A Work Project, presented as part of the requirements for the Award of a Master's degree in Management and Business Analytics from the Nova School of Business and Economics.

PRACTICAL PERSPECTIVES ON LOCAL ENERGY MARKET THEORY: THE IMPACT OF TECHNOLOGICAL INNOVATIONS

Maximilian Jagiello

Work project carried out under the supervision of:

João Castro

20/12/2023

Abstract

The advancement of Local Energy Markets (LEMs) signals a transformative change in the electricity sector towards decentralized renewable energy. They reduce dependence on traditional energy suppliers by providing an innovative market platform for participants to trade their locally generated renewable energy. A structured literature review provides an overview of current research. However, this review of extant literature has unveiled significant gaps between theory and real-world application of LEMs. To bridge these gaps, interviews with both, leading researchers and industry experts were conducted and synthesized with insights from literature. This synthesis across four key domains revealed two main tensions that hamper effective implementation of LEMs. First, there is a trade-off between complexity and simplicity. While model intricacy augments efficiency in theory, simplicity is a main driver for adoption of end-users. The second tension addresses the issue of initiating LEMs in practice. While consumers are not actively engaging in important decision-making and lack empowerment, current regulations struggle to provide frameworks and incentives that enable, promote, or facilitate the adoption of LEMs. Subsequently, derived implications for service design, business strategy and policymakers serve as baseline for practical recommendations. Concluding, LEMs' widespread implementation may be a decade away but their potential to contribute to a sustainable energy future is prominent.

Keywords

Renewable Energy, Decentralization, Prosumers, Energy-as-a-Service, Local Energy Market

1. INTRODUCTION

Imagine a world where the lights in your home, the charge in your car, and the power in your office come from a neighbour's rooftop or a community solar farm. A world, in which you have the autonomy and ability to actively choose which type of energy to purchase, where to buy it from, and the precise quantity you need.

This vision is at the centre of an energy revolution that responds to societies yearning for sustainability and responsibility (Žižek, Mulej, and Potočnik 2021). In the face of an escalating climate crisis, our planet stands at a critical point, where climate change, driven by surging greenhouse gas emissions, poses a profound challenge to global ecosystems and human societies. The current development of global warming is far exceeding sustainable limits, with an alarming increase of 2.9 degrees Celsius above pre-industrial levels (Bernard and Bryan 2023). This situation necessitates an urgent and decisive response to limit global warming to 1.5 degrees Celsius, a target that has been underscored by international efforts and environmental accords (United Nations 2015).

When the global leaders came together for the Conference of the Parties (COP28) in early December 2023, commitment to combatting climate change through comprehensive strategies was reaffirmed (UN Climate Press Release 2023). Key among the resolutions was the reduction of fossil fuel consumption and production. The approach aims to align with scientific recommendations to reach net zero by 2050 (Smyth and Clark 2023). Additionally, ambitious goals were set in COP28 to triple the capacity of renewable energy (RE) and to double the rate of improvements in energy efficiency by the year 2030, a testament to the urgency and scale of the transformation required (UN Climate Press Release 2023; Smyth and Clark 2023). In line with those ambitious goals, renewable energy sources (RES) increased significantly from previous years and accounted for

approximately 29% of global electricity generation as of 2021, further highlighting a global shift towards cleaner energy (IEA 2021). Particularly remarkable is Portugal's achievement of supplying the country solely with RE for six entire days, proving the potential of sustainable energy systems to create energy independence (Jones 2023). The matter of independence gained particular attention in recent years, where geopolitical events such as the war in Ukraine have highlighted market instability and strong dependencies in Europe (Adolfsen et al. 2022). It has become evident that the dependency on a limited group of major energy suppliers, primarily those using fossil fuels, has led to increasing energy costs, a direct result of their significant control over the energy market (Avalos and Huang 2022). High prices, global change, and concerns over the security of energy supplies have underscored the need for more controllable, localized solutions (Paravantis et al. 2020). In response, energy systems are transitioning from the previously centralized and fossil fuel-dependent infrastructure, towards frameworks that are decentralized, sustainable, smart, and interconnected. In this context the concept of LEMs emerges as a significant and forward-thinking response (Mengelkamp et al. 2017a). The promise of LEMs is profound: they revolutionize the way energy is produced, consumed, and managed. They envision a future where energy systems are decentralized and democratized, offering a pathway to a future that is not only more sustainable but also more attuned to the needs and capacities of local communities (Mengelkamp, Gärttner, and Weinhardt 2018). This thesis delves into the intricacies of LEMs, exploring their potential to redefine our energy landscape and catalyse the transition towards a more sustainable and equitable future.

Problem Statement

LEMs represent a key development in the global energy sector especially in theory. However, the practical implementations of these markets remain insufficiently explored, marking a conspicuous gap in the current academic discourse (Schwidtal et al. 2023). This thesis aims to address this gap

by methodically examining critical elements of the implementation of local energy market theory into practice. This study will explore how decentralized RE, and new, user-focused business models are changing how energy utility companies operate. Furthermore, it will evaluate the influence of LEMs on RE pricing, providing critical insights into market dynamics. The research will also explore the drivers and barriers affecting the adoption of these markets, with particular attention to consumer-related issues. Finally, the impact of technological innovations on the integration and adaptability of LEMs will be investigated through a practical lens. This multifaceted approach aims to provide a clearer understanding of the challenges and opportunities in applying local energy market theory, thereby contributing substantially to the field of sustainable energy practices. This research not only aims to bridge theoretical and practical realms but also seeks to offer a comprehensive perspective on the efficacy and viability of LEMs in contemporary energy contexts.

Motivation of the Study

The motivation for studying LEMs stems from the urgent need to transition to sustainable energy systems. LEMs have gained prominence as a viable solution for integrating RES, enhancing energy efficiency, and fostering community participation in energy systems (Bhandari 2023). The significance of LEMs is underscored by the potential of RE to contribute up to 45% of the total electricity supply by 2050, as estimated by the International Renewable Energy Agency (IEA 2021). This change is not only a response to the challenges of climate change and resource scarcity but also aliens with the global goal of achieving sustainable development and energy independence (United Nations 2023). Therefore, exploring LEMs is essential for advancing our understanding of sustainable energy transition and developing strategies that align with environmental, social, and economic objectives. Building on this foundation, our personal motivation and expertise in the energy sector further fuel our ambition to challenge traditional energy paradigms and explore the

implementation of decentralized systems. With our diverse background in management and business analytics, we are in a unique position to harmonize our skills and create a synergy that optimizes our approach in this innovative field. We aim to not only enrich academic discussions with significant insights but also to impact practical applications. Our goal is to educate and inform about innovative solutions, changing market dynamics, and sustainable options within the energy sector. In doing so, we strive to make a substantial contribution to the ongoing dialogue surrounding sustainable energy.

Delimitations

This thesis focuses on renewable energies, with a specific emphasis on solar energy generation within the context of LEMs. It deliberately excludes other forms of RES such as wind, hydrogen, and biogas due to the relative accessibility, lower investment barriers, maturity, and widespread adoption of solar power compared to other renewable sources. Additionally, the study does not consider niche market designs like completely isolated island models, as the aim is to explore more universally applicable frameworks through a practical lens. Despite these specific delimitations, the thesis imposes no geographic limitations at the country level. This approach is adopted to embrace the novelty of LEMs and to integrate diverse international insights and best practices.

Structure of the Thesis

Before delving into the antecedents of LEMs (LEMs), it is essential to outline its overall structure to understand its various components of the research. The subsequent, second chapter introduces LEMs, provides background information and explains theoretical concepts. Following this, in chapter three a Literature Review is conducted to reflect the current state of research on LEMs, offering insights into various models, case studies, and their advantages and challenges. A key outcome of this review is the identification of research gaps in the existing literature. In chapter four, the methodology of using expert interviews for first-hand insights and data analysis is

explained. To allow for a deeper exploration of aspects of the topic and bridge the gaps found through the Literature Review, the topic is divided into individual parts in chapter five. Each subtopic is focusing on a specific area of the research and different elements of LEMs, including consumer behaviour, business models, pricing strategies, and technological advancements. The thesis ends with an overall discussion of results, synthesizing all findings and discussing their implications. Overall, the thesis is structured to transition from a foundational understanding of LEMs to an in-depth exploration of various elements, culminating in a holistic discussion.

2. ANTECEDENTS AND BACKGROUND

Traditional Power Systems

To gain a better understanding of LEMs and associated matters, the energy industry and its evolution is described, and common concepts are explained. In traditional power systems, a hierarchical structure with centralized, fossil-fuelled power plants is key for efficient electricity delivery, where Transmission System Operators (TSO) manage high-voltage networks for long-distance transfer, and Distribution System Operators (DSO) oversee lower voltage networks for bridging transmission and localized distribution (Erdman and Zweifel 2008). Large power plants, interconnected with these networks, form the system's backbone ensuring stable electricity transportation over long distances (Erdman and Zweifel 2008). Electricity is then transformed through medium voltage networks for regional distribution, and finally, low-voltage networks deliver power safely to homes and businesses (Ströbele, Pfaffenberger, and Heuterkes 2012). This top-down, unidirectional flow from producers to consumers ensures stability and reliability, with consumers playing a passive role (Shahsiah 2017). Centralized control systems manage supply-demand balance, with large plants adjusting output for grid stability (Ströbele, Pfaffenberger, and Heuterkes 2012). The transmission system, and subsequent voltage-reducing distribution networks

ensure reliable electricity delivery to end users (Ströbele, Pfaffenberger, and Heuterkes 2012). With climate change being a predominant challenge, the energy landscape is transitioning from traditional, centralized fossil fuelled power systems to RES.

Transition to Renewable Energy Systems

The transition to RES like solar photovoltaics (PVs) is a crucial part of the global strategy to combat climate change and meet SDG targets (J. Chen et al. 2022). The global, cumulative capacity of solar PV systems surpassed 1 TW, with a record annual capacity of 235.8 GW added in 2022, a 35% increase from 2021(IEA-PVPS 2023). Furthermore, the solar industry is seeing significant investment in manufacturing capacity, expected to reach 716 GW, although the speed of upscaling is outpacing market development, leading to significant drops in module prices due to oversupply in 2023 (IEA-PVPS 2023). The contribution of renewables to new power capacity globally is expected to reach 80% by 2030, with solar PV alone accounting for more than half (IEA 2023c).This is caused by the immense increase of global solar capacity in the past years, as shown in Figure 1 (SolarPower Europe 2023).

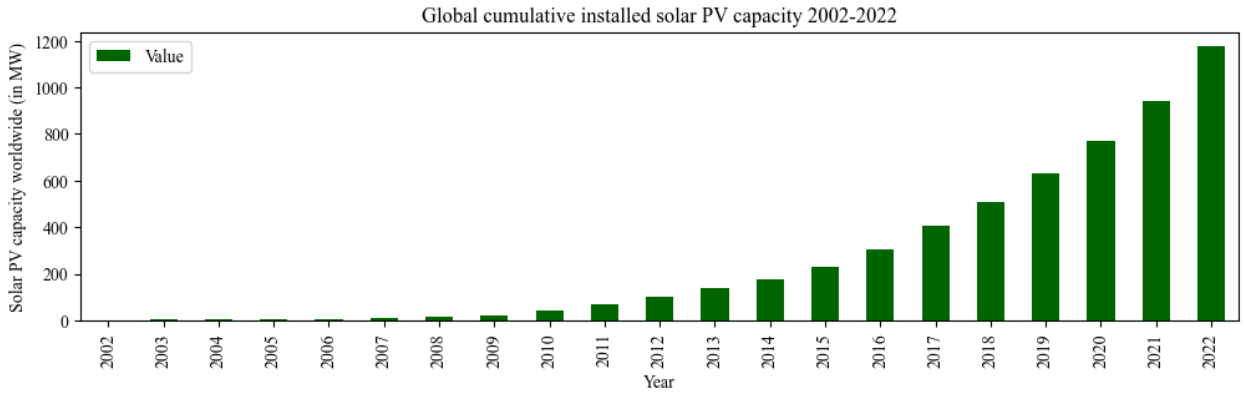

Figure 1- Global cumulative installed solar PV capacity 2002-2022

One reason for the increasing adoption of PVs is the 67.4% reduction in the cost of installing PV systems between 2009 and 2021, driven by improved efficiency of solar modules and enhancements in manufacturing processes and technology (EnergySage 2022). Moreover, the

decreased costs have empowered households to engage in RE for self-consumption, leading to a notable transition in the role of consumers. They are evolving from being merely consumers to 'prosumers'. In the context of renewable energy, a **prosumer** will be considered a consumer or business who also produces some of his electricity, blurring the boundaries between energy generation and consumption (Schwidtal et al. 2023). Using PVs, prosumers can generate their own electricity, and they can earn revenue by selling surplus energy back to the grid through feed-in tariffs or power purchase agreements (J. An et al. 2020). This shift results in different socio-economic incentives and a systemically different relationship to the grid (Schwidtal et al. 2023). Firstly, distributed energy resources (DERs) are now integrated and connected to the distribution grid and energy flows are no longer unidirectional but bidirectional. Secondly, the production patterns of RE follow a non-linear flow as they are inherently variable with night and day cycles and are closely tied to weather conditions changing the dynamics of electricity completely (Qiu et al. 2023).

Transactive Energy (TE)

In order to manage this complexity, advanced management systems are required introducing the concept of TE (S. Chen and Liu 2016). TE systems are a transformative approach to modern grid management, leveraging Information and Communication Technologies (ICT) to dynamically balance supply and demand across the energy network. These systems incentivize energy production or consumption in response to grid conditions, ensuring stability and efficiency (Zheng et al. 2022). In order to integrate TE systems, a more sophisticated grid infrastructure capable of monitoring and controlling energy and economic information flows in real-time is required (Dudjak et al. 2021). Smart grid technologies are the cornerstone of this new infrastructure. Smart grids employ advanced metering infrastructure (AMI), which includes smart meters capable of

recording and transmitting detailed energy usage data in real-time (Wu et al. 2021). This data is crucial for both operators and consumers, as it allows for more accurate billing, better demand forecasting, and the potential for consumers to participate in demand response programs.

Local Energy Markets

Building upon the foundation set by TE systems, LEMs take the concept of dynamic, real-time energy management to a more granular level. At their core, LEMs can be defined as "market platforms for trading locally generated RE among residential agents within a geographic and social community" (Weinhardt et al. 2019). These markets enable direct interaction between participants and lead to greater energy democratization by empowering individual producers and consumers. One of the primary benefits of LEMs is their contribution to increased **energy efficiency**. By facilitating the generation and consumption of energy within close proximity, LEMs significantly reduce transmission losses (Ilieva et al. 2019). In terms of **economic benefits**, LEMs are instrumental in stabilizing and potentially reducing energy prices, as they enable prosumers to trade excess energy within these markets, thereby mitigating price volatility and creating opportunities for lower energy costs (Neves, Scott, and Silva 2020a). Furthermore, the **diversification and flexibility** of LEMs stand out as critical advantages. By encouraging the integration of a variety of RES, LEMs enhance **energy security and reduce reliance** on any single source, augmenting energy resilience and independence. Additionally, the inherent flexibility of LEMs in managing energy is vital for accommodating intermittent renewable sources like solar. This adaptability ensures not only a more reliable and consistent energy supply but also aligns energy production more closely with fluctuating consumer demands and volatile renewable energy generation (REG) (Schreck et al. 2022a). Moreover, **environmental considerations** are at the forefront of LEMs. By promoting the use of clean energy sources, these markets contribute significantly to reducing

pollution and environmental degradation (Ilieva et al. 2019). LEMs also enhance **community engagement** by fostering a sense of ownership and responsibility among local communities (Sousa et al. 2019). This community-centric approach is instrumental in achieving broader acceptance and support for RE projects (Sousa et al. 2019).

The chapter delineates a significant paradigm shift in energy systems from traditional, centralized networks to decentralized networks and LEMs, driven by the adoption of RES and the emergence of prosumers. This transition is facilitated by the integration of smart grid infrastructure and TE systems, enabling bidirectional energy flows and real-time management. LEMs have emerged as a response to these technological and societal transformations, aiming to capitalize on the opportunities for increased energy efficiency, price stability, enhanced energy security and resilience, and environmental sustainability.

Within this innovative framework, the LEMs form a multi-layered system. This system includes a range of **various actors**, with specific roles and functions, each contributing to a more efficient, sustainable, and community-driven energy model. An overview of actors in LEMs, inspired by Schwidtal et al. is given in *Table* 1 below (Schwidtal et al. 2023).

Actor	Description
Prosumers	Individuals or businesses that both produce and consume energy at the grid connection point (bidirectional energy flow)
Pure Consumers	Entities that only consume energy and do not produce it, typically households or businesses connected to the grid (unidirectional energy flow)
Pure Generators	Producers of energy that do not consume their production within the same premises, such as large-scale solar or wind farms (unidirectional energy flow)
Platform Operators	Companies that provide the digital platform for energy trading between actors in the LEM and are not connected to the grid
Aggregators	Entities that are not physically connected to the grid and bundle small-scale production or consumption for participation in larger markets
Grid Operator	Entities responsible for the operation and maintenance of the energy grid, ensuring the distribution of electricity from producers to consumers
Retailers	Retailers are not directly involved in energy generation or consumption, but engage in purchasing and selling energy through platform operators

Energy Communities	A collaborative entity that jointly generates and shares energy resources, usually through renewable means, within a localized grid to promote sustainable and self-sufficient energy use

Table 1 - Overview of different actors in LEM

3. LITERATURE REVIEW

Results of the Literature Review

The purpose of this literature review was to explore LEMs, with a spotlight on Cluster 1, which gives a rich overview of market designs presented in literature. In this journey, a pattern of four additional themes was discovered, which also will be analysed.

The *table 2* below displays the formed clusters and subclusters, and their assigned authors.

