

Summary document of transnational analysis of SMEs' energy behavior and situation

Deliverable number: D.1.1.1

Date: 31 December 2024

**Interreg
Danube Region**



**Co-funded by
the European Union**



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2 Executive Summary

This document provides a comprehensive analysis of the energy behavior and transition challenges for small and medium-sized enterprises (SMEs) across the Danube region, with an emphasis on mapping renewable energy (RES) adoption and identifying key areas for improvement. SMEs are integral to the region's economy and play a pivotal role in achieving renewable energy targets; however, they face significant obstacles, including financial, regulatory, and infrastructural barriers. The transnational analysis – supported by insights from over 100 interviews, extensive desktop research, and cooperation findings – aims to understand the underlying barriers, needs, and opportunities SMEs encounter in their shift to greener energy solutions. By examining what drives or hinders RES adoption at the firm level, this analysis seeks to inform targeted policies, foster cross-border collaboration, and support the development of strategies that enable SMEs to actively and efficiently contribute to the region's renewable energy and climate objectives.

2.1 Renewable Energy Adoption and Gaps in Infrastructure

Despite a commitment to greener practices, SMEs in the Danube region exhibit varied adoption levels of renewable energy and energy-efficient technologies. Factors such as limited financial resources, complex regulatory frameworks, and insufficient infrastructure hinder broader adoption. High energy costs drive SMEs in some regions to seek alternatives, yet the initial investment costs for RES and energy-efficient technologies are often prohibitive, particularly for smaller businesses. Additionally, the lack of accessible information and incentives for energy efficiency initiatives further complicates the transition for many SMEs, highlighting the need for targeted support and simplified pathways to implement these sustainable solutions.

The analysis underscores a **significant gap in infrastructure readiness**, particularly in rural areas where outdated grids and limited access to renewable technologies restrict the potential for green transition. In energy-intensive sectors like manufacturing and agriculture, **grid limitations** pose challenges for integrating renewable sources. To address this, the report advocates for targeted investment in infrastructure improvements, especially distributed energy resources and energy storage solutions.

2.2 Knowledge and Skill Gaps

Many SMEs lack the **technical knowledge** to implement renewable energy solutions effectively. This gap is compounded by a shortage of skilled personnel and **limited access to energy experts** who can guide SMEs through complex energy audits and technology integration processes. To bridge these gaps, the report **recommends establishing regional knowledge hubs**, providing sector-specific training, and promoting **advisory services** that focus on RES adoption strategies. Such initiatives would enable SMEs to make informed decisions and optimize their energy consumption.

2.3 Behavioral and Investment Patterns

Behavioral patterns among SMEs vary significantly by sector and region, influenced by economic, cultural, and policy factors. In areas where RES adoption is prioritised by regional authorities, SMEs display a stronger commitment to green energy transitions. In contrast, in regions with minimal RES advocacy, many SMEs prioritize short-term financial goals over

long-term sustainability, viewing renewables as an additional cost rather than an investment opportunity.

Investment trends reveal that while some wealthier regions offer attractive incentives, other areas lack sufficient governmental support, limiting SMEs' access to necessary capital. The report suggests **increasing financial incentives, simplifying subsidy processes, and providing more accessible grant opportunities** tailored to SME needs.

2.4 Transnational Synergies and Collaboration Opportunities

The Danube region holds substantial potential for cross-border collaboration in renewable energy. Each country has unique renewable strengths that, when combined, can foster a diversified energy mix, increase grid resilience, and reduce reliance on fossil fuels. For example, Austria's expertise in community-based energy models and Germany's advancements in energy storage could be shared with regions focusing on biomass and solar resources.

Additionally, a number of key industries are common across the Danube region countries, such as automotive, metal processing, and agricultural production and processing, which are to a certain extent interlinked. These industries provide opportunities to align renewable energy initiatives with sector-specific needs, ensuring practical integration and maximizing impact.

Key synergy areas include **harmonizing regulatory frameworks, establishing knowledge-sharing platforms, and creating joint financial support mechanisms**. Harmonizing policies such as permitting, subsidies, and renewable energy targets would reduce administrative burdens for SMEs and encourage greater regional collaboration. Establishing cross-border pilot projects, regional knowledge hubs, and standardized training would further support SMEs in transitioning to RES.

2.5 Conclusion and Recommendations

This analysis highlights the critical need for a collaborative approach to address the infrastructural, financial, and knowledge barriers facing SMEs in the Danube region. Policy harmonization, targeted financial support, and cross-border partnerships can enable SMEs to contribute meaningfully to regional climate targets. Through shared resources, knowledge, and policy alignment, the Danube region can achieve a sustainable energy future, fostering a resilient, integrated network of SMEs aligned with the EU's green energy goals.

3 Key Terms

Energy Transition: Energy transition refers to the process of shifting from traditional energy sources like fossil fuels to renewable energy sources - such as solar, wind, and bioenergy.

Institutions: Institutions, including government bodies, regulatory agencies, and business support organizations, play a vital role in facilitating the energy transition. They are responsible for shaping policy frameworks, providing funding and incentives, and offering guidance to help businesses, particularly SMEs, adopt sustainable energy practices. By promoting innovation, supporting the integration of renewable energy, and reducing administrative burdens, institutions are key drivers in accelerating the shift to a low-carbon economy.

SMEs (Small and Medium-sized Enterprises): SMEs are defined as businesses with fewer than 250 employees, an annual turnover not exceeding 50M EUR, or a balance sheet total of no more than 43M EUR. They play a critical role in the economy and are key to advancing the transition to sustainable energy solutions.

Sustainable Energy Practices: The Interreg Danube SMEnergy project's primary objective is to transition to renewable energy sources. Consequently, all energy efficiency measures outlined in this document are accompanied by the introduction of renewable energy. It is also recognised that non-consumed energy can play a role in achieving climate neutrality targets without the introduction of renewable energy sources.

The Danube Region: 14 countries across Central and Eastern Europe, is a focal point for transnational cooperation, especially in advancing sustainable energy practices and supporting the energy transition. The Interreg Danube Region Programme (DRP), funded by the European Union, empowers nations within the region to address shared challenges and capitalize on opportunities through innovative projects.

4 Introduction

The SMEnergy project, funded by the Interreg Danube Transnational Programme, aims to support small and medium-sized enterprises (SMEs) across eight partner countries in the Danube region in adopting renewable energy and enhancing energy efficiency. The partnership involves 10 partners from 8 countries (7 EU and 1 non-EU country): Slovenia, Hungary, Germany (Bavaria), Austria (Burgenland), Slovakia, Czech Republic, Bulgaria, and Bosnia and Herzegovina.

This summary document presents findings from a transnational analysis, highlighting country-specific and sector-based insights into SMEs' energy usage. Key areas covered include renewable energy potential, existing infrastructure and knowledge gaps, and a map of transnational synergy potentials for renewable energy. These insights set the foundation for targeted strategies and collaborative actions, equipping SMEs with the tools and knowledge to advance their green energy transitions effectively.

5 Overview of Renewable Energy Integration in the Danube region

The following section presents the findings of desktop research conducted in eight countries. (See detailed in Annex 1)

The desktop research for this analysis explored critical areas related to green energy and small to medium-sized enterprises across participating countries. Key areas of focus included gathering statistics on green energy use, such as each country's current share of renewables in total energy consumption, overall emissions, and the sectoral breakdown of renewable energy and energy efficiency levels. This data provided insight into how advanced each country is in terms of green energy adoption as well as to where significant gaps remain.

The research also examined the SME sector, detailing the composition, size, and industry distribution of SMEs, as well as the extent to which these enterprises currently utilize renewable energy and energy-efficient technologies. This investigation helped identify the readiness and capacity of SMEs to transition towards greener practices and pinpointed challenges that certain sectors face more than others.

In addition to baseline data, the research reviewed available support schemes, such as state or EU subsidies, incentives, and other funding mechanisms designed to assist SMEs in adopting renewable energy sources. Information on environmental regulations that impact SMEs, including policies around energy communities, Energy Efficiency Obligation Schemes (EEOS), and other legislative frameworks, was compiled to assess how supportive or restrictive current policies are for green transition efforts.

Further, the study investigated energy efficiency measures already in place, as well as those that are planned by enterprises, to identify trends in retrofits, equipment upgrades, and general modernization efforts. This includes understanding the availability and affordability of green technologies, such as solar, wind, and hydro, and other energy-efficient innovations that could aid SMEs in their transitions.

Finally, the research gathered insights from professional organizations and research institutes on green energy trends within the SME sector. Reports from these bodies provided future expectations, sectoral forecasts, and strategic advice that could shape regional energy policies and guide SMEs towards sustainable practices more effectively. This comprehensive desktop analysis served as a foundation for understanding the current landscape and future potential of green energy adoption across the Danube region.

The research highlights that the adoption of renewable energy varies significantly across European countries, driven largely by each nation's energy needs, resources, and regulatory landscape.

5.1 Regional Profiles and Insights

Each country and region within this study exhibits unique characteristics in renewable adoption. In Austria, Burgenland stands out with 100% renewable electricity, mainly from wind and biomass, making it a model region for energy autonomy. Similarly, Bavaria's reliance on biomass and solar PV is complemented by strong local policies and community-driven initiatives, positioning it as a leader in decentralized renewable energy systems. Bosnia's Herzegovina region is particularly suitable for solar energy due to its climate, while Srpska has hydropower and wind potential that remains largely untapped. Bulgaria's

renewable energy hubs are concentrated in the South-West and South-Central regions, especially around Sofia, where investments have been focused on solar energy projects. The Czech Republic shows a regional tilt towards solar and biomass, particularly in Moravia and South Bohemia. Hungary's rural areas benefit from EU support to shift away from fossil fuels, with solar PV and biomass dominating the energy landscape. Meanwhile, Slovakia's renewable projects are concentrated on hydropower and biomass, with smaller-scale solar adoption across rural regions. Slovenia has regional strengths in hydropower and biomass, with urban areas increasingly adopting solar energy.

5.2 Investment Trends and Behavioral Patterns

Across the studied regions, investment in renewable energy is primarily motivated by high energy costs and the need for long-term stability, with SMEs displaying varying levels of commitment based on local policies and financial incentives. Austrian SMEs show proactive engagement, with over 50% working to reduce carbon footprints. In Bosnia and Herzegovina, investments are heavily supported by the Environmental Protection Fund and EU-backed projects, fostering energy efficiency. Bulgarian SMEs are also responding to increased incentives, especially in solar and storage solutions due to recent regulatory amendments. Czech SMEs benefit from programs like "New Green Savings" that subsidize renewable projects - yet they face challenges due to high initial costs and bureaucracy. Germany's Bavaria region promotes collaborative energy networks and regional funding to encourage SME energy efficiency, targeting its industrial base. In Hungary, high energy costs drive SMEs to invest in energy efficiency, supported by targeted subsidies. Slovakia's Green Business Program provides grants for renewable projects, albeit with significant bureaucratic delays. Slovenia's Eco Fund and energy advisory services are helping SMEs, especially those in high-energy cost sectors, to adopt renewable energy.

5.3 Challenges in the Energy Transition for SMEs

Despite incentives, SMEs across these regions encounter barriers that hinder their renewable energy adoption. Common challenges include regulatory complexity, limited funding, high initial investment costs, and inadequate infrastructure. Austrian SMEs cite administrative and grid limitations, while Bosnian SMEs face inconsistent policy enforcement and limited technical support. Bulgarian SMEs grapple with coal dependency and bureaucratic hurdles, while the Czech Republic's dependence on coal and stringent regulations increase costs and delays. In Germany, Bavaria's renewable diversification is constrained by limited wind resources. Hungary's SME sector, facing high energy costs and regulatory constraints, is challenged by limited awareness of subsidy options. Slovak SMEs face significant barriers to adopting renewable energy sources, including an unstable legislative framework, inconsistent subsidy schemes, bureaucratic burdens, and an oligopolistic market dominated by DSOs. High energy costs, particularly in 2022, further exacerbate these challenges. Slovenian SMEs face storage and grid challenges, limiting their renewable energy adoption.

5.4 Opportunities and Untapped Potential

Each country has distinct renewable potential based on its natural resources, market demand, and regulatory environment. Austria's potential lies in solar and district heating, with regions like Burgenland serving as exemplary models. Bosnia's Herzegovina region is ideal for solar investment, with untapped wind resources in Srpska. Bulgaria's climate conditions favor solar and wind expansion, while the Czech Republic's rural areas offer opportunities in biomass and small-scale solar. Bavaria in Germany has set ambitious targets for expanding ground mounted photovoltaics. Hungary's potential lies in solar PV, biomass, and geothermal, especially in rural areas where EU funding supports renewable transitions.

Slovakia's untapped solar and biomass resources, such as geothermal or wind on the southern part of the country also could help diversify its energy mix; meanwhile, Slovenia's potential is in solar, bioenergy, and geothermal, which aligns with its regional needs.

5.5 Policy Recommendations and Transnational Synergies

The document suggests that regional policy harmonization and cross-border collaboration are key to overcoming these challenges. Countries can benefit from sharing best practices in regulatory frameworks, financial support, and community-based renewable projects. Austria's community energy models and Germany's energy networks provide examples for regional integration. Bosnia and Herzegovina's experience with EU-backed initiatives like SMEnergy offers insights into technical and financial support for SMEs. Bulgaria's amendments to the Energy Act demonstrate effective policy adjustments that other regions could adopt. In the Czech Republic, adopting simplified renewable permitting, as seen in other EU countries, could alleviate bureaucratic delays. Further, Slovakia's involvement in cross-border programs emphasizes the importance of collective knowledge exchange to achieve green energy goals. Slovenia's participation in the EU Cohesion Fund promotes collaboration in sustainable practices, which can be replicated across the Danube region.

In conclusion, this analysis underscores the need for a tailored, collaborative approach to renewable energy adoption across European SMEs. Addressing regulatory, financial, and infrastructural challenges while leveraging regional strengths can accelerate the green transition, ultimately contributing to the EU's climate targets.

6 RES potential in the Danube Region

The Danube region, characterized by its diverse geography and climate, holds significant potential for renewable energy deployment, which varies substantially across countries. The renewable energy sources most viable for SMEs include solar, wind, biomass, and hydropower, though the distribution and feasibility of these resources are influenced by specific national and regional conditions. Analyzing each country's potential allows us to identify targeted opportunities for SMEs to leverage RES effectively, aligning their practices with the EU's decarbonization goals.

6.1.1 Solar Energy Potential

Solar energy stands out as one of the most accessible renewable resources for SMEs in many Danube countries. Due to the region's southern and central European location, solar photovoltaic (PV) systems can yield substantial energy production, particularly in Hungary, Bulgaria, where annual sunlight hours are high. Key insights include:

- **Hungary** and **Bulgaria** benefit from long sunshine durations, making solar PV installations both feasible and profitable.
- In **Austria** and **Germany**, where seasonal sunlight variations are more pronounced, SMEs are encouraged to consider hybrid solutions (e.g., combining solar PV with energy storage) to manage fluctuations in solar power availability effectively.

6.1.2 Wind Energy Potential

Wind energy potential varies considerably across the region. For example:

- **Austria** and parts of **Slovakia** show promising conditions for wind energy due to favorable wind speeds, especially in alpine regions and open plains.
- Countries with limited wind potential, such as **Hungary**, may still find localized opportunities, but scaling such projects affordably will require substantial technological and regulatory support. On-site wind energy generation could be relevant for SMEs in manufacturing and production with significant power demands. However, the scale of such projects is typically small, and their viability is limited to specific scenarios, such as regions with consistent wind resources, favorable permitting conditions, or access to targeted subsidies. High initial costs and infrastructure requirements remain significant barriers, often restricting adoption to a narrow set of cases.

6.1.3 Biomass and Bioenergy Potential

The extensive agricultural and forestry sectors in several Danube countries contribute to high biomass potential, offering a natural synergy for SMEs in rural and agricultural settings. Highlights include:

- **Bosnia and Herzegovina** and **Bulgaria** have robust biomass sectors due to their forested landscapes, which offer a substantial source of raw materials for biomass heating systems.
- In **Austria** and **Germany**, well-established biomass infrastructures support SMEs in all sectors, where bioenergy integration can offset energy costs and reduce reliance on fossil fuels. For SMEs in food production, waste-to-energy initiatives leveraging organic byproducts can improve both energy efficiency and waste management.

6.1.4 Hydropower Potential

Hydropower remains one of the Danube region's traditional renewable energy resources. While large-scale hydropower installations are typically outside SME capacity, small-scale hydropower presents viable options in water-rich areas.

- Countries like **Czech Republic**, **Slovakia** have numerous rivers, which can support micro-hydro projects suitable for SMEs with proximity to flowing water.
- **Austria** has integrated micro-hydro projects effectively, particularly for smaller communities and SMEs with limited space for large energy infrastructure. Despite these advantages, regulatory challenges often limit new hydropower projects, highlighting a need for streamlined processes to foster SME participation in this sector.

6.1.5 Challenges to Leveraging RES Potential

Despite the high RES potential, SMEs face several common challenges in harnessing these resources effectively. Key obstacles include:

- **Regulatory Complexity:** SMEs often face intricate and time-consuming regulatory requirements, particularly in countries where energy infrastructure is highly regulated, such as **Germany** and **Austria**.
- **High Initial Investment Costs:** For many SMEs, upfront costs associated with RES technologies remain prohibitive. Even in cases with available subsidies, the bureaucratic process can discourage adoption.
- **Technical Capacity and Knowledge Gaps:** Many SMEs lack in-house expertise to evaluate and implement renewable technologies. This gap is especially pronounced in sectors with limited exposure to green technologies.

