology consisted of the procedure of creating a set of comparable statements and findings / data, to which the necessary additional parameters from the results of the activities to date from the 1st period of the project and mainly from the activities A.T.1.1, A.T.1.2 and A.T.1.3 are subsequently added.

Then follows the creation of the so-called demo version of the consulting management SW itself and its distribution to the designated partners STRIA, JAIP, KSSENA and FORSCHUNG, including the working manual for installation into their own verification practice, for verification and commenting on the functioning so that by the end of December a jointly debugged basic verification variant is obtained - the project output for further testing in connection with other results of other related activities and for further periods of the project.

3. SUMMARY Appendix to activity A.T.3.3 – project NRGCOM

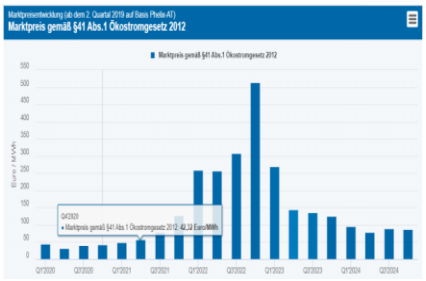
Table: Joint development of a technological solution for RECs involved in the project for more resource and cost-effective operation

Overview of the results of the survey participants' findings and evaluation of the applicability of the results as a basis for the creation of a SW tool for the management of Energy Communities. The table documents in detail the individual findings from the partner questionnaire.

	Question/ Specification:	***Answers/Partners:***					
		JAIP	**KSSENA**	**FORSCHUNG**	**NEK**	**IRENA**	**EVALUATION OF FINDINGS A- crucial for SW B - variable parameter C - irrelevant for SW**
	Circle of general questions:						
1.	**Which model of the functioning of the EC legal system in your country is decisive ?** (see your results from activity and documents A.T.1.1 and A.T.1.2) Tick the appropriate answer: A - Energy community as organization based on interest association B - Energy community as a cooperative form C - The energy community as a business company D - Energy community as association with connection and participation of citizens	**A,B,D**	**A,C,D**	**B,D**	**A**	**A Energy community organized as association**	**A**
2.	**Are there any registered communities within 50 km in your area?** *(Select answer):*	**A**	**A**	**A**	**B**	**B**	**A**

	A - YES B - NO C - DON'T KNOW						
3.	**In which location do you plan to create an EC?** *(Select answer):* A - housing estate, B - industrial development, C - house development	**?**	**A**	**Mixed form - Municipality of Neudörfl**	**B**	**Agency headquaters**	**B**
4.	**What amenities are in your area?** *(Select answer):* A - kindergartens, B - schools, C - local government, D - business and cultural centers, E - other ...	**A,B,C, D,E**	**A,B,C,D,E**	**A-E,** **others are Sports facilities, bathing lake, inns and wine taverns**	**D,E**	**A,B,C,D , E + F industry + hospitality activities and tourism**	**B**
5.	**Are there potential buyers of your energy resources or products in your area?** *(Select answer):* A - yes B - no	**A**	**A**	**A** **Yes, end customers for (electrical) energy**	**A**	**A**	**A**
6.	**Do you have support from local authorities?** *(Select answer):* A - yes B - No C - Cannot assess	**A**	**A**	**A**	**C**	**A**	**A**
7.	**How many households, institutions or companies are interested in working with you (within a radius of 500 m) ?** Please give an estimate of the number: *(Select answer):* A - up to 5 B - up to 20 C - up to 50	**B**	**B**	**C**	**B**	**B**	**B**
8.	**Is there spare capacity in your area to connect to the**	**B**	**B**	**B** **The exact capacity is not known, but all grid enquiries for PV**	**C**	**Yes**	

	distribution network, called an access point point (grid connection)? *(Select answer):* A - no If yes, in what capacity? B - sufficient C - insufficient *Note - indicate the possible capacity in KWh*			**systems <250 kWp are currently decided in favour**			**A**
9.	**Which form of RES - based energy mix provision do you prefer in your EC? (critical energy source)** *(Select answer):* A - RES based on photovoltaics B - RES based on ground source pumps and heat recovery units C - RES based on wind sources D – biomass and biodegradable waste E - hydro F - geothermal energy G - RES (EC placement on rooftops, land, other....) *Note: RES - renewable energy source (photovoltaic, hydro, wind, biomass, etc.)* *RES - conventional energy source (gas, solid fuels*	**A**	**A**	**A** **is reality, preferable would be a mix of all of them**	**A,B,D**	**A**	**B**
10.	**What form of technical design do you prefer for the localisation of RES in your EC?** *(Select answer):* A - location on the roofs of buildings B - location on agricultural on agricultural land C - siting in grey areas	**A**	**A**	**Should be also a mix, different studies show, that location only on rooftops are not sufficient to reach goals für renweable expansion**	**C**	**Location on the roofs of buildings location on parking lots**	**C**

