Interreg Danube Region

Co-funded by the European Union

NRGCOM

D.3.4.1 Efficiency report of the targeted energy communities

Activity lead partner: JAIP

April 2026

This document was prepared as part of the NRGCOM project, an Interreg Danube Region Programme project co-funded by the European Union.

Contents

Executive summary

This Efficiency Report (Deliverable D.3.4.1) presents the outcomes of the harmonized technological pilot actions implemented under Activity A.3.4 of the Interreg Danube Region project **NRGCOM** (Energy Communities for the Green Transition). The primary objective of this activity is to evaluate the operational efficiency, resource management, and regional readiness of targeted energy communities (ECs) across four project countries: Austria, the Czech Republic, Slovakia, and Slovenia.

To enhance the cost- and resource-effective operation of these communities, the project tested a jointly developed software solution called **ETMEC** (Expert Tool for the Management of Energy Communities), developed by the project partner NEK (Slovakia). ETMEC functions as an expert management and decision-making module designed for mapping, data processing, and monitoring alternative and critical inputs to simplify the daily operations of RECs and optimize their energy economy.

The evaluation of the pilot sites was conducted using a standardized **"Methodology for Verifying the Readiness of the Territory"** (part of the Pilot Readiness Package). This framework assesses the readiness of communities across three interlinked dimensions: Technical, Economic, and Institutional/Legal. Each dimension utilizes specific indicators scored on a 0–5 scale, providing a maximum possible score of 60 points to classify the communities into low, medium, or high readiness levels.

The pilot applications yielded diverse and valuable insights across the targeted regions:

- **Austria (Neudörfl):** Demonstrated a **high level of readiness (48/60 points)**. Transitioning from a research-driven Smart City framework to a mature local energy system, the community showed strong performance in technical indicators (e.g., quarter-hourly metering and RES share), though it faces challenges related to scaling participation and regulatory evolution.
- **Slovenia (Municipality of Velenje):** Achieved a **strong readiness score (49/60 points)**, indicating excellent preparation for its planned formal

operation launch in January 2026. The pilot highlighted the feasibility of monthly optimization of public-building consumption and production.

- **Czech Republic (Enerkom Šumavsko / Růže):** Representing a typical rural area, this pilot scored **25/60 points (low readiness)**. The evaluation highlighted significant potential for community energy but identified critical needs for future steps, including the expansion of smart metering, implementation of Energy Management Systems (EMS), and strengthening of legal frameworks.
- **Slovakia (Bratislava and Prešov regions):** Four pilot communities were evaluated, providing a uniquely broad picture of the Slovak landscape. EC SOM_EKO and EC TEEK in Petržalka represent the urban Bratislava context. EC Energetický Holding – Prešov Region (53/60 points, High Readiness) demonstrates a mature, already-operating community settling shared electricity through OKTE/EDC. EC ES Ivanka (41/60 points, Medium Readiness) provides a freshly registered (February 2026), early-stage counterpoint. Together these cases delivered essential feedback for updating the ETMEC tool — which has now grown from the original 22 demo indicators to more than 60 — for broader national application.

Overall, the pilot actions successfully validated the applicability of the readiness methodology and the ETMEC software logic in real-world environments. The findings confirm that while technical solutions are crucial for operational efficiency, scaling up ECs requires overcoming persistent administrative, legal, and financial barriers. The quantitative data, identified barriers, and best practices gathered in this report will serve as direct inputs for the project's final **White Paper on Renewable Energy Communities (O.3.3)**, providing evidence-based guidance for the sustainable expansion of RECs in the Danube Region.

Introduction and context

The pilot application of the harmonized technological solutions and the Methodology for Assessing Regional Readiness for the Establishment of Energy Communities (ECs) was carried out within the framework of the **NRGCOM – Energy Communities for the Green Transition** project. Co-funded by the Interreg Danube Region programme, the project's main goal is to support the

transition of European regions towards sustainable, decentralized energy systems by developing and implementing energy communities that enable local energy sharing, increase renewable energy utilization, and strengthen energy self-sufficiency.