6.1.6 Recommendations for Enhancing RES Integration among SMEs

To overcome these barriers, tailored support frameworks are essential. Based on feedback from stakeholders and best practices observed, the following recommendations are proposed:

1. **Financial Incentives and Support Programs:** Establish clear, accessible funding programs to offset initial RES installation costs, especially for solar PV, biomass, and small-scale hydropower projects.
2. **Streamlined Permitting Processes:** Simplify the regulatory framework surrounding RES projects, particularly for small-scale installations, to reduce administrative delays and costs.
3. **Technical Training and Advisory Services:** Develop sector-specific training for SMEs to build internal capacity for RES adoption, complemented by advisory services that guide SMEs through technical and regulatory landscapes.
4. **Cross-Border Knowledge Sharing:** Encourage transnational collaboration through knowledge-sharing platforms that allow SMEs to learn from successful RES implementations in neighboring regions, fostering an environment of shared growth.

7 Key Findings from Interviews on SME Energy Behavior and Transition

This section consolidates insights from over 100 interviews with SMEs, energy experts, suppliers, business communities, and decision-makers across 8 countries in the Danube region. The primary goal was to understand SME energy usage patterns, renewable adoption levels, and sector-specific challenges, providing a holistic view of the energy landscape for small and medium-sized enterprises. (See detailed in Annex 1)

Small and medium enterprises span a diverse range of sectors, including food production, manufacturing, construction, textiles, agriculture, and renewable energy. Their energy needs are varied and typically intensive, with costs related to energy comprising a significant portion – between 5% and 40% – of their overall expenses. Despite the growing recognition of renewable energy's value, adoption rates and readiness vary widely across both sectors and regions. While some SMEs have successfully implemented renewable energy solutions, such as photovoltaic systems, biomass heating, and energy-efficient machinery, others remain hesitant or lack the necessary resources to begin the transition.

The energy transition for SMEs faces numerous obstacles. One of the most significant barriers is financial. The high upfront costs associated with renewable technology investments often prevent SMEs from considering green energy solutions, even though these solutions may offer long-term savings. Access to financial support – such as grants, low-interest loans, and subsidies – is essential. However, many SMEs find funding difficult to obtain due to complex application processes and limited guidance on available financial resources. In addition to financial challenges, regulatory complexity poses another significant barrier. SMEs often encounter lengthy approval processes for renewable installations, with variable and sometimes contradictory regulations across different jurisdictions. This lack of regulatory consistency discourages SMEs from investing in renewable energy and can slow down adoption even when there is interest and financial readiness.

Knowledge gaps and skill shortages further complicate the transition to renewable energy for SMEs. Many SMEs do not have dedicated energy experts on staff and lack the technical knowledge required to make informed decisions about energy efficiency and renewable options. Finding qualified external consultants and contractors for specialized guidance is also challenging, as these resources are often in short supply, particularly in smaller or more remote regions. Additionally, inadequate infrastructure can restrict SME energy self-sufficiency, especially in rural and industrial areas. Poor grid connectivity for renewable energy sources, as well as limited local energy storage solutions, makes it difficult for SMEs to maximize their renewable energy usage and reduce their dependence on conventional sources.

To facilitate the transition to renewable energy, SMEs require targeted support in several areas. Financially, simplified and transparent access to funding is essential. Creating a streamlined process for grants and incentives would allow SMEs to pursue renewable energy investments more confidently and with reduced financial risk. Centralized resource hubs could also prove invaluable, offering SMEs access to approved service providers, technology options, and funding mechanisms. Such hubs would enable informed decision-making and reduce dependency on costly intermediaries. Additionally, training and advisory services are critical. Many SMEs need customized guidance that covers everything from navigating regulations to implementing technical solutions for energy efficiency. Establishing one-stop-shop advisory centers that provide a suite of relevant services would greatly support SMEs as they work to transition toward renewable energy.

Some SMEs have already demonstrated successful practices in the transition to renewable energy, achieving remarkable levels of energy self-sufficiency and realizing substantial cost savings. For example, photovoltaic systems, heat pumps, and energy management technologies have enabled certain SMEs to cut their energy costs and reduce their environmental impact significantly. Circular economy practices, including recycling production waste for energy purposes and conducting strategic energy audits, have also proven beneficial for energy-intensive sectors. Documented success stories, such as SMEs achieving up to 75% on-site energy generation, illustrate the tangible benefits of adopting renewable energy solutions and can serve as inspiration for other SMEs.

Interviewers also highlighted the importance of transnational collaboration, noting that shared learning and cooperation can help address common challenges. Areas identified for potential cross-border cooperation include joint educational programs, pilot projects, and the development of cross-border certified supplier databases. Creating energy communities and fostering partnerships across borders would allow SMEs to share knowledge, pool resources, and take advantage of economies of scale for renewable energy solutions. Public-private partnerships, especially with government agencies, are crucial to establishing a supportive environment. Such partnerships could help provide regulatory clarity, streamline resource access, and encourage the renewable transition across multiple regions.

Standardized and transparent regulations, along with clear incentives for renewable energy investments, are essential for reducing regulatory barriers. Tax breaks, simplified legal frameworks, and faster approval processes could significantly encourage SMEs to invest in sustainable practices. Additionally, policies that emphasize long-term savings and sustainability benefits over initial costs would be particularly effective. Developing national or regional roadmaps would provide SMEs with a stable and predictable policy environment, which is necessary for fostering confidence and encouraging long-term energy planning.

SMEs' willingness to adopt renewable energy is strongly influenced by fluctuating energy prices, economic uncertainty, and global market conditions. While regulatory requirements and potential cost savings motivate some SMEs, environmental awareness is not always a primary driver. However, with stronger educational initiatives and a clearer demonstration of renewable energy's benefits, SMEs could shift from a reactive to a more proactive energy strategy, enhancing their contribution to regional climate goals.

8 Comparative Analysis of Energy Strategies and Implementation across the Danube Region

The transition to renewable energy within the Danube region varies widely across countries, shaped by differences in policy frameworks, institutional capacities, and levels of strategic clarity. This chapter synthesizes a comparative analysis of energy strategies implemented across eight countries, identifying key strengths, challenges, and areas for improvement. The findings underscore the importance of tailored approaches that leverage each country's strengths while addressing unique regional obstacles. Additionally, it highlights the need for transnational collaboration and knowledge-sharing to support a unified energy transition.

8.1 Key Findings: Strategic Clarity and Policy Robustness

The analysis reveals significant disparities in the strategic clarity and robustness of policy frameworks across the Danube region:

- **High-Performing Regions:**
Austria and Germany stand out as leaders, demonstrating high strategic clarity and effective policy implementation. Austria (represented by FIB) maintains a well-defined energy roadmap with clear guidelines and robust institutional support.
- **Moderate to Low-Performing Regions:**
Regions such as Slovakia and Bulgaria exhibit moderate levels of strategic clarity, where certain policy frameworks exist but lack the full institutional support needed for effective implementation. Slovakia shows potential for improvement with better inter-agency coordination. Hungary and Bosnia-Herzegovina face more pronounced challenges. Hungary's strategy struggles with execution due to operational gaps, while Bosnia-Herzegovina lacks comprehensive policies and exhibits significant implementation weaknesses.
- **Suggestions for Improvement:**
To enhance strategic clarity, underperforming regions should focus on refining their policy frameworks and creating comprehensive energy transition roadmaps. Policy alignment with EU standards and global best practices will be essential for long-term success.

8.2 Divergence in Implementation Quality and Institutional Capacity

The quality of implementation and institutional maturity across the region are highly variable, impacting the effectiveness of energy strategies.

- **Regions Excelling in Implementation:**
Germany and Austria again emerge as top performers, with robust institutional support and well-coordinated implementation efforts. These regions demonstrate that high-quality execution is achieved through capacity building within public institutions, ensuring consistent policy enforcement.
- **Challenges in Institutional Capacity:**
Bosnia-Herzegovina and Slovakia face issues with institutional maturity, which hampers effective policy execution. These countries would benefit from

investment in institutional capacity-building initiatives, especially those that foster collaboration among government agencies and local authorities. The Czech Republic's inconsistencies in policy implementation reveal the need for improved coordination between local and national institutions to achieve uniform energy policy enforcement.

- **Recommendations:**

Investing in capacity-building programs for public sector employees and enhancing inter-agency coordination are crucial steps for underperforming regions. Strengthening institutional frameworks will support a more consistent and reliable implementation of energy policies.

8.3 Leveraging Transnational Collaboration for Improved Outcomes

Cross-border collaboration offers significant potential for regions with lower implementation quality and strategic clarity. By sharing best practices, successful policy models, and technological expertise, regions within the Danube area can strengthen their energy strategies.

- **Best Practice Sharing:**

High-performing regions like Austria and Germany can offer valuable insights into policy formulation, regulatory processes, and technological integration. Collaboration between these and lower-performing regions can foster knowledge transfer, allowing for adaptation of successful strategies to local contexts.

- **Opportunities for Joint Initiatives:**

Joint energy projects, such as shared solar or biomass installations, and transnational workshops on policy development and institutional capacity-building could serve as practical tools for fostering regional improvement. Participation in EU-funded projects and programs such as SMEnergy and Interreg can facilitate structured collaboration and access to additional resources, accelerating the transition across the Danube region.

8.4 Investment in Technology and Infrastructure

Adequate technological infrastructure is foundational for the energy transition. Regional differences in renewable technology adoption and infrastructure development highlight the need for increased investments in modern, efficient systems.

- **Current Investment Gaps:**

Many regions, particularly Bosnia-Herzegovina, lag in renewable energy infrastructure, such as smart grids, energy storage, and distributed generation systems. While Slovakia also faces challenges in renewable energy integration, these are less about infrastructure deficits and more about a lack of consistent and reliable regulatory support for integrating new, volatile sources like PV and wind. Additionally, Slovakia's largest energy consumers – industrial companies – rely heavily on stable baseload power from nuclear and gas sources. As Slovakia already produces a surplus of clean energy, with a strong emphasis on nuclear energy development, the incentive for many, including SMEs, to adopt strictly renewable sources is limited.

Nonetheless, improving grid capacity and connectivity is crucial for further integrating renewables and enhancing system flexibility, particularly to accommodate future growth in distributed renewable energy sources.

- **Recommendations for Technological Advancements:**

Prioritizing investments in smart grids, energy storage, and efficient renewable energy sources (e.g., wind, solar, biomass) will enhance the resilience of the regional energy grid. Governments should focus on targeted incentives for SMEs to adopt energy-efficient technologies, building a stronger foundation for sustainable growth.

8.5 Engaging Stakeholders and Building Public Awareness

Effective stakeholder engagement and public awareness are essential for sustainable energy transitions. This analysis indicates varying levels of public and SME engagement in energy policies across the Danube region.

- **High-Engagement Regions:**

Austria and Germany actively engage SMEs and other stakeholders through public awareness campaigns, collaborative energy initiatives, and transparent communication of policy goals. These efforts foster support for renewable energy projects and increase community investment.

- **Challenges in Low-Engagement Regions:**

Lower-performing regions, such as Bosnia-Herzegovina and Hungary, demonstrate limited public awareness and engagement, which impacts renewable adoption rates among SMEs. Raising awareness through targeted campaigns and stakeholder partnerships can address these gaps and build broader support for energy policies.

- **Recommendations for Engagement:**

Strengthening partnerships with the private sector, particularly SMEs, and launching awareness campaigns on renewable energy benefits can encourage broader participation. A regional approach to stakeholder engagement, leveraging communication channels across borders, can help standardize messages and increase public investment in energy transitions.

The Danube region's energy transition requires a tailored approach that acknowledges each country's strengths and challenges. By focusing on policy refinement, capacity-building, collaboration, technological investments, and stakeholder engagement, regions can achieve greater consistency and effectiveness in their energy strategies. Continued cooperation, driven by regional leaders, will be crucial to overcoming existing disparities and moving toward a unified, sustainable energy future.

9 Detailed Infrastructure and Knowledge Gap Analysis with Energy Usage Patterns

9.1 Infrastructure Gaps Affecting Renewable Energy Adoption

A comprehensive examination of SMEs' energy infrastructure across the Danube region reveals substantial gaps that inhibit the effective deployment of renewable energy sources. Many SMEs lack access to essential infrastructure like grid connections that can support renewable energy integration or sufficient capacity for distributed energy resources (DERs) such as solar or wind power systems. This shortfall is particularly pronounced in rural and semi-rural areas, where SMEs struggle with outdated electrical grids that limit both the adoption of on-site renewable energy systems and the incorporation of newer energy-efficient technologies.

For energy-intensive sectors, such as manufacturing and food production, the limitations in grid capacity and stability present significant barriers. The intermittent nature of renewables, such as solar and wind, requires infrastructure equipped for energy storage and load balancing, neither of which is adequately available for many SMEs. Without supportive grid modifications, SMEs in these sectors face high operational risks, including potential power interruptions and unpredictable costs.

9.2 Knowledge Gaps in Renewable Energy and Efficiency

There is a notable deficit in knowledge regarding renewable energy technologies and energy efficiency practices among SMEs. Many SMEs lack familiarity with available RES technologies, their operational benefits, and the cost savings they can generate over time. SMEs often do not possess sufficient understanding of regulatory frameworks, financial incentives, and optimal usage patterns for renewable technologies, which further discourages adoption. This lack of technical knowledge is compounded by a scarcity of skilled personnel within SMEs who can oversee the planning, implementation, and management of RES installations.

The need for training is high across sectors, with a particular requirement for guidance in evaluating energy needs, understanding consumption patterns, and selecting suitable renewable energy solutions. SMEs also express a need for support in navigating complex funding channels, such as grants and subsidies, which are critical for initial investments in RES.

9.3 Energy Usage Patterns Among SMEs by Sector

Energy usage among SMEs shows distinct patterns across sectors:

- **Manufacturing:** High energy demands are common, with reliance on continuous power supply making it challenging to transition fully to renewables. Energy consumption is generally stable, with peak usage during production hours, which necessitates stable and predictable energy sources.
- **Agriculture:** Energy use varies seasonally, especially in areas like irrigation and processing, where solar and biomass could provide significant benefits. However, infrastructure gaps and the lack of nearby RES facilities make the transition difficult.
- **Service and Retail:** SMEs in this sector often have lower overall energy consumption and more flexibility in adopting renewables, such as rooftop solar. However, without

clear guidance or incentives, many SMEs are reluctant to make the upfront investment.

9.4 Addressing Infrastructure and Knowledge Gaps for Effective RES Adoption

To bridge these gaps, the following measures are recommended:

1. **Upgrading Local Grids and Infrastructure:** A targeted approach to modernizing local grids, especially in high-density SME areas, would enable wider integration of renewable energy sources. This includes enhancing capacity for DERs and installing energy storage solutions to manage variable energy generation effectively.
2. **Knowledge Hubs and Training Programs:** Establishing regional knowledge hubs can address the knowledge gap by providing accessible information on renewable energy options, regulatory compliance, and best practices. Training programs focused on energy audits, RES selection, and usage optimization would empower SMEs with the skills necessary for informed decision-making.
3. **Energy Usage Monitoring Tools (Energy Management System):** Providing SMEs with energy usage monitoring tools and data analysis capabilities would help them understand and optimize their energy patterns, paving the way for more informed investment in renewable solutions.
4. **Simplified Access to Information on Financial Incentives:** Streamlined access to information on subsidies, grants, and low-interest loans would lower financial barriers, enabling more SMEs to consider RES. This can be complemented by one-stop advisory services to help SMEs prepare applications and project plans.

By addressing the current infrastructure and knowledge gaps, SMEs in the Danube region can better understand and manage their energy usage patterns. This foundational step is essential to equipping SMEs with the resources and knowledge required to transition to renewable energy in a way that is economically and operationally sustainable.

10 Infrastructure, Investment, and Behavioral Patterns of Partner Regions

10.1 Infrastructure Readiness and Regional Disparities

Across the partner regions in the Danube area, infrastructure readiness for renewable energy adoption varies widely, creating significant disparities in SMEs' abilities to transition to sustainable energy. Urban areas tend to have more robust energy infrastructure, including grid stability and capacity to handle renewable energy sources. In contrast, rural areas, which often host agriculture and manufacturing SMEs, face greater limitations. Outdated grid systems, limited access to high-capacity energy storage, and insufficient distribution networks pose major obstacles to integrating renewables at a regional level.

For example, some regions have successfully incorporated district heating systems and localized biomass projects, while others still rely heavily on conventional energy sources. The availability of local RES infrastructure, such as wind farms, hydroelectric sources, or solar installations, directly affects SME access to green energy options. Where these systems are absent, SMEs are less likely to pursue renewable solutions independently, given the prohibitive costs and technical challenges of off-grid or stand-alone systems.

10.2 Investment Trends and Financial Barriers

Investment in energy infrastructure and renewable energy projects is uneven across regions, influenced by each area's economic conditions, local policies, and available incentives. Wealthier areas, especially those with strong policy support, have invested in enhancing grid infrastructure and promoting RES installations. These regions often provide SMEs with attractive subsidies and tax incentives for green investments, thus encouraging sustainable practices.

However, in less economically developed regions, there is often limited governmental or financial support for such investments, placing a heavy burden on SMEs. Without sufficient access to financial resources or incentives, SMEs in these areas are hesitant to engage in renewable energy projects, even when they are aware of the long-term benefits. High initial costs, lack of credit access, and perceived financial risk associated with RES investments continue to deter adoption, particularly among smaller enterprises.