Cluster	Subcluster	Authors
LEM design	Decentralized P2P Trading	(J. An et al. 2020; Mengelkamp et al. 2017b) (Antal et al. 2021; Esmat et al. 2021; Li et al. 2019; Gayo-Abeleira et al. 2022; Mehdinejad, Shayanfar, and Mohammadi-Ivatloo 2022; K.C. and Verma 2023; Yao et al. 2021; Van Leeuwen et al. 2020; Y. Wang et al. 2021)
	Community Trading	(Bandara, Thakur, and Breslin 2021; Hahnel et al. 2020a; Khojasteh, Faria, and Vale 2023; Jiang, Yuan, and Li 2021; Mensin et al. 2022; Bokkisam, Acharya, and M.P. 2022; López González and Garcia Rendon 2022; García-Muñoz, Dávila, and Quezada 2023; Mengelkamp, Gärttner, and Weinhardt 2018)
	Hybrid Trading	(Y. Chen et al. 2022; Gazafroudi et al. 2021; Huang et al. 2022; Khorasany et al. 2022; Kiedanski, Orda, and Kofman 2020; Lee, Han, and Won 2022; Ma, Wang, and Liu 2021; Zhou et al. 2022)
Grid Operations	Grid operation, integration, and resilience	(Dudjak et al. 2021; Dwivedi, Yemula, and Pal 2023; S. An, Wang, and Leng 2022; Armioun et al. 2023; Chang, Xu, and Sun 2021; Houben et al. 2023; Barone et al. 2023; Di Silvestre et al. 2021; López-García, Torreglosa, and Vera 2019; Morstyn et al. 2020)
Consumer Perspective	Motivation Transformation Strategies	(Hahnel et al. 2020b; Zade et al. 2022; Kühnbach, Bekk, and Weidlich 2022; Huang et al. 2022; Mengelkamp, Gärttner, and Weinhardt 2018; Conradie et al. 2021)
Emerging Business Models	Different Actors and their Revenue Streams	(Pereira et al. 2018; Petrovich and Kubli 2023; Wolsink 2020; Roby and Dibb 2019; Schwabeneder et al. 2021; Ramos et al. 2020; McGovern 2021; Vernay, Sebi, and Arroyo 2023; Zhou et al. 2022)
Policies	Frameworks Innovative Approaches Implications	(Lin and Jianhui Wang 2022; McGovern 2021; Fuentes González, Sauma, and van der Weijde 2019; Ramos et al. 2020; Golla et al. 2022; Di Silvestre et al. 2021; J. Liu et al. 2023; Mello and Villar 2023; G. Liu et al. 2023; Wolsink 2020; Gjorgievski, Cundeva, and Georghiou 2021)

Table 2 - Clusters from systematic literature review

Cluster 1: Local Energy Market Designs

For this section, 31 paper were analysed and structured to give a better understanding on how LEMs are designed (Table 2). The operational structures of LEMs are categorized by examining the **degree of control and interaction among participants**. These structures range from fully decentralized systems based on peer-to-peer (P2P) trading to community trading systems managed by community coordinators and extend to hybrid models reliant on utility companies or operators for centralized coordination and management.

Direct bilateral P2P trading is the essence of a decentralized energy market, allowing participants to engage in one-on-one transactions. Mengelkamp et al. (2017) discuss the potential for this model to increase the economic efficiency of RE distribution, as it enables participants to optimize their energy usage and production based on personal needs and capacities. Papers by K.C. and Verma (2023) and An et al. (2020) note the importance of digital platforms in facilitating these direct trades, suggesting that advanced algorithms can help match buyers and sellers efficiently. K.C. and Verma (2023) build on this by discussing the role of machine learning in predicting energy consumption patterns, thereby optimizing matchmaking between sellers and buyers in a P2P market. Similarly, Mehdinejad, Shayanfar, and Mohammadi-Ivatloo (2022) highlight the flexibility of P2P markets in integrating RES, by detailing how dynamic pricing can be used within P2P trading to reflect the real-time balance of supply and demand, encouraging the use of RE when it's most abundant thereby fostering sustainability. However, Esmat et al. (2021) point out that the lack of a central authority raises questions about the reliability of the grid, which can be mitigated through robust grid management strategies. In decentralized LEMs, the market is typically self-managed by the participants, and decisions are made through consensus or automated smart contracts.

Blockchain technology is heralded as a transformative tool for LEMs due to its ability to create trust and transparency. Bandara, Thakur, and Breslin (2021) illustrate how smart contracts in blockchain platforms can be designed to not only automate billing and settlement but also to facilitate demand response services, where consumers adjust their energy consumption based on grid needs to enhance market efficiency. Yao et al. (2021) highlight a blockchain pilot program that managed to cut transaction costs by nearly 30%, underscoring the economic benefits of such systems. Wang et al. (2021) focus on the interoperability of blockchain systems, explaining how this aspect is crucial for the technology to integrate with existing energy infrastructures and markets seamlessly. In both papers, the security and scalability of blockchain solutions in energy markets is examined, emphasizing the technology's potential to enable secure, transparent transactions on a large scale. The decentralization of ownership and management in blockchain-based markets is further expounded by Li et al. (2019) and Jiang, Yuan, and Li (2021), who demonstrate how blockchain can support the decentralization of energy systems, ensuring that control is distributed among users rather than centralized entities. The contributions by López-García, Torreglosa, and Vera (2019) and Mengelkamp, Gärttner, and Weinhardt (2018) underscore the technical and regulatory challenges that accompany the adoption of blockchain, urging for clear policies and robust technological frameworks. Those papers focusing on decentralized LEMs underscore the transformative potential of decentralized LEMs in fostering a more sustainable and resilient energy future. While they all advocate for increased decentralization, they also bring to light the diverse challenges. Blockchain-based markets offer unprecedented security and transparency but face technical and regulatory hurdles. Direct bilateral trading is praised for its efficiency and flexibility but requires robust platforms and algorithms to manage transactions.

Community-based energy markets offer a collective approach to energy management and distribution, emphasizing local collaboration and shared benefits. Central to these markets is the

role of the Community Manager (CM), whose responsibilities include orchestrating energy trades, optimizing distribution efficiency, and nurturing cooperative relationships among members. The close-knit nature of these communities facilitates energy exchanges that are not only cost-effective but also more sustainable, owing to the reduction in transmission losses attributed to the short distances over which energy is traded. This system champions a localized model of energy governance that leverages proximity for enhanced energy efficiency and community empowerment. Research in this field has been extensive, with various models being proposed to optimize energy trading. Mensin et al. (2022) advocate for maximizing self-consumption within microgrids, while Dynge et al. (2021) strive to minimize total electricity costs, promoting efficient energy utilization. Mengelkamp, Gärttner, and Weinhardt (2018) suggest a local electricity market with intelligent learning strategies for residential customers to manage electricity use effectively. Further advancing the field, García-Muñoz, Dávila, and Quezada (2023) propose a model that not only aims to minimize community cost but also ensures fair trade. Their two-stage stochastic mixed-integer linear programming model considers both distributed and centralized market designs. The research underscores the pivotal role of the CM and prosumers, as detailed by Khojasteh, Faria, and Vale (2023), who describe a pricing and balancing model managed by the CM, and Jiang, Yuan, and Li (2021), who focus on optimizing economic interactions within the community.

Additional studies explore the practical aspects of Community-based energy markets. Hahnel et al. (2020) and Van Leeuwen et al. (2020) discuss the integration of energy storage and the technical feasibility of microgrids in Germany, emphasizing enhanced local RE use. The governance of these systems is also crucial, as noted by Antal et al. (2021) and Gayo-Abeleira et al. (2022) They stress the need for equitable and inclusive decision-making in market governance. Although these systems offer local empowerment and sustainability, they face challenges in governance and

technical management, requiring a certain expertise level within the community to handle the complexities of microgrids.

Hybrid LEMs are a blend of centralized and decentralized market structures, aiming to utilize the strengths of both systems to enhance the efficiency and reliability of electricity distribution. In the area of **auction-based trading**, Chen et al. (2022), Kiedanski, Orda, and Kofman 2020), Khorasany et al. (2022) and Zhou et al. (2022) shed light on the complicated balancing act between decentralized energy trading and centralized market clearing. In their papers, auction-based trading is presented as a mechanism where participants bid for energy in periodic auctions, with a market operator clearing the transactions and determining prices at set intervals. However, several authors argue that traditional implementations of LEMs, such as sequential auctions and P2P exchanges fail to capture the time-correlated nature of energy demand and supply and do not fully exploit the available flexibility (Kiedanski, Orda, and Kofman 2020). To handle this shift, advanced market designs are built that consider factors such as the physical limitations of the energy grid and the different kinds of information that participants share with each other. These studies unanimously conclude that a market operator is of central importance to ensure the integrity and smooth running of the trading process. The auction-based model provides a degree of autonomy to individual players and fosters a competitive environment for energy trading, while ensuring stability through regular market clearing. The concept of **demand-response programs** is adeptly explored by Huang et al. (2022) and Lee, Han, and Won (2022), who navigate the intricacies of real-time pricing and consumer engagement in energy consumption. Demand-response programs work by adjusting consumer energy usage in response to price signals, helping to balance supply and demand and stabilize the grid. These programs exemplify a dynamic market structure where consumers are both participants and active agents in shaping the market. The role of grid managers and utility companies is critical in transmitting price signals that encourage consumers to modulate their

energy usage, thus contributing to grid stability and efficiency. **Aggregated trading**, as presented by Gazafroudi et al. (2021) and Ma, Wang, and Liu (2021), offers a novel perspective on how small-scale producers and consumers can gain market presence. These papers delve into the role of aggregators who streamline the collective energy capabilities of distributed entities, allowing them to compete effectively in the market. The aggregators serve a dual purpose: they simplify the market entry for smaller players and enhance their negotiating power, thus injecting a level of democratization into the market.

In summary, the exploration of decentralized, community-based, and hybrid local energy market designs reveals a nuanced landscape of potential and challenges. Each model presents unique opportunities for advancing energy efficiency, sustainability, and local empowerment. As the layers of LEMs are discovered, repeating patterns were found. The evolving roles of consumers, producers and businesses, as well as the technical, regulatory, and governance complexities of these innovative market structures will be explored now.

Cluster 2: Grid Integration

The transition toward decentralized RES has prompted a re-examination of traditional power grid operations. LEMs are at the forefront of this transition, offering novel pathways to integrate a diverse range of energy sources into the grid. However, this shift introduces complex challenges to harmonize the intermittent nature of RE with the continuous demand for electricity. This chapter assesses recent advancements that address the uncertainty of renewable energy, the optimization of grid operations, grid stability and resilience, emphasizing the multifaceted approaches required for a seamless integration.

Dudjak et al. (2021) provide a comprehensive review of **LEMs' integration in power systems**, focusing on impacts on grid infrastructure and operation. Their analysis of various energy trading

models and their implications on distribution networks forms a broad foundation that complements the more specific study of Dwivedi, Yemula, and Pal (2023). The authors propose a method to evaluate the resilience of power distribution systems with DERs, leveraging complex network theory. The challenge of integrating DERs into multi-micro energy grids is adeptly tackled by An, Wang, and Leng (2022). Their model excels in optimizing grid safety and reducing RE curtailment, but it's tailored specifically to Southwest China's context, limiting its global applicability. This region-specific focus is complemented by the broader approach of Armioun et al. (2023), who introduce a more versatile two-stage optimization method for multi-carrier energy distribution systems that could potentially be adapted for various global contexts. In the domain of RE integration into smart grids, Chang, Xu, and Sun's (2021) online distributed neurodynamic optimization-based method stands out by addressing the fluctuating nature of RE, enhancing grid stability and resilience. This approach, focusing on real-time energy management, contrasts with Houben et al. 2023)'s multi-step forecasting method for Model Predictive Control in microgrids, which also aims to integrate renewable sources but emphasizes long-term operational cost and emission optimization. Barone et al. (2023) and Di Silvestre et al. (2021) both highlight the role of energy communities, yet in distinct contexts. Barone et al. (2023) develop a methodology focusing on P2P energy sharing to enhance grid stability, addressing renewable energy's unpredictability. Di Silvestre et al. (2021) offer an in-depth analysis of Italy's RECs, emphasizing their evolution and potential in managing electricity and contributing to grid stability. The findings of Di Silvestre et al. (2021) provide practical examples that could inform the theoretical models proposed by Barone et al. (2023), particularly in the context of energy sharing mechanisms. The decentralized P2P control scheme developed by López-García, Torreglosa, and Vera (2019) for energy trading in power grids, focusing on microgrid integration and grid stability, introduces another innovative approach to energy transactions. Their concept of Energy Fragments enhances accuracy in energy

trading and can potentially minimize disturbances in the grid through trading mechanisms. This decentralized approach is in line with the trends observed in OPEN, the open-source platform presented by Morstyn et al. (2020), designed for the integrated modelling, control, and simulation of smart local energy systems. Both studies emphasize the importance of decentralized platform solutions in managing the complexities of modern energy systems, albeit from different angles - one focusing on the transactional aspect and the other on system modelling and control.

Cluster 3: Consumer Perspective

In exploring LEMs (LEMs), it's notable that besides market design and the integration of grid in the existing infrastructure, a consistent focus in numerous studies lies on the participants' roles and motivations, specifically those of prosumers. This section involves the analysis and discussion of six papers, which are detailed in Table 2.

The studies conducted by Hahnel et al. (2020), Conradie et al. (2021), and Wang et al. (2022) provide insights into the **motivations for participation in LEMs** and Renewable Energy Communities (RECs). These investigations have sparked a debate on whether environmental or economic incentives play a more significant role in driving this participation. While environmental concerns are consistently highlighted as key motivators, the research also acknowledges the allure of economic benefits, such as cost savings. Hahnel et al. (2020) explore the psychological appeal of energy independence, Conradie et al. (2021) emphasize the community connection in RECs, and Wang et al. (2022) uncover varying motivations across demographics, illustrating the complexity of prosumer behaviour influenced by diverse socio-economic and cultural factors. However, it's important to note that these studies have their limitations, as the study subjects were not actual participants of LEMs, which may affect the generalizability and practical relevance of their conclusions. Furthermore, the studies by Conradie et al. (2021) and Zade et al. (2022) extend the

discussion to the broader aspects of market adoption and user preference integration in LEMs. They suggest that the adoption of LEMs extends beyond individual or corporate decisions, underscoring the necessity for **supportive regulatory frameworks** and public endorsement for fostering consumer adoption and ensuring effective market functionality.

Hahnel et al. (2020) and Kühnbach, Bekk, and Weidlich (2022) state that the **transformation from consumers to prosumers** in the energy sector is primarily driven by economic factors. This change is characterized by key decisions on the pricing of surplus energy and the procurement of additional energy. Hahnel et al. (2020) investigated how prosumers react to changes in market prices and emphasized the complicated interplay between financial motivations and energy demand. These decisions are critical to achieving market equilibrium and highlight the significant influence that prosumers have on the dynamics of the energy market. Finally, the exploration of diverse **bidding strategies** in studies like Mengelkamp et al. (2017) and Zade et al. (2022) underscores the importance of aligning these strategies with user preferences to enhance market efficiency and participant satisfaction in LEMs. The variety in these strategies significantly impacts market prices, efficiency, and stability, emphasizing the need for well-crafted bidding mechanisms that balance simplicity, sophistication, and participant requirements. However, a key limitation of these studies is their reliance on simulations without incorporating real-life data, which may not fully capture the complexities and unpredictable elements of actual market conditions, thereby affecting the applicability and robustness of their findings. In summary, the study of agent behaviour in LEMs (LEMs) underscores a complex interplay of environmental, economic, and psychological factors.

Cluster 4: Emerging Business Model

This analysis explores the dynamic roles and revenue strategies of key actors in energy business models, such as Grid Operators, Prosumers, Aggregators, Energy Communities, and Platform

Operators, highlighting their unique approaches to adapting and innovating in the evolving energy sector.

Grid Operators, notably Distribution System Operators (DSOs), are instrumental in the evolving LEM sector, as discussed in Pereira et al. 2018). They are transitioning from making profits as regulated monopolies to prioritizing innovation and R&D, especially in advanced grid technologies that are compatible with RES and decentralized production (Pereira et al. 2018). The authors argue that DSOs are generating revenue primarily through innovation and R&D partnerships for advanced grid technologies, and by offering flexibility management services to efficiently handle RE integration and reduce operational costs. While the study by Pereira et al. provides a comprehensive view of DSOs' adaptation to technological and market changes, it somewhat lacks in-depth analysis of the economic impacts on traditional business models and the practical challenges involved in transitioning to new regulatory frameworks and market designs.

Petrovich and Kubli (2023) delve into how small and medium enterprises (SMEs) are leveraging their position as **prosumers**. These SMEs are not only selling surplus electricity but also participating in ancillary services and demand response programs. However, the paper might overemphasize economic aspects at the expense of operational challenges. Wolsink (2020) and Roby and Dibb 2019) investigate how prosumers sell RE and other flexibility services directly to community members in local microgrids. Wolsink (2020) brings to the fore the importance of community-based models and the integration of RE in microgrids. However, the scalability and practical challenges of these models might be underplayed. Roby and Dibb (2019) provide an insightful analysis of community energy dynamics but tend to overlook the financial and regulatory hurdles that might impede such initiatives.

Aggregators represent a transformative shift in the realm of electricity distribution and management. Schwabeneder et al. (2021) delve into how aggregators optimize the demand-supply balance by harnessing residential customer flexibilities across various electricity markets.

On the other hand, Ramos et al. (2020) delve into the business models within Brazil's demand response program, particularly focusing on distributed generation. This study highlights the unique opportunities and challenges faced by aggregators in emerging markets like Brazil.

The strengths of Schwabeneder et al. 2021) lie in its deep insights into the economic benefits and technical optimization that aggregators can achieve. However, the study may not fully address the real-world implementation challenges that come with such optimization strategies. Ramos et al. (2020) provide a valuable perspective on the Brazilian market and its demand response mechanisms. Despite this, the study's limitations include its generalizability and adaptability in different regulatory environments.

Energy communities, as discussed in the works of McGovern (2021) and Vernay, Sebi, and Arroyo (2023), offer innovative approaches of revenue generation in the realm of renewable energy. They emphasize the revenue generation from collective investments of community members and the benefits derived from local energy efficiency initiatives. The strength of McGovern (2021) work lies in its integration of social and environmental values into the business models of energy communities. However, it faces challenges in terms of implementation and ensuring economic viability. Vernay, Sebi, and Arroyo (2023) provide detailed insights into Energy Community-Based Models (ECBMs) in France, emphasizing their potential for mobilizing private capital. Yet, the focus on the French context might limit the study's generalizability to other regions.

Platform operators, as explored by Zhou et al. 2022), are key players in managing platforms for local energy trading, sharing, or dispatch and earn revenue through registration fees, transaction fees, and profit margins on trading. Additionally, they capitalize on arbitrage opportunities between

wholesale and LEMs and on complementary services such as centralized optimization or forecasting. Zhou et al. (2022) highlights diverse revenue streams that platform operators can tap into. However, the study also points out the challenges in adaptability and compliance with evolving technology and regulatory frameworks.

In summary, a common theme emerges. The necessity for adaptation to and integration of new technologies and market conditions in the energy sector. Each actor: Grid Operators, Prosumers, Aggregators, Energy Communities, and Platform Operators, presents unique revenue streams and faces distinct challenges. While innovation and strategic restructuring are evident strengths among these actors, the transition to new business models presents significant challenges.

Cluster 5: Policies & Regulation

The role of **regulatory frameworks in shaping community energy** development is paramount. Fuentes González, Sauma, and van der Weijde (2019) analyse Scotland's policy landscape, highlighting the efficacy of initiatives like the Feed-In Tariff and Renewable Obligation System. However, they criticize the limited impact of these isolated policies, advocating for more comprehensive approaches. Ramos et al. (2020) discuss the evolving Brazilian regulatory environment, particularly emphasizing the integration of demand response programs and distributed generation as crucial tools in Brazil's electricity sector. Golla et al. (2022) focus on the European Union's regulatory concept of Citizen Energy Communities, particularly examining Germany's integration of CECs into national law, underscoring the positive impact of preferential regulation on sustainable technologies. Di Silvestre et al. (2021) delve into the implications of the European Directive RED-II for REC, discussing the challenges in integrating small RECs into the market.