Under **Activity A.3.4 (Implementation of the harmonised technological pilot actions in energy communities)**, the project focuses on verifying the practical applicability of a jointly developed software solution designed to enhance the resource and cost-efficiency of RECs. This technological pilot solution is adapted to various social and economic environments and tested in parallel across four distinct pilot sites in the Danube Region:

- **Austria:** The municipality of Neudörfl (Burgenland region), representing a transition from a research-driven Smart City framework to a mature local energy system.
- **Czech Republic:** Enerkom Šumavsko/Růže (South Bohemia), representing a typical rural area characterized by small municipalities and agricultural enterprises.
- **Slovakia:** Four pilot communities across two regions — EC TEEK and EC SOM_EKO in Petržalka (Bratislava region), representing a typical urban environment; EC Energetický Holding – Prešov Region, representing a mature mixed municipal/SME/residential community already in operation; and EC ES Ivanka (Bratislava region, peri-urban), representing a freshly constituted civic-association community at the start-up stage. The Energetický Holding and Ivanka evaluations were carried out by project partner PP12-NEK during the 5th project period as an additional contribution following the takeover of part of A.T.3.4 implementation.
- **Slovenia:** The municipality of Velenje and the energy community in Luče, focusing on coordinated energy management in public-building-based ECs.

The harmonized testing aims to standardize the assessment process of regional readiness for energy communities across Europe, ensuring comparability of results. The primary objective of this Efficiency Report (D.3.4.1) is to evaluate the technical, economic, and institutional readiness of these territories, measure the

impacts of the implemented technological solutions, and identify expected challenges during their operation.

The success of the implementation, the quantitative data gathered from the pilot sites, and the identified barriers will be thoroughly evaluated. Ultimately, the findings and best practices summarized in this report will serve as a crucial, evidence-based input for the project's final **White Paper on Renewable Energy Communities (Output O.3.3)**, ensuring that the guidance provided for the sustainable expansion of RECs in the Danube Region is grounded in real-world application and testing.

Methodology of the efficiency evaluation

To accurately measure the readiness of the territories and the efficiency of the implemented solutions, the consortium utilized the standardized **"Pilot Readiness Package"**.

The Classification Framework

The methodology systematically assesses regional preparedness across three distinct dimensions:

1. **Technical readiness:** Evaluates the quantity and type of local renewable energy sources (RES), the consumption profile of the territory, and the availability of critical infrastructure (specifically quarter-hourly metering and Energy Management Systems - EMS).
2. **Economic readiness:** Assesses expected operating and investment costs, the financial motivation of members (savings potential), the setting of sharing fees, and overall rate stability/price predictability.
3. **Institutional and legal readiness:** Examines the compliance of the founding entity with national energy acts (e.g., §46a in CZ), the involvement of municipalities and stakeholders, available management capacity, and the identification of legal barriers.

4.2 The Scoring Model Data was collected using local municipal documentation, national databases, and stakeholder workshops. Each of the 12 criteria is scored on a scale from 0 to 5 points, resulting in a maximum total score of 60 points.

Based on the total score, communities are categorized into three readiness models:

- **Low readiness (<50 % / <30 points):** Formally existing but lacking basic technical and economic prerequisites. Requires building generation sources and securing metering.
- **Medium readiness (50–80 % / 30–48 points):** Functional but with limitations. The EC has real members and sources, but lacks full-fledged EMS or internal rules.

- **High readiness (>80 % / 48–60 points):** Developed and fully functional EC. It operates at a professional level with diversified resources, advanced metering, and stable legal structures

Following the first round of pilot testing, the methodology was further refined in the 4th period (Slovak update "METHODOLOGY FOR VERIFYING THE READINESS OF A SELECTED TERRITORY FOR THE ESTABLISHMENT OF AN ENERGY COMMUNITY") in response to legislative changes and the practical experience gathered in the field. The refinement primarily concerned the economic-readiness criteria (operating, establishment and investment costs) and the institutional & legal dimension, where several state-side barriers had been removed in favour of community building. The applied scoring table operationalises the three dimensions as four criteria each (twelve criteria, max 60 points), which has been used consistently for the Slovak Energetický Holding and ES Ivanka evaluations described below.