10.3 Behavioral Patterns and Attitudes Toward Renewable Energy

The attitudes and behaviors of SMEs toward renewable energy and energy efficiency measures also differ across regions, influenced by cultural, economic, and regulatory factors. In regions where renewable energy adoption is prioritized at the governmental level, SMEs show a higher willingness to transition. This supportive environment, bolstered by information campaigns, training programs, and active promotion of sustainability, has positively shaped SME attitudes, making them more open to green initiatives.

Conversely, regions with minimal RES advocacy or supportive structures face challenges with SME engagement. Here, SMEs may lack awareness of renewable options or see them as an additional burden rather than an opportunity for growth. The perception that renewables are costly, complex, and impractical persists in these regions, reinforcing resistance to change. Additionally, many SMEs still prioritize short-term financial gains over long-term sustainability, especially in highly competitive sectors where profit margins are slim.

10.4 Recommendations to Enhance Infrastructure, Investment, and Behavioral Support for SMEs

1. **Targeted Infrastructure Development:** Regional governments should prioritize infrastructure development in underserved areas, focusing on enhancing grid capacity and stability. For rural and semi-urban areas, investments in distributed energy resources, such as localized solar, wind, and biomass systems, could bridge the infrastructure gap and promote regional parity.
2. **Financial Incentives and Simplified Access to Funding:** Expanding financial support mechanisms – such as grants, tax credits, and low-interest loans – can alleviate the high initial costs associated with RES adoption. Regional governments should consider simplified application processes for SMEs, particularly in financially weaker areas, to reduce the perceived complexity of securing funding.
3. **Behavioral Change Programs and Awareness Campaigns:** Conducting behavioral change programs that highlight the long-term cost savings and competitive advantages of RES adoption can shift SME perspectives toward sustainability. Additionally, public awareness campaigns and case studies from SMEs that have successfully implemented renewables can serve as valuable tools for inspiring broader adoption.
4. **Enhanced Training and Capacity Building:** Providing SMEs with technical training and capacity-building programs can equip them with the knowledge to make informed energy choices. Workshops, information sessions, and regional knowledge hubs focusing on renewable technologies, energy management, and financial planning would be beneficial.
5. **Public-Private Partnerships for Energy Projects:** Encouraging public-private partnerships (PPPs) in energy projects can attract additional investment and technical expertise. Partnering with private sector entities can help improve infrastructure resilience and energy availability while distributing costs and risks across stakeholders.

By addressing infrastructure inadequacies, fostering investment, and promoting a cultural shift toward renewable energy, the Danube region can create an environment where SMEs are not only encouraged but also empowered to engage in sustainable energy practices. Through these regionalized efforts, SMEs will be better positioned to integrate renewables, reduce operational costs, and align with the broader sustainability goals of the Danube area.

11 Detailed Map of Transnational Synergy Potentials on Renewable Energy

11.1.1 Renewable Resource Synergies

Each Danube region country brings strengths in renewable resources that, when interconnected, could provide a stable, diversified energy supply:

- **Austria and Germany:** Austria's leadership in community-based energy models and renewable integration, alongside Germany's ability to integrate renewables, presents valuable frameworks for regions seeking to maximize wind, biomass, and solar potential. Austria's decentralized community energy initiatives can be applied across regions in need of adaptable, scalable energy systems, enhancing overall grid resilience and reducing emissions at the local level.
- **Bosnia and Herzegovina and Slovenia:** With Bosnia's solar-rich regions and Slovenia's geothermal resources, there is strong potential for complementary energy development. Joint infrastructure projects in these areas, such as cross-border renewable energy corridors or shared geothermal facilities, would capitalize on each country's natural strengths. This collaboration could address both countries' grid demands while fostering energy security and reducing dependency on fossil fuels.
- **Hungary and Slovakia:** Hungary's investments in biomass and solar can pair effectively with Slovakia's hydroelectric resources to create a balanced renewable energy mix. Coordinated energy storage solutions and joint research on integrating renewable types could provide these nations with energy stability throughout seasonal variations, while shared research could lower costs and speed up renewable adoption for SMEs and larger enterprises alike.

11.1.2 Harmonizing Regulatory Frameworks and Reducing Bureaucracy

Regulatory alignment across the Danube region remains crucial for a collaborative energy future. Each country's unique legislative and permitting structures create barriers that hinder seamless renewable energy sharing, limiting transnational integration. Key areas for synergy include:

- **Unified Policy Frameworks:** Harmonizing core policies, such as permit issuance, subsidy structures, and renewable energy targets, would streamline administrative processes and enable smoother cross-border renewable energy exchange. Austria's successful community-based permit models and Germany's supportive subsidy frameworks offer adaptable models for countries with more complex or prohibitive regulations.
- **Cross-Border Grid Modernization:** Coordinated investments in grid enhancements and interconnections can facilitate greater energy sharing, particularly in countries with limited infrastructure. Establishing a Danube-region energy grid initiative to modernize and interlink national grids would help stabilize energy supplies and allow for efficient cross-border power flows, especially during peak demand periods.
- **Simplifying Bureaucratic Processes:** Reducing administrative overhead, particularly for smaller SMEs, can encourage faster adoption of renewable solutions. Regulatory best practices, such as streamlined application processes and reduced documentation for smaller-scale projects, would enable SMEs to focus resources on renewable

investments rather than administrative compliance. Harmonizing these frameworks at the regional level could spur greater participation from SMEs in transnational projects.

11.1.3 Knowledge Transfer and Collaborative Capacity Building

Regional collaboration in knowledge transfer can significantly enhance renewable energy adoption rates, especially among SMEs that often lack access to critical expertise and training. Key initiatives include:

- **Regional Energy Knowledge Hubs:** Establishing regional knowledge hubs, modeled after successful programs in Austria, would centralize expertise, tools, and best practices, connecting SMEs with experts across the Danube region. These hubs would facilitate technical training, grant application guidance, and shared access to best practices for energy management, enhancing the region's overall capacity for renewable energy integration.
- **Cross-Border Pilot Projects:** Joint pilot projects that pool renewable resources, such as transnational solar parks or biomass facilities, can showcase the benefits of shared investments. In addition to reducing individual financial burdens, these collaborative projects demonstrate scalable renewable energy models applicable across the region. Austria's community energy models could be replicated in other regions to illustrate how collective action among SMEs can drive the renewable transition.
- **Standardized Training and Certification Programs:** Implementing standardized training and certification for energy professionals across the region would raise the quality and consistency of renewable energy installations. Cross-border training programs in energy auditing, renewable technology implementation, and maintenance would build a common skill base and ensure SMEs have access to high-quality support across national boundaries.

11.1.4 Joint Financial Support Mechanisms

Financial collaboration across the Danube region can alleviate the significant costs associated with renewable energy transitions. Developing shared funding structures and aligning subsidy programs can streamline access to capital for SMEs, enabling more efficient deployment of renewable solutions:

- **Regional Renewable Energy Fund:** Establishing a Danube-region fund specifically for renewable energy investments could support SMEs across national borders, enabling access to financial resources for high-cost projects like solar installations and energy storage systems. Models like Hungary's SME Energy Cost and Investment Support Programme could be expanded regionally, offering cross-border financing solutions for joint projects.
- **Leveraging EU Funds for Transnational Projects:** Coordinated applications to EU funds, such as Horizon Europe or Interreg, would increase the financial support available for cross-border renewable projects. By pooling applications and developing cohesive project proposals, countries in the Danube region can attract larger grants and foster long-term projects that deliver scalable renewable solutions.
- **Flexible Subsidy Programs:** Aligning and simplifying subsidy structures across the region would allow SMEs to take advantage of financial incentives with fewer barriers. Transnational programs that offer subsidies for renewable infrastructure development, especially for joint projects or cross-border collaborations, could make significant strides in renewable adoption rates, particularly among resource-constrained SMEs.

The Danube region's diverse resources, regulatory landscapes, and industrial capacities present a compelling case for transnational collaboration in renewable energy. Through aligned policies, shared renewable initiatives, and cohesive financial strategies, the region can establish a sustainable and resilient energy system that benefits each participating country. By leveraging its collective strengths, the Danube region can advance renewable energy adoption while serving as a model for regional cooperation, ultimately creating a robust, interconnected energy network that enhances energy security and supports climate goals.

12 Conclusion

Based on the desktop research, interviews, and comparative analyses discussed above, some clear conclusions emerge regarding renewable energy adoption of SMEs in the Danube region, which provide clear guidance for achieving sustainable energy practices.

Recurring Challenges: Key obstacles faced by SMEs include a lack of financial support, a complex regulatory environment, and inadequate infrastructure, particularly in rural areas. Additionally, there is a significant shortage of knowledge and skilled personnel, which hinders the efficient transition to and adoption of renewable energy technologies.

Opportunities and Synergies: Significant potential exists for cross-border collaboration within the region, especially in areas such as shared energy resources, joint technological investments, and community energy models. Each country's strengths in renewable energy—such as Austria's community energy initiatives and Germany's integrated energy networks—can contribute to creating a more unified, resilient green energy network.

Recommendations and Suggested Actions: The research clearly indicates the need for targeted political and financial support, infrastructure development, and regulatory harmonization to enable a successful renewable energy transition for SMEs. Additionally, establishing regional knowledge hubs and training programs would help SMEs overcome technical and knowledge-based barriers to adoption.

In summary, the energy landscape for SMEs in the Danube region is complex but offers substantial shared goals and opportunities for developing an effective, sustainable energy system. The joint efforts recommended above could accelerate the region's green transition, ensuring that SMEs play an active and successful role in this transformation.

Annex 1 Aggregated Summary of the Interviews conducted in SMEnergy Project

12.1 Aggregated Summary of Interviews with Energy-Intensive SMEs in Slovakia

1. Sectors and Activities

- The SMEs interviewed come from diverse sectors, including packaging, IT and software development, energy construction, food production, and electric energy supply.
- Activities range from designing and recycling packaging, data platform development, constructing photovoltaic power plants, retail bakery operations, to providing electric energy as merchants.

2. Usage and Plans for Energy Sources

- Most SMEs currently rely on mains electricity with reserved capacity for market pricing.
- Some are in the process of implementing photovoltaic (PV) systems and exploring energy accumulation solutions.
- Plans include optimizing energy consumption through waste heat, installing PV power plants, and, for some, exploring broader RES solutions to support their clients or demonstrate sustainable practices.

3. Good Practices Known for Energy Transition

- While some SMEs are aware of good practices in energy transition, these are not always publicly shared or documented.
- A few SMEs, especially those involved in renewable energy services, have installed PV systems to showcase to clients or for their own operational use.

4. Barriers to Transition

- Common barriers include **regulatory hurdles** (such as rigid regulations and bureaucratic processes), **lack of financial support**, **limited awareness and understanding** of renewable energy systems, and **skepticism** within professional communities.
- Some SMEs specifically noted difficulties with local Distribution System Operators (DSOs) and a lack of long-term national strategies for renewable energy adoption.

5. Support Needs

- SMEs expressed a need for **financial support** and clear, centralized information on available stakeholders and suppliers in the renewable energy sector.
- Other support needs include legislative reforms to enable easier access to RES technology, dynamic pricing, surplus energy selling options, and a reliable national strategy for RES adoption.

6. Other Important Issues

- Key issues include the high costs and complexities associated with obtaining permits for ground-mounted solar installations, the lack of competitive suppliers in the market, and resistance or antagonistic attitudes from certain government bodies toward renewable energy initiatives.
- Additionally, there is a notable gap among some SMEs in understanding and fully leveraging the potential of renewable energy technologies, which further limits their adoption and integration.

12.2 Aggregated Summary of Interviews with Energy Experts in Slovakia

1. Sector and Main Services

- The experts represent diverse sectors within the energy field, including smart energy solutions, national energy agencies, non-profit organizations, energy communities, and energy service providers.
- Services offered include energy consulting, control systems for energy management, renewable energy support, customized energy storage, and community energy development.

2. Service Specifications

- Experts provide a range of services from customized control systems for renewable energy installations, energy balance evaluations, feasibility studies, to guaranteed energy services.
- The national energy agency (SIEA) offers non-commercial consulting and training for energy auditors and specialists, while other experts focus on energy self-sufficiency for their clients, including community and business sectors.

3. Typical Customers

- Customers include SMEs, local governments, cities, businesses, energy auditors, and residential end-users. The focus is on a variety of stakeholders in need of renewable energy solutions and advisory services for energy management.

4. Main Barriers to Transition

- Common barriers identified include fragmented or insufficient information from government sources, lack of financial resources, over-regulated environments, and challenges with distribution charges.
- Experts also highlighted a lack of long-term support frameworks, unpredictable policies, and limited public communication about renewable energy support from the state.

5. Collaboration Potential in the Project

- Experts indicated potential for collaboration, especially in creating an international marketplace and leveraging support structures for SMEs.
- Organizations like SIEA and the Cluster of Energy Communities of Slovakia expressed interest in supporting advisory activities, energy audits, and education on energy concepts within the SMEnergy project.

6. Lessons Learned from Known Activities

- Lessons from past activities include the importance of well-structured energy communities, accessible consultation centers, and continuous communication between municipalities and citizens.

- Some experts pointed out that poorly set legislation can hinder energy projects, while successful initiatives often involve clear rules and community support.

7. Other Important Issues

- Additional issues noted include political instability affecting energy agencies, lack of state cooperation, and a need for greater awareness and education among entrepreneurs on renewable energy usage.

12.3 Aggregated Summary of Interviews with Decision Makers (Ministry of Economy in Slovakia)

1. Main Activity of the Organisation

- The Ministry of Economy in Slovakia is responsible for drafting laws and strategic documents related to energy, submitting them to the government, and issuing decrees and certifications for the construction of energy facilities.

2. Jurisdiction of the Organisation

- The primary strategic document guiding their activities is the **Integrated National Energy and Climate Plan 2021-2030**, which outlines energy efficiency measures. Other significant regulatory documents include the **Act on Energy Efficiency** and regulations related to the energy performance of buildings.

3. Regulatory Framework

- Energy efficiency is a priority as set out in the Integrated National Energy and Climate Plan 2021-2030. The ministry implements this through drafting laws, providing financial support, and issuing certifications to promote energy efficiency.

4. Supportive Tools

- Key tools to support energy initiatives include **European Structural Funds** (Slovakia Programme), the **Slovak Recovery and Resilience Plan**, and the **Green Business Programme**.

5. Main Barriers for Transition in SMEs

- Key barriers include **financial constraints**, a lack of understanding of renewable technology benefits, skepticism due to past impacts on competitiveness, and concerns from the industrial sector about the Energiewende (energy transition).

6. Collaboration Potential in the Project

- Direct collaboration potential with the Ministry is limited. However, the Ministry collaborates with the associated partner, **SIEA** (Slovak Innovation and Energy Agency), which operates under the Ministry of Economy of the Slovak Republic.

7. Issues Identified for Change

- Slovakia is currently transposing the **Energy Efficiency Directive 2023/1791** into national legislation. This includes:
 - Development of programs to incentivize SMEs to undergo energy audits and follow through with recommendations.
 - Establishment of one-stop shops or similar services to provide comprehensive advice on energy efficiency topics for SMEs and micro-enterprises.

- Preparation for implementing **ETS2** (Emissions Trading Scheme for the buildings and transport sector), with micro-enterprises as a target group, making them eligible for support from the **Social Climate Fund**.

8. Other Important Issues

- The ministry generally shares limited information publicly, which may impact transparency and accessibility for stakeholders.

12.4 Aggregated Summary of Interviews with Energy-Intensive SMEs in Hungary

1. Sectors and Activities

- The SMEs interviewed represent diverse sectors, including the **plastics industry**, **ornamental and fruit plant retail**, **food industry** (craft brewing), and **mining and processing** (bentonite production).
- Their activities include plastic production, gardening supplies retail, brewing and distribution of premium-quality beer, and clay-based product manufacturing.

2. Usage and Plans for Energy Sources

- SMEs primarily use electricity and are exploring renewable energy sources, such as **solar panels** and **energy storage**. However, challenges such as high installation costs, unclear regulatory conditions, and limited financial incentives slow their progress.
- Some SMEs have plans to expand solar capacity and improve energy efficiency but face obstacles in approval and implementation due to complex regulations.

3. Good Practices Known for the Transition

- Some SMEs have implemented energy audits, installed submeters for energy monitoring, and adopted energy-efficient technologies.
- Examples include insulation improvements, energy-efficient machinery, and transitioning from gas to electric systems powered by renewable energy sources (e.g., solar panels).

4. Barriers to Transition

- **High energy costs** and **financial uncertainty** are major challenges, with rising electricity prices and limited access to alternative financing options.
- **Regulatory and bureaucratic barriers** are significant, particularly for solar panel installation and navigating unclear policies for energy buy-back and approvals.
- SMEs also report a **lack of skilled labor** and difficulties finding knowledgeable contractors for green energy installations, alongside limited technical support from energy providers.

5. Support Needs

- SMEs expressed a need for **one-stop-shop services** that provide clear guidance on financing, regulations, and supplier information for renewable energy transitions.
- They require **clearer regulations** and **faster approval processes**, particularly for energy systems not connected to the public grid. Financial aid in the form of grants and loans would also facilitate their energy transition.

6. Other Important Issues

- SMEs are concerned about **energy price volatility**, which affects their competitiveness, particularly in cost-sensitive markets.
- They highlighted the value of **connecting with other SMEs** that have successfully transitioned to renewable energy to share insights and experiences, as existing resources are limited.
- Concerns also include a **lack of skilled professionals** and slow adoption of supportive infrastructure, which complicates their shift toward sustainable energy sources.