The **integration of innovative approaches** in energy sharing within existing institutional frameworks highlights the dynamic nature of LEMs. In (McGovern 2021) study, the emphasis is on how policies and regulations play a pivotal role in the incorporation of civic energy into local and regional development.

(G. Liu et al. 2023) advocate a policy-centric paradigm through their innovative credit-based P2P energy sharing model. This approach underscores the imperative of harmonizing regulatory frameworks with the evolving intricacies of energy sharing while addressing network constraints and optimizing social welfare within the energy ecosystem. (Mello and Villar 2023) engage with energy policy intricacies, examining the convergence of local energy and flexibility markets with wholesale balancing responsibilities. They stress the essential policy alignment with existing collective self-consumption regulations, underlining the need for policy coherence in this multifaceted energy context.

The papers in this category explore the broader **policy design and implications of community energy systems**. (J. Wang et al. 2022) delve into the realm of RE policies, scrutinizing the factors that drive residents' involvement in REC. Their study highlights the significance of government support mechanisms while underscoring the critical role of consumer segmentation in shaping effective policy frameworks.

(Wolsink 2020) addresses the policy dimension of RE transition via Distributed Energy Systems, advocating for policy alternatives that empower self-regulation within microgrids. (Golla et al. 2022) emphasis that decision inertia slows down the transformation process. It suggests that policy measures need to be tailored not just to incentivize investments but also to counteract such inertia. (Gjorgievski et al. 2023) examine the impact of regulatory frameworks and fiscal policies on energy sharing within RECs, focusing on the influence of measures such as electricity tariffs and regulated charges.

The papers offer comprehensive analyses and valuable policy recommendations, especially in the works of (Fuentes González, Sauma, and van der Weijde 2019) and (Gjorgievski et al. 2023). They propose innovative approaches and frameworks, as seen in (G. Liu et al. 2023) and (Mello and Villar 2023), showcasing forward-thinking in energy system management. The diverse contextual focus, from Europe to Brazil and Chile, provides a broad perspective on global energy market trends.

Summary of Literature Review Findings

Our comprehensive research has explored the complicated and multi-layered landscape of LEMs through the different clusters explained. LEMs are a concept, whose success depends on a complex web of interdependencies. The analysis has allowed us to develop a detailed understanding of the myriad factors that play a critical role in shaping the efficiency and functionality of LEMs.

The first chapter has provided an in-depth examination of '**Local Energy Market (LEM) designs'**, drawing from a rich tapestry of academic literature to illuminate the varying operational structures and their implications. The decentralized models, with their foundation in blockchain technology, are at the forefront of promoting autonomy and efficiency, while community-based markets are championing collaboration and shared benefits at a local level. The hybrid models aim to harmonize these approaches, leveraging both centralized and decentralized elements to strike a strategic balance between autonomy and market stability. Despite their differences, these models share a common goal: to enhance the sustainability, reliability, and efficiency of energy systems.

The '**Integration of LEMs into Traditional Power Grids'** is a dynamic and evolving area, marked by diverse and innovative approaches to address the challenges posed by RES. Extant literature highlights the multifaceted nature of this integration, ranging from optimizing grid operations and enhancing resilience to developing region-specific and globally adaptable models.

The emphasis on decentralized systems, real-time energy management, and energy sharing mechanisms reflects a growing recognition of the need for flexible, scalable solutions to harmonize the intermittent nature of RE with the grid's continuous demand. The **'Consumer Perspective'** cluster underscores a dynamic interplay of environmental, economic, and psychological factors influencing agent behaviour. Research indicates that environmental concerns, along with personal benefits such as financial gains and energy independence, are primary motivators for participation in LEMs, varying significantly across different cultural and demographic contexts. Economic factors are pivotal in the transition from consumers to prosumers, significantly affecting market dynamics. These findings highlight the importance of understanding and balancing various participant motivations and behaviours to develop effective and sustainable LEMs. In the **'Emerging Business Models'** cluster, key actors like Grid Operators, Prosumers, Aggregators, Energy Communities, Retailers, Pure Generators and Platform Operators are innovating and adapting to the changing energy sector, each developing distinct revenue strategies. These models highlight a shift towards integration of new technologies and market conditions, focusing on innovative revenue streams like R&D partnerships, direct energy sales, and optimization services. However, they also face challenges in adapting to new regulatory frameworks, ensuring operational feasibility, and achieving scalability in diverse markets. The last cluster **'Policies'** shows, how the development and success of LEMs are significantly influenced by political and regulatory environments. They require comprehensive policies that effectively support and integrate sustainable technologies, highlighting the importance of harmonized and adaptive regulations for ensuring growth and operational efficiency.

Discussion of Results

LEM Design	Strengths	Weaknesses
Decentralized Bilateral P2P trading (based on blockchain)	- Enhances consumer empowerment with greater decision-making autonomy - Promotes widespread participation in energy decisions - Optimizes RE utilization - Matches energy supply with demand dynamically - Ensures high levels of transaction visibility	- Absence of centralized oversight - Dependence on sophisticated information and communication technologies - Challenges with ensuring reliable energy provision and maintaining grid integrity - Susceptibility to systemic vulnerabilities - Necessity for forward-thinking regulatory policies specific to blockchain governance
Community-based- Energy	- Bolsters community ties through shared energy initiatives - Ensures equitable distribution of energy resources for mutual benefit - Reduces overall energy-related expenses for the community	- Issues with expanding system capacity to larger scales - Difficulty in mitigating community management partiality; need for fair governance mechanisms - Concerns with ensuring consistent energy provision - Requirement for specialized knowledge and skills in energy management
Hybrid LEMs	- Boosts the efficiency and dependability of power distribution - Offers operational benefits and flexibility - More readily expandable to meet growing demand - Allows for simplified oversight with a centralized regulatory component - Aligns well with anticipated future energy infrastructure - Attracts a diverse range of market participants, potentially increasing trade activity	- Tendency towards less competitive energy pricing - Centralized management may stifle innovation - Often overlooks the temporal aspects of energy supply and demand, missing out on exploiting flexibility

Table 3 - Overview Strengths and Weaknesses of different LEM designs

In numerous aspects, the benefits of hybrid LEMs surpass those of highly decentralized systems. Firstly, hybrid LEMs enhance the **efficiency and reliability** of power distribution. By leveraging advanced technologies and integrated systems, they ensure a more stable and consistent energy supply, a crucial factor for any energy market. This reliability is especially important in meeting the demands of modern, energy-intensive societies. Moreover, Hybrid LEMs offer exceptional **operational flexibility**, designed to efficiently adapt to fluctuating energy demands and REG. Their **central management** structure reduces coordination issues, while simplifying oversight and ensuring consistent regulation for system integrity and consumer protection. Additionally, this

flexibility allows for easy **scalability** to meet growing demands and facilitates seamless interconnectedness among market participants. Furthermore, utilities with a wide customer base can attract a diverse range of participants, thereby stimulating trade and **enhancing market dynamism.** On the downside, hybrid LEMs may lead to less competitive energy pricing and potentially stifle innovation due to centralized management. Recognizing these challenges, it is evident that the positive attributes of hybrid LEMs significantly mitigate their limitations. These advantages emphasize their suitability for the dynamic and evolving energy market landscape. For the purposes of this study, we will therefore focus primarily on hybrid market design.

Gaps in Literature

In our comprehensive literature review, we have identified several critical gaps that warrant further investigation to enhance our understanding and implementation of LEMs and advanced market designs. Firstly, there is a noticeable gap in research into the **practical applicability of advanced market concepts**. The literature is full of theoretical models and simulations, but there is a lack of assessment of their feasibility in real-life scenarios. This gap is particularly evident in the case studies focusing on with hybrid market models, which lack empirical data and insights from companies into the feasibility of the models. This gap emphasises the need for more robust research that reconciles theoretical models with practical implementation and draws on industry insights. Secondly, our review highlights a significant deficiency in **understanding the full spectrum of motivations and barriers affecting consumer behaviour** in LEMs. Existing research predominantly emphasizes theoretical aspects, often neglecting the practical insights that could be gleaned from real-life data. This gap in understanding the dynamics of consumer behaviour is critical, as consumer involvement is a cornerstone for the efficiency, sustainability, and democratization of energy systems. Bridging this gap is imperative for policymakers and market

designers, offering them the insights necessary to foster more effective and inclusive LEMs. Furthermore, extant literature often explores **highly advanced technological models** without sufficiently addressing the relevant factors influencing their adoption, feasibility, and acceptance. There is also a notable lack of focus on the development of interoperable systems and standards, which are crucial for ensuring seamless functionality and communication between diverse technological elements within LEMs. These gaps highlight a significant need for a more holistic approach in research, one that not only emphasizes technological advancements but also addresses the practical, sustainable, and systemic adaptability challenges to build resilient and secure energy systems. Also, there is a notable gap in addressing the **future role of traditional electricity generators**, retailers, and producers in the evolving energy market landscape. The focus tends to be predominantly on newer market players like aggregators and prosumers, overlooking how established entities, with a history spanning over a century, will adapt their business models to forge novel revenue streams and remain relevant and competitive in a decentralized, renewable energy-driven market. Lastly, a significant inconsistency in terminology across various studies was found. Some papers discuss decentralized models but then paradoxically include central units, and others claim to look at P2P trading but involve community models with market aggregators. This lack of standardization in defining market designs highlights a notable gap in the existing literature. In conclusion, these gaps in the literature underscore a critical need for holistic, practical, and empirically grounded research in the field of LEMs and advanced market designs. Addressing these gaps will not only contribute to academic knowledge but also provide practical guidance for industry practitioners and policymakers in shaping the future of energy markets.

4. METHODOLOGY

Research Design

The research adopts a qualitative approach, as highlighted by (Flick, Kardorff, and Steinke 2005) due to its effectiveness in uncovering unknown causes, motives, and ideas. Qualitative expert interviews represent a structured, theory-driven approach for gathering data by interviewing individuals possessing exceptional knowledge in their respective fields. This approach is particularly suited for the study's aim of examining individual cases from various angles. Guided interviews, as suggested by (Flick, Kardorff, and Steinke 2005), are employed for their balance of systematicity and flexibility, allowing interviewees' practical perspectives to emerge more freely compared to standardized methods. Grounded in theoretical frameworks and a literature review, this qualitative research is exploratory in nature, utilizing semi-structured in-depth interviews (Blaikie 2009); (Creswell 2009). This method is ideal for studying areas of research that cannot be directly observed but are instead reported on, encouraging participants to share narratives for the researcher to analyse and interpret (Blaikie 2009). Since the expert's primary focus is not on the research question or the latest research findings, they adopt a more practical perspective when considering the research context. Therefore, qualitative face-to-face interviews offer in-depth insights on real-world experiences and provide control over the interview process.

Data Collection and Analysis Strategy

The research aims to conduct six qualitative online interviews with industry experts in LEMs, such as utilities, start-ups, academic researcher, and consultants that have an academic and practical expertise. The novelty of LEMs makes finding participants challenging, but also underscores their suitability as a research subject. As displayed in *Table 4*, six interviews were conducted via Microsoft Teams, scheduled between the end of October and November 2023, and lasted between

45 and 60 minutes each. These semi-structured interviews begun with general, open-ended questions to draw out participants' perspectives (Creswell 2009). This interview guideline (*Appendix E: Interview Guideline*) was developed to address issues related to the research questions. Following the interviews, each session was transcribed into text, ensuring a detailed record of the conversations (Creswell 2009). This transcription served as the foundational data for further in-depth analysis, allowing for further examination and interpretation of the insights and perspectives shared by the interviewees. This qualitative data was clustered into distinct key themes regarding LEMs in practice.

Expert	Country	Profession	Educational Background	Company Field
A	Portugal	R&D Engineer	M.Sc. Engineering	Utility
B	Portugal	Consultant	M.Sc. Business Administration	Utility
C	Portugal	Assistant Professor, Consultant	PhD in Energy Systems	Academic Researcher
D	Estonia	Strategic Director	M.Sc. Business Administration	Platform Operator Start-up
E	Germany	Academic Research, Director, Consultant	PhD in Engineering LEMs	Utility, Consulting
F	Germany	Head of Business Development	M.Sc. International Business	EaaS Start-up

Table 4 - Overview of interviewed industry experts n=6

5. ANALYSIS

1. Introduction

In times where sustainability and energy efficiency are at the forefront of global priorities, Local Energy Markets (LEMs) are emerging as pivotal field for innovation and practical application of renewable energy technologies. The shift towards LEMs represents a transformative approach to renewable energy generation, distribution, and consumption, challenging the traditional centralized energy paradigms. In 2022, solar energy experienced an impressive surge, growing by approximately 23% globally compared to the previous year, highlighting its rapidly increasing

significance in the RE sector (IEA, 2023). This transition towards decentralized energy is further fuelled by the increasing adoption of advanced technologies like smart grids, forming the physical fundament of future electricity networks (Yan et al. 2021). However, the journey towards fully realizing the theoretical potential of LEMs is facing diverse challenges. Key among these is the gap between the rapid pace of technological innovation and the slower evolution of market structures, policy frameworks, and consumer adoption.

The current trajectory of research in local energy market theory primarily emphasizes cutting-edge technological innovations while often neglecting the critical aspects of real-world application and integration. This leads to a significant oversight in understanding the factors that drive the practical adoption and long-term viability of these technologies. Furthermore, there is a noticeable shortfall in addressing the necessity of standardized, interoperable frameworks essential for the seamless integration of diverse technologies within local energy systems. This oversight creates barriers to the effective functioning and scalability of these systems. Consequently, there is an imperative need for a research paradigm that not only focuses on technological advancements but also examines and proposes solutions for the challenges of practical implementation, system interoperability, and user-centric adoption. Addressing these issues is essential for the realization of both, efficient and viable LEMs. Thus, the following **research question** has emerged:

RQ: What are the key barriers and drivers that influence the impact of technological innovations in LEMs from a practical perspective?

The motivation for this study stems from a growing academic and personal interest in the practical challenges of LEMs, especially in integrating technological innovations with sustainability practices. Academically, this area is crucial as it sits at the intersection of renewable energies and

technological innovations, where there's a pressing global need for cleaner, more efficient energy systems. In the subject of local energy markets, technological innovations are fundamental moderators of efficiency and resilience and ultimately, sustainability. The effective implementation of these technologies can lead to more optimized energy distribution, reduced carbon footprints, and enhanced energy security, aligning with global sustainability goals (International Energy Agency, 2023). However, the practical challenges in realizing proposed theoretical models in real-world settings are significant. This study aims to explore relevant barriers and drivers, offering insights on approaches that are not only technologically advanced but also feasible and adaptable to LEMs. Personally, the work experience in a German solar start-up with the vision of creating interconnected energy communities has also shaped the practical perspective on these issues. I've seen the potential and the hurdles of implementing sustainable energy technologies locally. Complemented by a master in business analytics, it offers a balanced view of both the theoretical and practical aspects of RE and the impact of technological innovations. This study is driven by the ambition to bridge the gap between advanced innovations and their application in viable LEMs.

2. Theoretical Foundation

The vast array of technologies reshaping the energy sector, particularly within the subject of local energy markets (LEMs), presents a complex ecosystem where each component plays a crucial role. To clarify terminology and to navigate this complexity, the following chapter elaborates on a LEM Technology Functionality Framework clustering the technological landscape into distinct functionalities. This structured approach not only facilitates a granular understanding of each technology's role and impact but also serves as a baseline for further analysis. By categorizing technologies from generation to end-user efficiency, this overview highlights the interconnectedness of these technologies and how they collectively contribute to a more resilient,

sustainable, and economically viable energy system. Navigating the technological complexities of LEMs and the explanation of key innovations that drive them forward sets the stage for the subsequent exploration of key technological drivers and barriers that impact the success of LEMs.

Functionality	**Technologies**
Generation	Solar PV panels, wind turbines
Transmission & Distribution	Transmission grid, distribution grid, smart grids, microgrids, transformers
Integration & Interoperability	Distributed energy resource management system (DERMS), Virtual Power Plants (VPP), Grid management Software, Communication Technologies (e.g., IoT devices, wireless communication networks)
Storage	Batteries, capacitors
Market Operation	Trading Platforms, Blockchain, Smart Contracts, optimization algorithms (e.g., forecasts, price building, grid stability), billing & compliance tools
Energy Efficiency & Management	Efficiency technologies (e.g., LED lighting, high efficiency appliances), Home Automation Systems (e.g., smart thermostats, smart home), Demand-Response Technologies (e.g., AMI, Automated Demand Response ADR)

Table 5- LEM Technology Functionality Framework

Facing increased generation of RES and more complex energy systems with prosumers that introduce bidirectional energy flows, particularly the role of **distribution systems** becomes increasingly crucial in delivering this power from and to end-users effectively. The transmission grid carries high-voltage electricity over long distances from power plants to substations, while the distribution grid steps down this voltage to deliver electricity directly to consumers. **Smart grids** enhance grid infrastructure by utilizing digital technologies, sensors, and software to efficiently track and balance electricity supply and demand in real-time while minimizing expenses and ensuring grid stability and reliability (Barone et al. 2023). Microgrids are localized grids that can disconnect from the traditional grid to operate autonomously, improving resilience and supporting local energy independence (Mengelkamp et al. 2018).

The increasing complexity of energy flows due to distributed generation also necessitates advanced **management technologies** to ensure overall system stability. In terms of enhanced integration, tools such as DERMS facilitate the management of DER, including storage and demand-response programs, by optimizing their operation for cost, performance, and reliability (IEA, 2023). They have the capability to integrate and leverage the growing number of RES, including electric vehicle charging stations and battery energy storage systems. Furthermore, they effectively address grid requirements such as voltage control and congestion management at the local level. **IoT devices** collect and transmit energy data to enable real-time monitoring and analysis (Hu et al. 2018). The effective management and optimization provided by these systems can be further enhanced by integrating energy storage solutions to play their part in balancing the grid. Batteries store electrical energy helping to mitigate the intermittency of RES by releasing power during periods of low generation or high demand, yet storage solutions tend to be quite expensive.

Moreover, the implementation of LEMs into this complex ecosystem is enabled by **market platform** technologies that allow for energy trading and economic dispatch. LEM trading platforms enable buying and selling of energy, often leveraging real-time data to reflect current supply and demand. **Optimization algorithms** allow for LEM design approaches that include aspects such as market pricing mechanisms, grid balancing or load-shifting, essential for an efficient market and an attractive value proposition (Dynge et al. 2021).

Additionally, blockchain introduces a secure, decentralized ledger for these transactions, increasing transparency, fairness and reducing the need for intermediaries. Smart Contracts are implemented to automatically execute trades based on predefined rules to streamline market operations.