	industrial areas D – location in a „ brownfields “abandoned industrial areas						
11.	**Is there any financial support for the construction of the EC from subsidies in your country?** *(Select answer):* A - yes B - no C - don't know	**A**	**A**	**For the organisational part there is a funding programm from national climate fund for innovative ECs:** Energiegemeinschaften 2024 – Klima- und Energiefonds **For infrastructure different funding options independent from EC are applicable**	**A**	**No**	**C**
12.	**Can you specify a crucial figure for the feed-in tariffs in your country in the current period of 2024?** *(Please provide an estimated figure in EUR per unit price and also an estimate of the total feed-in price for application in the EC if it is specifically defined or possibly discounted)*	**0,15 €/kWh**	**Feed-in tariffs are no longer available for new solar power plants since 2012 and the existing ones are about to expire.** **A state aid scheme offering premium tariffs is based on the market price of electricity each year.**	**The OEMAG feed-in price has been calculated in two stages since Jan 2024:** **the settlement prices of the last five trading days on which all base load quarterly futures for electricity deliveries of the following four quarters were quoted on the European Energy Exchange (EEX) are used as the basis for the calculation at the end of the respective quarter.**  **Based on the marketed electricity volumes of the green electricity settlement agent, an average volume-weighted day-ahead hourly price per month is now calculated and published by the green electricity settlement agent in accordance with section 41 para. 2a of the Green Electricity Act 2012. This volume-weighted day-ahead hourly price is used to set an upper limit for the market price to be remunerated. The lower limit is also 60 per cent of the market price in accordance with section 41(1) Green Electricity Act 2012. Further information**	**No**	**No feed-in tariffs for EC**	**B**

				can be found on the website of the Green Electricity Settlement Body. **Prices of 2024:** **Jan: 8,137 ct/kWh** **Feb: 6,293 ct/kWh** **Mar: 5,776 ct/kWh** **Apr-Jun: 4,655 ct/kWh** **July: 5,339 ct/kWh** **August: 5,827 ct/kWh** **Sept: 6,038 ct/kWh** **Oct: 6,867 ct/kWh**			
13.	**Are you planning to build warm water or central DHW systems as part of the local EC development in your country?** *(Select answer):* A - yes already at present B - yes, but prospectively C - no D - not relevant to domestic conditions	**C**	**A**	**C**	**C**	**No**	**B**
14.	**How much energy do you plan to produce within your EC?** Please provide a specific estimate in kWh/day	**?**	**In average: 5652 kWh/day**	**Energy is only provided by the members' plants; the EC alone will not build any plants.** **The energy produced therefore depends on the members' systems - currently just under 400 kWp of photovoltaic output.**	**We cannot judge**	**Not calculated still. Based on current capacity (250 kW) taken in consideration 337.500 kWh/year .**	**B**
15.	**Are you interested in recuperation systems in your apartment buildings, buildings and consumer distribution units?** *(Select answer):* A - yes B - no C - partially, but in conjunction with others RES sources	**C**	**B**	**C**	**A**	**No**	**A**
16.							

	The range of operational issues:						
17.	**What is the current RES-based energy mix in your country?** *(Select answer):* A - companies and ECs where today already presented a ratio of RES in the total energy mix between 0 and 10%. B - enterprises and ECs where the RES share of the total energy mix is already presented today from 10 to 30% C - enterprises and ECs where the share of RES in the total energy management above 30% is already presented today	**A**	**A**	**C – app. 50% over all sectors of energy**	**B**	**No operation EC in our country (3 EC have been registrated but are not fully operational)**	**B**
18.	**What is the current estimate of gross turnovers /total sales for the critical ECs in your country, taking into account the share of RES?** *(Select answer):* A - unknown B - less than EUR 100 000 per year C - between EUR 100 000 and EUR 300 000 per year D - above EUR 300 000 per year	**B**	**I can't judge.**	**For EC in Neudörfl B, for all ECs in Austria D**	**B**	**NA**	**C**
19.	**What do you estimate the profit rate in your ECs in the last financial year under review?** *(Select answer):* A - unknown B - indicate the specific % of total brutto EC turnover	**A**	**I can't judge.**	**+/- 0% By definition, energy communities must be non-profit organisations and any profits must be reinvested**	**A**	**NA**	**C**
20.	**Please give the characteristics of the region of operation of your EC in your**	**A,B,C**	**B 1 energy community in the**	**B/C**	**B**	**NA**	**B**

	country and indicate the number of known ECs? *(Select answer):* A - in the capital or major metropolitan areas of the country B - in regions outside the centres C - in local neighbourhoods		**Savinjska region. This number is expected to increase in 2025, when the submissions to the national call for proposals for co-financing the construction of new solar electricity generation systems on public buildings and car parks are evaluated and approved.**				
21.	**What is the total number of staff in the EC in question in terms of management and operational tasks?** *(Select answer):* A - up to 9 B - 10 to 24 C - 25 to 49 D - 50 or more	**A**	**A**	**A** **all of them honorary**	**B**	**NA**	**C**
22.	**To what extent are RES-based energy carriers currently included in the energy consumption of your ECs?** *(Please select your answer and rate on a scale of importance 1-5: (1 - fully deployed , 2 - deployed above 70%, 3 - deployed at 60%, 4 - deployed above 50%, 5 - deployed below 50%):* A - The company	**?**	**C**	**D** **The EC supplies around 30% of the members' grid procurement from the EC. It is not possible for the EC to determine which electricity supply contracts and therefore which shares of renewable energy are included.**	**B**	**NA**	**B**