Qualitative Data Gathering: International Study Visits

Beyond quantitative scoring, crucial qualitative insights and peer-learning experiences were gathered during two international study visits organized within the project framework.

These field trips provided the consortium with direct observation of operating energy models and the practical barriers they face:

Study Visit 1: Czech Republic (Budweis / Svatý Jan nad Malší, Feb 27–28, 2025)

- This visit focused on the practical experience of establishing the ENERKOM Růže energy community
- Partners explored a rural municipal energy model demonstrating the transition from solid fossil fuels to centralized biomass heating and PV integration, managed by a local Energy Group

Study Visit 2: Slovenia (Luče, September 25, 2025)

- The partnership visited the village of Luče, recognized as the first fully operational energy community in Slovenia (established under the previous COMPILE project)

- As a pioneer in local self-sufficiency, Luče serves as a primary testing ground for advanced technological solutions and demonstrates high social acceptance and mutual trust among local stakeholders

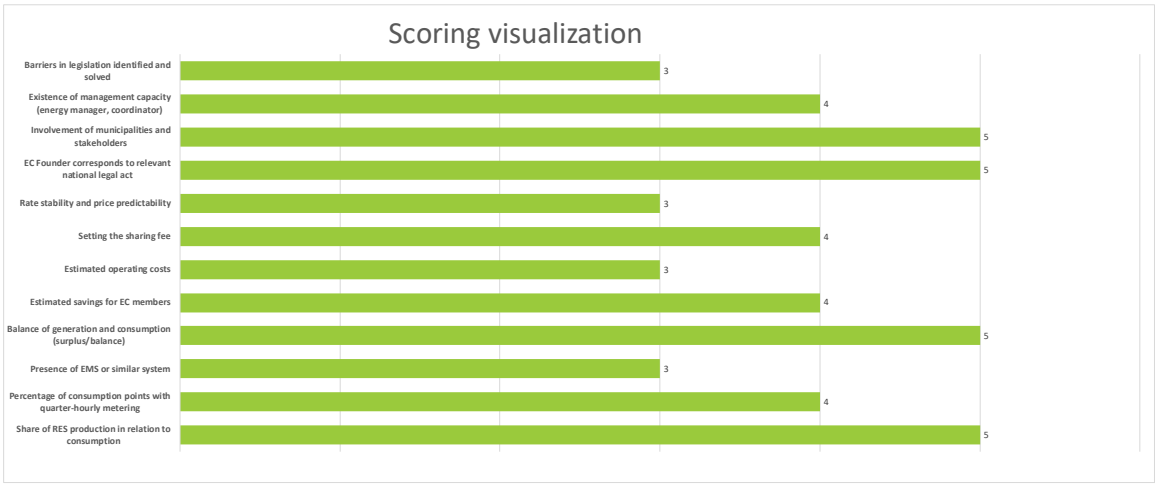
These real-world observations provided essential context for the readiness criteria evaluated by the ETMEC tool, highlighting that technological deployment must go hand-in-hand with stakeholder engagement and municipal leadership.

Pilot sites baseline and efficiency evaluation

Austria (Burgenland) – EEG Neudörfl

- Total Score: **48 / 60 points (High Readiness)**.
- Originating from a research-driven Smart City project (RES² Community), Neudörfl represents a transition to a mature local energy system.
- Scored exceptionally well (5/5 for generation balance and RES share). The presence of quarter-hourly metering scored 4/5, though the actual EMS scored a moderate 3/5.
- Economic savings for members are clear (4/5), but long-term operating costs and rate predictability scored lower (3/5). Institutionally, the legal foundation and stakeholder involvement are flawless (5/5).
- The primary insecurity is not technological, but structural: scaling participation and navigating the evolution of grid tariffs and network charges in Austria.