Yet, the efficiency and management of energy is not only dependent on the effective operation of these markets but also on the **end-user technologies** that enable consumers or prosumers to participate in and respond to market signals. End-user technologies aim to reduce energy

consumption on the one hand and enhance energy management on the other hand. Innovative and efficient appliances such as LED lighting are used to significantly reduce energy consumption compared to traditional appliances. Moreover, home automation systems like smart thermostats automatically adjust heating and cooling based on user behavior and preferences. AMI systems collect and provide the relevant energy consumption and generation data (Wu et al. 2021).

Summarizing, this overview briefly explores the functionality and how technological components from generation to end-user consumption are linked. It supports better understanding of the relationships between various technologies, emphasizing their collective contribution to the efficiency, stability, and sustainability of LEMs.

3. Analysis

To address the gaps in literature that have been previously identified in the results of the literature review and to bridge the gap between theory and practice, interviews with leading research or industry experts have been conducted. The qualitative analysis of these interviews revealed four predominant themes across all expert insights: Technical Integration, Security and Operation, Socio-Economic Factors, and Policy and Regulations. The table below summarizes the key insights gathered from the interviews, while the subsequent analysis offers an in-depth exploration of these themes, highlighting the intricacies and interdependencies that impact the current application of technological innovations in LEMs.

Expert	Barriers & Challenges	Drivers and Opportunities
A	- Integrating LEM technologies in legacy systems and system interoperability - Grid stability issues due to RE intermittency - Consumer often do not understand advanced technological market designs	- Advanced gird management systems to address RES intermittency and grid stability - Leverage end-user applications to drive consumer engagement and simplify participation in LEMs

B	- Shortage of expertise and skilled personnel to operate and maintain LEM systems - Absence of legal frameworks for LEMs and associated technologies	- Integrate demand-response technologies - Mobile applications and platforms to promote empowerment in decision-making - Visualization tools to foster understanding
C	- Data privacy, security and validity - Accurate assessment of technological resource requirements and costs to achieve economic viability - Physical grid constraints	- Blockchain to ensure data integrity, transparency and fairness - Cloud platforms for secure and scalable data storage, management and analysis - Regulations that drive investments and innovation in LEM technologies
D	- Integrating novel technologies into existing ecosystems - Digital divide and technological readiness among consumers - Absence of legal frameworks leave grey zones and slow deployment of LEMs	- Blockchain to reduce risks of tampering and fraud and to enhance transparency - Implementation of innovations such as NFTs for RE assets to promote engagement and to explore new markets
E	- Design limitations of current grids to integrate innovative technologies - System interoperability issues hamper effective implementation and scalability - Technology affinity, knowledge gaps and low public awareness hamper adoption	- Data model standards to harmonize information exchange and facilitate information flows - Scalable and flexible LEM solutions drive economic viability and energy efficiency - Demand-response technology allows for more flexibility options and grid stability
F	- Maintaining consistent supply due to the intermittency of RES - Lack of skilled professionals for installation, operation and maintenance of RES technologies - Need for significant grid modernization efforts to enable and facilitate technical integration of LEMs	- Technologies to support balancing demand and supply of consumers - Cost reductions through economies of scale in the overall industry - Job creation enhancing public perception - Governmental support and incentives to drive innovation and adoption of technologies

Table 6 – Practical Insights from Expert Interviews

3.1 Barriers and Challenges

Technical Integration

The technical integration of LEMs into existing energy infrastructure involves overcoming compatibility and interoperability issues with legacy systems and ensuring grid stability (Parag and Sovacool 2016). Expert A particularly emphasizes the practical relevance of interoperability, stating, "it's crucial to integrate our cutting-edge technologies with existing, sometimes outdated systems and standards" (Expert A). Due to the diverse technological landscape this is particularly

difficult for integrating novel technologies such as blockchain into existing ecosystems (Expert D). Furthermore, efficient platform solutions in LEMs require the implementation of data model standards to harmonize information exchange and mitigate interoperability issues (Expert E). Another integration aspect is the intermittency of RES, creating challenges in maintaining consistent energy supply as storage solutions are still expensive (Expert F). Therefore, the technical integration of decentralized RES requires significant grid modernization efforts (Parag and Sovacool 2016). The issue of bidirectional power flows in networks designed for unidirectional flows requires consideration of physical grid constraints to ensure grid stability (Expert E). Thus, there is a need for further research and studies on LEM designs that fully incorporate these physical constraints, as current research tends to elaborate on advanced approaches that hamper aspects such as interoperability (Expert C, Expert E).

Security and Operation

The integration of advanced technologies into energy systems introduces several long-term challenges regarding information security, maintenance, and reliability of these technologies. As Expert C emphasizes, "LEM platforms run on vast volumes of data, making the reliability, authenticity, and trustworthiness of this data very relevant to ensure effective application". Additionally, Expert C highlights the practical issue of data privacy in LEMs as "consumer data such as bids and offers submitted by market participants contain data about their energy use, which may be classed as personal data". This introduces a crucial aspect often overlooked in research about the risks associated with the loss of personal data across, further complicating the practical application of energy systems (Expert C). As energy systems become more interconnected and reliant on digital technologies, they also become more vulnerable to cyber threats, ranging from data breaches to the disruption of energy supply (Xu et al. 2022). This underscores the need for

robust cybersecurity measures to effectively anticipate and respond to cyber threats, ensuring the protection of critical data and the privacy of prosumers in LEMs (Expert C). Moreover, a significant challenge to the operation and maintenance of new energy systems is the shortage of skilled professionals and the gap in technical expertise (Parag and Sovacool 2016). In practice, the rapid advancement in technology outpaces standards of training and education programs, leading to a scarcity of professionals capable of operating and managing LEMs (Expert B, Expert F).

Socio- Economic Factors

Another critical aspect for the practical implementation of LEMs are socio-economic barriers and challenges. First, public acceptance and knowledge gaps immediately affect the adoption of RE technologies in LEMs. As Expert E states, "the willingness and ability to use new technologies such as trading platforms is one of the most basic requirements for LEM participation.". The affinity to technology of a household positively influences the willingness to participate in LEMs and seems to be one of the core practical challenges (Expert E, Expert F). Expert D also adds that “one of the more critical challenges we've encountered is the digital divide in different communities. While some are quick to adapt to new platforms, others are hesitant, often due to a lack of understanding of how these technologies work.”. This divide highlights not only access issues but also the varying levels of technological readiness among consumers and is further complicated by regional differences in understanding consumer capabilities (Expert D). Moreover, as most of the solutions are implemented as services, one of the most important success factors for profitable and sustainable LEM business models revolves around information systems as a critical cost-driver (Expert E). There is an observable shift in business costs towards software development and operation, underscoring the high relevance of information systems for LEMs (Expert E). Adding to this, Expert C states that "There's a notable gap in research regarding the specification

of technological resources and costs to accurately assess the economic viability of business models in LEMs.". Another issue is the negligence of high initial investment costs for advanced RE technologies as Expert C claims that “Many papers recognize PV systems as essential for prosumers and investors but do not discuss the investment barrier". Adding to this, Expert B highlights that communities often hesitate to adopt advanced energy technologies due to concerns about general economic viability. Paired with uncertain returns, this could also deter potential investors and the emergence of economies of scale which would then in turn, contribute to cost decreases of relevant technologies (Expert C).

Regulatory and Policy Frameworks

Another major barrier around technological innovations is portrayed by regulatory and policy frameworks. Policy frameworks are often inconsistent across different jurisdictions, creating complex barriers to the implementation of new technologies. First, legal limitations to energy trading are one of the most basic barriers for LEMs (Expert C). For example, regulations in Portugal limit consumers to self-consumption, posing a fundamental barrier for the expansion of P2P markets (Expert C). Furthermore, there's a notable lag in regulations to keep pace with rapid technological advancements, often leaving innovative solutions in a regulatory grey zones (Parag and Sovacool 2016). This disconnect may significantly slow the development and deployment of innovative technologies. Expert D elaborates that especially in Eastern Europe, the absence of a legal framework for establishing LEMs is a significant barrier and particularly hinders scaling of technologies due to unclear future developments. This is also stressed by Expert B who points out that the absence of a supportive legal frameworks for LEMs and associated technologies can create critical uncertainty and hinder the adoption of innovative solutions (Expert B). Another important aspect is the complexity of business approval and grid integration processes deterring investment

and delay implementation (Vernay, Sebi, and Arroyo 2023). This complexity is also emphasized by Expert B, who notes that "obtaining necessary permits for establishing LEMs can be a lengthy and difficult process, especially when integrating new technologies" (Expert B). Finally, Expert C points out a critical gap in research, stating that many papers lack a discussion of the regulatory implications, which is essential for the practical application of these business models. This gap represents a significant challenge to their economic viability, suggesting research that explores the application of these business models in real-life contexts and with consideration to policy frameworks (Expert C). Concluding, these barriers and challenges illustrate the urgent need for regulatory advancements and harmonization to facilitate the growth and effectiveness of LEMs.

3.2 Drivers and Opportunities

Technical Integration

While the impact of innovations in LEMs faces a complex array of barriers and challenges in practice, there are is also a variety of drivers and opportunities that emerge in this context. Advancements in smart grid infrastructure are central to the technical integration of LEMs. These systems enable a two-way communication flow between producers and consumers, integrating energy distribution and management from various sources. To address RE intermittency and grid stability, the role of real-time data management and analytics becomes essential. Expert A claims the potential of advanced grid management systems utilizing machine learning algorithms, that allow to significantly mitigate the challenges posed by RE intermittency (Expert A). These sophisticated management systems capable of real-time analysis allow to monitor and optimize the flow and reliability of energy (Expert C). Furthermore, business models around LEMs significantly benefit from scalable and flexible technical integration in smart grids (Expert C). Scalability ensures that energy systems can adapt to varying system requirements without sacrificing

efficiency or reliability and increased flexibility allows for the seamless integration of different RES to enhance grid resilience (Expert E). In this context, particularly the system integration of demand-response technologies promises enhanced flexibility options and portrays a cheaper alternative to storage solutions (Expert C, Expert F). It enables consumers to automatically adapt their energy consumption in real-time, responding to fluctuations in energy supply and thus, supports the grid system in terms of stability. Expert B also stresses the significance of integrating demand-response technologies as they enable energy consumers to adjust or shift energy usage during peak times, both reducing costs and promoting more efficient energy consumption (Expert B). Additionally, cross-sectoral linkages with sectors like transportation or EV charging infrastructure provides potential for even more grid flexibility options (Expert E).

Security and Operation

In the domain of local energy markets, technologies such as blockchain and cloud computing are becoming increasingly vital for ensuring information security, data validity, transparency, and trustworthiness. Blockchain technology provides a transparent and immutable ledger system, which is crucial for maintaining the integrity of transactions and data exchanges (Expert C). In the face of frequent transactions and information flow, blockchain's ability to reduce the risk of tampering and fraud is highly valuable (Expert D). Furthermore, blockchain enhances transaction transparency, allowing to track and verify transactions. This transparency also fosters trust and a sense of fairness among stakeholders, a critical factor to combat scepticism and to promote technology adoption of consumers in LEMs (Expert C). Additionally, by streamlining processes and reducing the need for intermediaries, blockchain simplifies transactions. For instance, smart contracts can automate many processes within local energy markets, from bidding to billing and to compliance management (Expert D). This automation not only reduces operational costs but also

minimizes human error, further enhancing the operational reliability of the system (Expert C). Another opportunity is found in the role of cloud computing and data analytics to reinforce information security and operational stability. Cloud platforms offer a secure and scalable environment for data storage and management, which is crucial for handling the vast amounts of data generated and analyzed in LEMs (Expert C). In conclusion, technologies like blockchain and cloud computing are pivotal in driving the security and efficiency of LEMs. Blockchain's decentralized ledger system ensures transparency and reduces fraud risks, while cloud computing's storage and analytical capabilities enable effective data management and operational stability.

Socio- Economic Factors

The socio-economic aspects of technological innovations, including consumer behavior, preferences and capabilities significantly influence their adoption LEMs. Public engagement and education are crucial in driving the adoption of new technologies. Hereby, the implementation of technologies such as mobile end-user applications can significantly support engagement by providing insights into energy consumption data and enabling simplified participation in energy trading within communities (Expert A, Expert D). Furthermore, visualization tools aid users in understanding their energy consumption patterns and the performance of different devices within their energy ecosystem (Expert B). Digital platforms and applications also foster community engagement by facilitating access to information, educational content, forums for discussion and collaboration among LEM members (Expert B). In order to make these systems more accurate, the implementation of smart metering infrastructure paired with energy management systems are drivers for collecting and analysing data on energy usage (Expert C). Furthermore, the exploration of new and innovative technologies like NFTs for energy assets leverages the growth potential of personalized energy management and interesting new business models (Expert D). Regarding

economic aspects, Expert F highlights that cost reductions achieved through economies of scale and manufacturing innovations have made RE technologies more accessible and competitive, further fuelling adoption. Moreover, the increased implementation of technologies in energy communities leads to the creation of new jobs opportunities in fields such as research and development but also the installation, operation, and maintenance of these technologies.

Regulatory and Policy Framework

Government policies and incentives play a crucial role in shaping the impact of innovation in LEMs. They not only encourage investments and the adoption of innovative energy solutions but may also facilitate their integration into existing systems. First, policy and regulation can drive investment and thus, further innovation and in RE technologies (Expert C). Expert F elaborates that "By setting clear targets for RE expansion, governments can create a stable investment environment, encouraging private sector participation (Expert F). This can lead to increased research and development in new technologies, further driving down costs and improving efficiency (Expert C). Furthermore, Expert F emphasizes that "We need more grid modernization policies to drive the integration of RES technologies from the political side" in order to enable facilitated integration of innovative solutions. Additionally, mobile applications and platforms facilitate greater consumer engagement in energy decision-making, allowing users to track their energy consumption, participate in demand response programs. Expert B suggests these platforms may also be leveraged by including consumers in relevant decision-making such as "Voting on local energy initiatives to foster the sense of responsibility" (Expert B). Thereby, these technologies promote transparency and facilitate a more participatory approach in LEMs, aligning sustainable energy practices with broader democratic and environmental goals. Concluding, effective regulatory frameworks promote the adoption of LEMs and can be enhanced through the

introduction of technologies that enable or enhance consumer participation and foster an active role in decision-making.

4. Summary of Findings

This analysis assesses the complex interplay between technical, operational, socio-economic, and regulatory dimensions for technological innovation in LEMs, drawing from both, research and industry expert insights to bridge the gap between theoretical concepts and practical implementation. The technical integration poses significant challenges in harmonizing LEMs with existing infrastructures. Experts emphasize the difficulty of integrating LEMs with legacy systems, while addressing issues such as interoperability, grid stability and the intermittency RES. However, opportunities lie in advancements in smart grid infrastructure and leveraging management systems to enhance system flexibility and scalability. Security and reliability are also key concerns as LEMs solutions rely on vast volumes of data, raising issues of data privacy and vulnerability to cyber threats. Yet, technologies like blockchain and cloud computing offer robust solutions, ensuring transaction integrity and secure data management while streamlining operations. Furthermore, the adoption of innovations is influenced by technological readiness, acceptance, and economic considerations. The digital divide and high initial costs of advanced RE technologies are crucial barriers. Conversely, platforms that foster public engagement, educational programs paired with cost reductions through economies of scale can drive adoption. The creation of new jobs and innovative business models, including mobile applications and energy management systems, further amplify opportunities. Regarding regulatory frameworks, inconsistency challenges development and deployment of innovations across different jurisdictions. Legal barriers and the absence of supportive frameworks further slow these processes. Nonetheless, governmental policies and incentives are essential drivers for growth by promoting grid modernization and

encouraging investment but also facilitate the integration of innovative solutions. In summary, while innovations in the domain of LEMs are facing multifaceted challenges, there are substantial opportunities in leveraging technological advancements to foster the practical application of LEMs. Insights from experts underscore the need for holistic approaches that address both barriers and drivers, ensuring the effective and sustainable integration of LEMs into existing energy systems.

5. DISCUSSION OF RESULTS

The advancement of LEMs is often characterized by disruptive business models (Schwidtal et al. 2023), democratization of energy and empowerment of consumers (Hahnel et al. 2020a), improved integration of RES in the electricity system (Stadler et al., 2016), and an overall transition towards a service-oriented approaches in the electricity sector (Source). The synthesis of literature and analytical results reveals a complex interplay between these factors and illustrates how theoretical models often neglect the real-life constraints and practical challenges encountered in the implementation of LEMs. This chapter elaborates on two key tensions that address the issues that have been identified regarding a practical perspective on existing LEM theory.

Synthesis of Findings

The **first tension** in LEMs lies in the stark contrast between the theoretically high efficiency of complex market models and the practical desire for simplicity among consumers. In theory, LEMs aim to maximize efficiency, optimize the use of renewable energy, balance demand and supply and decrease prices for consumers. Due to the variable and uncertain nature of RES, highly complex models utilizing advanced algorithms, sophisticated real-time bidding systems, and complex responsive technologies promise the largest economic benefits for prosumers with the highest cost reductions. In contrast, the practical reality shows that this complexity clashes with what consumers

prefer. Most consumers want straightforward, low-engagement models, largely due to the desire to minimize the mental effort and complexity involved in energy trading. This preference is further reinforced by the general perception of electricity as a basic, low-involvement commodity. The increase of real-world economic benefits may not equal expectations of consumers and does not justify the increased mental burden due to added market dimensions such as bidding mechanisms. In summary this division leads to a significant problem, as market models become more complex and theoretically efficient, they increasingly lose appeal to the typical consumer.

The **second tension** revolves around the dilemma in initiating LEMs, stemming from the fact that neither consumer movements nor governmental authorities are actively driving their development. On the one hand, there is a need for an effective top-down approach, to create the basis and a suitable environment for LEMs by introducing regulatory frameworks. However, the inertia of government action is often due to a lack of consumer demand for change. This low desire is in turn due to a lack of consumer empowerment, reinforced by insufficient awareness of their active and important role, motivation, and relevant resources. In addition, consumer aversion is partly due to the high upfront costs associated with adopting LEMs, which discourages their interest and limits widespread adoption. Regulatory frameworks for LEMs are currently only developed in a top-down approach, neglecting the diverse requirements of real-world scenarios. Concluding, these tensions significantly complicate and hamper the effective, practical implementation of LEMs and require actionable recommendations that drive the adoption of LEMs.