	exclusively uses CHP electricity sources from distribution central grids at 100% B - The company exclusively uses electricity sources from RES from distribution central grids up to 70% C - The company exclusively uses electricity sources from RES from distribution central grids up to 50% D - The company exclusively uses electricity sources from RES from distribution central grids up to 20%.						
23.	**To what extent do you foresee the involvement of RES-based energy carriers in the future energy consumption of your EC?** *(Select answer and rate on a scale of importance 1-5:* *(1 - use above 50% ,* *2 - use above 40%,* *3 - use at 30%,* *4 - use above 20%,* *5 - use impossible):* A - the EC will continue to use RES electricity sources from distribution central grids B - the EC will use electricity sources from the company's own RES in a minimum defined share of the total energy supply above 30% C - the EC will use electricity sources from the company's own RES in a minimum defined share of the total energy supply	**A1**	**B**	**A1:** **The EC will not use electricity from centralised distribution grids - by definition as a renewable energy community subject to proximity criteria, this is not possible. However, the members will continue to use around 70% of their electricity from such sources. This rate shoud be decreased to to additional measuares (use of storage and flexibility activatin measures).** **B1**	**B**	**A1,B2,C3,D4**	**B**

	above 30% D - the EC will use electricity sources from the company's own RES in a minimum defined share of the total energy supply up to 10%						
24.	**Which RES-based energy carrier source do you consider to be the mainstay for future application in the energy economy of your EC?** *(Select the answer and assign the appropriate designation to the RES energy carrier considered for application in the enterprise according to 1-4:* *(1 – biomass and biodegradable waste,* *2 - photovoltaics,* *3 - heat pumps,* *4 - solar energy)):* The EC will be preferably and proportionally be significant in the application of RES in the energy management of the enterprise within the energy mix, in particular: A – biomass and biodegradable waste B - Photovoltaics C - heat pumps D - heat recovery E - hydro power	**B**	**B,C**	**B**	**A,B,C**	**B**	**A**
	The range of management issues:						
25.	**What do you consider important in your EC when using management tools in energy management?** *(Please select your answer and rate on a*	**A - Software support (1)** **B - Sophisticati**	**A1,D2,E2,K2**	**A,C,E,K**	**A2,F1, G3**	**A1,B1,C 3,D1, E1,F3,G 3,H3, K3**	**B**

	scale of importance 1 - 5 : *(1 - very important + 5 unimportant/not important)):* A - Software support B - Sophistication and updating of the management methodology C - Fostering a team spirit of creativity and innovation D - Support for quick decision-making in crisis situations E - Price and operating costs F - Possibility of immediate partial solutions to overcome problems G - Level of external consultancy support services H - Speed of implementation of solutions K - Ease and clarity of deployment and use of tools	**on and updating of the management methodology (2)** **E - Price and operating costs (1)**					
26.	**To what extent are the following statements inherent in your management practice in the EC?** *(Please select your answer and rate on a scale of importance 1-5 :* *(1- strongly agree, 5- do not agree at all)):* A - The range of current management methods and tools for managing and assessing energy and environmental efficiency is difficult to navigate B - Most of the related management methodologies and	**A2,B3 C1**	**A2,B3,C4**	**A3,B4,C2**	**A3,B3**	**NA**	**C**

	techniques are complicated, technically demanding and therefore own intuitions and considerations are rather preferred C - The available methodologies and tools are adequate for managing and assessing the energy and environmental performance of EC operations						
27.	**Appreciate this statement: the EC's innovation and governance strategy for the energy economy is clearly communicated, everyone knows what the improvement is** *(Select answer):* A - yes, this is true B - no, it is an unfulfilled statement C - the fulfilment of the statement is only average and vague	**A**	**C**	**A/C**	**C**	**NA**	**B**
28.	**Appreciate this statement: the EC works directly with major customers and consumers to produce and distribute energy that takes into account the energy and environmental technical and social aspects and requirements of the times and, in particular, the stability of the EC's operation** *(Select answer):* A - yes, this is true	**?**	**A**	**A** **however, major customers may not be active members of ECs**	**A**	**NA**	**B**