12.5 Aggregated Summary of Interviews with Energy-Related Suppliers in Hungary

1. Sectors and Activities

- The suppliers interviewed are involved in various energy-related sectors, including **biogas power generation, control and energy management systems, solar energy solutions, and integrated energy infrastructure for data centers.**
- Activities range from operating biogas plants, designing control systems, and implementing renewable energy solutions (like solar panels and geothermal systems) to providing energy infrastructure for industrial and data center applications.

2. Customer Viewpoints

- Customers are generally **price-sensitive** and driven by the need to reduce costs or comply with regulations.
- While larger clients in energy-intensive sectors are more open to adopting renewable solutions, smaller clients often lack technical knowledge and may focus more on short-term costs than long-term benefits.

3. Market Overview

- The **biogas and solar energy** markets are competitive, with fluctuations influenced by regulatory changes and government support. However, regulatory uncertainty and a lack of consistent incentives can hinder growth.
- Integration challenges and high startup costs are notable obstacles, especially for smaller firms.

4. Obstacles and Contributing Factors of Green Transition

- Common barriers include **high implementation costs, regulatory instability,** lack of incentives, and **technical complexity.** Many SMEs lack awareness of available energy-saving options and face challenges in integrating renewable systems into existing operations.
- The need for government support and a more stable regulatory environment is emphasized to foster broader adoption of renewable solutions.

5. Lessons Learned from Past Activities

- Key lessons include the importance of **customer education,** the need for a **strategic approach** in project implementation, and the benefits of preventive maintenance.
- Success stories highlight the value of synchronized energy management with production schedules and careful integration of renewable technologies like solar panels and energy-efficient cooling systems.

6. Collaboration Potential in the Project

- Suppliers are open to collaboration with the SMEnergy project, particularly in offering expertise, workshops, or pilot demonstrations.
- They express interest in sharing knowledge on renewable energy system design, energy optimization for data centers, and advanced green technologies to help SMEs transition more effectively.

7. Other Important Issues

- Suppliers noted the importance of **government support,** particularly incentives for smaller-scale renewable projects, and the need for more stable regulations.

- They are also exploring emerging technologies, such as **hydrogen storage**, **smart energy storage**, and **advanced cooling solutions**, to enhance efficiency in renewable energy systems.

12.6 Aggregated Summary of Interviews with Energy Experts in Hungary

1. Sector and Main Services

- The energy experts work in **energy efficiency consultancy** and **renewable energy solutions**, focusing on energy audits, energy management systems, solar power, and heat pump installations.
- Their main services include designing strategies for energy efficiency, providing financial consulting, and implementing renewable energy systems like solar power plants and climate action plans.

2. Service Specifications

- Both experts specialize in helping SMEs optimize energy consumption and transition to renewable energy sources. Services include providing technical specifications, advising on equipment upgrades, and offering monitoring systems to track energy usage.
- They also help SMEs access financial incentives and offer post-installation support, such as evaluating supplier performance.

3. Typical Approach of SMEs in Energy Transition

- SMEs tend to take a **reactive approach** to energy transition, often focusing on immediate solutions (e.g., solar or heat pumps) without comprehensive planning or strategic analysis.
- Many SMEs prioritize urgent operational needs and prefer simpler, cost-effective solutions. They often lack a long-term perspective on sustainability unless required by regulations.

4. Main Barriers to Transition

- Key barriers include a **lack of specialized knowledge** and financial resources, unclear regulatory requirements, and insufficient cost-benefit analysis.
- SMEs may struggle to understand the alignment between green investments and business operations, often opting for incremental improvements rather than adopting a holistic approach.

5. Collaboration Potential in the Project

- The experts are open to collaborating on projects like SMEnergy, emphasizing the value of industry-specific projects, tailored communication, and involving stakeholders (e.g., energy suppliers, property owners).
- They suggest that connecting SMEs with service providers and focusing on sector-specific needs can accelerate energy transition efforts.

6. Lessons Learned from Past Activities

- Lessons include the importance of **maximizing energy efficiency** before implementing renewable energy solutions and continuously monitoring energy consumption for better decision-making.
- Successful transitions often involve a holistic approach, where SMEs address operational inefficiencies before investing in green energy sources.

7. Other Important Issues

- **Pricing** is a significant challenge, as SMEs often face difficulties aligning energy services with their budgets. Additionally, rapid technological advancements can be overwhelming, so SMEs benefit from user-friendly, easily maintainable solutions.
- There is also a need for educational platforms to help SMEs stay updated on energy technologies, as they typically rely on proven, familiar equipment.

12.7 Aggregated Summary of Interviews with Business Communities in Hungary

1. Main Activity and Goal of the Organisations

- **Hungarian Renewable Energy Association:** Focuses on integrating renewable energy through collaboration and advocating for systemic changes in the energy sector.
- **Chamber of Commerce and Industry of Pécs-Baranya:** Provides professional consulting and support for local businesses on various issues, including regulatory compliance and green energy transition.
- **MANAP Iparági Egyesület (Solar Industry Association):** Supports SMEs in the solar sector, advocating for a favorable regulatory framework and addressing infrastructure limitations.

2. View on SMEs' Behavior and Needs

- SMEs in Hungary are generally **reactive** rather than proactive regarding green energy adoption, often viewing the transition as a financial burden rather than an opportunity.

- SMEs, especially in the solar sector, face significant challenges due to **network infrastructure limitations** and **regulatory hurdles**, complicating long-term planning and development.

3. View of the Market

- The energy market in Hungary is influenced by **international supply chains**, with a heavy reliance on imports, particularly from China.
- While there is a growing push for sustainable solutions, **regulatory frameworks lag behind**, creating a gap between market demands and policy support.

4. Main Barriers to Transition for SMEs

- **Financial constraints**, lack of technical expertise, regulatory instability, and a shortage of skilled suppliers are major obstacles.
- **Infrastructure limitations** in the solar sector and high system usage fees further hinder the green transition, with many SMEs dependent on external grants or consulting for support.

5. Best Practices Identified

- Success stories include SMEs achieving **rapid returns on green investments** through support from financial institutions or industry associations.
- **Comprehensive advisory services**, responsive support, and structured follow-ups are effective in helping SMEs navigate complex transitions and regulatory challenges.

6. Collaboration Potential in the Project

- Organisations are open to collaboration in areas such as **educational programs**, creating certified supplier databases, and participating in pilot projects.
- Emphasis is placed on partnerships with government agencies and industry experts to strengthen the support system for SMEs in transitioning to green energy.

7. Issues Identified for Change

- There is a strong need for **regulatory stability** and clearer long-term policies to encourage more SMEs to invest in renewable energy.
- Improvements in **digital infrastructure**, **advisory capacity**, **financing options**, and solar energy integration into the national grid are necessary to support SME growth in renewable energy.

8. Other Important Issues

- **Infrastructure**, particularly the electrical grid, is a major obstacle, requiring better coordination between government bodies, energy companies, and regulatory agencies.
- **Continuous training and knowledge-sharing** are crucial for supporting SMEs, along with improved access to information on grants and financing opportunities.

12.8 Aggregated Summary of Interviews with Energy-Intensive SMEs in Germany

1. Sectors and Activities

- The SMEs operate across diverse sectors, including **food industry** (bakery, brewery, abattoir), **optics** (eyewear manufacturing), **metal processing** (metal and crane construction), and **plastic technology**.
- Activities range from food production to metal construction, each with unique energy needs and challenges.

2. Usage and Plans for Energy Sources

- Energy costs represent 5-15% of expenses, with sources varying between **electricity**, **gas**, **PV (solar)**, and **oil**.
- Some SMEs have adopted renewable energy solutions like **PV systems**, with some generating up to 75% of their energy on-site. However, limitations exist, such as unused energy from PV systems on weekends, highlighting the potential need for energy storage solutions.
- Many SMEs aim to increase their energy efficiency and explore self-sufficiency through renewable sources but face financial constraints or are concerned about reliability of renewable energy.

3. Good Practices Known for the Transition

- Examples of good practices include **transitioning transport fleets to electric vehicles** and the use of waste materials (e.g., wood chips) for energy production.
- Some SMEs are aware of external companies that serve as models for implementing sustainable practices, though many have not implemented comprehensive strategies themselves.

4. Barriers to Transition

- **Financial constraints** are a primary barrier, with many SMEs finding renewable solutions costly or uncertain due to fluctuating energy prices.
- Other barriers include **security of energy supply**, limited awareness of technological improvements, and a lack of **political direction** and **bureaucratic hurdles**.
- Many SMEs also express distrust in the stability of energy transition policies and perceive renewable options as impractical as long as cheaper alternatives, like gas, are available.

5. Need and Type of Support

- SMEs report needing **financial support** and **political stability** to feel secure in investing in renewable energy.
- Specific support requests include **reliable information on changes in regulations**, **less bureaucracy**, and access to **high-quality specialist advice** to guide their transition.
- There's a call for more streamlined processes to access subsidies and better communication from regulatory bodies.

6. Other Important Issues

- Many SMEs emphasize that their primary motivation for energy efficiency is **cost savings** and competitiveness rather than environmental goals.
- Digitalization remains a low priority, with some SMEs lacking energy management systems (EMS) but expressing interest in improving efficiency long-term.

- Additional information on topics like **energy communities**, **energy storage technology**, and **hydrogen** could be beneficial to SMEs looking to diversify their energy sources and optimize usage.

12.9 Aggregated Summary of Interviews with Energy Experts in Germany

1. Sector and Main Services

- The experts operate in **consulting**, **education**, **research**, and **energy storage technology**. They provide services such as energy audits, project management, energy storage concept development, and efficiency analysis.
- Some experts are also involved in **university education** and serve on boards of energy and infrastructure organizations, providing a mix of theoretical and applied expertise.

2. Service Specifications

- Services include the use of custom-developed software and processes tailored to specific business needs, although one expert noted they no longer serve businesses due to market saturation.
- Another expert focuses on energy storage, analyzing production efficiency and developing technologies for renewable energy storage systems, particularly for the battery manufacturing industry.

3. Typical Customers

- Typical clients include **industrial businesses**, **municipal utility companies**, **churches**, **hospitals**, and **businesses in the battery manufacturing and renewable energy storage sectors**.

4. Main Barriers to Transition

- Key barriers include **network stability issues** due to Germany's transition away from nuclear energy while adopting more renewables, as well as **political instability** and **bureaucracy**.
- Financial and resource constraints are major challenges, especially for industries with long investment timeframes (e.g., food and chemical sectors, with timelines extending up to 30 years).
- Limited lending from banks and challenges in effectively communicating a vision for energy transition were also highlighted as obstacles.

5. Collaboration Potential in the Project

- One expert sees potential for collaboration in supporting SMEs, while another expressed willingness to help as needed.
- However, some experts feel that there is already a lot of support available, and collaboration would depend on businesses actively seeking and accepting help.

6. Lessons Learned from Known Activities

- Successful projects can achieve significant energy savings (up to 50%), demonstrating the potential impact of effective energy management.
- Networks like **BEENi** (run by C.A.R.M.E.N. and Bayern Innovativ) serve as valuable frameworks for supporting energy transitions by facilitating collaboration and resource-sharing.

7. Other Important Issues

- Concerns were raised about the **high cost of energy in Germany**, which makes operations unsustainable for some manufacturers.
- There's a call for developing **blueprints for energy transition** that other businesses could adopt.
- The experts emphasized the need for **funding pioneers** in energy transition who can set examples for others, particularly in large sectors like IT.

12.10 Aggregated Summary of Interviews with Decision Makers in Germany

1. Main Activity and Jurisdiction of the Organisation

- **Contact 1:** A regional-level officer acts as a central authority between the Bavarian state government and district authorities, overseeing planning and approvals for public and private projects.
- **Contacts 2 & 3:** District-level officers coordinate activities across 39 municipalities, supporting local governments in implementing energy and climate initiatives.

2. Regulatory Framework

- All contacts operate within the regulatory framework of the **Bavarian State Government** and do not act independently. This framework guides their decision-making and support functions.

3. Supportive Tools

- **Contact 1** provides a **central contact point** for energy transition questions, offers access to the Bavarian region funding program, and is part of a team focused on energy transition.
- **Contact 2 & 3** are conceptualising an energy agency for the district of Passau. The agency will coordinate and support the energy transition actions of municipalities, society and later on SMEs. Contact 3 works with the chamber of commerce, providing substantial support for SMEs.

4. Main Barriers to Transition for SMEs

- **Electricity grid expansion** is a significant barrier, especially for SMEs that cannot produce renewable energy on-site.
- Other barriers include **limited resources** and challenges in **engaging SMEs** to participate in energy transition efforts.

5. Collaboration Potential in the Project

- **Contact 1** has no interest in collaboration, while **Contact 2** may consider it based on the outcomes of future meetings related to the energy agency.
- **Contact 3** expresses interest in a supportive role, with the potential to provide specific data on SME energy usage as needed.

6. Issues Identified for Change

- **Contacts 2 & 3** emphasize the need for better **coordination across municipalities** to streamline energy use and optimize resources.
- No specific changes were identified by **Contact 1**.

7. Other Important Issues

- **Contact 1** had no further comments and directed queries to SMEs and the IHK (Chamber of Industry and Commerce).
- **Contact 2** highlighted the potential usefulness of creating a **blueprint for businesses** to support energy transition across sectors.
- **Contact 3** raised concerns about **biogas producers**, as approximately two-thirds are set to lose subsidies in the coming years, posing a challenge for their future sustainability.

12.11 Aggregated Summary of Interviews with Business Communities in Germany

1. Main Activity and Goal of the Organisation

- The business representative serves as a **voice for businesses** in the manufacturing sector in Lower Bavaria, providing support and acting as a regional contact for businesses.

2. View on SMEs' Behavior and Needs

- SMEs are facing **high energy costs** and are concerned about the future, particularly regarding the potential removal of the Energy Price Brake.
- They are struggling to navigate extensive **rules and regulations**, adding to their operational burden.

3. View of the Market

- The representative sees the market as **competitive and transparent** but notes that SMEs are **overwhelmed** by regulatory demands.
- Financial support is considered adequate, but the complexity of regulations poses challenges for SMEs in implementing sustainable energy practices.

4. Main Barriers to Transition for SMEs

- Major barriers include **network stability and availability**, **decreasing acceptance of renewables** in rural areas, **bureaucracy**, and strict **rules for electricity self-consumption**.

5. Best Practices Identified

- Lower Bavaria (LB) is essentially **electricity autonomous**, which serves as a model for self-sufficiency in energy but may be difficult to replicate widely due to varying regional infrastructure and support.

6. Collaboration Potential in the Project

- The representative does not see collaboration potential in the SMEnergy project at this time.

7. To-Be-Changed Issues Identified

- No specific issues for change were identified in this summary.

8. Other Important Issues

- No additional issues were mentioned.

12.12 Aggregated Summary of Interviews with Energy-Related Suppliers in Bulgaria

1. Sectors and Activities

- The suppliers operate in **solar energy** and **mobile megawatt battery supply**.
- Activities include the **construction of photovoltaic power plants** and **lithium-ion battery supply** for both residential and commercial applications.

2. Customer Viewpoints

- **Supplier 1 (NetSolar)** works with a diverse clientele, including small, medium, and large companies, primarily motivated by cost savings rather than ecological concerns.
- **Supplier 2 (Solar MD Giga 2)** serves business customers and distributors focused on sustainability and reducing environmental impact. Customers face challenges finding qualified installers and support for the transition to sustainable energy use.

3. Market Overview

- **NetSolar** describes the market as lacking in real competition, with major players being energy distribution companies and a few independent suppliers.
- **Solar MD Giga 2** sees the market as **dynamic and competitive**, shaped by legislation, carbon regulations, and renewable energy incentives that promote investment in green technologies.

4. Obstacles to Green Transition

- **NetSolar** identifies a significant barrier as the lack of **market liberalization** in the region, which has been postponed repeatedly, hindering the green transition.
- **Solar MD Giga 2** lists multiple obstacles, including financial, regulatory, technical, and social challenges. Overcoming these requires a coordinated approach involving governments, businesses, and academia.

5. Lessons from Past Activities

- **NetSolar** did not report specific lessons, while **Solar MD Giga 2** noted several key lessons:
Lack of financial support is a significant barrier, especially for small businesses.
Technical challenges arise with new technologies, requiring trained employees to manage green energy systems effectively.

There is a need for **awareness and training** to ensure employees understand their role in sustainability

6. Collaboration Potential in the Project

- **NetSolar** expressed interest in becoming acquainted with the **SMEnergy** project.
- **Solar MD Giga 2** offers collaboration through **energy audits, assessments, financial consulting, training, and monitoring services** to support SMEs in transitioning to green energy.

7. Other Important Issues

- **NetSolar** mentioned the upcoming launch of **Networx NRG**, a low-cost electricity supplier that aims to use local storage systems and smartphone applications to help customers reduce energy costs.
- **Solar MD Giga 2** highlighted good practices such as **energy audits, financial incentives, partnerships with clean energy providers, and monitoring and reporting** as essential for the effective adoption of sustainable energy.

12.13 Aggregated Summary of Interviews with Energy-Intensive SMEs in Bulgaria

1. Sectors and Activities

- The SMEs operate across various sectors, including **agrifood, construction, renewable energy solutions (RES), food production, and livestock farming**.
- Activities range from producing cold-pressed oils to wholesale renewable energy solutions and artisan bread production.