Implications & Recommendations

Policy Implications

The analysis of the identified tensions in LEMs reveal several critical implications for policy makers that need to be addressed to facilitate the effective implementation and adoption. Firstly,

the disparity between the **pace of policy development** and the rapid rate of innovation in the energy sector is a significant impediment. Policies significantly lag behind, creating regulatory barriers or allowing for legal loopholes that either hinder or drive the practical application of LEMs. For instance, in Germany, consumer households are limited in their ability to sell or trade energy, with LEMs largely confined to pilot research projects. In contrast, Austria and Switzerland have recently implemented policies enabling energy trade among communities and mandating the implementation of smart metering devices by grid operators. Learning from these examples, other countries should consider revising their policies to allow more flexibility and autonomy for households in energy trading. Secondly, there is also a need for policies that support flexible contractual agreements among different LEM participants. This flexibility is crucial for accommodating the diverse needs and capacities of various stakeholders in the energy market, ranging from large-scale producers to individual consumers. Additionally, the bureaucracy surrounding the adoption and implementation of LEMs needs simplification. The current processes in establishing LEMs are often complicated and slow, substantially discouraging efforts and participation. Streamlining these processes, making them more user-friendly and efficient, would significantly support the adoption of LEMs by ensuring that installation processes are quick and hassle-free. To counter this, there is an urgent need for policy frameworks that are more adaptable and responsive to technological advancements. This could involve setting up dedicated task forces or committees that work closely with both experts and relevant end-users to ensure that regulations are in sync with the latest developments and real-world requirements. In terms of financial aspects, creating an attractive investment environment is essential for the growth and success of LEMs. Currently, the economic viability of LEMs is adversely affected by taxation measures, which can deter investment and participation. One effective approach is the establishment of supportive funds and the provision of financial incentives, both of which can stimulate innovation and attract

investments into the market. In addition to this, the high initial costs for LEMs infrastructure present a significant barrier. To address this, government subsidies could play a pivotal role in making LEMs more accessible to a wider range of participants by mitigating these upfront costs. As the market matures and benefits from economies of scale, the costs associated with infrastructure may decrease. Furthermore, tax revenues generated from early adopters of LEMs could be reinvested to offset governmental expenses. This cycle of investment and return can create a sustainable financial environment that supports the continuous growth and development of LEMs. Lastly, policymakers and regulators must also focus on education and empowerment in order to foster consumer participation. Many consumers are not fully aware of their potential role and the benefits of participating in LEMs. Educational campaigns and incentives that highlight these aspects could significantly boost consumer engagement. This involves not only informing consumers about the financial benefits but also about the environmental impact and the societal value of participating in LEMs. Therefore, there is a need for policy frameworks that empower consumers willing to actively contribute to political decision-making. In conclusion, the challenge is to create policy frameworks that not only support these innovative models but also promote consumer participation. This can be achieved through incentives and educational campaigns and empowerment to highlight the role and benefits of active involvement in LEMs.

Managerial Implications

In addition to the policy implications, the analysis of the identified tension within LEMs also reveals several crucial managerial implications. Innovative service offerings and market models are required to align with the customers and their future needs. To be economically viable, LEMs must include different types of energy resources and a mix of users with different demand profiles to manage the fluctuations associated with intermittent REG. A balance between efficient and therefore highly complex market designs and convenient, low-effort service offerings is required

for the business success of LEMs. The key to achieving this balance is the integration of trading mechanisms that demand minimal effort from end-users while still being complex enough to ensure efficiency. Furthermore, it is essential to find the right mix of automation and user autonomy in these systems. The development of these models must concentrate on straightforwardness and wide accessibility to align with the consumer-friendly approach that is central to the adoption of LEMs. This could be materialized through market design variations such as an 'easy mode' for full automation, alongside an 'expert mode' that grants more customization and autonomy. By streamlining the user experience and integrating consumer preferences and behaviours, LEM design becomes more aligned with the needs and expectations of its users. Also, it's important to provide an intuitive interface that is straightforward and easily comprehensible to ensure the service platform appeals to a diverse range of users without being overwhelming. To ensure the practicality of LEMs, it is necessary to establish a minimum IT infrastructure that supports easy integration. Such technologies need to be simple to install and operate, promoting their widespread adoption. Innovative technologies that offer 'out of the box' installation are essential, minimizing the effort required for consumers to adopt and integrate them into their daily routines. Addressing the challenge of IT infrastructure availability is also crucial, as components like smart metering systems are often in short supply and may have long delivery times. To address the barrier of initial investment costs in LEMs, it's advantageous to consider comprehensive service offerings. All-in-one packages could significantly mitigate upfront expenses by bundling essential services and technologies. In addition, offering energy efficiency solutions, such as smart home technologies, can further attract consumers by demonstrating the value and potential savings. Ensuring that these packages include hardware maintenance and dedicated consumer support will not only increase the appeal of LEMs, but also encourage long-term engagement and satisfaction.

Strategic Implications

The emergence of energy communities and servitization of the electricity sector are inducing several strategic implications due to creating new market opportunities and challenging existing business models. Due to the predominant role of utilities in the established market, they are especially affected by this evolution. In contrast to traditionally unidirectional electricity sales, utilities are facing reduced revenue due to the emergence of residential prosumers and decentralized energy systems. To stay competitive in the long run, this shift requires utilities to transition into Energy as a Service (EaaS) companies. **New service offerings** allow for revenue generation through customer-centric and platform-based solutions. Utilities need to leverage data analytics and customer feedback to develop and refine services that cater to the specific, evolving needs and preferences of their customers. This approach necessitates a deep understanding of customer behaviour and expectations, enabling utilities to offer tailored solutions.

To effectively **market LEMs** to consumers, it's imperative to communicate their benefits such as cost savings, energy independence, and environmental sustainability in a clear, concise, direct and personal way. Emphasizing the user-friendly and convenient aspects of LEMs can quickly convey their practical advantages, sparking consumer interest and facilitating their integration into everyday life. However, closing the knowledge gap and educate customers about LEM benefits remains a significant challenge. Informative campaigns, user-friendly informational content, and interactive workshops can play a crucial role in making LEMs better known. Furthermore, implementing Feedback Mechanisms is essential for continual improvement. Engaging “Opinion Leaders” in communities can be a game-changer, as these influential figures can bring credibility to LEMs.

Regarding **potential business models**, there is an opportunity to develop more integrated solutions. This could be achieved by integrating generation infrastructure with LEM services in a subscription-based customer solution. This model could significantly mitigate the adoption barrier

of high initial investment costs, making RE more accessible to a broader range of consumers. Additionally, utilities should explore opportunities in storage solutions and advanced demand-response technologies, which are crucial for increasing system flexibility and resilience. Therefore, investing in the development of innovative technologies and smart infrastructure, such as smart grids, Internet of Things (IoT) devices, and AI-driven analytics, is fundamental for enhancing operational efficiency and to reduce costs in the long-term.

Moreover, **strategic partnerships and collaborations** between established utilities, start-ups, and local energy communities are becoming highly relevant. These alliances synthesize the experience, customer base, and resources of utilities with innovative approaches and the agility of start-ups. Such synergy is mutually beneficial: start-ups gain access to physical infrastructure and customer base, essential for improving and scaling their innovations, while utilities may enhance their offerings with innovative approaches. This collaborative approach not only solidifies competitiveness and adaptability but also fosters a more inclusive and diverse energy market. Furthermore, collaboration between businesses and energy communities can provide valuable insights into specific consumer preferences. Inclusion of local energy communities into larger networks allows for more flexibility options and potential for scalability, fostering a more and responsive and resilient energy ecosystem.

6. CONCLUSION & FUTURE OUTLOOK

Impact of LEMs

As LEMs become more widespread, they will have a significant impact on different key areas in the future such as market structure, industry dynamics, social aspects, and the environment.

Regarding future **market structure** the trend towards decentralization will be fundamental to the evolving energy sector. Hereby, LEMs serve as a catalyst for the change from centralized

production to local generation, control, and consumption of energy. This decentralization is likely to increase REG, resulting in more available energy at potentially lower prices. In turn, market volume may decrease as consumers transition into prosumers by producing their own energy. This change will also impact established **industry dynamics**. Energy retailers face a transformative era where they need to evolve, or risk being pushed out of the market. Adapting to offer hybrid LEMs in their product portfolio could allow them to maintain their market power. The growing recognition of LEMs is attracting a diverse range of new participants to the energy market. The entry of energy tech start-ups, community groups, and entrepreneurs brings fresh perspectives and innovative solutions, ranging from advanced energy management technologies to community-driven initiatives, enriching the energy sector's landscape. New market models such as profit-sharing models in local energy community could emerge through those industry shifts, incentivizing sustainable practices and equitable energy distribution. Furthermore, LEMs are expected to play a central role in reducing emissions and **promoting sustainability**. A key aspect of this is the increased use of RES, as LEMs provide an optimal framework for incorporating these environmentally friendly and sustainable energy alternatives. Since RE is generally generated close to the point of consumption, LEMs reduce the need for extensive nationwide transmission and distribution networks. This approach not only saves energy, but also plays an important role in preserving natural landscapes and minimizing the environmental footprint associated with large-scale infrastructure development. The **social impact** of LEMs requires a strong focus on equity and fairness. It is important that LEMs are inclusive and meet the diverse needs of society, especially those who do not have the means to invest in renewable technologies. This aspect of equity is even more important in urban areas, where space for installations such as solar panels is often limited. Developing LEM models that are adaptable and equitable in both urban and rural areas is crucial. Another important issue in connection with LEMs is the possible shift in the cost

burden. Solar users who can generate their own electricity may contribute less to the maintenance of the electricity grid. This lower contribution may inadvertently lead to higher costs for non-solar users, who often cannot afford to invest in renewable technologies. Such a scenario raises serious questions of social injustice and highlights the importance of developing policies that avoid an unfair financial burden on certain consumer groups. In summary, the rise of LEMs promises a new era of energy distribution and a more decentralized, sustainable, and equitable future. This shift towards LEMs will not only transform the energy sector but will also have a profound impact on social justice and environmental protection.

Relevance of LEMs

The wide implementation of LEMs is a concept that, while promising, is likely to materialize more significantly over the next decade, and several critical factors contribute to this anticipated timeline. Firstly, the energy market is currently not mature enough to support the rapid integration of LEMs, displaying a notable inertia that slows down the pace of change. This lack of market readiness is compounded by the absence of viable, sustainable business models for LEMs. Without these models, which could potentially include hybrid systems blending traditional and decentralized energy approaches, the long-term success and scalability of LEMs remain uncertain. Due to the low market readiness and entrenched operational frameworks, there's a noticeable lack of urgency for utilities in adjusting existing systems to accommodate LEMs. Additionally, the limited competition threats posed by LEMs, given the strong market power of established energy companies and their lobbying influence, further slows down the momentum for change. In addition, the regulatory environment, which plays a critical role in the growth and adoption of LEMs, is slow to adapt. The speed at which **policies and regulations** evolve to support new energy models such as LEMs is a major bottleneck to their adoption. Finally, the **cultural aspect** should not be

overlooked. There is a noticeable resistance to change in communities and industries, a reluctance to transition from traditional energy roles to more proactive roles in LEMs. This reluctance is not just a technological barrier but represents a broader behavioural change in energy consumption and production patterns. While the potential for LEMs to revolutionize the energy landscape is immense, their path to widespread adoption is paved with multiple challenges. Overcoming these challenges will be key to unlocking the full potential of LEMs in the coming years.

Critical Appraisal

In this work, a notable limitation identified is the analysis of barriers in LEMs without directly engaging with consumers. This approach might lead to presumptions that don't accurately capture consumer perspectives and concerns, potentially affecting the study's real-world relevance. To enhance the validity of the findings, future research should focus on direct consumer engagement. This would involve ascertaining genuine consumer interest in LEMs and understanding how these systems could be integrated into their everyday lives, thereby addressing awareness, interest, and possible challenges in adoption. Moreover, the analysis of RE prices only relies on prosumer data from Estonia. While this provides a focused case study, the findings might not be easily generalizable to other regions with different energy infrastructures, regulatory environments, or consumer behaviours. In addition, the alignment of regulations and policies with the objectives of LEMs is seen as an important area of research. This includes a thorough examination of how existing policies either support or hinder the development of LEMs. Regulatory changes that promote and ensure the growth and sustainability of these markets are needed but are not proposed in this thesis. The literature review for this research, despite using a wide range of sources, may have overlooked some literature and data (Loosen 2016). Additionally, the use of qualitative guided interviews, while established and adaptable, may limit comparison with other studies due to their

specific application to this research. Guided interviews might be subject to the researcher's influence, due to the flexible nature of the interview environment, where spontaneous decisions by the researcher can, to some extent, affect the participants' responses (Loosen 2016).

Future Research Avenues

Research Avenue	Description
Acknowledging Real-World Constraints	Research in LEMs must move beyond the hypothetical scenarios of perfect markets and completely rational behaviour. Embracing the complexities and imperfections of real-world markets will provide insights that are far more applicable and valuable for the practical implementation of LEMs.
Consumer-Focused Investigations	There is a significant need for research that centres around the consumer. Instead of presuming consumer needs, studies should actively seek to understand the actual desires and requirements of consumers. This consumer-centric approach is crucial for aligning the development of LEMs with the expectations and needs of end-users.
Standardization of Terminology	The emerging field of LEMs suffers from a lack of unified terminology. Future research must aim to establish clear and consistent terminology, enabling better communication and understanding among researchers, policymakers, and practitioners in this domain.
Incorporating Policy and Regulation	The impact of policy and regulation on the development and operation of LEMs cannot be overstated. Research needs to delve deeper into how governmental policies and regulations shape the possibilities and limitations of LEMs, ensuring that new models are both innovative and compliant.
Conducting LEM Simulations	To gain a realistic understanding of LEMs, conducting simulation studies is imperative. These simulations should replicate real-life scenarios as closely as possible, thereby shedding light on the potential operational challenges and opportunities.
Demographically Diverse LEM Simulations	Advocacy for simulation studies that consider a wide range of demographic factors is vital. Such studies should examine how various factors like age, gender, income, housing type, and RE system ownership influence behaviour within LEMs. This approach will provide a more comprehensive view of how different population segments may interact with LEMs.

Table 7- Future Research Avenues and Description

The thesis has presented a thorough analysis and evaluation of LEMs and contributes to bridging the gap between theoretical concepts and practical application. While the vision of sourcing energy from your neighbour’s rooftop solar installation might seem both simple and progressive, real-world complexities and challenges still need to be navigated effectively. The conclusion drawn is that, although LEMs align with sustainability goals and empower consumers, they still need more development and time to reach their full potential. With ongoing technological progress and shifts

in societal views on energy use, the feasibility and appeal of LEMs are expected to grow. Finally, this work suggests that active engagement and continued innovation are key to unlocking the future promise of LEMs.

REFERENCES

Adolfsen, Jakob Feveile, Friderike Kuik, Tobias Schuler, and Eliza Lis. 2022. 'The Impact of the War in Ukraine on Euro Area Energy Markets', June. https://www.ecb.europa.eu/pub/economic-bulletin/focus/2022/html/ecb.ebbox202204_01~68ef3c3dc6.en.html.

An, Jongbaek, Minhyun Lee, Seungkeun Yeom, and Taehoon Hong. 2020. 'Determining the Peer-to-Peer Electricity Trading Price and Strategy for Energy Prosumers and Consumers within a Microgrid'. *Applied Energy* 261 (March): 114335. https://doi.org/10.1016/j.apenergy.2019.114335.

An, Su, Honglei Wang, and Xiaoxia Leng. 2022. 'Optimal Operation of Multi-Micro Energy Grids under Distribution Network in Southwest China.' *Applied Energy* 309 (March): N.PAG-N.PAG.

Antal, Claudia, Tudor Cioara, Marcel Antal, Vlad Mihailescu, Dan Mitrea, Ionut Anghel, Ioan Salomie, et al. 2021. 'Blockchain Based Decentralized Local Energy Flexibility Market'. *Energy Reports* 7 (November): 5269–88. https://doi.org/10.1016/j.egyr.2021.08.118.

Armioun, Majid, Mehrdad Setayesh Nazar, Miadreza Shafie-khah, and Pierluigi Siano. 2023. 'Optimal Scheduling of CCHP-Based Resilient Energy Distribution System Considering Active Microgrids' Multi-Carrier Energy Transactions.' *Applied Energy* 350 (November): N.PAG-N.PAG.

Austin, Heather. 2022. 'Wholesale Electricity Market Design: Rationale and Choices'. The World Bank.

Avalos, Fernando, and Wenqian Huang. 2022. 'Commodity Markets: Shocks and Spillovers'.

Bandara, Kosala Yapa, Subhasis Thakur, and John Breslin. 2021. 'Flocking-Based Decentralised Double Auction for P2P Energy Trading within Neighbourhoods.' *International Journal of Electrical Power & Energy Systems* 129 (July): N.PAG-N.PAG.

Barone, G., A. Buonomano, C. Forzano, A. Palombo, and G. Russo. 2023. 'The Role of Energy Communities in Electricity Grid Balancing: A Flexible Tool for Smart Grid Power Distribution Optimization.' *Renewable & Sustainable Energy Reviews* 187 (November): N.PAG-N.PAG.

Bernard, Steven, and Kenza Bryan. 2023. 'Global Warming on Track for up to 2.9C as Greenhouse Gases Keep Rising, UN Says'. 20 November 2023. https://www.ft.com/content/9bbd39e8-eccc-4827-989d-0a2c3bfd934d.

Bhandari, Dr Vivek. 2023. 'Council Post: How To Pave The Future Of Local Energy Markets'. Forbes. 2023. https://www.forbes.com/sites/forbestechcouncil/2023/06/16/how-to-pave-the-future-of-local-energy-markets/.

Bichler, Martin, Hans Ulrich Buhl, Johannes Knörr, Felipe Maldonado, Paul Schott, Stefan Waldherr, and Martin Weibelzahl. 2022. 'Electricity Markets in a Time of Change: A Call to Arms for Business Research'. *Schmalenbach Journal of Business Research* 74 (1): 77–102. https://doi.org/10.1007/s41471-021-00126-4.

Blaikie, Norman. 2009. *Designing Social Research: The Logic of Anticipation*. 2nd edition. Cambridge, UK ; Malden, MA: Polity.

Bokkisam, Hanumantha Rao, Ritesh Mohan Acharya, and Selvan M.P. 2022. 'Framework of Transactive Energy Market Pool for Community Energy Trading and Demand Response

Management Using an Auction-Theoretic Approach.' *International Journal of Electrical Power & Energy Systems* 137 (May): N.PAG-N.PAG.

Brummer, Vasco. 2018. 'Community Energy – Benefits and Barriers: A Comparative Literature Review of Community Energy in the UK, Germany and the USA, the Benefits It Provides for Society and the Barriers It Faces'. *Renewable and Sustainable Energy Reviews* 94 (October): 187–96. https://doi.org/10.1016/j.rser.2018.06.013.

Chang, Xinyue, Yinliang Xu, and Hongbin Sun. 2021. 'Online Distributed Neurodynamic Optimization for Energy Management of Renewable Energy Grids.' *International Journal of Electrical Power & Energy Systems* 130 (September): N.PAG-N.PAG.

Chen, Jie, Fan Su, Vipin Jain, Asma Salman, Mosab I. Tabash, Akram M. Haddad, Eman Zabalawi, Alaa Amin Abdalla, and Malik Shahzad Shabbir. 2022. 'Does Renewable Energy Matter to Achieve Sustainable Development Goals? The Impact of Renewable Energy Strategies on Sustainable Economic Growth'. *Frontiers in Energy Research* 10 (March): 829252. https://doi.org/10.3389/fenrg.2022.829252.