	B - no, this is an unfulfilled statement C - the fulfilment of the statement is only average and vague						
29.	**Rate this statement: Substantial and clearly readable indicators and assessments are applied to help improve innovative energy management in the EC** *(Select answer):* A - yes, this is true B - no, this is an unfulfilled statement C - the fulfilment of the statement is only average and vague	**A**	**A**	**A**	**C**	**NA**	**C**
30.	**Appreciate this statement: Innovative ideas, energy saving solutions and deliveries to customers and consumers, independent of changes in the EC's energy management, are usually completed on time, on budget and on cost.** *(Select answer):* A - yes, this is true B - no, this is an unfulfilled statement C - the fulfilment of the statement is only average and vague	**A**	**A**	**A**	**B**	**NA**	**C**
	Other ideas of your own to complete the questionnaire:						
		No	**No**	**No**	**No**	**No**	

4. Conclusion.

4.1 Concept of the proposed expert SW tool *ETMEC*

The concept of the solution and the creation of outputs of activity A.T.3.3 was built by the PP12 – NEK author team in two separate phases, namely:

Preparation phase 1:

The preparatory phase is shown in Figure 1 and includes the involvement of the solution participants and the sequence of steps in the form of a flow chart when processing input data and summarizing the obtained results and their subsequent generalization for the purpose of determining appropriate and responsible criteria for assessment in the SW tool itself. The result is a set of precise criteria, evaluation statements, and based on which the expert system determines the further procedure and the correctness of its results when choosing a respondent / user.
Source: created by the team of authors PP12-NEK

Application Phase 2:

This phase is application and consists of gathering the essential findings from Phase 1 into the flow chart of the ETMEC SW tool itself, the subsequent architecture and SW installation manual for selected participants – partners of this activity A.T.3.3 and functionality verification. The PP12 NEK will gather the results and subsequently eliminate the error rate and risky problem factories and fine-tune the architecture of the SW tool itself.
Source: created by the team of authors PP12-NEK

Note:

For simplicity, Figure 2 shows only one of the partners of PP3 JAIP as a model co-researcher and verifier, but this flow chart applies equally to all partners and interested parties of the NEGCOM project.

In the next period of the NRGCOM project, the completion of the set of findings from the 2nd period of the activity will be verified and the results of all other relevant activities will be gradually incorporated, and the authors will thus be able to create a comprehensive tool for energy community management as an output of the NRGCOM project.

In parallel with the implementation of the questionnaire for NRGCOM partners, the authors of the activity continuously consulted the outputs with their own team of ambassadors, experts and project stakeholders for Slovakia, and the verification of possible outputs for the *EMTEC* SW tool is also being verified in the DEMO version at the 5th National Workshop PP12-NEK with international participation of project partners, on December 10-12, 2024 in Košice.