2. Usage and Plans for Energy Sources

- Energy costs vary significantly, with some SMEs spending 5-40% of total costs on energy, depending on the sector and energy sources used (electricity, gas, natural gas, and renewable sources like solar).
- Some SMEs have implemented basic energy efficiency measures, such as insulation, energy-efficient equipment, and PV systems, but there is limited use of alternative energy sources due to financial and regulatory barriers.

3. Good Practices Known for the Transition

- Knowledge of support programs, such as grants for RES, is limited, with many SMEs unaware of state instruments to aid the green transition.
- Even where support programs are known, SMEs find the application process challenging due to bureaucracy and lack of transparency.

4. Barriers to Transition

- Major barriers include **lack of financial support, limited knowledge** of the green transition process, and **non-transparent or complex regulatory frameworks**.
- SMEs find the legislative environment inconsistent, with unclear guidelines, which hinders the planning and execution of green initiatives.

5. Need and Type of Support

- SMEs expressed a need for **flexible programs** tailored to small businesses, **financial support**, and **one-stop-shop services** that provide practical guidance on transitioning to green energy.
- Other desired support includes a **transparent database** of service providers, model contract proposals, and reforms to simplify both the process of accessing funding and the legislation that leads to achieving compliance with European Green Deal goals.

6. Other Important Issues

- Many SMEs lack information on existing support tools and regulations for the green transition, which creates uncertainty and a sense that the state is not facilitating the transition.
- There is also a recognition that some SMEs lack specific skills needed to adopt green technologies, which further limits their progress.

12.14 Summary of Interviews with Decision-Makers in Bulgaria

1. Main Activities of the Organizations

- One regional administration focuses on energy-related coordination and executive roles, while another municipal organization provides administrative services and energy consultations, though it lacks a specific regulatory framework for SMEs.

2. Jurisdiction of the Organizations

- One region incorporates SME contributions toward energy savings in its **Regional Energy Efficiency Program**.
- Another municipality provides consultations for SMEs but leaves energy efficiency decisions to individual enterprises, without a unified roadmap for energy efficiency.

3. Regulatory Framework

- In one region, green energy goals are outlined in a **Regional Energy Efficiency Program**, targeting measures for public buildings and renewable energy projects.
- Another municipality follows the "energy efficiency first" principle in national legislation, focusing on restrictions on fossil fuels, energy efficiency in public buildings, and **Public-Private Partnerships (PPPs)** for rooftop photovoltaic power plants.

4. Supportive Tools

- One region relies on **training and workshops** to build staff expertise but serves primarily as a coordinator.
- Another municipality gains expertise through self-study due to a lack of formal training opportunities. Municipalities in general lack direct financial leverage, with state-level support required for impactful initiatives.

5. Main Barriers to the Transition at SMEs

- Lengthy documentation and project implementation processes were cited as barriers in one region.
- High electricity and fossil fuel prices were identified as key challenges in another municipality, limiting SMEs' ability to transition to green energy.

6. Collaboration Potential in Projects

- No specific collaboration opportunities were identified.

7. To-Be-Changed Issues Identified

- No particular issues requiring change were highlighted.

8. Other Important Issues

- One region has plans to improve the energy efficiency of its administrative buildings but has yet to implement green energy projects.
- A best practice example was noted: **photovoltaic power plants** installed on the roofs of elderly care facilities, demonstrating renewable energy integration in public infrastructure.

12.15 Aggregated Summary of Interviews with Energy Experts in Bulgaria

1. Sector and Main Services

- Both experts operate in **consulting services for energy efficiency and renewable energy sources**.
- **Energy Expert 1 (Encon Services Ltd.)** focuses on the creation and management of credit lines, energy audits, feasibility studies, and project financing.
- **Energy Expert 2 (Eco Power Systems Ltd.)** provides high-tech solutions and energy optimization models, serving private enterprises, households, and government entities across Bulgaria and the Balkan Peninsula.

2. Service Specifications

- **Encon Services** participates in projects with international financial institutions and specializes in energy audits and creating methodologies for carbon emission estimation.
- **Eco Power Systems** supports the development of RES systems, including those connected to the grid and off-grid, with a focus on advising clients on suppliers and energy sales, along with a proprietary data monitoring system.

3. Typical Customs of an SME's Transition

- Both experts work with SMEs in facilitating their green transition, though specific customer details were not provided.

4. Main Barriers to Transition

- **Encon Services** identifies the lack of an integrated approach to the green transition in Bulgaria, along with complex and unclear standards for energy efficiency, which complicate implementation.
- **Eco Power Systems** notes that **long administrative procedures** are a significant barrier, particularly for SMEs aiming to develop RES and connect to the national grid.

5. Collaboration Potential in the Project

- **Encon Services** points out that 75% of European SMEs are interested in transitioning to renewable energy for competitiveness and cost avoidance, and could benefit from knowledge of renewable energy practices.

- **Eco Power Systems** is open to organizing training seminars and meetings with experts to support SMEs' green transition.

6. Lessons Learned from Known Activities

- **Encon Services** highlights the importance of best practices and peer insights, and directs clients to resources available online.
- **Eco Power Systems** observes that many clients have opted out of building their own RES due to **complex and lengthy administrative requirements**.

7. Other Important Issues

- **Encon Services** emphasizes the potential of **green hydrogen** production as a solution for excess energy from photovoltaic plants, especially during high-production periods.
- **Eco Power Systems** notes that many clients have successfully developed their own renewable sources, particularly photovoltaic systems for on- and off-grid setups, which are popular among organic farms and large manufacturing facilities.

12.16 Aggregated Summary of Interviews with Business Communities in Bulgaria

1. Main Activity and Goals of Organizations

- The **Plovdiv Chamber of Commerce and Industry** focuses on export documentation, certificates of origin, B2B events, and support for local SMEs.
- The **Mechatronics and Automation Cluster** supports innovation and internationalization for companies in fields like robotics, automation, and energy efficiency, along with organizing targeted information services.
- The **Bulgarian Industrial Association** represents SME interests, offers B2B events, workshops, and conducts specialized studies.
- **ARK Consulting EOOD** works on innovation assessments and consulting for SMEs, especially in the agricultural sector and Industry 4.0.

2. View on SMEs' Behavior and Needs

- The **Plovdiv Chamber** reports a lack of skilled workforce to support industrial transformation.
- **Mechatronics Cluster** sees SMEs forced to operate at high speeds to stay competitive, with little time for exploring new markets.
- **Bulgarian Industrial Association** observes that SMEs feel forced into the green transition, viewing it as economically unjustified and unprofitable.
- **ARK Consulting** identifies a lack of resources and staff as significant barriers, with SMEs struggling to adopt green technologies due to financial constraints.

3. Market View

- Many SMEs are attempting to diversify energy sources with limited resources, primarily focusing on partial self-sufficiency through RES like photovoltaics.
- Larger companies within the **Mechatronics Cluster** have adopted RES systems, motivated by energy independence and cost savings.
- **Bulgarian Industrial Association** reports that SME readiness for green energy is currently low, with many SMEs sceptical of its economic benefits.
- **ARK Consulting** notes that sector type and resources are key determinants of whether SMEs can introduce RES technologies.

4. Main Barriers to Transition

- **Plovdiv Chamber** and **ARK Consulting** highlight a lack of financial and human resources.
- **Mechatronics Cluster** points to high investment costs and the need for expert planning for efficient RES systems.
- **Bulgarian Industrial Association** adds that some sectors, like metallurgy, face technical challenges that make a green transition difficult or impractical.

5. Best Practices Identified

- Examples include **shared RES parks** for multiple businesses, modern energy-saving equipment, and photovoltaic installations.
- Some SMEs are using advanced systems like hydrogen cells for cleaner combustion in diesel engines, while others meet 95% energy needs through solar panels.

6. Collaboration Potential in the Project

- All organizations see potential in **expert advisory services**, energy audits, planning of RES systems, technical assistance, and access to green financing.
- They suggest that a **comprehensive approach** including **energy audits** and **low-interest financing** would ease the transition for SMEs.

7. To-Be-Changed Issues Identified

- Emphasis on having installations built by experts to ensure efficiency in line with specific company needs (highlighted by the Mechatronics Cluster).
- Other organizations did not specify additional changes needed.

8. Other Important Issues

- **Plovdiv Chamber** and **ARK Consulting** emphasize the need for market liberalization to facilitate easier adoption of RES systems by SMEs.
- Suggested incentives include financing programs, grants, and technical assistance for constructing and maintaining RES systems, particularly for businesses with favorable conditions for green energy use.

12.17 Summary of Interviews with Energy-Intensive SMEs in Bosnia and Herzegovina

1. Sectors and Main Activities of the Companies

- **Diverse Industry Representation:** SMEs in Bosnia and Herzegovina are involved in a wide range of sectors, including textile manufacturing, fruit preservation, metal recycling, agriculture, construction, machining of metals, and herbal cultivation.
- **Key Activities:**
 - **Textile Industry:** Production and sale of various textiles, including polyester wadding and medical textiles.
 - **Agriculture and Plant Cultivation:** Organic berry production and cultivation of medicinal and aromatic plants.
 - **Metal and Construction Sectors:** Production and processing of metal structures, metal recycling, and construction.
 - **Machining of Metals:** Services related to metal processing and forging.
 - **Energy Usage:** Primarily dependent on electricity, with some use of solar energy and gas in specific cases.

2. Energy Usage and Transition Plans

- **Current Energy Sources:** Electricity is the primary energy source across all SMEs, with some incorporating renewable energy sources, such as solar energy, and a few using gas.
- Many companies aim to switch to renewable energy sources like solar panels and heat pumps.
- Investment in energy efficiency through building insulation, window replacement, and energy-efficient machinery is a common goal.
- Recycling of production waste for energy is also explored by a few companies, especially those in the manufacturing sector.

3. Good Practices Known for the Transition

- **Energy Efficiency and Modernization:** SMEs are adopting energy-efficient technologies and equipment, such as steam systems, cooling systems, and compressors, to reduce energy consumption.
- **Use of Renewable Energy:** Some SMEs are installing solar panels and heat pumps as part of their transition plans.
- Recycling waste as an energy source is also being practiced by certain companies to improve sustainability and reduce costs.

4. Barriers to Green Transition

- **Financial Constraints:** A common challenge is the lack of access to financial support and subsidies, which makes it difficult for SMEs to invest in the required technology and equipment for the green transition.
- High upfront costs for new energy-efficient machinery and renewable energy installations are also prohibitive.
- **Legislative and Bureaucratic Issues:** Complex legislation, lack of clear guidelines, and bureaucratic delays are significant obstacles.
- Some SMEs face issues with unreliable or non-transparent processes when seeking permits or funding for green initiatives.
- **Skills and Expertise Gaps:** There is a shortage of trained personnel and energy experts who can guide SMEs through the transition process.
- SMEs also struggle to find reliable contractors and implementation specialists for green energy projects.

5. Need and Type of Support

- **Financial Assistance:** SMEs need grants, subsidies, and simplified access to EU and global funds to afford the necessary investments.
 - Suggestions include tax reliefs and financial incentives specifically tailored for energy transition projects.
- **Information and Training:**
- SMEs require better information about available support options, as well as clear and accessible guidance on regulatory requirements.
- Training programs and the creation of transparent databases of suppliers and contractors would assist SMEs in making informed decisions.
- **Streamlined Processes:** Companies advocate for simpler, more transparent laws and processes that reduce bureaucratic obstacles, making the transition process more feasible.

6. Other Important Issues

- **Administrative and Financial Hurdles:** SMEs highlight a need for clearer information on the types of available support, as well as a simplified approach to accessing these resources.
- **Incentives for Independent Energy Generation:** Some SMEs express interest in achieving energy independence through the construction of renewable energy systems, but face barriers due to financial constraints and complex regulations.
- **Limited Awareness of Best Practices:** Companies also lack examples of best practices and practical case studies relevant to the Bosnian context, which would help in understanding the benefits and challenges of renewable energy adoption.

12.18 Summary of Interviews with Business Communities in Bosnia and Herzegovina

1. Main Activity and Goal of the Organizations

- **Chamber of Craft and Entrepreneurship of the Banja Luka Region:** Represents the interests of independent entrepreneurs in the Banja Luka region. Aims to promote entrepreneurship, strengthen competitiveness, and provide advisory assistance to entrepreneurs.
- **Chamber of Commerce and Industry of Republic of Srpska, Regional Chamber in Banja Luka:** Focuses on representing the economy, offering professional training, and issuing documents by competencies. Supports economic promotion and provides advisory services to large, medium, small, and micro enterprises.

2. View on SMEs' Behavior and Needs

- **Entrepreneurial Support:** The Chamber of Craft and Entrepreneurship works on improving entrepreneurial activities, encouraging competition, and harmonizing interests of SMEs, particularly independent entrepreneurs. The Chamber of Commerce and Industry reports that member companies face issues such as lack of financial, technological, and human resources, with an added burden from the global market crisis.
- **Participation in Activities:** Companies in the Chamber of Commerce participate actively in chamber activities, including board meetings, branch associations, and communication through digital platforms.

3. View of the Market

- **Challenges in the Market:** Both chambers report issues with the grey economy, unfair competition, and problematic legal regulations. The supplier market is changing, with a shift towards green suppliers driven by energy efficiency, production of green products, and regulatory changes.

4. Main Barriers to Transition for SMEs

- **Information and Knowledge Gaps:** Independent entrepreneurs lack sufficient information on green energy transition, which has led to slow adoption. Inadequate infrastructure for renewable energy production and distribution poses additional challenges.
- **Resource Constraints:** Many SMEs lack the necessary knowledge and capacity to adopt green energy solutions, and some are only in the early phases of considering energy transition strategies.

5. Best Practices Identified

- **Green Initiatives:** Successful examples include the installation of solar panels and biomass usage in smaller samples. Some members of the Chamber of Commerce have

implemented solar power plants, solar panels, hot water pumps, and are developing green products as part of their green initiatives.

6. Collaboration Potential in the Project

- **Interest in Advisory Services:** The Chamber of Craft and Entrepreneurship sees potential interest among some members for participation, though they have not specifically surveyed members for readiness. The Chamber of Commerce provides advisory services and may collaborate on projects to facilitate the green transition for interested companies.

7. Issues Identified for Change

- **Regulatory Framework and Infrastructure Support:** Both chambers emphasize the need to adjust the regulatory framework to better support renewable energy infrastructure. Government support through incentive tax policies, financial lines, and energy efficiency management systems would be beneficial.

8. Other Important Issues

- **Systematic Approach Needed:** The Chamber of Commerce highlights the importance of a systematic approach to the green energy transition, ensuring that policies and practices align with SMEs' needs.

12.19 Summary of Interviews with Energy-Related Suppliers in Bosnia and Herzegovina

1. Sector and Activity of the Company

- **MH Elektroprivreda of Republic of Srpska - MH ERS** Engages in the production, distribution, and supply of electricity, including trade activities within the electricity sector. Provides electricity to various users, including business entities and individuals.

2. Overview of the Market

- MH ERS is a public company operating in Bosnia and Herzegovina, specifically in the Republic of Srpska, and serves a significant role in the national electricity market.

3. Obstacles and Contributing Factors of the Green Transition

- The company faces challenges primarily due to financial constraints and complex procedural requirements, which hinder the green energy transition efforts.

4. Collaboration Potential in the Project

- MH ERS expresses a potential for collaboration, particularly highlighting the importance of easy access to financial resources as a critical enabler for participating in green transition initiatives.

12.20 Summary of Interviews with Energy Experts in Bosnia and Herzegovina

1. Sector and Main Services of the Expert/Company

- **Minela Isaković - GIZ Sector:** Provides technical assistance to institutions in Bosnia and Herzegovina (BiH). Main Services: Focuses on technical support in the energy sector, particularly in housing sector reconstruction and establishing energy communities for public institutions.

2. Service Specification

- GLZ assists in restructuring the housing sector, aiming to enhance energy efficiency. Additionally, they support the creation of energy communities within public institutions, fostering collective approaches to energy use and management.

3. Typical Customs of an SME's Transition

- Primarily focused on the residential sector and public facilities, with GLZ's efforts directed at supporting these sectors in transitioning toward energy-efficient practices.

4. Main Barriers to Transition

- A significant obstacle in the green energy transition is the **lack of knowledge and manpower**, limiting the capacity to implement energy efficiency projects.

12.21 Aggregated Summary of Interviews with Decision Makers in Bosnia and Herzegovina

1. Main Activity of the Organisations

- **Ministry of Energy and Mining of Republic of Srpska:** Focuses on legislative tasks, managing energy product-related departments, and overseeing energy production policies.
- **Environmental Protection and Energy Efficiency Fund of the Republic of Srpska:** Dedicated to environmental protection and energy efficiency, actively participating in projects and initiatives to promote sustainable energy use.

2. Jurisdiction of the Organisations

- **Ministry of Energy and Mining:** Adopts legal solutions that align with EU legislation, ensuring regulatory harmony with European standards.
- **Environmental Protection and Energy Efficiency Fund:** Participates in both international and local projects related to energy efficiency and renewable energy, overseeing the adoption of by-laws and monitoring the outcomes of energy efficiency action plans.

3. Regulatory Framework

- **Ministry of Energy and Mining:** Provides subsidies for green energy production, aiming to encourage the transition to sustainable energy sources.
- **Environmental Protection and Energy Efficiency Fund:** Supports the green energy goals for SMEs as part of a broader framework of agreements and declarations adopted by the Republic of Srpska.