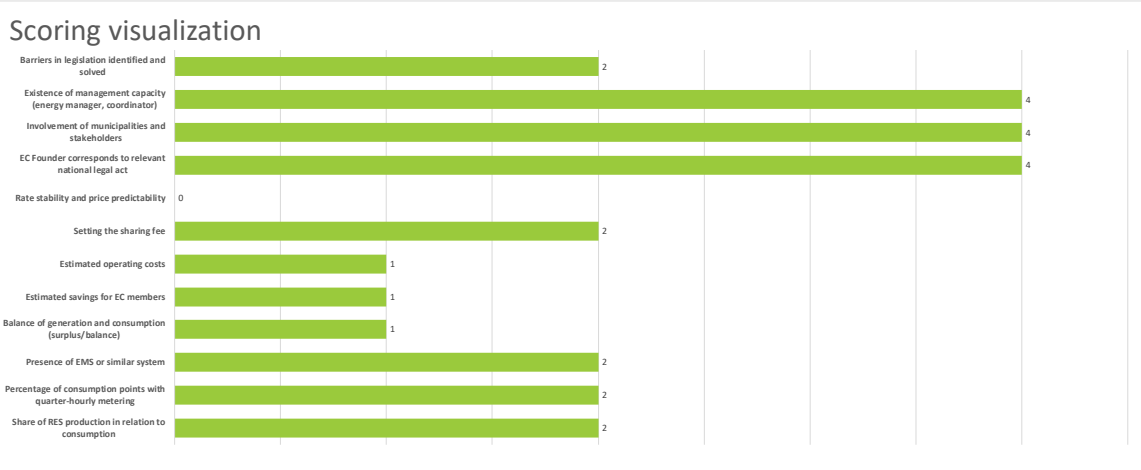
Scoring table tool		
Enter the name of the case	**EEG Neudörfl**	
Area	*Criterion*	*Rating (0 to 5) (enter your score)*
Technical readiness	Share of RES production in relation to consumption	**5**
	Percentage of consumption points with quarter-hourly metering	**4**
	Presence of EMS or similar system	**3**
	Balance of generation and consumption (surplus/balance)	**5**
Economic readiness	Estimated savings for EC members	**4**
	Estimated operating costs	**3**
	Setting the sharing fee	**4**
	Rate stability and price predictability	**3**
Institutional and legal readiness	EC Founder corresponds to relevant national legal act	**5**
	Involvement of municipalities and stakeholders	**5**
	Existence of management capacity (energy manager, coordinator)	**4**
	Barriers in legislation identified and solved	**3**
	Total score (max. 60 pts)	**48**



Czech Republic (South Bohemia) – Enerkom Šumavsko & Enerkom Růže

- Total Score (Šumavsko): **25 / 60 points (Low Readiness)**.
- Total Score (Růže): **48 / 60 points (Medium to High Readiness)**,.
- These pilots represent typical rural contexts. While stakeholder enthusiasm is high (Involvement scored 4/5 and 5/5 respectively), infrastructure varies drastically.
- Šumavsko is severely limited by the absence of quarter-hourly metering (score 2/5) and EMS (2/5). Economic modeling is practically non-existent (Savings scored 1/5, Price predictability 0/5).
- A field study to Svatý Jan nad Malší highlighted a highly successful model. The municipality operates a centralized heating system (consuming 900 spatial meters of wood chips annually) alongside 74 kWp of PV installations. The community utilizes the "ECM Marfy" software for tracking, demonstrating that targeted investments yield high readiness.

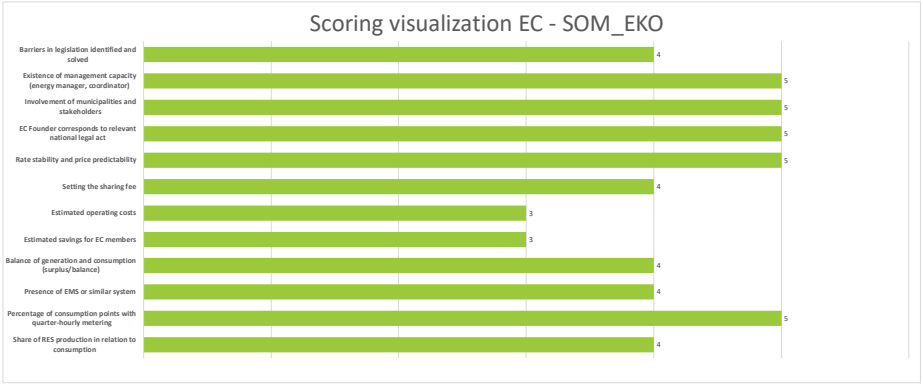
Scoring table tool		
Enter the name of the case	**ENERKOM Šumavsko**	
Area	*Criterion*	*Rating (0 - 5) (enter your score)*
Technical readiness	Share of RES production in relation to consumption	**2**
	Percentage of consumption points with quarter-hourly metering	**2**
	Presence of EMS or similar system	**2**
	Balance of generation and consumption (surplus/balance)	**1**
Economic readiness	Estimated savings for EC members	**1**
	Estimated operating costs	**1**
	Setting the sharing fee	**2**
	Rate stability and price predictability	**0**
Institutional and legal readiness	EC Founder corresponds to relevant national legal act	**4**
	Involvement of municipalities and stakeholders	**4**
	Existence of management capacity (energy manager, coordinator)	**4**
	Barriers in legislation identified and solved	**2**
	Total score (max. 60 pts)	**25**