Fig.1: 1ST PHASE OF THE PREPARATION PROCESS SW PP-NEK SK for REC PP

Source: created by the team of autors PP12-NEK

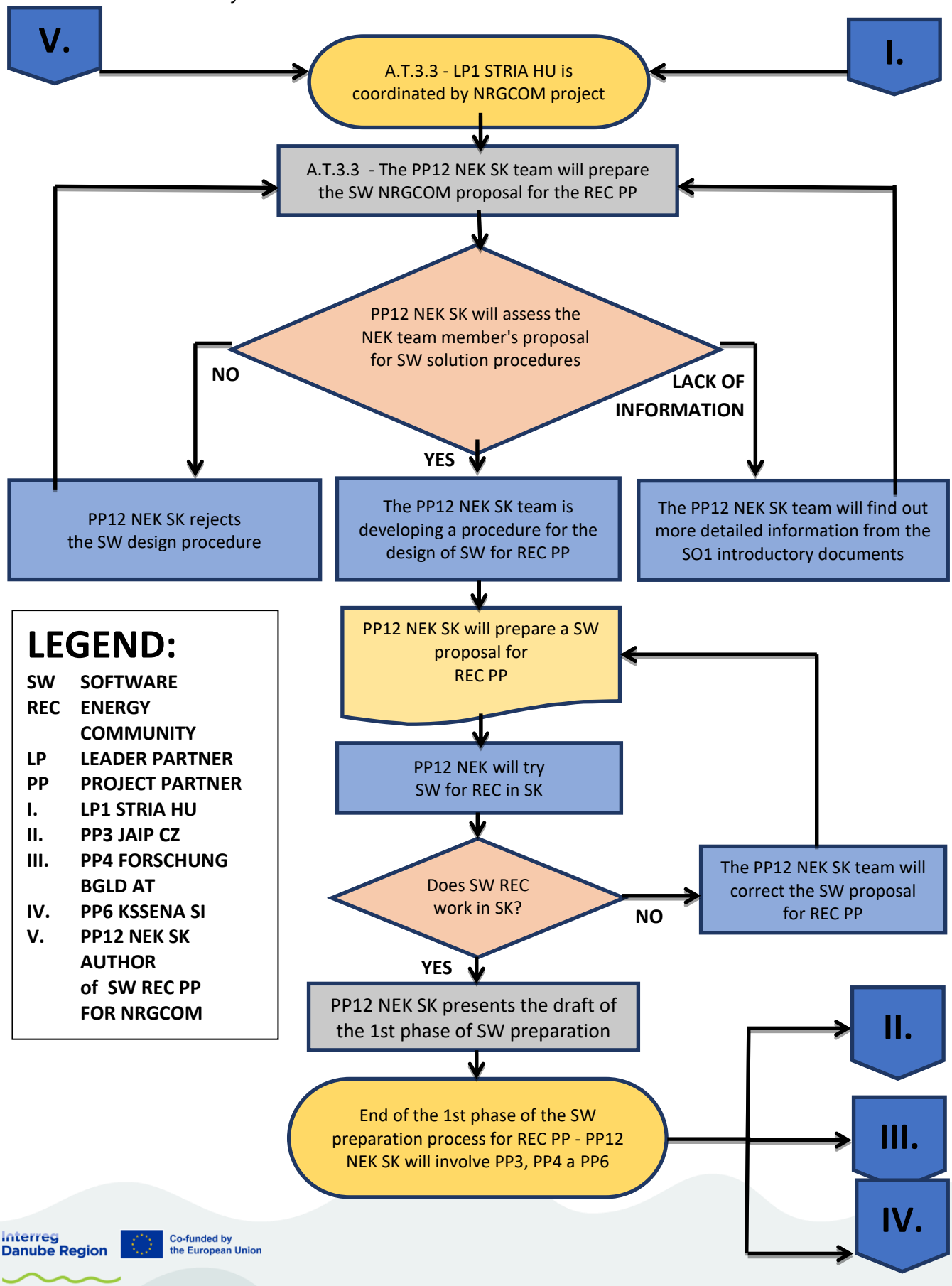
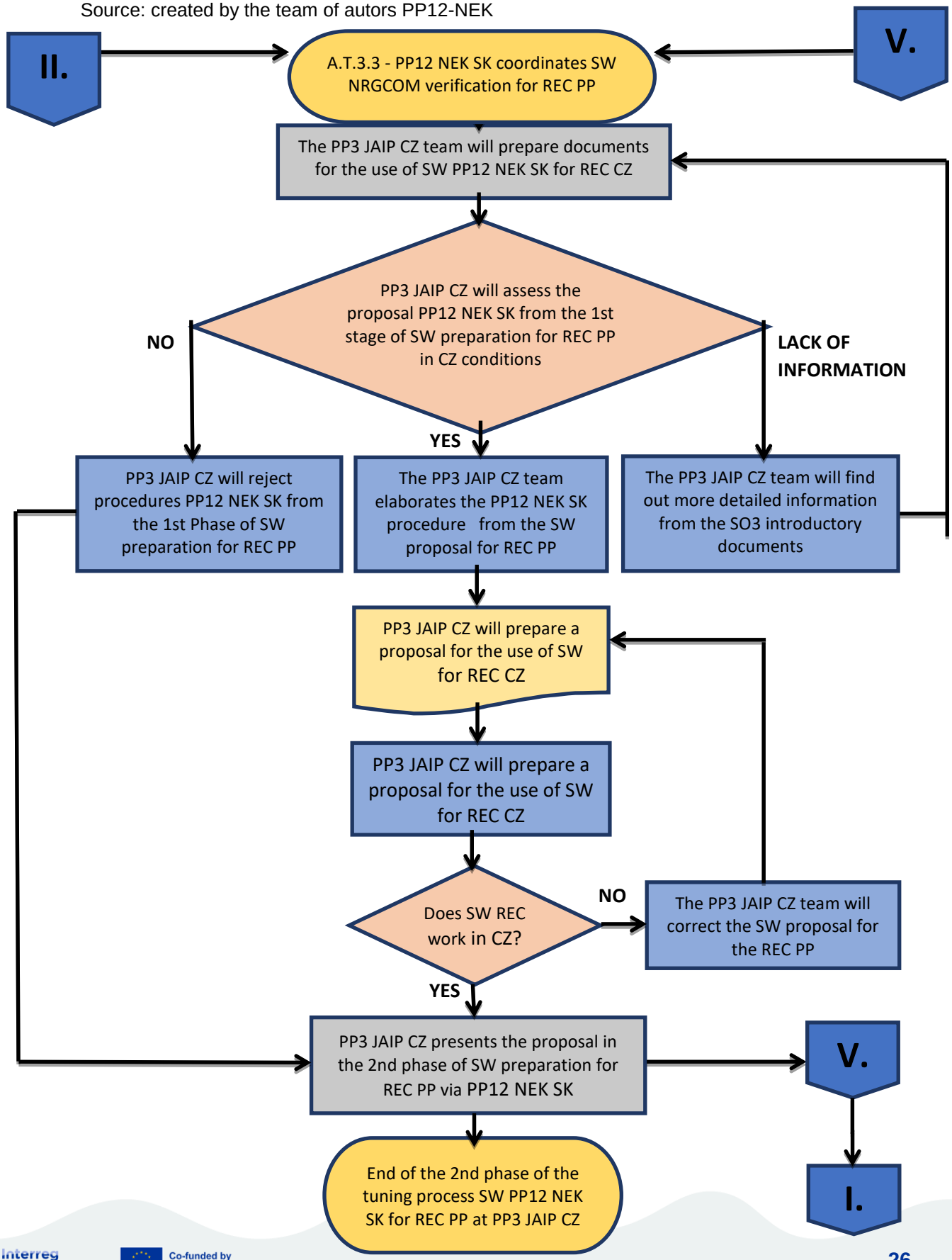