4. Supportive Tools

- **Ministry of Energy and Mining:** No specific tools reported.
- **Environmental Protection and Energy Efficiency Fund:** Offers support specifically for SMEs, as evidenced by a dedicated public competition to enhance energy efficiency.

5. Main Barriers of the Transition at SMEs

- **Ministry of Energy and Mining:** Identifies continuous energy supply security and financial constraints as significant challenges for SMEs.
- **Environmental Protection and Energy Efficiency Fund:** Highlights limited financial support, insufficient expert capacity, and a lack of awareness as primary obstacles. Additionally, inadequate professional resources, including literature and staff, impede progress in energy efficiency.

6. Collaboration Potential in the Project

- **Ministry of Energy and Mining:** No specific collaboration potential noted.
- **Environmental Protection and Energy Efficiency Fund:** Plays a supportive role in preparing and guiding applicants for public competitions, indicating potential collaboration with SMEs seeking energy efficiency funding.

7. To-be-Changed Issues Identified

- **Ministry of Energy and Mining:** No issues specifically identified.
- **Environmental Protection and Energy Efficiency Fund:** Suggests that SMEs could benefit from accessible measures, such as energy management systems and behavioral changes to reduce consumption. The Fund also offers training programs and software solutions to help manage and monitor energy efficiency in SMEs.

8. Other Important Issues

- No additional issues were highlighted by either organisation.

12.22 Aggregated Summary of Interviews with Energy-Intensive SMEs in Austria

1. Sectors and Main Activities of Companies

- **Sonnentherme Lutzmannsburg-Frankenau GmbH:** Operates in the thermal baths and leisure sector, providing spa and relaxation services.
- **Wolf Nudeln GmbH:** Part of the food industry, focusing on pasta production for retail and wholesale.
- **Sonnenerde GmbH:** Engages in soil and substrate production, catering to various customer needs.

2. Usage and Plans for Energy Sources

- **Sonnentherme Lutzmannsburg-Frankenau GmbH:** Aims to reduce reliance on fossil fuels and manage energy cost fluctuations. Plans to implement a biomass energy concept, a photovoltaic (PV) system, and heat pumps with wastewater heat recovery over the coming years.
- **Wolf Nudeln GmbH:** Focuses on continuous optimization and runs a biogas plant for combined heat and electricity production.
- **Sonnenerde GmbH:** Has shifted from diesel to electric vehicles for tasks like loading and remains committed to environmental protection and energy efficiency improvements.

3. Good Practices for Energy Transition

- **Sonnentherme Lutzmannsburg-Frankenau GmbH:** Utilizes biomass heating and heat pumps with wastewater heat recovery in combination to enhance energy efficiency.
- **Wolf Nudeln GmbH:** Implemented a biogas plant and practices circular economy principles.
- **Sonnenerde GmbH:** Offers guided tours to demonstrate climate protection initiatives and inspire other businesses.

4. Barriers to Transition

- **Sonnentherme Lutzmannsburg-Frankenau GmbH:** Faces long administrative proceedings and an unclear regulatory situation, especially around elections.
- **Wolf Nudeln GmbH:** High investment costs, limited knowledge, difficulty comparing offers, and logistical challenges from heavy goods traffic.
- **Sonnenerde GmbH:** Struggles with a lack of price transparency for energy and finds bureaucratic and legislative processes cumbersome.

5. Needed Support

- **Sonnentherme Lutzmannsburg-Frankenau GmbH:** Suggests a labeling and database system for solution providers to facilitate easier access to reliable resources.
- **Wolf Nudeln GmbH:** Needs financial support, tax relief, low-interest loans, a clear legal framework, and a structured database of resources.
- **Sonnenerde GmbH:** Requires financial support, tax relief, and accessible examples of successful climate protection efforts to help shape their transition strategy.

6. Other Important Issues

- No additional issues were highlighted by the companies.

12.23 Aggregated Summary of Interviews with Energy-Related Suppliers in Austria

1. Sectors and Main Activities of Companies

- One supplier operates in the heat supply sector, specifically providing district heating.
- Another is involved in the production and distribution of district heating from biogenic fuels, supplying heat for private, commercial, and public buildings.

2. View of the Customers

- Customers often compare district heating costs to previous heating systems. Hesitancy exists due to supplier dependency and the high costs associated with system conversion. However, after understanding the benefits, such as reduced maintenance costs and lower electricity consumption, customers recognize the added value of district heating.
- For most customers, supply security and cost are prioritized over the origin of energy. New infrastructure for district heating presents challenges due to high administrative costs, and dependence on a single supplier is a concern.

3. Market Overview

- The subsidy landscape in the district heating market creates a near-monopoly, where district heating becomes the preferred option when technically

feasible, excluding other heating systems. Key players include energy wood suppliers and technical personnel.

- Another perspective highlights limited bargaining power in procurement due to small company size. The market features wood chip suppliers, energy companies, and technical providers. Demographic shifts, like increased vacancy rates, also impact sales in this sector.

4. Obstacles and Contributing Factors of the Green Transition

- Public understanding of green transformation remains limited, requiring more education. A thorough cost analysis of fossil fuels, including environmental impacts, could aid the transition. Additionally, there is no single technology that can fully achieve a green transformation.
- Scepticism, misinformation, and supplier dependency pose obstacles. Factors supporting the transition include local master plans for energy supply, increased CO₂ prices, mandatory grid connections for densification, and reduced particulate emissions.

5. Lessons from Past Activities

- Recommendations include utilizing all available opportunities to support SMEs in adopting green energy.
- Emphasis is placed on ensuring customer satisfaction and addressing misinformation about district heating, particularly regarding energy consumption and emissions benefits.

6. Collaboration Potential in the Project

- There is potential collaboration with local politics, newspapers, and local installers to raise awareness and support for the green transition.

7. Other Important Issues

- Transparency in the green transformation process is essential to engage the public and encourage participation.
- High-quality, clear communication, especially in rural areas, is vital for building credibility and support for district heating and green energy solutions.

12.24 Aggregated Summary of Interviews with Energy Experts in Austria

1. Sector and Main Services of the Experts

- Experts come from varied sectors, including energy technology training, industrial project development, and customized energy solutions for SMEs in sectors like food, tourism, and production.
- Their services range from practical student training projects to worldwide engineering services, product development, and energy concept development, focusing on efficiency and energy management.

2. Service Specification

- One expert focuses on guiding initial implementation and improvement for energy projects.
- Others emphasize self-developed methods that achieve energy efficiency gains in industrial settings, with one expert's work focusing on creating tailored energy concepts using advanced software and data from energy management systems. Energy audits are also conducted under Austrian legislation for energy efficiency.

3. Typical Customs of SMEs in Transition

- SMEs often implement popular measures seen in media or industry trends, driven primarily by business owners' motivation.
- Many SMEs develop their own technology projects but require professional support to proceed effectively.
- A significant challenge is companies' reluctance to change processes, often due to lack of awareness of long-term savings, with potential energy savings exceeding 50% through effective measures.

4. Main Barriers to the Transition

- Common barriers include lack of in-house expertise, high investment costs, and structural limitations such as space and building requirements.

- The political and regulatory framework can limit the feasibility of green transitions, and companies often face difficulties with implementation due to financial constraints and inadequate internal resources.
5. **Lessons Learned from Known Activities**
 - Key insights include the importance of raising awareness among SMEs about energy-saving behaviors and technology implementations like PV systems, biomass, and heat pumps.
 - Experts emphasize the value of honesty, transparency, and a goal-oriented approach tailored to each SME's needs, noting that many positive lessons have been drawn from customized development projects for SMEs.
 6. **Collaboration Potential in the Project**
 - Experts indicate openness to providing support through professional consultations and tailored energy solutions for interested companies, though collaboration specifics were not extensively discussed.
 7. **Other Important Issues**
 - The need for genuine engagement from companies is highlighted, as consulting services alone cannot drive the energy transition. Experts suggest a collaborative, transparent approach to encourage long-term changes that align with both financial and environmental goals.

12.25 Aggregated Summary of Interviews with Decision Makers in Austria

1. **Main Activity of the Organisation**
 - The primary role is as a local authority (municipality) involved in overseeing regional development, climate, and energy-related initiatives.

2. Jurisdiction of the Organisation

- The jurisdiction includes creating incentives (e.g., subsidies) and enacting regulations, such as zoning and development guidelines, to encourage energy efficiency and sustainable development.
- The municipality also focuses on citizen participation, public relations, and serves as a role model by establishing energy and climate protection concepts and promoting public transport.

3. Regulatory Framework

- Energy efficiency can be mandated within building guidelines. However, challenges include navigating complex regulations, bureaucracy, and a shortage of funds and resources.

4. Supportive Tools

- The municipality uses tools like informational newsletters, training sessions, and conferences to raise awareness. Additionally, they provide advice, leverage networks, and help establish contacts to facilitate energy transition efforts.

5. Main Barriers of the Transition at SMEs

- SMEs face low awareness about the importance of energy efficiency. The high upfront investment costs versus long-term lifecycle savings often deter them from adopting green measures.

6. Collaboration Potential in the Project

- Specific collaboration potential for this project was not identified in detail.

7. To-Be-Changed Issues Identified

- No specific changes were highlighted, though underlying issues of regulation and funding needs were implied.

8. Other Important Issues

- None were specified.

12.26 Aggregated Summary of Interviews with Business Communities in Austria

1. Main Activity of the Organisations

- The organisations cover various roles, including drinking water supply, economic growth support, business development, promotion of heat supplies from biomass, cross-community project funding, and representation of business interests in Burgenland.

2. Activities and Goals

- Goals range from ensuring drinking water supply to fostering economic growth, innovation, and support for regional SMEs and EPU (one-person businesses) through subsidies, technology transfer, environmental protection, and network development.

3. Views on SMEs (Behavior, Needs, Clusters)

- Common challenges for SMEs include high energy costs, a shortage of skilled labour, and bureaucracy. There is a trend towards green energy, driven by the need for compliance with regulations and a desire for modernization. However, financial constraints and limited resources often hinder progress.

4. View of the Market

- The market is significantly influenced by regulations, administrative requirements, and key players, such as the Chamber of Commerce, municipalities, and energy suppliers. There is a substantial demand for green solutions, yet current practices are influenced by EU taxonomy, supply chain laws, and resource conservation policies.

5. Main Barriers and Enablers of the Green Transition

- Obstacles include high costs, infrastructure limitations, bureaucratic challenges, and outdated attitudes toward green energy. Factors that support the transition include government subsidies, high funding rates, awareness initiatives, tax incentives, and the potential for improved branding through green certifications.

6. Best Practices Identified

- Best practices include grid connections for reliable energy, the use of heat recovery technologies, circular economy practices, energy management systems, and sustainable construction. Businesses also highlight personal initiatives and openness to new technologies as essential to successful transitions.

7. Collaboration Potential in the Project

- Potential collaborations include connections to political decision-makers and the provision of networks to facilitate further research and support for SMEs.

8. Other Important Issues

- There is a preference for incentives over prohibitive regulations to encourage green initiatives, fostering a more motivating environment for SMEs to adopt sustainable practices. Some sectors have seen the emergence of ESG (Environmental, Social, Governance) managers, emphasizing the growing importance of sustainability in business strategies.

Here's the aggregated version of the two suppliers into a concise summary for each section:

12.27 Summary of Interviews with Energy-Related Suppliers in Czech Republic

1. Sectors and Activities of the Companies

- Both suppliers are active in energy-related services, including energy audits, calculations, and sustainable design. They also address specific areas like heat islands and energy efficiency in buildings. Supplier 1 focuses on audits and projections, while Supplier 2 additionally works on municipal energy strategies, sustainable building certification, and urban heat island mitigation using advanced modeling and data analysis.

2. Activities of the Companies

- The suppliers are involved in energy auditing, design, and advisory services. Supplier 1 emphasizes audits and calculations, while Supplier 2 incorporates broader activities, such as strategic energy planning and sustainable construction.

3. View of the Customers

- Both suppliers highlight challenges related to time constraints in project implementation. Customers often face delays due to complex processes, dynamic market conditions, and workforce limitations. Additionally, customers seeking subsidies rely heavily on these suppliers to navigate the lengthy and intricate approval and implementation phases, which can take up to two years.

4. Overview of the Market

- Neither supplier provided substantial insights into the overall market context.

5. Obstacles and Contributing Factors to the Green Transition

- The green transition is hindered by time-intensive processes and lengthy subsidy-related procedures, which involve multiple steps that cannot easily be accelerated. Both suppliers stress that project delays and the challenge of finding suitable contractors are key barriers.

6. Lessons from Past Activities

- Past projects reveal that energy audits and related activities are generally successful when properly managed. Supplier 2 highlights the legal requirement for audits every 4 years (or 2 years for significant energy use changes), with audits targeting a minimum 10% energy savings. Tailored recommendations based on client priorities are key to achieving these outcomes.

7. Collaboration Potential in the Project

- No direct collaboration opportunities were identified during the interviews.

8. Other Important Issues

- Energy audits remain a critical tool for achieving energy savings, while energy consultation centers (EKIS) serve as valuable platforms for providing advice and promoting energy efficiency, particularly for residential customers.

12.28 Summary of Interviews with Energy-Intensive SMEs in the Czech Republic

1. Sectors and Main Activities of the Companies

The SMEs represent diverse sectors: manufacturing of mycelium-based products (SME 1), alcohol production (SME 2), and education and entertainment as a science center for families (SME 3).

2. Usage and Plans for Energy Sources

All three SMEs rely on electricity and gas for their operations. Their primary focus is on reducing energy costs, though financial resources are needed to implement any meaningful changes. SME 3 has even resorted to partial closures, such as shutting down elevators, to save energy during the recent crisis.

3. Good Practices Known for the Transition

Most SMEs have no significant examples of green practices. However, SME 3 has expressed an interest in adopting solar panels and wind turbines to transition to renewable energy, though this is currently limited by financial constraints.

4. Barriers to the Transition

All SMEs face similar challenges, including:

- Financial limitations.
- A shortage of skilled personnel and experts.
- Legislative and bureaucratic obstacles.

5. Needs and Type of Support

The SMEs require substantial support to facilitate the energy transition, including:

- Financial assistance (EU funds, government sponsorship).
- Expert support and consultancy.
- Clearer processes and guidance for transitioning.

6. Other Important Issues

The SMEs emphasized the need for a clear understanding of available processes, support mechanisms, and best practices for transitioning to sustainable energy. For SME 3, financial challenges dominate their immediate concerns.

12.29 Summary of Interviews with Energy Experts in the Czech Republic

1. Sectors and Main Activities of the Experts

The experts represent a range of sectors related to energy efficiency and green transitions:

- Development and research in environmentally friendly and energy-efficient buildings.
- Legal expertise in green finance, public affairs, and low-carbon energy transitions.
- Solar energy installation and efficiency calculations.
- Consulting for startups and SMEs, with a focus on sustainability and leading by example through the Impact Hub network.

2. Main Services

The experts provide services such as:

- Comprehensive support for sustainable and energy-efficient building projects, including design, optimization, and certification (Expert 1).
- Legal consulting for energy purchase agreements and corporate responsibility (Expert 2).
- Solar panel services, including installation, audits, and revisions (Expert 3).
- Consulting and guidance for startups and SMEs on adopting sustainable practices (Expert 4)

3. Typical Support for SME Transition

- Support for municipalities and community energy solutions Legal advice and support for SMEs in transitioning to low-carbon energy Efficiency calculations and guidance for local SMEs and authorities. General advice and sustainable environment building under the Impact Hub network.

4. Main Barriers to the Transition

All experts emphasized key barriers to SME energy transition, including:

- Lack of information, uniform methodologies, and state financial support (Experts 1 and 2).
- Financial constraints, limited motivation, and poor access to data for assessing potential profits (Experts 3 and 4).

5. Collaboration Potential in the Project

- Experts 1 and 2 highlighted the importance of long-term price guarantees, centralizing information, and improving infrastructure.
- Experts 3 and 4 noted limited collaboration potential due to resource and knowledge gaps.

6. Lessons Learned

- Projects like **SBToolCZ** and **Water in the City** demonstrate successful approaches to sustainability (Expert 1).
- Other experts did not specify notable lessons from past activities.

7. Other Important Issues

- Expert 2 noted cooperation with UKEN, an umbrella organization promoting community energy.
- Expert 4 highlighted the lack of SME awareness about available opportunities and emphasized the role of banks in providing transition funding programs, presenting untapped potential for lending and investment.

12.30 Summary of Interviews with Energy-Intensive SMEs in the Czech Republic

1. Sectors and Main Activities of the Companies

The companies operate in diverse sectors, including manufacturing of mycelium-based products, alcohol production, and educational services through a science-focused fun park for families and children.

2. Usage and Plans for Energy Sources

The companies primarily use electricity and gas as energy sources. All aim to reduce energy costs, with some having taken drastic measures, such as shutting down parts of their operations during the energy crisis, to save on energy expenses.

3. Good Practices Known for the Transition

Good practices are limited. One company is exploring the use of solar panels and wind turbines, though progress is hindered by financial constraints.

4. Barriers to the Transition

The main barriers to transitioning include:

- Financial constraints.
- Shortages of skilled personnel and experts.
- Legislative and bureaucratic obstacles.

5. Needs and Type of Support

The companies require the following types of support to facilitate their transition:

- Financial assistance through EU funds and government sponsorship.
- Expert guidance and consultancy.
- Clearer understanding of processes and available support mechanisms.

6. Other Important Issues

A lack of financial resources remains a critical issue, alongside the need for clear processes, information, and guidance to enable the transition.