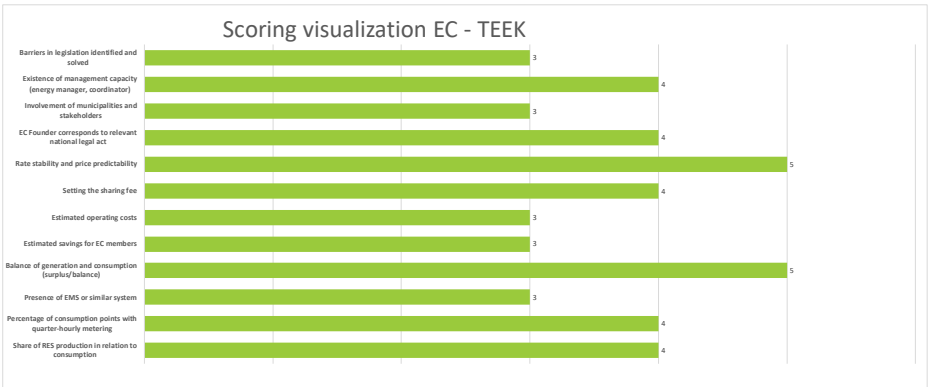
Slovakia (Bratislava and Prešov regions) – EC SOM_EKO, EC TEEK, EC Energetický Holding & EC ES Ivanka

- Total Score (SOM_EKO): **51 / 60 points (High Readiness)**.
- Total Score (TEEK): **45 / 60 points (Medium Readiness)**.
- These urban pilots demonstrate an excellent institutional grasp of the new legislative environment.
- EC SOM_EKO achieved perfect scores (5/5) in quarter-hourly metering, legal founding, stakeholder involvement, and management capacity. EC TEEK also scored highly in generation balance (5/5) and rate stability (5/5). For both, the main weakness is accurately estimating operating costs and the exact sharing fee (scoring 3/5 and 4/5).

Scoring table tool		
Enter the name of the case	**EC - SOM_EKO**	
Area	*Criterion*	*Rating (0 to 5) (enter your score)*
Technical readiness	Share of RES production in relation to consumption	**4**
	Percentage of consumption points with quarter-hourly metering	**5**
	Presence of EMS or similar system	**4**
	Balance of generation and consumption (surplus/balance)	**4**
Economic readiness	Estimated savings for EC members	**3**
	Estimated operating costs	**3**
	Setting the sharing fee	**4**
	Rate stability and price predictability	**5**
Institutional and legal readiness	EC Founder corresponds to relevant national legal act	**5**
	Involvement of municipalities and stakeholders	**5**
	Existence of management capacity (energy manager, coordinator)	**5**
	Barriers in legislation identified and solved	**4**
	Total score (max. 60 pts)	**51**