Fig.2: 2ND PHASE OF THE PREPARATION PROCESS SW PP-NEK SK for REC PP

Source: created by the team of autors PP12-NEK



4.2 Overview of results and findings from the creation of activity A.T.3.3

Brief summary of content	The analysis and presented results of the task A.T.3.3 contain an overview of the current development of energy communities in selected partner countries with regard to the application of renewable energy sources in their local and regional operation. At the same time, they point to the available organizational structures and initial capabilities of individual partners in individual countries of the implemented sphere of this NRGCOM project. The analysis includes an analysis of 30 questions specially created by the guarantor of the task NEK to provide an overview of the issue, as well as a summary and opinions of individual partners on the knowledge addressed. The following was found - a brief summary of the essential findings: The following was found - a brief summary of the essential findings from the questionnaire according to the question groups: The evaluation and significance of the individual answers and statements of the partners of the activity A.T.3.3 are summarized and marked according to significance as follows: **A**- crucial for SW **B** - variable parameter **C** - irrelevant for SW The general question group (questions no. 1 to 15) has the following results: Questions no.: 1, 2, 5, 6, 8, 15 are in the result group **A** Questions no.: 3, 4, 7, 9, 12, 13, 14 are in the result group **B** Questions no.: 10, 11 are in the result group **C** The operational question group (questions no. 17 to 24) has the following results: Question no. 24 is in result group **A**

	Questions no.: 17, 20, 22, 23, 25, 27, 28 are in result group **B** Questions no.: 18, 19, 21 are in result group **C** The question set (questions no. 25 to 30) for management has the following results: No question is in result group **A** Questions no.: 27, 28 are in result group **B** Questions no.: 26, 29, 30 are in result group **C** **Note**: Question no. 16 was not included and answered in the questionnaire.
Evaluation of goal and activity fulfillment A.T.3.3	The objective of the activity, defined in part 1. The initial data on the fulfillment of the task of this document, namely the creation of a database of analytical data on possible and legislative, operational and product options for energy communities, their creation and development, was successfully fulfilled in this activity A.T.3.3. The solution to the task A.T.3.3 was managed by fulfilling the partial tasks assigned by the PP12 – NEK processor, namely: 1. Research on the issue and mapping the current state of the topic from the perspective of the addressed partner countries. 2. Extensive theoretical research and mapping of the situation in individual countries participating in the project based on internal information from individual PP partners in the form of an overview table with a questionnaire with 10 questions. 3. Development of the professional output of task A.T.3.3, namely D3.3.1 Creation of an expert SW tool for energy community management with instructions for subsequent testing by partners JAIP, FORSCHUNG, STRIA, NEK, KSSENA These partial tasks were fulfilled in the document. Despite the fact that the building of energy communities and companies, especially with an emphasis on the implementation of renewable energy sources in their production and distribution to end

	consumers and community members themselves, is generally only in its early stages, it is obvious that a high level of professional organizational activity already prevails for the successful development of this issue, which will also have an impact on the application itself and subsequent updates of the proposed SW tool for practice within the NRGCOM project. Looking at any known methodology or management tool, if even the most sophisticated model of the organization's functioning is analyzed, there are still perceptions and feelings as if something is missing. As the authors of this analytical and implementation work within the framework of the processing of task A.T.3.3 of the NRGCOM project, but especially our long-term professional research, business and consulting activities in connection with our own comprehensive research, we see promising areas of application and development of this topic in management consulting operating models of energy communities in the future as: 1. Research into models of organizational systems and structures based on the innovative and inventive capacity of energy communities and the enterprises and organizations involved in them, especially from the SME environment, specifically in the area of designing and applying RES to an appropriate extent in the production and energy economy of energy communities and the production and distribution of energy within their scope. 2. Creation of inspection and management databases and subsequently expert systems for identifying and quantifying innovative and product qualities in the energy operating system of enterprises in energy communities.
Recommenda-tions and suggestions	Several partners are only at the beginning of building energy communities, and therefore do not have the opportunity to obtain an external expert and information database, but they have effectively and very successfully used a similar structure of possible knowledge from the field of industrial production of energy based on RES, mainly in SMEs.