Chen, Sijie, and Chen-Ching Liu. 2016. 'From Demand Response to Transactive Energy: State of the Art | Journal of Modern Power Systems and Clean Energy'. 2016. https://link.springer.com/article/10.1007/s40565-016-0256-x.

Chen, Y., X. Lei, J. Yang, H. Zhong, and T. Huang. 2022. 'Decentralized P2P Power Trading Mechanism for Dynamic Multi-Energy Microgrid Groups Based on Priority Matching'. *Energy Reports* 8: 388–97. https://doi.org/10.1016/j.egyr.2022.08.109.

Cohn, Lisa. 2022. 'The Day of Reckoning Approaches for Local Energy Markets'. Microgrid Knowledge. 16 December 2022. https://www.microgridknowledge.com/community-microgrids/article/21439003/microgridfacilitated-local-energy-markets-advance-but-innovation-is-needed.

Conradie, Peter D., Olivia De Ruyck, Jelle Saldien, and Koen Ponnet. 2021. 'Who Wants to Join a Renewable Energy Community in Flanders? Applying an Extended Model of Theory of Planned Behaviour to Understand Intent to Participate'. *Energy Policy* 151 (April): N.PAG-N.PAG. https://doi.org/10.1016/j.enpol.2020.112121.

Cramton, Peter. 2017. 'Electricity Market Design'. *Oxford Review of Economic Policy* 33 (4): 589–612. https://doi.org/10.1093/oxrep/grx041.

Creswell, John W. 2009. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd Ed*. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd Ed. Thousand Oaks, CA, US: Sage Publications, Inc.

CSI Market. 2023. 'Utilities Sector Profitability, Gross Margin, Net Margin, Cash Flow Margin, ROE'. 2023. https://csimarket.com/Industry/Industry_Profitability.php?s=1200.

Di Silvestre, Maria Luisa, Mariano Giuseppe Ippolito, Eleonora Riva Sanseverino, Giuseppe Sciumè, and Antony Vasile. 2021. 'Energy Self-Consumers and Renewable Energy Communities in Italy: New Actors of the Electric Power Systems.' *Renewable & Sustainable Energy Reviews* 151 (November): N.PAG-N.PAG.

Dudjak, Viktorija, Diana Neves, Tarek Alskaif, Shafi Khadem, Alejandro Pena-Bello, Pietro Saggese, Benjamin Bowler, et al. 2021. 'Impact of Local Energy Markets Integration in Power Systems Layer: A Comprehensive Review.' *Applied Energy* 301 (November): N.PAG-N.PAG.

Dwivedi, Divyanshi, Pradeep Kumar Yemula, and Mayukha Pal. 2023. 'Evaluating the Planning and Operational Resilience of Electrical Distribution Systems with Distributed Energy Resources Using Complex Network Theory.' *Renewable Energy Focus* 46 (September): 156–69.

Dynge, Marthe Fogstad, Pedro Crespo del Granado, Naser Hashemipour, and Magnus Korpås. 2021. 'Impact of Local Electricity Markets and Peer-to-Peer Trading on Low-Voltage Grid Operations.' *Applied Energy* 301 (November): N.PAG-N.PAG.

Ecker, Franz, Ulf J. J. Hahnel, and Hans Spada. 2017. 'Promoting Decentralized Sustainable Energy Systems in Different Supply Scenarios: The Role of Autarky Aspiration'. *Frontiers in Energy Research* 5 (July): 14. https://doi.org/10.3389/fenrg.2017.00014.

EEA. 2023. 'Share of Energy Consumption from Renewable Sources in Europe'. 24 October 2023. https://www.eea.europa.eu/en/analysis/indicators/share-of-energy-consumption-from.

Eljand, Kristjn, Martin Laid, Jean-Baptiste Scellier, Sohier Dane, Maggie Demkin, and Addison Howard. 2023. 'Enefit - Predict Energy Behavior of Prosumers'. https://kaggle.com/competitions/predict-energy-behavior-of-prosumers.

EnergySage. 2022. 'How Solar Panel Cost & Efficiency Change Over Time'. EnergySage. 8 February 2022. https://www.energysage.com/solar/solar-panel-efficiency-cost-over-time/.

Erdman and Zweifel, bücher de IT and. 2008. 'Energieökonomik'. bücher.de. 2008. https://link.springer.com/book/9783540707738.

Esmat, Ayman, Martijn de Vos, Yashar Ghiassi-Farrokhfal, Peter Palensky, and Dick Epema. 2021. 'A Novel Decentralized Platform for Peer-to-Peer Energy Trading Market with Blockchain Technology.' *Applied Energy* 282 (January): N.PAG-N.PAG.

'Eurobarometer Survey'. 2023. 2023. https://europa.eu/eurobarometer/surveys/detail/2954.

Eurostats. 2023. 'Electricity Price Statistics'.

Exnaton AG. 2023. 'Renewable Energy Communities'. September 2023. https://www.exnaton.com/renewable-energy-communities.

Falchetta, Giacomo, Bruno Michoud, Manfred Hafner, and Marcus Rother. 2022. 'Harnessing Finance for a New Era of Decentralised Electricity Access: A Review of Private Investment Patterns and Emerging Business Models'. *Energy Research & Social Science* 90 (August): 102587. https://doi.org/10.1016/j.erss.2022.102587.

Flick, Uwe, Ernst von Kardorff, and Ines Steinke, eds. 2005. 'Qualitative Forschung. Ein Handbuch. 4. Aufl.' Rowohlts Enzyklopädie. 3990. Reinbek: Rowohlt-Taschenbuch Verl.

Fuentes González, Fabián, Enzo Sauma, and AdriaanHendrik van der Weijde. 2019. 'The Scottish Experience in Community Energy Development: A Starting Point for Chile.' *Renewable & Sustainable Energy Reviews* 113 (October): N.PAG-N.PAG.

García-Muñoz, Fernando, Sebastián Dávila, and Franco Quezada. 2023. 'A Benders Decomposition Approach for Solving a Two-Stage Local Energy Market Problem under Uncertainty.' *Applied Energy* 329 (January): N.PAG-N.PAG.

Gayo-Abeleira, Miguel, Carlos Santos, Francisco Javier Rodríguez Sánchez, Pedro Martín, José Antonio Jiménez, and Enrique Santiso. 2022. 'Aperiodic Two-Layer Energy Management System for Community Microgrids Based on Blockchain Strategy.' *Applied Energy* 324 (October): N.PAG-N.PAG.

Gazafroudi, Amin Shokri, Mohsen Khorasany, Reza Razzaghi, Hannu Laaksonen, and Miadreza Shafie-khah. 2021. 'Hierarchical Approach for Coordinating Energy and Flexibility Trading in Local Energy Markets.' *Applied Energy* 302 (November): N.PAG-N.PAG.

German Federal Government. 2023. 'So Läuft Der Ausbau Der Erneuerbaren Energien in Deutschland- Deutsche Bundesregierung 2023'. In .

Gielen, Dolf. 2021. 'Critical Materials for the Energy Transition'.

Gjorgievski, Vladimir Z., Snezana Cundeva, and George E. Georghiou. 2021. 'Social Arrangements, Technical Designs and Impacts of Energy Communities: A Review.' *Renewable Energy: An International Journal* 169 (May): 1138–56.

Gjorgievski, Vladimir Z., Bodan Velkovski, Minuto Francesco Demetrio, Snezana Cundeva, and Natasa Markovska. 2023. 'Energy Sharing in European Renewable Energy Communities: Impact of Regulated Charges.' *Energy* 281 (October): N.PAG-N.PAG.

Golla, Armin, Nicole Röhrig, Philipp Staudt, and Christof Weinhardt. 2022. 'Evaluating the Impact of Regulation on the Path of Electrification in Citizen Energy Communities with Prosumer Investment.' *Applied Energy* 319 (August): N.PAG-N.PAG.

Grid Singularity. n.d. 'Grid Singularity'. Accessed 18 December 2023. https://gridsingularity.com/company/our-approach.

Grimm, Veronika, Lars Schewe, Martin Schmidt, and Gregor Zöttl. 2017. 'Uniqueness of Market Equilibrium on a Network: A Peak-Load Pricing Approach'. *European Journal of Operational Research* 261 (3): 971–83. https://doi.org/10.1016/j.ejor.2017.03.036.

Hahnel, Ulf J.J., Mario Herberz, Alejandro Pena-Bello, David Parra, and Tobias Brosch. 2020a. 'Becoming Prosumer: Revealing Trading Preferences and Decision-Making Strategies in Peer-to-Peer Energy Communities.' *Energy Policy* 137 (February): N.PAG-N.PAG. https://doi.org/10.1016/j.enpol.2019.111098.

———. 2020b. 'Becoming Prosumer: Revealing Trading Preferences and Decision-Making Strategies in Peer-to-Peer Energy Communities'. *Energy Policy* 137 (February): 111098. https://doi.org/10.1016/j.enpol.2019.111098.

Hall, Max. 2021. '"Residential Batteries Are Less Profitable than Selling Excess Power to the Grid"'. Pv Magazine International. 1 July 2021. https://www.pv-magazine.com/2021/07/01/residential-batteries-are-less-profitable-than-selling-excess-power-to-the-grid/.

Hall, Stephen, Donal Brown, Mark Davis, and Mark Davis, M. Ehrtmann Lars Holstenkamp. 2020. 'Business Models for Prosumers in Europe'.

Harris, Kevin. 2023. 'UK Total Energy', September.

Helms, Thorsten, Moritz Loock, and René Bohnsack. 2016. 'Timing-Based Business Models for Flexibility Creation in the Electric Power Sector'. *Energy Policy* 92 (May): 348–58. https://doi.org/10.1016/j.enpol.2016.02.036.

Horstink, L., et al. 2019. 'Review and Characterisation of Collective Renewable Energy Prosumer Initiatives'.

Houben, Nikolaus, Armin Cosic, Michael Stadler, Muhammad Mansoor, Michael Zellinger, Hans Auer, Amela Ajanovic, and Reinhard Haas. 2023. 'Optimal Dispatch of a Multi-Energy System Microgrid under Uncertainty: A Renewable Energy Community in Austria.' *Applied Energy* 337 (May): N.PAG-N.PAG.

Hu, Mian, Jiang-Wen Xiao, Shi-Chang Cui, and Yan-Wu Wang. 2018. 'Distributed Real-Time Demand Response for Energy Management Scheduling in Smart Grid.' *International Journal of Electrical Power & Energy Systems* 99 (July): 233–45.

Huang, Chunyi, Mingzhi Zhang, Chengmin Wang, Ning Xie, and Zhao Yuan. 2022. 'An Interactive Two-Stage Retail Electricity Market for Microgrids with Peer-to-Peer Flexibility Trading.' *Applied Energy* 320 (August): N.PAG-N.PAG.

IEA. 2021. 'Renewables 2021 - Analysis and Forecast to 2026'. https://iea.blob.core.windows.net/assets/5ae32253-7409-4f9a-a91d-1493ffb9777a/Renewables2021-Analysisandforecastto2026.pdf.

'———'. 2023a. IEA. 2023. https://www.iea.org/energy-system/renewables/solar-pv.

———. 2023b. ‘World Energy Investment 2023 – Analysis’. IEA. 2023. https://www.iea.org/reports/world-energy-investment-2023.

———. 2023c. ‘The Energy World Is Set to Change Significantly by 2030, Based on Today’s Policy Settings Alone - News’. IEA. 24 October 2023. https://www.iea.org/news/the-energy-world-is-set-to-change-significantly-by-2030-based-on-today-s-policy-settings-alone.

IEA-PVPS. 2023. ‘Snapshot of Global PV Markets - 2023’.

Ilieva, I, B Bremdal, A A S De La Nieta Lopez, and S H Simonsen. 2019. ‘Local Energy Markets as a Solution for Increased Energy Efficiency and Flexibility’. *IOP Conference Series: Earth and Environmental Science* 352 (1): 012036. https://doi.org/10.1088/1755-1315/352/1/012036.

INEA. 2021. ‘Supporting Innovative Smart Grids and Storage Projects’. 29 November 2021. https://cinea.ec.europa.eu/publications/supporting-innovative-solutions-smart-grids-and-storage-2021_en.

IRENA. 2016. ‘Renewable Energy in Cities’. 1 October 2016. https://www.irena.org/publications/2016/Oct/Renewable-Energy-in-Cities.

Jiang, Aihua, Huihong Yuan, and Delong Li. 2021. ‘A Two-Stage Optimization Approach on the Decisions for Prosumers and Consumers within a Community in the Peer-to-Peer Energy Sharing Trading.’ *International Journal of Electrical Power & Energy Systems* 125 (February): N.PAG-N.PAG.

Jones, Callum. 2023. ‘Portugal Just Ran on 100% Renewable Energy for Six Days in a Row’. UNILAD. 19 November 2023. https://www.unilad.com/news/world-news/portugal-renewable-energy-six-days-straight-622623-20231119.

Kantor, Alice, and Ainsley Thomson. 2023. ‘Why Energy Bills Are So High Right Now Around the World - Bloomberg’. 10 February 2023. https://www.bloomberg.com/news/articles/2023-02-10/why-energy-bills-are-so-high-right-now-around-the-world?embedded-checkout=true.

K.C., Bevin, and Ashu Verma. 2023. ‘Decentralized Local Electricity Market Model Using Automated Market Maker.’ *Applied Energy* 334 (March): N.PAG-N.PAG.

Kennedy, Ryan. 2022. ‘Polysilicon Prices Rise over 200% in 2022 amid Supply Shortages’. Pv Magazine USA. 6 July 2022. https://pv-magazine-usa.com/2022/07/06/polysilicon-prices-rise-over-200-in-2022-amid-supply-shortages/.

Khojasteh, M., P. Faria, and Z. Vale. 2023. ‘A Distributed Robust ADMM-Based Model for the Energy Management in Local Energy Communities’. *Sustainable Energy, Grids and Networks* 36. https://doi.org/10.1016/j.segan.2023.101136.

Khorasany, Mohsen, Amin Shokri Gazafroudi, Reza Razzaghi, Thomas Morstyn, and Miadreza Shafie-khah. 2022. ‘A Framework for Participation of Prosumers in Peer-to-Peer Energy Trading and Flexibility Markets.’ *Applied Energy* 314 (May): N.PAG-N.PAG.

Kiedanski, Diego, Ariel Orda, and Daniel Kofman. 2020. ‘Combflex: A Linear Combinatorial Auction for Local Energy Markets’. In *2020 IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm)*, 1–7. Tempe, AZ, USA: IEEE. https://doi.org/10.1109/SmartGridComm47815.2020.9302988.

Koirala, Binod Prasad, Elta Koliou, Jonas Friege, Rudi A. Hakvoort, and Paulien M. Herder. 2016. ‘Energetic Communities for Community Energy: A Review of Key Issues and Trends Shaping Integrated Community Energy Systems’. *Renewable and Sustainable Energy Reviews* 56 (April): 722–44. https://doi.org/10.1016/j.rser.2015.11.080.

Krause, Carsten. 2023. 'Case Study: Kodak's Downfall—A Lesson in Failed Digital Transformation and Missed Opportunities'. The CDO TIMES. 27 September 2023. https://cdotimes.com/2023/09/27/case-study-kodaks-downfall-a-lesson-in-failed-digital-transformation-and-missed-opportunities/.

Kühnbach, Matthias, Anke Bekk, and Anke Weidlich. 2022. 'Towards Improved Prosumer Participation: Electricity Trading in Local Markets.' *Energy* 239 (January): N.PAG-N.PAG.

Lakshmanan, Rohit. 2022. 'Environmental Impact of Additive Manufacturing on the Renewable Energy Industry: Case of Wind Turbine'. https://doi.org/10.13140/RG.2.2.35701.24806.

Lee, W.-P., D. Han, and D. Won. 2022. 'Grid-Oriented Coordination Strategy of Prosumers Using Game-Theoretic Peer-to-Peer Trading Framework in Energy Community'. *Applied Energy* 326. https://doi.org/10.1016/j.apenergy.2022.119980.

Li, Yinan, Wentao Yang, Ping He, Chang Chen, and Xiaonan Wang. 2019. 'Design and Management of a Distributed Hybrid Energy System through Smart Contract and Blockchain.' *Applied Energy* 248 (August): 390–405.

Lin, Yanling and Jianhui Wang. 2022. 'Realizing the Transactive Energy Future with Local Energy Market: An Overview', January. https://doi.org/10.1007/s40518-021-00198-0.

Liu, Guozhong, Shuying Lai, Jing Qiu, Yuechuan Tao, and Junhua Zhao. 2023. 'Credit-Based Peer-to-Peer Energy Sharing Mechanism under the Distributed Negotiation Framework.' *International Journal of Electrical Power & Energy Systems* 144 (January): N.PAG-N.PAG.

Liu, Jiejie, Yao Li, Yanan Ma, Ruomu Qin, Xianyang Meng, and Jiangtao Wu. 2023. 'Coordinated Energy Management for Integrated Energy System Incorporating Multiple Flexibility Measures of Supply and Demand Sides: A Deep Reinforcement Learning Approach.' *Energy Conversion & Management* 297 (December): N.PAG-N.PAG.

Loosen, Wiebke. 2016. 'Das Leitfadeninterview – Eine Unterschätzte Methode'. In , 139–55. https://doi.org/10.1007/978-3-658-01656-2_9.

López González, Diana María, and John Garcia Rendon. 2022. 'Opportunities and Challenges of Mainstreaming Distributed Energy Resources towards the Transition to More Efficient and Resilient Energy Markets.' *Renewable & Sustainable Energy Reviews* 157 (April): N.PAG-N.PAG.

López-García, D.A., J.P. Torreglosa, and D. Vera. 2019. 'A Decentralized P2P Control Scheme for Trading Accurate Energy Fragments in the Power Grid'. *International Journal of Electrical Power & Energy Systems* 110 (September): 271–82. https://doi.org/10.1016/j.ijepes.2019.03.013.

Lüth, Alexandra, Jens Weibezahn, and Jan Martin Zepter. 2020. 'On Distributional Effects in Local Electricity Market Designs—Evidence from a German Case Study'. *Energies* 13 (8): 1993. https://doi.org/10.3390/en13081993.

M. J. Thompson, H. Sun and J. Jiang. 2021. 'Blockchain-Based Peer-to-Peer Energy Trading Method'. *CSEE Journal of Power and Energy Systems*. https://doi.org/10.17775/CSEEJPES.2021.00010.

Ma, Li, Lingfeng Wang, and Zhaoxi Liu. 2021. 'Multi-Level Trading Community Formation and Hybrid Trading Network Construction in Local Energy Market.' *Applied Energy* 285 (March): N.PAG-N.PAG.

McGovern, Gerard. 2021. 'Capturing Community Value in Civic Energy Business Model Design.' *Energy Policy* 156 (September): N.PAG-N.PAG. https://doi.org/10.1016/j.enpol.2021.112468.

McKinsey. 2022. ‘Lessons from Green-Tech Unicorn Enpal | McKinsey’. 7 August 2022. https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/from-vision-to-green-tech-unicorn-lessons-from-enpal.