Scoring table tool		
Enter the name of the case	**EC - TEEK**	
Area	*Criterion*	*Rating (0 to 5) (enter your score)*
Technical readiness	Share of RES production in relation to consumption	**4**
	Percentage of consumption points with quarter-hourly metering	**4**
	Presence of EMS or similar system	**3**
	Balance of generation and consumption (surplus/balance)	**5**
Economic readiness	Estimated savings for EC members	**3**
	Estimated operating costs	**3**
	Setting the sharing fee	**4**
	Rate stability and price predictability	**5**
Institutional and legal readiness	EC Founder corresponds to relevant national legal act	**4**
	Involvement of municipalities and stakeholders	**3**
	Existence of management capacity (energy manager, coordinator)	**4**
	Barriers in legislation identified and solved	**3**
	Total score (max. 60 pts)	**45**



- Total Score (Energetický Holding – Prešov Region): **53 / 60 points (High Readiness)**.
- Constituted in November 2024 as an interest association of legal entities (*záujmové združenie právnických osôb*), Energetický Holding is among the first truly functioning community-energy projects in Slovakia. It unites six founding members across 20 consumption points (one local office, four schools, one wood-production site, one shopping centre, ten SMEs and four apartment buildings with 148 flats) around four RES sources — two ground-mounted PV plants, one rooftop PV on a municipal school and one biomass-fired plant — with 560 kWp of PV planned and a combined output of approximately 8,890 MWh per year. The community already settles shared electricity via OKTE/EDC and covers about 73 % of local consumption from its own RES (≈ 60 % domestic / 40 % externally procured RES). Institutional and legal readiness scored 19/20 (legal form, municipal involvement and management capacity all maxing out at 5/5); technical readiness 18/20 thanks to full quarter-hourly metering at all 20 points and a balanced generation/consumption profile. The weakest dimension is economic readiness (16/20), with *estimated operating costs* at 3/5 reflecting the 2026–2028 Slovak energy-price forecasts published by the regulator. Identified barriers — protracted ÚRSO/OKTE/MV SR registrations, delays in collecting statutory signatures from all member entities, and inertia in SEPS operating certification — were overcome through a constituted dispatch and service team that allowed real settlement to begin before SEPS clearance was fully closed. Estimated annual savings reach up to €180,000 across the EC (≈ €269/member/year at the 20.8 MWh threshold).
- Total Score (ES Ivanka): **41 / 60 points (Medium Readiness)**.
- Registered in February 2026 as a civic association (*občianske združenie*), ES Ivanka represents the freshly constituted, early-stage counterpoint to Energetický Holding. Five founding members operate three RES sources (two PV plants — one ground-mounted at an SME site, one rooftop on the local primary school — and one biomass plant) across 17 consumption points including 37 private dwellings, with a combined RES output of approximately 3,290 MWh per year against 821 MWh of expected

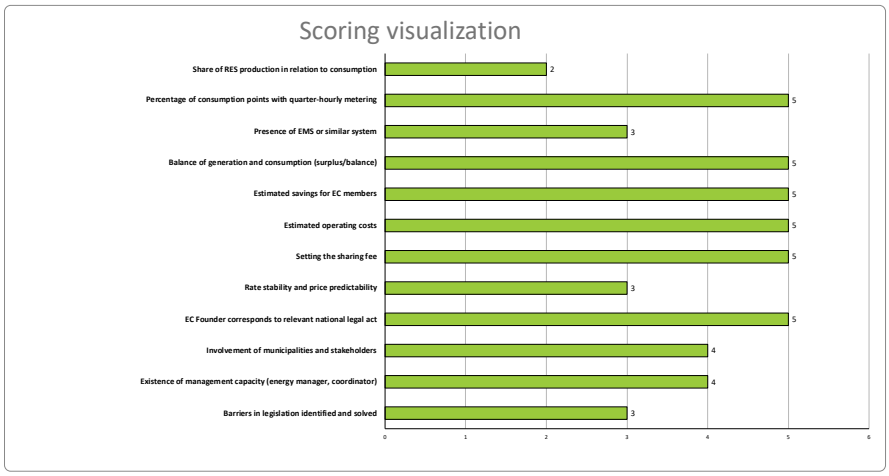
community demand. Local consumption is covered to about 65 % from own RES (≈ 57 % domestic / 43 % externally procured). All 17 points have quarter-hourly metering, and *rate stability and price predictability* uniquely scored a perfect 5/5 thanks to fixed contractual internal tariffs. The weakest dimension is institutional & legal readiness (13/20): the civic-association form does not fully match the Slovak Energy Act's expected *interest association of legal entities*, municipal/stakeholder involvement is limited, and a SEPS certification delay of more than one year forces the community to operate in a "verification / demo" mode rather than full production. The Ivanka case confirmed for the consortium that quarter-hourly metering can be deployed well before legal and operational readiness is in place — and that the civic-association form combined with the SEPS backlog produces a measurable downgrade across the institutional axis, an evidence-based finding fed into national policy advocacy.