	To ensure the effective and sustainable development of community energy, the following steps can be defined: **Financial and technical incentives:** Adequate financial incentives for participants and founders of the ES and ES to optimize production facilities and effectively prepare for project operation. This also includes the application of such a tool and management control tool as the SW called *ETMEC* in practice. **Flexibility in connection:** Involvement of production plants/members of the energy community in such a way that they reflect the actual required reserve power of the network, so that oversizing does not occur and efficient energy distribution is ensured. **Quality Assurance:** Emphasis on the competence and quality of SW installation and consulting companies involved in the preparation and creation of energy communities in order to ensure reliable and efficient operation. The participation factor indicates the percentage of consumption or production of a member in the ES that it contributes to the community. It determines the maximum percentage of generated electricity that can be supplied to the energy community, or the maximum percentage of electricity consumption covered by the energy community. Participation in multiple energy communities allows for an increase in the share of surplus electricity sold or purchased from energy communities. This is a very suitable innovation factor for managing the energy economy not only of the given community, but also of the managed region or locality. Adjusting the participation factor within the energy community can help limit high consumption, making dynamic allocation more attractive.Participation in multiple energy communities allows members to better manage electricity supplies and promote the use of renewable energy.

	Aggregators of flexibility are a solution to reduce the costs of consumers for electricity and at the same time the carbon footprint. They can optimize and manage the operation of flexible devices of consumers and producers in real time. The task of the aggregator will be to aggregate unnecessary electricity from consumers and smaller providers and then provide it to the transmission system **Recommendation 1:** Finish and repeatedly assess the synergy of the results of activities A.T.1.1, A.T.1.2 and A.T.1.3 and connect with the currently resolved results from activities A.T.2.2, A.2.4, A.T.3.1 and especially activity A.T.3.5. At the same time, the implementation of activity A.T.3.4 in the next period of the NEGCOM project will also be crucial for the implementation and verification of the *ETMEC* SW tool. **Recommendation 2:** In the next step of the NRGCOM project, analyze in more detail the internal methodology for creating organizational structures and managing ECs and focus on a modern method of process and project management of these ECs in practice and, in particular, transfer this to the flow chart of the concept and the architecture of the SW tool for management. **Recommendation 3:** Inform all project partners LP, PP to PP13 in detail about the content of this activity and its results and ensure awareness, a User Manual and, especially, instructions for testing in practice. A suitable form for awareness and education of project members - an international NRGCOM conference under the guarantee of NEK and subsequent promotion on social networks, etc. In doing so, it is essential to comply with the rules of authorship and protection of the *ETMEC* product exclusively for the needs of NEGCOM project members.
Contribution to the sustainability of project	The recommended overall procedure for the creation of an EC at the local or regional level can be determined from the overall documentation of activity A.T.3.3, in particular as: - Mapping of legislative, self-governing, economic and operational

results	aspects and financial possibilities in the catchment region of the establishment and functioning of the given energy community - Mapping of local energy potential and energy consumption at a defined location. - Starting preparations for the construction of new own energy sources around the location with an emphasis on RES in order to best and most advantageously cover the consumption of the entire defined area. - Maximizing the use of subsidy programs and possible financial resources for construction solutions and the necessary infrastructure. - Creating a suitable environment and ensuring personnel and managerial professional capacities for the energy community. - Preparing for the creation and establishment of an energy community in a given location. - Creation of an internal organizational system and sales techniques in the energy community - Methodology of community customer care and crisis and problem resolution - Audit of the internal energy economy of individual energy suppliers /community members in the production and distribution of energy based on RES. A significant contribution to the sustainability of energy systems based on RES in the application of ES and ES activities is the knowledge and summary of models and the management and control system of energy communities and the application of relatively universal business models for managing these communities.
Concept of the	It is important to know the specification and specific content