Mehdinejad, Mehdi, Heidarali Shayanfar, and Behnam Mohammadi-Ivatloo. 2022. ‘Decentralized Blockchain-Based Peer-to-Peer Energy-Backed Token Trading for Active Prosumers.’ *Energy* 244 (April): N.PAG-N.PAG.

Mello, J., and J. Villar. 2023. ‘Integrating Flexibility and Energy Local Markets with Wholesale Balancing Responsibilities in the Context of Renewable Energy Communities.’ *Energy* 282 (November): N.PAG-N.PAG.

Mengelkamp, Esther, Johannes Gärttner, Kerstin Rock, Scott Kessler, Lawrence Orsini, and Christof Weinhardt. 2018. ‘Designing Microgrid Energy Markets’. *Applied Energy* 210 (January): 870–80. https://doi.org/10.1016/j.apenergy.2017.06.054.

Mengelkamp, Esther, Johannes Gärttner, and Christof Weinhardt. 2018. *Intelligent Agent Strategies for Residential Customers in Local Electricity Markets*. https://doi.org/10.1145/3208903.3208907.

Mengelkamp, Esther, Philipp Staudt, Johannes Garttner, and Christof Weinhardt. 2017a. ‘Trading on Local Energy Markets: A Comparison of Market Designs and Bidding Strategies’. In *2017 14th International Conference on the European Energy Market (EEM)*, 1–6. Dresden, Germany: IEEE. https://doi.org/10.1109/EEM.2017.7981938.

———. 2017b. ‘Trading on Local Energy Markets: A Comparison of Market Designs and Bidding Strategies’. In *2017 14th International Conference on the European Energy Market (EEM)*, 1–6. Dresden, Germany: IEEE. https://doi.org/10.1109/EEM.2017.7981938.

Mensin, Y., N. Ketjoy, W. Chamsa-ard, M. Kaewpanha, and P. Mensin. 2022. ‘The P2P Energy Trading Using Maximized Self-Consumption Priorities Strategies for Sustainable Microgrid Community’. *Energy Reports* 8: 14289–303. https://doi.org/10.1016/j.egyr.2022.10.400.

Moret, Fabio, and Pierre Pinson. 2019. ‘Energy Collectives: A Community and Fairness Based Approach to Future Electricity Markets’. *IEEE Transactions on Power Systems* 34 (5): 3994–4004. https://doi.org/10.1109/TPWRS.2018.2808961.

Morstyn, Thomas, Katherine A. Collett, Avinash Vijay, Matthew Deakin, Scot Wheeler, Sivapriya M. Bhagavathy, Filiberto Fele, and Malcolm D. McCulloch. 2020. ‘OPEN: An Open-Source Platform for Developing Smart Local Energy System Applications’. *Applied Energy* 275 (October): 115397. https://doi.org/10.1016/j.apenergy.2020.115397.

Neves, Diana, Ian Scott, and Carlos A. Silva. 2020a. ‘Peer-to-Peer Energy Trading Potential: An Assessment for the Residential Sector under Different Technology and Tariff Availabilities’. *Energy* 205 (August): 118023. https://doi.org/10.1016/j.energy.2020.118023.

———. 2020b. ‘Peer-to-Peer Energy Trading Potential: An Assessment for the Residential Sector under Different Technology and Tariff Availabilities’. *Energy* 205 (August): 118023. https://doi.org/10.1016/j.energy.2020.118023.

Nowshin, Sadia. 2023. ‘The European Energy Startups with the Fastest Growing Teams’. Sifted. 24 August 2023. https://sifted.eu/articles/energy-fastest-growing-teams/.

Ostrowska, Anna, Tomasz Sikorski, Alessandro Burgio, and Michał Jasiński. 2023. ‘Modern Use of Prosumer Energy Regulation Capabilities for the Provision of Microgrid Flexibility Services’. *Energies* 16 (1): 469. https://doi.org/10.3390/en16010469.

Parag, Yael, and Benjamin K. Sovacool. 2016. 'Electricity Market Design for the Prosumer Era'. *Nature Energy* 1 (4): 16032. https://doi.org/10.1038/nenergy.2016.32.

Paravantis, John A., Nikoletta Kontoulis, John A. Paravantis, and Nikoletta Kontoulis. 2020. 'Energy Security and Renewable Energy: A Geopolitical Perspective'. In *Renewable Energy - Resources, Challenges and Applications*. IntechOpen. https://doi.org/10.5772/intechopen.91848.

Pereira, Guillermo Ivan, Jan Martin Specht, Patrícia Pereira Silva, and Reinhard Madlener. 2018. 'Technology, Business Model, and Market Design Adaptation toward Smart Electricity Distribution: Insights for Policy Making.' *Energy Policy* 121 (October): 426–40. https://doi.org/10.1016/j.enpol.2018.06.018.

Petrovich, Beatrice, and Merla Kubli. 2023. 'Energy Communities for Companies: Executives' Preferences for Local and Renewable Energy Procurement'. *Renewable & Sustainable Energy Reviews* 184 (September): N.PAG-N.PAG. https://doi.org/vernay.

Porter, Michael. 1985. 'The Competitive Advantage: Creating and Sustaining Superior Performance - Book - Faculty & Research - Harvard Business School'. 1985. https://www.hbs.edu/faculty/Pages/item.aspx?num=193.

Qiu, W., Y. Huang, X. Zhai, J. Ma, T. Zhang, S. Liu, and Z. Lin. 2023. 'Operational Risk Assessment on Power System Based on Weather Regionalization Considering Power Ramp of Renewable Energy Generation'. *Energy Reports* 9: 396–408. https://doi.org/10.1016/j.egyr.2023.04.070.

Rääsk, Viljar. 2022. 'Russia's Invasion of Ukraine Will Affect the Estonian Economy through Supply Difficulties and Higher Inflation'. Eesti Pank. 30 March 2022. https://www.eestipank.ee/en/press/russias-invasion-ukraine-will-affect-estonian-economy-through-supply-difficulties-and-higher-30032022.

Ramalho, M., Lorrane Camara, Guillermo Ivan Pereira, Patricia Pereira da Silva, and Guilherme Dantas. 2017. 'Photovoltaic Energy Diffusion through Net-Metering and Feed-in-Tariff Policies: Learning from Germany, California, Japan and Brazil'. In *6th Latin American Energy Economics Meeting, New Energy Landscape: Impacts for Latin America*. https://research.manchester.ac.uk/en/publications/photovoltaic-energy-diffusion-through-net-metering-and-feed-in-ta.

Ramos, Dorel Soares, Tesoro Elena Del Carpio Huayllas, Marciano Morozowski Filho, and Mauricio Tiomno Tolmasquim. 2020. 'New Commercial Arrangements and Business Models in Electricity Distribution Systems: The Case of Brazil.' *Renewable & Sustainable Energy Reviews* 117 (January): N.PAG-N.PAG.

Richter, Mario. 2012. 'Utilities' Business Models for Renewable Energy: A Review'. *Renewable and Sustainable Energy Reviews* 16 (5): 2483–93. https://doi.org/10.1016/j.rser.2012.01.072.

Roby, Helen, and Sally Dibb. 2019. 'Future Pathways to Mainstreaming Community Energy.' *Energy Policy* 135 (December): N.PAG-N.PAG. https://doi.org/10.1016/j.enpol.2019.111020.

Rozite, Vida, Matthieu Prin, Silva Laera, Josh Oxby, and Alexandre Roussel. 2023. 'Empowering People – the Role of Local Energy Communities in Clean Energy Transitions – Analysis'. IEA. 8 September 2023. https://www.iea.org/commentaries/empowering-people-the-role-of-local-energy-communities-in-clean-energy-transitions.

Ruderer, Dminik. 2022. 'Infrastructure Solutions: The Power of Purchase Agreements'.

Schreck, Sebastian, Robin Sudhoff, Sebastian Thiem, and Stefan Niessen. 2022a. 'On the Importance of Grid Tariff Designs in Local Energy Markets'. *Energies* 15 (17): 6209. https://doi.org/10.3390/en15176209.

———. 2022b. 'On the Importance of Grid Tariff Designs in Local Energy Markets'. *Energies* 15 (17): 6209. https://doi.org/10.3390/en15176209.

Schwabeneder, Daniel, Carlo Corinaldesi, Georg Lettner, and Hans Auer. 2021. 'Business Cases of Aggregated Flexibilities in Multiple Electricity Markets in a European Market Design.' *Energy Conversion & Management* 230 (February): N.PAG-N.PAG.

Schwidtal, J.M., P. Piccini, M. Troncia, R. Chitchyan, M. Montakhabi, C. Francis, A. Gorbatcheva, et al. 2023. 'Emerging Business Models in Local Energy Markets: A Systematic Review of Peer-to-Peer, Community Self-Consumption, and Transactive Energy Models.' *Renewable & Sustainable Energy Reviews* 179 (June): N.PAG-N.PAG.

Shahsiah, Ahmad. 2017. '1 - Evolution of the Traditional Power System'. In *The Power Grid*, edited by Brian W. D'Andrade, 1–36. Academic Press. https://doi.org/10.1016/B978-0-12-805321-8.00001-X.

Shi, Xunpeng, Qiang Ji, Dayong Zhang, Farhad Taghizadeh-Hesary, and Phoumin Han. 2020. 'Editorial: Energy Market and Energy Transition: Dynamics and Prospects'. *Frontiers in Energy Research* 8. https://www.frontiersin.org/articles/10.3389/fenrg.2020.603985.

Smyth, Jamie, and Pilita Clark. 2023. 'COP28: The New Climate Commitments That Really Count'. 15 December 2023. https://www.ft.com/content/af71fc48-b89f-4920-a35b-2867b7adcc0c.

SolarPower Europe. 2023. 'Cumulative Installed Solar PV Capacity Worldwide from 2000 to 2022 (in Megawatts)." Chart'. Statista. https://www.statista.com/statistics/280220/global-cumulative-installed-solar-pv-capacity/.

Sousa, Tiago, Tiago Soares, Pierre Pinson, Fabio Moret, Thomas Baroche, and Etienne Sorin. 2019. 'Peer-to-Peer and Community-Based Markets: A Comprehensive Review'. *Renewable and Sustainable Energy Reviews* 104 (April): 367–78. https://doi.org/10.1016/j.rser.2019.01.036.

Ströbele, Wolfgang, Wolfgang Pfaffenberger, and Michael Heuterkes. 2012. 'Energiewirtschaft'. In *Back Matter*, 371–89. Oldenbourg Wissenschaftsverlag. https://doi.org/10.1524/9783486716740.bm.

Tumino, Pietro. 2021. 'Understanding the Difference Between Distributed and Centralized Generation - Technical Articles'. 2021. https://eepower.com/technical-articles/understanding-the-difference-between-distributed-and-centralized-generation/.

Turner, Craig, and Somayeh Taheri. n.d. 'Somayeh Taheri, UrbanChain: Leading the Transition to Renewable Energy'. Accessed 6 June 2023. https://open.spotify.com/episode/0UgOQCctO4vnvQPk2ROHDC?si=jLsqNxGjSDaguOGHmmptBA.

UN Climate Press Release. 2023. 'COP28 Agreement Signals "Beginning of the End" of the Fossil Fuel Era | UNFCCC'. 13 December 2023. https://unfccc.int/news/cop28-agreement-signals-beginning-of-the-end-of-the-fossil-fuel-era.

United Nations. 2015. 'Paris Agreement'. In .

———. 2023. *Synergy Solutions for a World in Crisis: Tackling Climate and SDG Action Together: Report on Strengthening the Evidence Base - First Edition 2023*. United Nations. https://doi.org/10.18356/9789213585238.

U.S. EIA. 2023. 'Annual Energy Outlook'.

Van Leeuwen, Gijs, Tarek AlSkaif, Madeleine Gibescu, and Wilfried Van Sark. 2020. 'An Integrated Blockchain-Based Energy Management Platform with Bilateral Trading for Microgrid Communities'. *Applied Energy* 263 (April): 114613. https://doi.org/10.1016/j.apenergy.2020.114613.

Vernay, Anne-Lorène, Carine Sebi, and Fabrice Arroyo. 2023. 'Energy Community Business Models and Their Impact on the Energy Transition: Lessons Learnt from France.' *Energy Policy* 175 (April): N.PAG-N.PAG. https://doi.org/10.1016/j.enpol.2023.113473.

Wang, Jianjun, Fang Liu, Li Li, and Jian Zhang. 2022. 'More than Innovativeness: Comparing Residents' Motivations for Participating Renewable Energy Communities in Different Innovation Segments.' *Renewable Energy: An International Journal* 197 (September): 552–63.

Wang, Yahui, Yijia Cao, Yong Li, Lin Jiang, Yilin Long, Youyue Deng, Yicheng Zhou, and Yosuke Nakanishi. 2021. 'Modelling and Analysis of a Two-Level Incentive Mechanism Based Peer-to-Peer Energy Sharing Community.' *International Journal of Electrical Power & Energy Systems* 133 (December): N.PAG-N.PAG.

Webster, Jane, and Richard T. Watson. 2002. 'Analyzing the Past to Prepare for the Future: Writing a Literature Review'. *MIS Quarterly* 26 (2): xiii–xxiii.

Weinhardt, Christof, Esther Mengelkamp, Wilhelm Cramer, Sarah Hambridge, Alexander Hobert, Enrique Kremers, Wolfgang Otter, Pierre Pinson, Verena Tiefenbeck, and Michel Zade. 2019. 'How Far along Are Local Energy Markets in the DACH+ Region?: A Comparative Market Engineering Approach'. In *Proceedings of the Tenth ACM International Conference on Future Energy Systems*, 544–49. Phoenix AZ USA: ACM. https://doi.org/10.1145/3307772.3335318.

Widuto, Agnieszka. 2023. 'Reforming the EU Electricity Market', March.

Wolsink, Maarten. 2020. 'Distributed Energy Systems as Common Goods: Socio-Political Acceptance of Renewables in Intelligent Microgrids.' *Renewable & Sustainable Energy Reviews* 127 (July): N.PAG-N.PAG.

Wu, Y., Y. Wu, J.M. Guerrero, and J.C. Vasquez. 2021. 'Digitalization and Decentralization Driving Transactive Energy Internet: Key Technologies and Infrastructures'. *International Journal of Electrical Power and Energy Systems* 126. https://doi.org/10.1016/j.ijepes.2020.106593.

Xu, Junjun, Zaijun Wu, Tengfei Zhang, Qinran Hu, and Qiuwei Wu. 2022. 'A Secure Forecasting-Aided State Estimation Framework for Power Distribution Systems against False Data Injection Attacks.' *Applied Energy* 328 (December): N.PAG-N.PAG.

Yan, Linfang, Xia Chen, Dan Liu, Jianyu Zhou, and Yin Chen. 2021. 'Fully Distributed Energy Management in Smart Grids Based on Diffusion Strategy.' *International Journal of Electrical Power & Energy Systems* 129 (July): N.PAG-N.PAG.

Yao, Yunting, Ciwei Gao, Tao Chen, Jianlin Yang, and Songsong Chen. 2021. 'Distributed Electric Energy Trading Model and Strategy Analysis Based on Prospect Theory.' *International Journal of Electrical Power & Energy Systems* 131 (October): N.PAG-N.PAG.

Zabaleta, Koldo, Diego Casado-Mansilla, Evgenia Kapassa, Cruz E. Borges, Guntram Presmair, Marinos Themistocleous, and Diego Lopez-de-Ipina. 2020. 'Barriers to Widespread the Adoption of Electric Flexibility Markets: A Triangulation Approach'. In *2020 5th International Conference on Smart and Sustainable Technologies (SpliTech)*, 1–7. Split, Croatia: IEEE. https://doi.org/10.23919/SpliTech49282.2020.9243744.

Zade, Michel, Sebastian Dirk Lumpp, Peter Tzscheutschler, and Ulrich Wagner. 2022. 'Satisfying User Preferences in Community-Based Local Energy Markets — Auction-Based Clearing Approaches.' *Applied Energy* 306 (January): N.PAG-N.PAG.

Zheng, Siqian, Xin Jin, Gongsheng Huang, and Alvin CK. Lai. 2022. 'Coordination of Commercial Prosumers with Distributed Demand-Side Flexibility in Energy Sharing and Management System.' *Energy* 248 (June): N.PAG-N.PAG.

Zhou, Wei, Yuying Wang, Feixiang Peng, Ying Liu, Hui Sun, and Yu Cong. 2022. 'Distribution Network Congestion Management Considering Time Sequence of Peer-to-Peer Energy Trading.' *International Journal of Electrical Power & Energy Systems* 136 (March): N.PAG-N.PAG.

Žižek, Simona Šarotar, Matjaž Mulej, and Amna Potočnik. 2021. 'The Sustainable Socially Responsible Society: Well-Being Society 6.0'. *Sustainability* 13 (16): 9186. https://doi.org/10.3390/su13169186.

APPENDICES

Appendix A: List of Abbreviation

AMI	Advanced Metering Infrastructure
ADR	Automated Demand Response
CEM	Central Energy Market
COP 28	Conference of the Parties
DER	Distributed Energy Resource
DERMS	Distributed Energy Resource Management
EaaS	Energy-as-a-Service
EDA	Explorative Data Analysis
EC	Energy Community
ICT	Information Communication Technology
IoT	Internet of Things
LEC	Local Energy Community
LEM	Local Energy Market
NIMBY	Not-In-My-Back-Yard
P2P	Peer-to-Peer
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
REG	Renewable Energy Generation
RES	Renewable Energy Systems
TA	Transactive Energy
VPP	Virtual Power Plant

Appendix B: List of Tables

Appendix C: List of Figures

Appendix D: Methodology Literature Review

The purpose of this explanation is to outline the strategy employed in the literature review process, ensuring the identification of relevant sources. It serves to methodically identify, evaluate, and synthesize pertinent academic literature and establishes a solid foundation for the research, bolstering the credibility and trustworthiness of the subsequent findings (Webster and Watson 2002). The review is designed to delve into various aspects of LEMs, including market designs, participant roles and benefits, regulatory influences, and technological advancements, aiming to investigate **the state of the art of the literature** regarding LEMs. To ensure consistence and precision, a structured methodology was employed using EbscoHost and Scopus, two esteemed academic databases recognized for their extensive scholarly content. The approach involves crafting a detailed search query that incorporates carefully chosen search parameters, filtering literature by keywords, publication date, and journal quality, enabling a focused and effective literature search.

The strategy for **refining keywords** in the literature review involves integrating synonyms and related terms across various subcategories like "LEMs", "decentralized energy systems," and "regional electricity trading" ensuring a broad and inclusive search scope. By broadening the search scope in this way, a thorough and diverse collection of literature can be ensured. This strategy is key to encompassing a variety of viewpoints and methodologies, thereby deepening comprehension and analysis of the subject matter. The literature review will focus on journals **published from 2018 onwards**, which aligns with significant developments in renewable energy and emerging technologies within the last few years, ensuring the review's relevance and timeliness. One additional paper from 2017 was included, as this study counts as fundamental paper in this research area and has therefore be included.