12.31 Summary of Interviews with Decision-Makers in the Czech Republic

1. Main Activities of the Organizations

The organizations are involved in supporting sustainable energy initiatives and providing advisory services:

- Linking public administration and municipalities with the EU's sustainable energy strategies.
- Offering consultancy and information services on innovation, grant opportunities, energy financing, corporate social responsibility (CSR), and gender equality.
- Organizing local initiatives, such as CSR awards, and supporting project activities to drive sustainable development.

2. Jurisdiction and Roles

Both organizations play a supporting role rather than a regulatory one:

- Providing expertise on energy performance, climate action plans, and promoting green energy initiatives.
- Supporting local action groups and mayors in implementing energy solutions.
- Facilitating partnerships and providing consultancy on energy efficiency and innovation.

3. Regulatory Framework

Their primary role is to share good practices, inform stakeholders about upcoming energy efficiency legislation, and cooperate with innovators and local leaders to promote energy transition. Efforts also include spreading awareness among municipalities and businesses on energy-efficient solutions.

4. Supportive Tools

Supp

ort mechanisms provided include:

- Regulatory instruments and energy audits.
- Developing energy communities and financing experts for green projects.
- Promoting the idea of green energy through partnerships with companies, municipalities, and small businesses.
- Highlighting innovative solutions, such as energy vouchers for audits or novel insulation technologies.

5. Main Barriers to the Transition at SMEs

Key challenges for SMEs include:

- High acquisition and operational costs.
- Limited financial resources.
- Lack of knowledge and technical expertise for transitioning to green energy.

6. Collaboration Potential in the Project

Both organizations expressed willingness to collaborate on projects that support green energy transitions.

7. To-Be-Changed Issues Identified

- A comprehensive document with detailed information to guide SMEs in their transition to green energy.
- The need for better funding mechanisms from the state and more regional-level financial tools.

8. Other Important Issues

- Best practices are collected to share innovative solutions, such as energy-efficient insulation for historic buildings.
- Collaboration with the Ministry of Education and Culture to develop RIS3 strategies and financial instruments like energy vouchers to subsidize energy audits and proposed solutions.
- Efforts to expand these tools, such as energy vouchers, to other regions.

12.32 Summary of Interviews with Energy-Intensive SMEs in Slovenia

1. Sectors and Main Activities of the Companies

The companies represent a variety of industries, including:

- Carpentry and roof construction.
- Mechanical engineering.
- Social and healthcare services.
- Winemaking and agriculture.
- Food service and catering.
- Metalworking and welding.

2. Usage and Plans for Energy Sources

Energy costs vary across businesses, typically representing 6-25% of total operational expenses. Key insights include:

- Most companies have faced rising energy costs over the past three years, largely due to market volatility and the global energy crisis.
- Some companies actively produce renewable energy through solar and geothermal sources, while others aim to incorporate renewables in their future plans.
- Energy audits are conducted by some businesses, and the suggestions have been partially implemented to improve energy efficiency.

3. Good Practices Known for the Transition

Good practices are limited:

- Most companies lack specific examples of successful green transitions within their operations or their industry.
- One company cited examples of practices observed in Austrian companies but has not implemented them yet.

4. Barriers to the Transition

The main barriers to transitioning to green energy include:

- High costs and substantial financial investments required for new equipment and technology.
- A lack of qualified personnel to manage and implement green initiatives.
- Complex and non-transparent financial support mechanisms, making it challenging to secure necessary funding.
- Insufficient guidance and clear instructions on the transition process.
- Regulatory obstacles, particularly for renewable energy installations in densely populated areas.

5. Needs and Type of Support

The companies emphasized the need for:

- Increased financial support, including government subsidies and EU-funded grants.
- Simplified processes for accessing funds and implementing green technologies.
- Specific programs tailored for SMEs in agriculture, manufacturing, and other sectors.

6. Other Important Issues

- Some companies expressed difficulties in navigating the vast amount of information available online about green energy regulations and tools, finding it overwhelming and unclear.
- A lack of awareness and familiarity with regulatory requirements and energy transition support tools limits progress.

12.33 Summary of Interviews with Energy Experts in Slovenia

1. Sectors and Main Services of the Experts

The experts work primarily in energy consulting, regulation, and implementation of sustainable energy practices:

- **Energy Consulting and Rehabilitation Projects:** Management of energy audits, local energy concepts, energy certificates, and studies related to energy efficiency.
- **Energy Monitoring:** Services like energy bookkeeping, monitoring in public buildings, and energy rehabilitation projects.
- **Renewable Energy Projects:** Preparation and implementation of renewable energy solutions.

2. Service Specification

The services are aimed at supporting municipalities, businesses, and individuals to:

- Reduce energy consumption.
- Lower carbon emissions.
- Transition to sustainable energy sources.
- Increase energy self-sufficiency, particularly in local regions.

3. Typical Customs of an SME's Transition

The typical transition journey for SMEs includes:

- Comprehensive consulting and planning services for energy projects.
- Implementation of energy management practices, such as energy bookkeeping and audits.
- Accessing grants, tenders, and financial resources.
- Facilitating networking opportunities between SMEs, municipalities, and other stakeholders to encourage collaboration and knowledge sharing.

4. Main Barriers to the Transition

The most common barriers identified for SMEs include:

- Financial constraints limiting investments in sustainable technologies.
- Dependence on relatively cheap fossil fuels and energy price volatility.
- Lack of technical expertise and know-how to implement renewable energy solutions.
- Challenges in long-term planning due to fluctuating market prices and regulatory complexities.

5. Collaboration Potential in Projects

- Some experts indicated collaboration potential in projects with specific companies or international partners.
- Networking and cooperation across regions were emphasized as valuable tools for advancing energy transition goals.

6. Lessons Learned from Known Activities

- Successful energy transitions are often rooted in rigorous planning, effective implementation of renewable energy solutions, and proactive emission reduction strategies.
- Failures tend to arise from poor initial planning, insufficient funding, or an underestimation of regulatory and technical challenges.
- Fluctuations in global markets and national regulations can limit the financial benefits of transitioning from fossil fuels to alternatives like biomass boilers.

12.34 Summary of Interviews with Decision-Makers in Slovenia

1. Main Activities of the Organization

The organization focuses on energy-related initiatives, operating within a multi-level governance structure that combines local autonomy, regional cooperation, and national oversight.

2. Jurisdiction of the Organization

The municipality's responsibilities encompass a wide range of administrative, legal, and service-related functions, all aimed at enhancing the quality of life for residents while addressing energy-related priorities

3. Regulatory Framework

There is no specific regulatory plan identified for SMEs in the industrial sector regarding energy efficiency. However, various regulatory plans and initiatives exist to promote energy efficiency in general.

4. Supportive Tools

Subsidies and grants are available for energy audits, enabling companies to hire experts and receive guidance on energy efficiency. However, the available financial support is limited in scope.

5. Main Barriers to the Transition at SMEs

The municipality identified the high start-up costs of investing in sustainable technologies and infrastructure as the primary barrier for SMEs transitioning to green energy solutions.

6. Collaboration Potential in the Project

No specific information was provided regarding collaboration potential in this project.

7. To-Be-Changed Issues Identified

No specific issues were highlighted as needing change.

12.35 Summary of Interviews with Business Representative in Slovenia

1. Main Activities of the Organization

The organization represents the interests of the economy, focusing on creating competitive conditions to support business growth and development in the Podravje region and beyond.

2. Goals of the Organization

The primary goal is to foster a supportive business environment by:

- Enhancing the competitiveness of businesses.
- Connecting SMEs with resources, partners, and opportunities.
- Organizing events and providing technical assistance for accessing public funds and expanding networks.

3. View on SMEs

The organization actively supports SMEs by:

- Offering consulting, training, and technical assistance.
- Facilitating networking and joint selling opportunities.
- Providing access to resources like research and data.
- Addressing financial challenges by organizing events to help SMEs find public funding.

4. View of the Market

The organization operates at local, national, and international levels. It considers the competitiveness of its businesses to be strong due to its robust support network and strategic initiatives tailored to SMEs.

5. Main Barriers to the Transition for SMEs

Key obstacles for SMEs in transitioning to green energy include:

- Financial constraints and difficulties in securing funding.
- Regulatory complexities and challenges in implementing green energy solutions. The organization emphasizes the importance of:
- Public education and awareness about green energy benefits.
- Legislative reforms to encourage and simplify the use of renewable energy.
- Consulting and technical support services to assist SMEs in adopting green practices.

6. Best Practices Identified

The organization has observed successful practices among SMEs, such as:

- Building low-energy facilities.
- Modernizing processes to improve energy efficiency.
- Implementing energy management systems.
- Producing hydrogen as an energy source. Challenges remain for larger projects, which face funding gaps and regulatory hurdles, often leading to delays and setbacks.

7. Collaboration Potential in the Project

The organization suggested a specific company as a potential collaborator.

Annex 2 - Summary of the desktop research

12.36 Renewable Energy Landscape in Austria

12.36.1 Overview of Renewable Energy Integration

Austria's energy consumption in 2022 was approximately 1,060 PJ, with nearly 40% sourced from renewables. This is higher than the EU average, largely due to substantial contributions from hydropower and biogenic energy. However, fossil fuels still account for 60% of energy use, with gas and oil dominant. In Burgenland, renewable sources cover all electricity needs. Detailed data indicate that Austria's energy production is largely renewable-based, with biogenic energy accounting for 50%, followed by hydropower at 25%. Solar energy's role remains small, comprising around 3% of production. Burgenland, which consumes 35 PJ of energy, relies significantly on biogenic and wind energy, while solar and ambient heat remain marginal contributors.

12.36.2 Key Findings and Comparative Analysis

Austria performs above the EU average in renewable energy adoption, particularly in wind and biogenic energy. The transition to renewables has significantly reduced greenhouse gas emissions, with Burgenland emitting 2.3% of Austria's total 77.5 million tons of CO₂-equivalent. The transportation sector is the largest emitter, responsible for 45% of GHG emissions, followed by buildings (20%), industry (13%), and agriculture (13%).

12.36.3 Regional Profiles and Insights

Each region has unique energy profiles, with Burgenland leading in renewables, featuring 42% wind and 49% biomass. This region provides a model for other Austrian regions and neighboring countries due to its renewable-driven electricity autonomy.

12.36.4 Investment Trends and Behavioral Patterns

Around 53% of SMEs are actively working to reduce their carbon footprints due to high energy costs and incentives, surpassing the EU average of 24%. Costs are a strong motivator, with six out of ten companies listing energy prices as a significant challenge. In Burgenland, SMEs consume 21,147 TJ, of which 11.4% is renewable. Renewable consumption in the region highlights the emphasis on sustainability among local enterprises.

12.37 Renewable Energy Landscape in Bosnia and Herzegovina

12.37.1 Overview of Renewable Energy Integration

In Bosnia and Herzegovina, the Republic of Srpska stands out due to its substantial hydropower resources, with renewable energy comprising 49.8% of gross electricity consumption in 2019. The high share of renewables, notably hydropower, places Srpska among the top countries in renewable energy adoption within the EU. Investments have targeted hydropower, with additional focus on solar and wind, reflecting the region's growing commitment to sustainable development.

12.37.2 Key Findings and Comparative Analysis

While hydropower is dominant, Bosnia lags in adopting other renewables like wind and solar. Herzegovina's solar potential is considerable due to favorable climate conditions, while

Srpska has untapped wind resources. Bosnia's reliance on large hydropower, however, limits flexibility and innovation in other renewables.

12.37.3 Regional Profiles and Insights

Herzegovina is emerging as a solar hub, with climate conditions ideal for solar investments. Meanwhile, Srpska's resources include both hydro and potential wind, although infrastructure for these resources is underdeveloped, pointing to significant future opportunities if investments in regional infrastructure are prioritized.

12.37.4 Investment Trends and Behavioral Patterns

Investment trends from 2013 to 2022 show a steady increase in renewable projects, with a focus on energy efficiency, equipment modernization, and educational campaigns aimed at energy reduction. The Environmental Protection Fund and the EU's EENergy project offer financial support, emphasizing SMEs as key participants in the energy transition.

12.38 Renewable Energy Landscape in Bulgaria

12.38.1 Overview of Renewable Energy Integration

Bulgaria achieved a 23% renewable energy share in 2022, exceeding its EU target, though coal remains a dominant energy source, accounting for 52.3% of electricity. Solar and biomass are prominent renewable sources, with new regulations promoting further integration and expansion.

12.38.2 Key Findings and Comparative Analysis

Bulgaria's energy landscape reflects a strong push towards solar, particularly in South-West and South-Central regions where solar capacity has increased. Compared to other EU countries, Bulgaria shows rapid progress in solar but limited wind development due to infrastructural constraints.

12.38.3 Regional Profiles and Insights

The South-West and South-Central regions are Bulgaria's renewable hubs, with Sofia leading in renewable investments. The regulatory landscape has shifted, simplifying procedures for small and medium-sized installations, and attracting foreign investment in solar projects.

12.38.4 Investment Trends and Behavioral Patterns

Despite recent progress, market saturation and bureaucratic delays have slowed the entry of new renewable companies. However, the amendments to the Energy Act in 2023 provide incentives for storage solutions and energy communities, making renewable energy projects more accessible for SMEs.

12.39 Renewable Energy Landscape in the Czech Republic

12.39.1 Overview of Renewable Energy Integration

The Czech Republic achieved its EU 2020 target early, reaching 18.2% renewable consumption by 2022. However, fossil fuels still dominate, particularly coal and nuclear energy. The government has implemented simplified regulations for renewable installations, especially solar, which has fostered growth among SMEs interested in renewables.

12.39.2 Key Findings and Comparative Analysis

Czechia's reliance on coal and nuclear energy makes it one of the EU's more fossil fuel-dependent countries. Recent initiatives like the "New Green Savings" and EU-funded programs aim to support renewable projects and increase renewable consumption through streamlined processes.

12.39.3 Regional Profiles and Insights

Moravia and South Bohemia lead in renewable adoption, primarily through solar and biomass projects supported by local agencies. The regional focus highlights solar as a key renewable resource in the country.

12.39.4 Investment Trends and Behavioral Patterns

Czech SMEs are increasingly interested in renewables, despite high initial costs and administrative complexities. Programs such as the Modernization Fund and Operational Program Environment offer financial support, although subsidy awareness among SMEs is relatively low.

12.40 Renewable Energy Landscape in Germany (Bavaria)

12.40.1 Overview of Renewable Energy Integration

Germany's renewable share in 2023 reached 22% of total energy and 52% in electricity production, with Bavaria sourcing 59% of its electricity from renewables, primarily biomass and solar. The German government's goal is 600 TWh of renewable electricity by 2030, driven by solar and wind expansions.

12.40.2 Key Findings and Comparative Analysis

Germany's renewable capacity is one of the highest in Europe, with 149.8 GW in 2022. Bavaria, distinct in its renewable approach, relies heavily on biomass and faces diversification challenges due to limited wind resources.

12.40.3 Regional Profiles and Insights

Bavaria focuses on biomass and distributed rooftop PV, supporting its energy-intensive manufacturing sector. Federal and Bavarian subsidies aim to support renewable energy initiatives and energy-intensive SMEs in the region.

12.40.4 Investment Trends and Behavioral Patterns

Subsidies for energy efficiency have fostered investments among SMEs, with programs like BEEN-i and Bavarian Regional Funding (BRF) promoting rural and SME-focused energy efficiency. CO₂ emissions in Bavaria decreased by 9.9%, largely due to efficiency gains in energy conversion.

12.41 Renewable Energy Landscape in Hungary

12.41.1 Overview of Renewable Energy Integration

Hungary's renewable energy sector is led by biomass and solar PV, comprising 14.1% of consumption in 2022. Solar capacity has expanded significantly, with goals to reach 12 GW by 2030, although wind energy has stagnated due to regulatory constraints.

12.41.2 Key Findings and Comparative Analysis

Hungary's renewable adoption is modest relative to the EU, with solar and biomass leading the way. Although wind energy is limited, regulatory adjustments are underway to boost its growth in the coming years.

12.41.3 Regional Profiles and Insights

Solar is predominant in urban and rural areas, while biomass supports rural heating and job creation. Some countries benefit from EU support for transitioning from fossil fuels to renewable sources.

12.41.4 Investment Trends and Behavioral Patterns

Hungarian SMEs face high energy costs, prompting energy efficiency measures. Programs such as the SME Energy Cost and Investment Support Programme offer financial relief, although access to non-repayable grants remains a priority.

12.42 Renewable Energy Landscape in Slovakia

12.42.1 Overview of Renewable Energy Integration

Slovakia's renewable energy landscape is led by hydropower, contributing over two-thirds of the total installed renewable capacity. Bioenergy and solar PV are also growing, although wind and geothermal are less developed due to infrastructural limitations.

12.42.2 Key Findings and Comparative Analysis

Compared to other EU countries, Slovakia's renewable energy growth has been slower, hindered by regulatory restrictions and reliance on biomass and hydropower. Hydropower's role in the energy landscape has increased gradually, with small hydro plants making notable contributions.

12.42.3 Regional Profiles and Insights

Solar PV and biomass have limited regional diversity, with hydropower prevailing across Slovakia. The government's goals to diversify energy sources focus on expanding biomass and small hydro projects in rural areas.

12.42.4 Investment Trends and Behavioral Patterns

Slovakia's green transition relies on programs like the Green Business Program and Just Transition Fund, although bureaucratic delays continue to affect renewable project timelines. The estimated investment requirement to meet 2030 targets is EUR 4.3 billion.