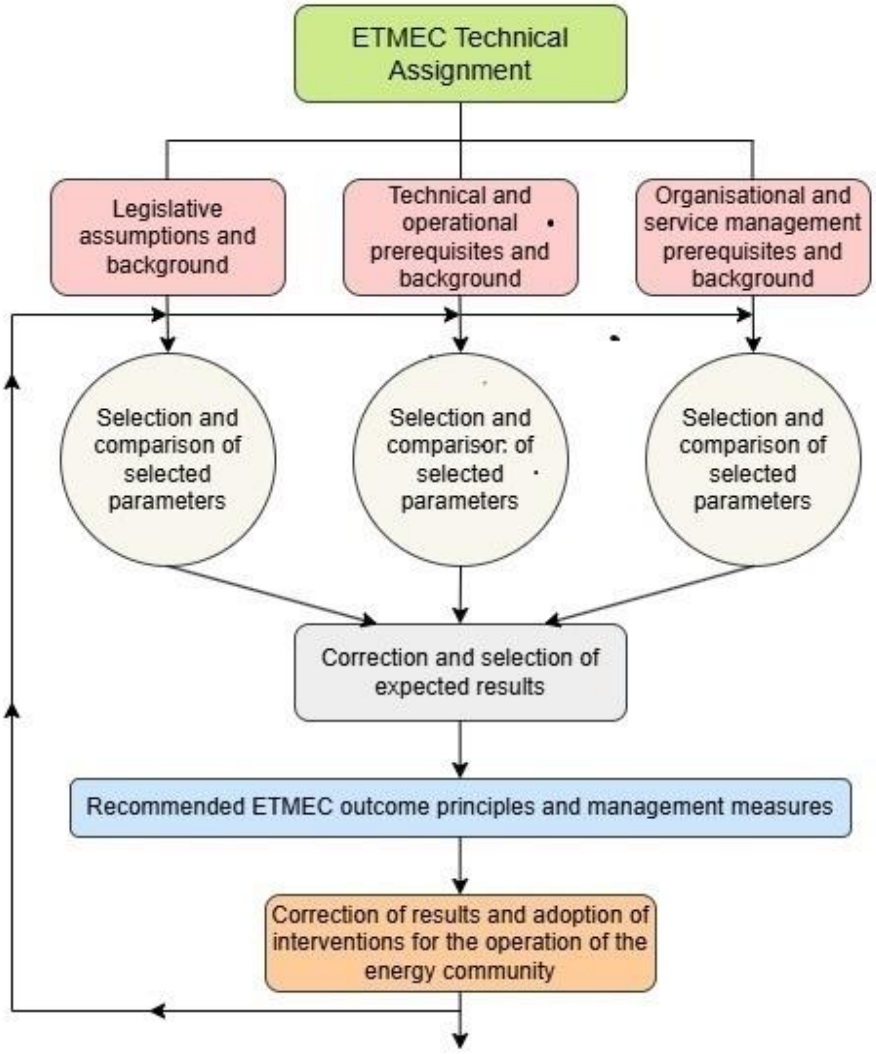
proposed expert SW tool ETMEC	composition of the created SW tool itself for expert management and decision-making of energy community managements in the creation and construction of energy communities and at the same time in the real operation and production of the energy economy. The *ETMEC* concept is built on three separate groups of SW architecture and activities and assessment of individual steps and questions for successful assessment and determination of the real state of a given energy community. The following overview briefly describes the main attributes of the architecture of the SW tool being solved, and the details are contained in the document itself D3.3.1 Software solution with instructions for installing REC in the form of a separate Expert tool for managing energy communities *ETMEC*.
Working model for designing an expert tool for managing energy communities ETMEC	The author collective of the solvers of the activity A.T.3.3 - ambassadors, experts and stakeholders, built for the needs of designing *ETMEC* this clear working model describing the individual components and the architecture of the created SW tool for energy community management. This consists of three separate levels, namely: **Level I:** Determination of the technical task, needs and expectations of managements and future users from *ETMEC* and subsequent specification of the available information in individual countries and regions of the energy community's scope on legislative assumptions and starting points, but also technical and operational requirements and limitations and own organizational and service management and personnel assumptions. **Level II:** It consists of the selection and comparison of selected parameters based on a gradually created and updated database of information, individually for each area of the SW tool in connection with the previous level I. The result is the correction and selection of expected results and their professional formulation, preferably in the form of specific statements and values / data.

Level III:

It is the so-called decision-making expert level and provides recommended resulting interventions and measures for the management of the energy community. This is followed by the correction of these results and the adoption of evaluation interventions and measures for the management and subsequent monitoring of the operation of the energy community.

Figure 3: *ETMEC* design model

Source: created by the team of autors PP12-NEK



Defining the needs and expectations of EMTEC software users	An essential requirement of the solved expert SW tool for management and decision-making of energy community managements *ETMEC* is knowledge of the needs and expectations of future users, namely: 1. Is there a need to create an energy community in a given region? 2. Is there sufficient technical, energy and professional management background for establishing an energy community? 3. Are the basic prerequisites for the effective functioning of an energy community given? 4. Are the energy potentials of the members of the energy community given for the production and distribution of energy in a given region? 5. Does the management of the energy community have the ability and knowledge to successfully manage and monitor activities? 6. Is there sufficient legislative and financial background in the given country of jurisdiction for the functioning of the energy community?
Defining the expected outputs and recommen-dations of EMTEC software	The decisive value of the solved expert SW tool for management and decision-making of energy community managements *ETMEC* is the knowledge of possible potential results and setting parameters for expert advice on specific steps carried out through the resulting software recommendations to energy community managers, especially future users, namely: 1. Whether the energy community meets the conditions and parameters for the establishment and launch of activities in a given region and country of operation ? 2. Whether the economic parameters and energy potential opportunities in the area of operation enable the effective functioning of the energy community ?

	3. Whether the operational and organizational factors of the energy community enable its functioning and successful operation in a given state, environment and under given circumstances ? *ETMEC* should in all circumstances be able to determine at least an approximate measure of whether the answer to the given expected outputs is YES or NO, or UNDER WHAT CONDITIONS (proposed measures or return to repeated self-assessment in the SW by the given management. Concluding note: Details will be specified by the *ETMEC* management expert tool itself and the related manual for implementation within the substantive output D3.3.1 Software solution with REC installation instructions. **Final note:** Details will be specified in the *ETMEC* management expert tool itself and the related implementation manual within the substantive output D3.3.1 Software solution with REC installation instructions.

5. Sources

Sources:	In this part, decisive information sources from individual partners are selected, which, along with the complete related text, can also be found in the descriptions of individual questions for the given partners in the Appendix - table for activity A.T.3.3
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