Slovenia – Municipality of Velenje

- Total Score: **49 / 60 points (High Readiness)**.
- Velenje is establishing a public-building-based EC, set to launch formally on January 1, 2026.
- The technical and economic dimensions are exceptionally strong. Metering, generation balance, estimated savings, operating costs, and sharing fee setting all scored perfect 5/5 marks.
- The high readiness of Slovenian municipalities is heavily influenced by the successful precedent set by the village of Luče, the country's first self-sufficient energy community. During the project's study visit to Luče, partners observed a "bottom-up" approach where the community effectively manages high electricity production during summer months (e.g., from school rooftops during holidays) and redirects it to high-demand infrastructure like water treatment plants. The Luče pilot proved that addressing high electricity prices through community self-supply is highly effective and provided the KSSENA agency with the exact technical and social know-how required to scale the ETMEC technological solutions to larger entities like the Municipality of Velenje.

- Velenje is fully prepared for the monthly optimization of electricity flows and intra-month balancing between public institutions, proving the viability of the ETMEC logic.

Scoring table tool		
Enter the name of the case	**Municipality of Velenje**	
Area	*Criterion*	*Rating (0 to 5) (enter your score)*
Technical readiness	Share of RES production in relation to consumption	**2**
	Percentage of consumption points with quarter-hourly metering	**5**
	Presence of EMS or similar system	**3**
	Balance of generation and consumption (surplus/balance)	**5**
Economic readiness	Estimated savings for EC members	**5**
	Estimated operating costs	**5**
	Setting the sharing fee	**5**
	Rate stability and price predictability	**3**
Institutional and legal readiness	EC Founder corresponds to relevant national legal act	**5**
	Involvement of municipalities and stakeholders	**4**
	Existence of management capacity (energy manager, coordinator)	**4**
	Barriers in legislation identified and solved	**3**
	Total score (max. 60 pts):	**49**



Comparative analysis of the pilot actions

The harmonized methodology reveals significant regional disparities in REC maturity across the Danube Region.

Advanced pilot sites like Velenje (SI) and Neudörfl (AT) demonstrate that once the core technical infrastructure (specifically 15-minute smart metering) is deployed, communities can easily transition to automated, dynamic energy sharing. In these regions, ETMEC acts as a refinement tool to optimize the distribution of midday/weekend solar surpluses.

Conversely, the rural Czech pilot (Šumavsko) highlights the limitations of "enthusiasm without infrastructure." Despite a strong institutional base driven by Local Action Groups (LAGs), the lack of continuous metering and an absence of localized Energy Management Systems prevent the deployment of dynamic sharing models.

However, the parallel ENERKOM Růže case proves that even in rural settings, strategic investments in biomass and PV—combined with capable tracking software—can quickly elevate a community to high readiness.

Economically, almost all evaluated communities across the four countries struggled with "Rate stability and price predictability" and accurate forecasting of "Operating costs" (frequently scoring 3/5).

This underscores a universal European challenge: **the shifting landscape of grid tariffs and market volatility makes long-term economic modeling highly uncertain** for community managers.

The two additional Slovak pilots evaluated in the 5th period sharpen the contrast between mature and start-up communities within a single national context. Energetický Holding – Prešov Region (53/60, High) shows that once the legal form (interest association of legal entities), full quarter-hourly metering and a constituted dispatch team are in place, settlement through OKTE/EDC begins to flow even before SEPS certification is fully cleared. ES Ivanka (41/60, Medium) shows the mirror image: equivalent metering quality but a civic-association founder form, a SEPS certification backlog exceeding one year, and limited

management capacity hold the community in a “verification / demo” mode. This pairing isolates the institutional & legal dimension as the binding constraint in Slovakia today, with technical readiness no longer being the bottleneck for well-prepared communities.