12.43 Renewable Energy Landscape in Slovenia

12.44 Overview of Renewable Energy Integration

Slovenia's NECP targets a 36% reduction in greenhouse gases, with a 27% renewable share by 2030. The current renewable share is 23%, primarily hydropower-dependent, although solar capacity expanded by 49% in 2022 due to self-supply initiatives.

12.45 Key Findings and Comparative Analysis

Hydropower and biomass dominate Slovenia's renewables, but slow uptake in wind and solar limits progress. Transport lags in renewable integration, while incentives for solar self-supply are proving successful.

12.45.1 Regional Profiles and Insights

Hydropower plants on major rivers supply most renewable electricity, while solar is expanding in urban areas. Biomass is vital in rural energy, with geothermal energy focused regionally in Spodnje Podravje.

12.45.2 Investment Trends and Behavioral Patterns

High energy prices have driven SMEs to invest in renewables, although initial costs and regulatory issues pose barriers. Support programs like the Eco Fund provide loans and grants, while storage limits and grid constraints remain challenges.

12.46 Green Energy Support Measures

12.46.1 Green Energy Support Measures in Austria

Austria provides extensive support for SMEs through national and EU-backed programs to encourage renewable energy adoption and efficiency improvements. The klimaaktiv initiative and the "Raus aus Öl und Gas" program offer targeted assistance for renewable installations, particularly beneficial for SMEs. These programs help reduce fossil fuel dependency by providing subsidies for converting heating systems and adopting renewable technologies. The Austrian Energy Agency manages a database of subsidies to simplify SME access to funding options, supplemented by financing from EIB and UniCredit.

The government has introduced a range of incentives, including ÖROK and klimaaktiv, focusing on heating and insulation upgrades, which are essential for the extensive SME base, especially those aiming to achieve carbon neutrality. Burgenland, specifically, has seen significant support, with 55.8% of its final energy consumption covered by renewables due to the region's emphasis on wind and biogenic energy.

12.46.2 Green Energy Support Measures in Bosnia and Herzegovina

In Bosnia and Herzegovina, the Republic of Srpska provides several green energy support measures for SMEs, primarily through the Fund for Environmental Protection and Energy Efficiency. This fund finances a range of energy efficiency and renewable energy initiatives, including public competitions for grants aimed at increasing energy efficiency in small and medium-sized businesses. In 2024, the Fund allocated a substantial budget to improve energy efficiency in vulnerable businesses affected by energy crises, supported by EU budget contributions.

International initiatives such as EU4Energy and EENergy also contribute significant funding, with the latter providing €9 million across 900+ grants for SMEs in the Western Balkans. Additionally, the SMEnergy project, part of the Interreg Danube Regional Program, aims to create support networks for energy-intensive SMEs by offering knowledge transfer and planning tools to facilitate renewable energy adoption.

12.46.3 Green Energy Support Measures in Bulgaria

Bulgaria has introduced several regulatory and financial support measures aimed at fostering SME renewable integration. Recent amendments to the Energy Act and RES Act in 2023 simplify project approvals, specifically for small and medium-sized renewable installations. Programs such as Structural Funds schemes and the EENergy project provide financial grants, particularly beneficial for SMEs engaging in energy efficiency upgrades.

Bulgaria's National Resilience and Recovery Plan (NRRP) focuses on funding energy efficiency improvements and renewable projects. SMEs involved in solar, biomass, and energy storage projects receive targeted incentives, including streamlined grid connections for faster

renewable integration. Additionally, the Renewable Energy Support Scheme supports smaller-scale projects and community-based renewable energy initiatives.

12.46.4 Green Energy Support Measures in the Czech Republic

The Czech Republic offers various renewable energy support programs for SMEs, including the New Green Savings Program, which subsidizes up to 65% of costs for renewable installations like PV systems. The Operational Program Technology and Applications for Competitiveness (OPTAK) also provides grants and loans for SME energy efficiency improvements, backed by EU Recovery and Resilience Facility (RRF) funds.

Amendments to the Energy Act have removed permit requirements for solar installations below 50 kW, lowering entry barriers for SMEs. The National Recovery Plan dedicates substantial resources to support renewable initiatives, making solar installations more accessible to smaller businesses. Further, the Operational Program Environment offers subsidies specifically for renewable energy and efficiency projects, highlighting the government's commitment to helping SMEs transition to greener energy sources.

12.46.5 Green Energy Support Measures in Germany (Bavaria)

Germany offers extensive support for SMEs adopting renewable energy, with Bavaria benefiting from both federal and regional programs. The Federal Funding for Energy and Resource Efficiency covers up to 60% of renewable heating costs and up to 25% for energy-efficient machinery, targeting SMEs. Bavaria's own Bavarian Regional Funding (BRF) adds a 5% bonus for rural energy efficiency improvements.

Bavaria's Energy Efficiency Networks, such as BEEN-i, promote collaborative energy goals among SMEs, allowing businesses to pool resources for energy-saving initiatives. These programs are particularly effective in energy-intensive sectors like manufacturing, where subsidies support efficiency upgrades and resilience-building against energy price fluctuations. Additionally, Eco-Energy Advice Centers provide tailored assistance to SMEs, further enhancing the region's focus on renewable adoption.

12.46.6 Green Energy Support Measures in Hungary

Hungary's Green National Champions Programme dedicates €55 million to green technology investments, particularly in renewable heating, biomass, and solar PV. The SME Energy Cost and Investment Support Programme also provides relief for energy-intensive SMEs, allocating €25 million annually to offset high energy costs and fund efficiency improvements.

Additional support through the MFB Corporate Energy Efficiency Loan program, worth €100 million, finances SME building retrofits and renewable installations. The GINOP Plus program, which includes the Technology Shift Support Programme and Hungarian Multi Programme, has offered substantial funds to boost SME green technology adoption and R&D efforts, positioning Hungarian SMEs favorably for renewable expansion.

12.46.7 Green Energy Support Measures in Slovakia

Slovakia's primary support initiatives for SME renewable energy projects include the Green Business Program, offering up to €70,000 for renewable installations, and the State Aid Scheme, which dedicates €20 million annually to biomass and hydropower projects. The Slovakia 21-27 Program provides broader support for SMEs investing in renewables across various sectors.

Subsidy programs emphasize rural SME projects, with grants and low-interest loans designed to foster regional energy independence. However, bureaucratic delays remain a challenge. The Just Transition Fund offers additional support for energy-intensive sectors in central Slovakia to assist in transitioning from fossil fuel dependency.

12.46.8 Green Energy Support Measures in Slovenia

Slovenia's Eco Fund offers both loans and grants for renewable energy projects, with the Renewable Energy Support Scheme specifically targeting solar and biomass projects suitable for SMEs. Slovenia also benefits from the EU Cohesion Fund, which provides substantial backing for renewable adoption and efficiency upgrades among SMEs, particularly those impacted by high energy costs.

The Energy Advisory Services program offers SMEs guidance on navigating green technology adoption and finding suitable funding. In addition, incentives for solar self-supply and small-scale storage solutions are tailored to enhance SME resilience, particularly in regions with limited grid capacity.

13 Challenges in the Energy Transition for SMEs

13.1 Challenges in the Energy Transition for SMEs in Austria

13.1.1 Joint Challenges Across Regions

Austrian SMEs face several common obstacles in the transition to renewable energy, including high initial costs, complex administrative requirements, and dependency on fossil fuels. Administrative hurdles, especially related to grid connection permits and renewable energy installations, slow down adoption rates among SMEs.

13.1.2 Specific Challenges in Austria

High energy costs pose a particular challenge for Austrian SMEs, impacting competitiveness, especially among smaller firms with limited resources. Additionally, outdated infrastructure and the need for costly retrofits are significant barriers. Sectors like transportation and manufacturing face unique challenges due to their high fossil fuel reliance, making the transition to renewables more complex and expensive.

13.1.3 Infrastructure and Knowledge Gaps

Austrian infrastructure limitations, including grid flexibility and capacity issues, hinder rapid renewable energy adoption. In rural areas, lack of knowledge on available subsidies and uniform standards also limits SMEs from maximizing green energy use.

13.2 Challenges in the Energy Transition for SMEs in Bosnia and Herzegovina

13.2.1 Joint Challenges Across Regions

SMEs in Bosnia and Herzegovina face regulatory complexities and high upfront investment costs for renewable projects. Inconsistent enforcement of energy policies across regions further complicates the green transition, deterring smaller businesses from fully engaging in renewable energy projects.

13.2.2 Specific Challenges in Bosnia and Herzegovina

In the Republic of Srpska, limited grid capacity for small-scale renewable energy installations and a shortage of technical support create barriers. Additionally, the lack of financing options restricts renewable adoption, especially for businesses in remote or less economically developed areas.

13.2.3 Infrastructure and Knowledge Gaps

The SME sector's limited awareness of funding opportunities and green initiatives hampers adoption rates. Educational campaigns and capacity-building efforts are often limited, resulting in an overall low level of renewable energy knowledge among SMEs.

13.3 Challenges in the Energy Transition for SMEs in Bulgaria

13.3.1 Joint Challenges Across Regions

Bulgarian SMEs encounter significant financial constraints and regulatory complexities, especially regarding grid access and renewable permits. The dependence on coal as a

primary energy source slows the green transition, with renewable options like wind and solar still facing bureaucratic obstacles.

13.3.2 Specific Challenges in Bulgaria

The renewable energy sector struggles with limited access to funding, and energy prices are volatile because of the coal dependency of energy production in Bulgaria, impacting SME stability. The renewable energy adoption by SMEs is further hindered by limited infrastructure, as well as regulatory barriers that complicate project development.

13.3.3 Infrastructure and Knowledge Gaps

A significant knowledge gap exists, with many SMEs unaware of available subsidies or technological options for renewable energy. Bulgaria's grid infrastructure requires upgrades to support small-scale renewable installations, and more educational programs are needed to empower SMEs.

13.4 Challenges in the Energy Transition for SMEs in the Czech Republic

13.4.1 Joint Challenges Across Regions

High initial investment costs, coupled with a lengthy and complex regulatory approval process, pose significant challenges for Czech SMEs in the renewable sector. Legislative requirements, particularly for projects above 50 kW, create additional delays for SMEs.

13.4.2 Specific Challenges in the Czech Republic

Energy costs and grid capacity limits are specific challenges, especially for SMEs in rural areas where grid modernization is still lacking. The Czech reliance on coal also hampers the adoption of cleaner technologies, as coal remains a cheaper, yet less sustainable, option for small businesses.

13.4.3 Infrastructure and Knowledge Gaps

Awareness of renewable energy subsidies and resources remains low, particularly outside major cities. Rural SMEs face additional infrastructure challenges, including limited access to solar and wind resources, as well as fewer regional support programs to facilitate transition.

13.5 Challenges in the Energy Transition for SMEs in Germany (Bavaria)

13.5.1 Joint Challenges Across Regions

German SMEs, particularly in Bavaria, struggle with high investment costs and complex regulatory frameworks.

13.5.2 Specific Challenges in Bavaria

Bavaria's limited wind resources restrict renewable energy options, causing a reliance on biomass and solar. For energy-intensive industries like chemicals and manufacturing, the shift to renewables requires costly retrofits, making it difficult for many SMEs to invest in long-term sustainable solutions.

13.5.3 Infrastructure and Knowledge Gaps

Grid infrastructure and renewable energy knowledge gaps remain significant in rural Bavarian areas. Energy networks and awareness programs are growing, but many SMEs still

lack the technical know-how and financial literacy to navigate renewable options effectively.

13.6 Challenges in the Energy Transition for SMEs in Hungary

13.6.1 Joint Challenges Across Regions

Hungarian SMEs face a range of challenges, including limited financing, regulatory complexity, and high energy costs. The lack of incentives for wind energy further restricts renewable options for businesses, especially as wind projects remain stalled due to regulatory constraints.

13.6.2 Specific Challenges in Hungary

Energy efficiency upgrades are costly, with many SMEs in older buildings needing significant retrofitting. Solar PV is growing, but initial costs and grid access limitations restrict widespread adoption, especially in rural regions where awareness of financial support is low.

13.6.3 Infrastructure and Knowledge Gaps

Hungary's grid infrastructure requires modernization to accommodate increased renewable capacity, particularly for distributed solar PV systems. Limited awareness and accessibility of subsidies hinder adoption, while knowledge gaps remain regarding energy efficiency practices among SMEs.

13.7 Challenges in the Energy Transition for SMEs in Slovakia

13.7.1 Joint Challenges Across Regions

Slovakian SMEs share common challenges of high initial costs, regulatory complexity, and centralized reliance on biomass. Limited funding options and a slow-moving regulatory environment further hinder renewable energy adoption for small businesses.

13.7.2 Specific Challenges in Slovakia

In Slovakia, reliance on traditional energy sources like biomass and hydropower limits diversification into solar and wind. Infrastructure constraints, particularly grid connectivity for solar PV, further restrict renewable options for SMEs.

13.7.3 Infrastructure and Knowledge Gaps

The grid infrastructure in Slovakia needs modernization, with a focus on expanding capacity for renewables like solar and wind. SMEs face additional challenges due to limited awareness of subsidy programs, and more educational outreach is needed to close these knowledge gaps.

13.8 Challenges in the Energy Transition for SMEs in Slovenia

13.8.1 Joint Challenges Across Regions

Slovenian SMEs are burdened with high costs and complex regulations, which limit renewable energy investment. Hydropower dependency also creates seasonal vulnerabilities, making diversification challenging for businesses reliant on consistent energy supply.

13.8.2 Specific Challenges in Slovenia

Slovenia's geographic constraints limit wind energy, leaving solar and biomass as the primary options. Storage limitations and grid constraints further complicate renewable integration, especially for SMEs in remote areas where reliable grid access is crucial.

13.8.3 Infrastructure and Knowledge Gaps

Awareness of funding options is low among SMEs, and the lack of storage infrastructure poses additional barriers. Slovenia's grid constraints and limited technical assistance programs for SMEs also hamper renewable adoption efforts.

13.9 Conclusions by countries

13.9.1 Conclusion for Austria

Austria's well-established policy framework, including the Renewable Energy Sources Act and extensive incentive programs, positions it as a leader in the SME energy transition. The country's regional models, particularly Burgenland's success with wind and hydrogen, offer a blueprint for other regions seeking renewable energy autonomy. Continued support for SMEs, including streamlined administrative processes and targeted subsidies, will be essential for Austria to achieve its climate targets and foster sustainable energy adoption across all sectors.

13.9.2 Conclusion for Bosnia and Herzegovina

Bosnia and Herzegovina's reliance on hydropower provides stability in its renewable energy sector, yet there is a clear need for diversification into wind and solar resources to reduce vulnerability to seasonal fluctuations. Strengthening regulatory frameworks, enhancing SME support mechanisms, and fostering cross-border collaborations through initiatives can significantly enhance the country's green transition. Bosnia's participation in the Danube Regional Program also highlights the importance of regional partnerships in accelerating renewable adoption.

13.9.3 Conclusion for Bulgaria

Bulgaria's renewable energy landscape has shown substantial progress, particularly in solar energy development. However, a continued focus on overcoming regulatory and infrastructural constraints, as well as addressing the country's dependency on coal, will be vital. Expanding SME support and increasing grid flexibility are essential steps to align Bulgaria with EU renewable energy goals. Bulgaria's proactive stance in energy storage solutions and community energy projects sets a strong foundation for future growth.

13.9.4 Conclusion for the Czech Republic

The Czech Republic has made notable strides in renewable integration but still faces challenges due to its reliance on coal and complex administrative barriers. Expanding renewable capacity, particularly in solar and biomass, while simplifying regulatory processes, will be crucial for Czechia to meet its decarbonization goals. The New Green Savings Program and other SME-focused initiatives highlight the importance of government support in overcoming barriers to renewable energy adoption.

13.9.5 Conclusion for Germany (Bavaria)

Germany's national energy policies and Bavaria's unique renewable profile position the region as a leader in the EU's green transition. Bavaria's extensive use of biomass and solar PV, along with supportive regional policies and energy networks, provide a replicable model

for other regions. Infrastructure support, continued subsidies, and education initiatives focused on renewable energy awareness among SMEs will be vital in meeting Germany's 2045 carbon neutrality goals.

13.9.6 Conclusion for Hungary

Hungary has made considerable progress in solar PV growth, but high energy costs, outdated infrastructure, and limited wind energy adoption present ongoing challenges. Expanding renewable energy capacity, particularly in rural regions, alongside supporting SMEs through targeted incentives, will enable Hungary to align with EU sustainability targets. Hungary's involvement in green financing and support programs like the Green National Champions Programme sets a positive example for future renewable adoption.

13.9.7 Conclusion for Slovakia

Slovakia has shown gradual progress in renewable adoption, yet regulatory, financial, and infrastructural challenges remain. Expanding support for SMEs, simplifying bureaucratic processes, and modernizing grid infrastructure are essential steps for Slovakia to meet its ambitious 2030 targets. Cross-border collaborations, particularly with the Danube Regional Program, will play a crucial role in leveraging regional expertise and accelerating Slovakia's green energy transition.

13.9.8 Conclusion for Slovenia

Slovenia has made strides in solar and hydropower integration, yet the country faces challenges with energy storage, grid constraints, and limited wind potential. Expanding SME incentives, enhancing storage capabilities, and improving regulatory processes are key steps for Slovenia to meet its renewable targets. Regional collaborations within the EU provide Slovenia with access to best practices and technologies, supporting a sustainable transition aligned with EU goals.