Identified barriers and adopted solutions

The testing of ETMEC and the readiness methodology exposed several critical barriers:

- **Infrastructure and Grid Capacity Constraints:** In the Czech Republic, a major hurdle is the "first come first served" rule for grid capacity allocation. A single applicant can exhaust an entire municipality's capacity, forcing subsequent participants to connect without the ability to overflow to the network.
    - *Solution / Recommendation:* Implementing "reasonable guaranteed reserved power" limits (e.g., 2-3 kW of network flow) ensures broader community participation.
- **Data Availability and Quality:** The effective use of the ETMEC tool requires reliable, verified data. During implementation in Slovakia, developers noted that some partners provided "feeling" statements or unverified data, which complicates algorithmic modeling.
    - *Solution:* The deployment of standardized measuring systems (e.g., ISTA-type automatic remote measurement) and mandatory 15-minute smart meters.
- **Consumer Rights and GDPR:** Energy communities face unique legal challenges. If a community acts as both a distributor and a supplier, issues arise regarding the right to disconnect a member for non-fulfillment of obligations, which clashes with consumer protection laws (especially during winter). Additionally, data collection for tools like ETMEC must stringently comply with GDPR.
    - *Solution:* Communities must institute transparent contractual frameworks, clearly defining the "member/investor" relationship and utilizing alternative dispute resolution procedures.
- **Legal-form Mismatch with the Energy Act:** ES Ivanka highlighted that founding an energy community as a civic association (*občianske združenie*) scores lower against criteria designed for the Energy Act's expected *interest*

association of legal entities. This creates a measurable institutional downgrade even when all technical readiness criteria are met.

- *Solution / Recommendation:* National guidelines should make the preferred legal form transparent at the planning stage, and existing communities under suboptimal forms should be supported in legal restructuring rather than penalised through scoring or registration friction.

- **Operational Certification Backlogs at the TSO:** Both Slovak pilots evaluated by PP12-NEK in the 5th period — and particularly ES Ivanka, with a SEPS certification delay exceeding one year — identify operator certification as a recurring blocker that prevents full-production sharing even where metering and contracts are ready.
  - *Solution / Recommendation:* Time-bound certification SLAs at the TSO/DSO interface, complemented by a regulated "interim verification mode" enabling demonstrably ready communities to begin real settlement on a provisional basis.

Conclusions and recommendations

The Activity A.3.4 pilot actions successfully validated the readiness methodology and the operational logic of the ETMEC software. The tool proved capable of diagnosing technical gaps and guiding the management of energy flows. To ensure the successful transferability of these models, the findings from this report must directly inform the project's final **White Paper on Renewable Energy Communities (O.3.3)**. The following evidence-based recommendations are emphasized:

1. **Mandate and Subsidize Smart Metering:** High operational readiness is impossible without quarter-hourly data. The White Paper must strongly advocate for national subsidies directed specifically at the installation of smart meters and basic Energy Management Systems (EMS) in rural and emerging communities. Slovak pilots confirm that quarter-hourly metering coverage can be achieved well ahead of legal and operational readiness, which makes targeted national subsidies for metering and basic EMS not only feasible but also a high-leverage early move.
2. **Reform Grid Allocation Policies:** To prevent the monopolization of local grid capacity by single entities, regulatory frameworks must shift away from strict "first come first served" models toward equitable capacity distribution (e.g., guaranteed reserved power thresholds for active community customers).
3. **Enhance Financial Predictability:** Because rate stability remains a universal weakness, policymakers must provide clear, long-term guarantees regarding distribution fees and renewable support taxes for community-shared electricity.
4. **Standardize Legal and Governance Templates:** To overcome administrative complexity, the White Paper should provide standardized, GDPR-compliant legal templates for member agreements, clearly defining investor returns, supplier switching rights, and dispute resolution mechanisms.

By addressing these core areas, the technical solutions and operational models tested in Austria, the Czech Republic, Slovakia, and Slovenia can be effectively scaled, accelerating the transition to robust and decentralized green energy across the Danube Region.