As the **journal quality** is crucial for the following quality of the literature review, a selection of peer-reviewed papers from **14 journals** that are highly regarded and recognized by industry experts has been made. After conducting the specified search in the academic databases **367 articles** were initially identified, which were then filtered down using stringent criteria, to guarantee the relevance of the sources, especially considering the high volume of papers. The most influential factor in narrowing down the selection were the topic specific criteria. The comprehensive list of all exclusion criteria is detailed below. After applying all criteria, **64 papers** were left to be

analysed in the review, which were downloaded and organized using Zotero for citation management and referencing purposes.

Literature Review - Search Query Scopus

```
(
TITLE ((local* OR region* OR decentrali* OR communit* OR distribut* OR flexib*)
        AND
    (Energy OR Energies OR Power OR Electricity OR Electric)
        AND
    (market* OR communities OR platform* OR exchang* OR transact* OR shar* OR trad*
    OR system OR grid* OR coordinat* OR cluster* OR structure*))
AND ABS (“peer to peer” OR P2P OR “distributed management system” OR consumer OR
prosumer
        OR “price competition” OR “grid optimization” OR “demand response” OR
        “levelized cost of energy” OR forecast* OR predict* OR “smart contract” OR
        “analytics”)
AND ISSN (2058-7546 OR 1754-5692 OR 1754-5706 OR 2398-9629 OR 1872-9118 OR 2352-
4847
        OR 1949-3037 OR 1879-0690 OR 2214-6326 OR 2753-6580 OR 2766-6565 OR
        0306-2619 OR 0360-5442 OR 0196-8904 OR 0301-4215 OR 0142-0615 OR
        1364-0321 OR 1755-0084 OR 0960-1481 OR 2211-467X OR 2210-6707 OR
        2213-1388 OR 2352-4677))
AND NOT(
    ABS (“electric vehicle” OR “battery system” OR “storage system” OR material OR
        assembly OR manifactur* OR waste OR gas OR coal OR fuel)
    OR TITLE (solar OR photovoltaic OR PV OR wind OR water OR thermal OR gas OR
        coal OR CO2 OR carbon OR environm* OR cost OR pump* OR tax* OR vehicle
        OR battery OR storage OR material OR assembly OR manifactur* OR waste OR
        building OR pric* OR production OR governance Or compliance OR product OR
        coast* OR sea* OR offshore OR tariff
    )
)
```

Literature Review - Exclusion Criteria

1. **Publication Date (Post-2018)**
   Focusing on recent publications ensures that the review includes the latest research and developments in the field.
2. **Publication Type/Quality (Peer-Reviewed Academic Publications):**
   Only peer-reviewed academic publications will be considered in the literature review. Blog posts, news articles, and non-academic publications will be excluded. Peer-reviewed sources are essential for ensuring the credibility and rigor of the research, as they undergo a rigorous evaluation process by other experts in the field.
3. **Duplicate Sources:**
   Duplicate sources are removed to avoid redundancy, ensuring that each source contributes unique information to the review.
4. **Exclusion of Literature Reviews:**
   Papers that are literature reviews themselves will be excluded to focus on primary research articles and original findings.
5. **Full Text Availability:**
   Only sources that can be accessed in their entirety will be included. Including only sources with available full texts ensures that the review is based on complete information, allowing for a thorough analysis and understanding of each source.
6. **Topic-Specific Criteria:**
   - **Relevance to Topic:**
     Only sources directly related to the research topic will be considered. Sources without any relevant keywords in their title or abstract will be excluded, to ensure that the review stays focused on the specific research question or topic, thus maintaining its depth and relevance.
   - **Irrelevant Disciplines:**
     Sources from disciplines unrelated to the research topic will be excluded. Excluding sources from unrelated disciplines helps to maintain the focus and coherence of the review.
   - **Form of Energy Traded (Electricity, Heat, or Combination):**
     Only papers discussing those forms of energy trading are considered in the literature review. Gas, Heat, or similar trading is not considered. This narrows the focus to specific types of energy, which is important for a more targeted review.
   - **Form of Renewable Energy Traded (only Solar):**
     Only papers discussing solar generated energy are considered in the literature review. Wind, Hydro, or similar sources are not included.
   - **Objective of Energy Markets (Local Renewable Generation Integration):**
     This criterion further specifies the focus of the review, ensuring that the sources are directly relevant to the specific aspect of energy markets you are studying.
   - **Purpose of LEM trading (only Local Renewable Generation):**
     Only papers discussing the improved usage of locally generated RE are discussed. Cases where LEMs are used to provide energy to areas with energy poverty are excluded.

Appendix E: Interview Guideline

WARM UP

Hello and thank you for taking the time to participate in our interview. My name is _____and these are my colleagues _____. We are master's students at Nova Business School in Lisbon, specializing in Management and Business Analytics. Our research focuses on the impact of local energy markets, and we're particularly interested in incorporating real-world experiences and insights into our study.

To this end, we would like to conduct a 30-minute, open interview with you to understand your opinion, your thoughts, and your experiences on this topic. This means that we will ask you several questions to which there are no right or wrong answers and to which you can say whatever comes to your mind on the respective topic. The conversation can develop freely and is not firmly structured.To accurately capture your valuable insights, we would like to record this conversation. Please be assured that your statements will be completely anonymized in our research, ensuring that they cannot be traced back to you. Your privacy and the confidentiality of your responses are of utmost importance to us. May we have your consent to record this interview?

Do you have any questions?

1. **INTRODUCTION**
   - Can you please give us a quick introduction of yourself?
   - Could you give us a short overview of your position and projects that you have worked on in the field of Local Energy Markets?
   - How would you define a local energy market?
   - Could you start by giving us a brief overview of your current project?

2. **MARKET DYNAMICS & CHALLENGES**
   - The landscape is changing, how big of a threat do you think new market players pose?
     - Many new small companies are entering the renewable energy market, what impact does the increase of decentralization pose on the business model on established players and big utilities?
   - What are the key components of the projects business model, and how do they integrate to fulfill your company's vision?
   - What are future business model and portfolio strategies to ensure the companies competitiveness?

3. **LEM MARKET ARCHITECTURE:**
   - Could you walk me through the structure and flow of the market design in your project? How does it facilitate energy allocation, trading, and price clearing effectively?

- In what ways do data analytics and predictive modeling drive your market operations? Could you provide examples of specific models or algorithms you employ and the generated insights?
- What are the innovative or unique aspects of your market design that set it apart from competitors? How do these contribute to your market's performance and reliability?
- Can you elaborate on the specific mechanisms and technologies you have implemented for executing energy trades? How do these enhance transaction efficiency and transparency?

4. TECHNOLOGY & INNOVATION

- What are key technical challenges when integrating RES and local energy markets into the existing grid infrastructure?
- Which technological approaches to enhance the integration of RES do you consider the most fundamental and promising?
- In your experience, what kind of technological innovations benefit local energy markets the most in terms of overall adoption, efficiency, and grid resilience?

5. POLICY & REGULATORY

- How do current policy and regulatory frameworks influence consumer behavior and choices in your industry? Can you provide examples of how these regulations have directly impacted consumer decisions, either encouraging or discouraging them from engaging with your services?
- What are the biggest regulatory challenges you face, and are there any regulatory advantages that benefit your business model?
- How have policies and regulations influenced strategies to improve grid operations and integration regarding local energy markets?

6. CONSUMER SIDE

- What attitudes towards energy trading have you observed in consumers or prosumers?
- What are the main factors that, in your experience, motivate consumers to become prosumers and participate in P2P energy trading? What are the main barriers or challenges that prevent consumers from becoming prosumers or participating in P2P energy trading?
- Would you say there are specific requirements for consumer participation in Local Energy Markets (LEMs) and P2P trading?
- Are there discrepancies between the expected interaction of consumers with your platform in theory and the actual interaction? If yes what factors contribute to this discrepancy?

- Are there any additional aspects or insights you would like to share regarding the role of consumers and prosumers in P2P trading?

7. CLOSING

- Do you have any additional thoughts or insights you'd like to share that we haven't covered in this interview?

Thank you very much for taking the time, you have helped us a lot. Do you have any questions for us?

Appendix F: Interview Transcripts

Transcript Expert A:

<v Stefan Abadzic>I wanted to ask you is maybe you can also start by telling us a bit more about the project itself.</v>
<v Stefan Abadzic>It be nice to hear a bit more because it's kind of directly meets our master thesis topic.</v>
<v Stefan Abadzic>And yeah, very interesting.</v>
<v Expert A>Yep.</v>
<v Expert A>OK, so as I mentioned, I mentioned you the two objectives of the project.</v>
<v Expert A>So one thing are the objectives I shared in the chat, but I it didn't appear on my chat.</v>
<v Expert A>I don't know if you have received it or not.</v>
<v Stefan Abadzic>Umm.</v>
<v Expert A>The link no know what happens.</v>
<v Expert A>OK, now it's you should have.</v>
<v Expert A>So one thing is that the objective is another thing is how you reach those objectives and actually it's been quite hard, especially in southern Europe to promote the adoption of energy communities.</v>
<v Expert A>There are a lot of difficulties and the projects that we developed is a bit to address those difficulties, so some are more on the social level that they're smart on the financial level, but to one, I'll say maybe I'll highlight, love them.</v>
<v Expert A>So one is that there's a lack of knowledge on the topic, so people are do not know what our energy communities out they can they benefit et cetera.</v>
<v Expert A>And another thing is a a lack of trust and this is happens through various reasons, but for example in the in Eastern Europe and anything that is community related is very associated with communists because they they were ex Soviet Union.</v>
<v Expert A>So they tend to reject these types of things even without knowing exactly how they work or what are the benefits.</v>
<v Expert A>So there's a big barrier there immediately.</v>
<v Expert A>So you see, if you go and check regulation on on the Eastern Europe countries, you see that even the ones that are part of the EU, which should have transposed the Renewable Energy Directive and you can check that summer at least some of them, I I cannot tell you if it is all of or not because I don't have that that knowledge.</v>
<v Expert A>But at least I know that some of them have not transposed the concept of renewable energy communities or citizen energy communities.</v>
<v Expert A>And so people there don't know how they work.</v>
<v Expert A>But then, if even if they did know how how it worked, there is no legal framework to establish it, so that will be a an added difficulty.</v>
<v Expert A>And then sometimes there's lack of trust, because I think in in southern Europe.</v>
<v Expert A>While the Northern Europe, we see that people are more motivated by uh, for example, in Germany there's a big motivation for shifting out of nuclear energy use.</v>
<v Expert A>You go to the Netherlands or or Sweden and there's a lot of motivation behind producing green energy.</v>
<v Expert A>But then when we go to southern Europe, you can have that as well.</v>
<v Expert A>But the most of the motivation is driven by cost, and if if you present a solution there is not a cost effective, you will immediately get negative responses and then if you present a solution that is cost effective, people suspect.</v>
<v Expert A>Tend to suspect and think this is too good.</v>
<v Expert A>There's some catch here that I'm not getting, so this is a bit of so I I'm entering a lot in this social part of the project.</v>
<v Expert A>I'm not a social scientist as I have told you, but we have.</v>
<v Expert A>We are working directly with the with social scientists in these projects to try and overcome these type of barriers and this is actually a very important part part of the project is how to address this social component and how to overcome these apps.</v>
<v Expert A>Because so this is more on the adoption part of energy communities and then we have a more technical part within the project.</v>
<v Expert A>So which focus on developing solutions for the energy community?</v>
<v Expert A>So these solutions either and facilitate the management process or are tools that, for example, enable citizens to participate in ancillary services such as local flexibility markets.</v>
<v Expert A>So these are the types of tools that we are developing.</v>
<v Expert A>And I think if you go to the website, you can have an overlook of all of of all the tools that we are aiming to develop in this project.</v>
<v Expert A>And then as as this project goes, I don't know if you are familiarized with the with this type of Verizon projects, but usually there's like this development stage and then there is this demonstration stage.</v>
<v Expert A>So then we we have a demonstration sites scattered across Europe.</v>
<v Expert A>So our main ones were we'll test most of our solutions are in Spain, in the Netherlands and in Italy and we will test most of our solutions then in these sites and see if the solutions make sense.</v>
<v Expert A>If the people are adopting the solutions, then we can make some iterations during the project period to try to improve the solutions to make citizens more interested about these solutions, and then it felt was well at the end we should have like a a not a finalized product, but like a almost a product that is not in a commercial stage but is you're a commercial stage.</v>
<v Expert A>It could be picked up by a commercial unit, for example a a commercial unit from PDP such as EDP Commercial, which you probably know about are the guys that retail energy, so solutions that.</v>
<v Expert A>They could pick up and introduce to the market.</v>
<v Stefan Abadzic>OK, nice.</v>
<v Stefan Abadzic>Yeah, already a lot of information and think umm, and if we start maybe with Rachel it here only spoke a few things about social parts.</v>

<v Stefan Abadzic>Do you have some questions regarding that?</v>
<v Rachel Sulollari>And yeah, you already mentioned some like motivation drivers for the consumer.</v>
<v Rachel Sulollari>So it's the economic part, right?</v>
<v Rachel Sulollari>And probably what else beside the environment?</v>
<v Expert A>Yeah.</v>
<v Rachel Sulollari>Yeah.</v>
<v Expert A>So it it depends a lot on on the country as well as I was saying so I I guess there's this environmental part is a big motivation in some countries more than others then you have this cost part which is a big motivation in southern Europe.</v>
<v Expert A>And besides those factors, then you have people.</v>
<v Expert A>That is just because they are in the neighborhood that already has a community they want to join as well that community.</v>
<v Expert A>But I think overall, uh, the main motivations, at least that I'm aware of in that people usually mention is this component is either more environmental side wanting to, uh, reduce start the pendency on on the grid because maybe for example we see this in Germany as I was saying that they know that the grid is supported a lot by nuclear and they want to phase out of nuclear.</v>
<v Expert A>So they decide.</v>
<v Expert A>Let's let's produce our own energy and let's establish an energy community.</v>
<v Expert A>Or just wanting to be more environmentally friendly and wanting to produce renewable energy.</v>
<v Expert A>So I would say that these are the the main, the main drivers you probably find find some others and I can I can share it with you a document.</v>
<v Rachel Sulollari>But with me.</v>
<v Expert A>I don't know if we have identified other drivers, but by the by the way, most of our work in this type of projects is public.</v>
<v Expert A>So we publish all the the work so I I can share things with you no problem.</v>
<v Rachel Sulollari>So that's.</v>
<v Expert A>And one thing that we did at the beginning of the project is the we, we did a lot of interviews like small workshops like was not individual interviews, but more like workshops where we invited local population to come and to state what are their motivations, what are the barriers that are preventing.</v>
<v Expert A>So maybe people have identified other specific barriers, but I think for people these are mostly the barriers.</v>
<v Expert A>Then when you go to the implementation stage, then you find other barriers such for example like I was telling before the legal barriers.</v>
<v Expert A>Uh, so it.</v>
<v Expert A>In many countries is hard to establish or the process of approval, which is the case in Portugal, for example, the process to get the Community approved is extremely long and people lose interest over time.</v>
<v Expert A>So.</v>
<v Expert A>So this is something that I can tell you because it happens here in Portugal is like the timing between you start to prepare an energy community and actually having this legally accepted.</v>
<v Expert A>I'm not even saying like assets installed etcetera, just to get it legally accepted.</v>
<v Expert A>This is about, at least at the very least, one year and.</v>
<v Expert A>Uh people lose interest in the meanwhile, because maybe one year ago you went, you gave a speech about our energy.</v>
<v Expert A>Communities are interesting how you can benefit from them, but then after a year people can't forget or tend to lose interest and think, OK, things are not moving a lot.</v>
<v Expert A>Maybe this is not as interesting, so there's a people lose motivation in this loss of motivation is usually driven by this legal barriers of the either difficulty to implement it or then if you have a legal framework to implement it, sometimes it's hard to wait a long time to get approvals, et cetera.</v>
<v Rachel Sulollari>Alright, perfect.</v>
<v Rachel Sulollari>Thank you very much.</v>
<v Rachel Sulollari>It was very valuable insights for me.</v>
<v Rachel Sulollari>Thank you.</v>
<v Expert A>And I can share this document that I was telling you about where we have the interviews, if you want to take a look.</v>
<v Rachel Sulollari>That would be, yeah.</v>
<v Stefan Abadzic>No.</v>
<v Rachel Sulollari>There were very nice thank you.</v>
<v Stefan Abadzic>Perfect.</v>
<v Stefan Abadzic>Thank you very much.</v>
<v Stefan Abadzic>When you do, you have a question.</v>
<v Ronja Julia Suhling>Yes, I would take over from here.</v>
<v Ronja Julia Suhling>Uh, I just had a quick look into your website because I it's not very interesting.</v>
<v Expert A>Umm.</v>
<v Ronja Julia Suhling>And then the first look I saw that one of the key tools that you are developing is like a PP energy market platform, which is said to have to develop innovative energy markets.</v>
<v Ronja Julia Suhling>Maybe could you walk me through the structure and flow of the market design like in the project you are implementing and also like looking at the energy location, the trading and like us the pricing?</v>
<v Expert A>Yep.</v>
<v Expert A>So I'll try to maybe I'll not go to the level of detail that you wish, but I'll try to go as as detailed as as I can actually do.</v>
<v Expert A>The thing that I was that I had before was with a professor from Nova, which is actually is developing this peer to peer energy trading tool.</v>
<v Ronja Julia Suhling>But what is the name of the professor?</v>
<v Expert A>So maybe you can consider is Ian.</v>
<v Ronja Julia Suhling>Have you can afford?</v>
<v Ronja Julia Suhling>Thank you.</v>
<v Expert A>Scott is from Nova IMS, not SBE.</v>
<v Ronja Julia Suhling>Yeah, no.</v>

<v Stefan Abadzic>I already read the paper from him.</v>
<v Stefan Abadzic>I know who he is.</v>
<v Expert A>Yeah.</v>
<v Expert A>So I was.</v>
<v Expert A>I was talking with him and with other other partners as well, another professor from Nova.</v>
<v Expert A>Actually, who loves?</v>
<v Expert A>But he's more on the demand response side.</v>
<v Expert A>So maybe if you want to know something on demand response, you could also talk to him.</v>
<v Expert A>Could be interesting, but he's from Nova FCT.</v>
<v Expert A>So the one on the on the other side of the river.</v>
<v Stefan Abadzic>OK.</v>
<v Expert A>So going through the the peer to peer it's it's quite complex because you see a lot of European projects.</v>
<v Expert A>They mentioned that they are doing peer to peer and then when you look into the tile you see that your to peer is actually not infect peer to peer.</v>
<v Expert A>Something like that.</v>
<v Expert A>Says something similar, but difficult to implement and I can give you an example of a project which is called local hash.</v>
<v Expert A>Uh.</v>
<v Expert A>Where they have invited us to go there and to support them on the development of year to year because they had a peer to peer solution that was rejected by the European Commission, they did not found it as a peer to peer or well, it's it's more complicated.</v>
<v Expert A>It's not so simple.</v>
<v Expert A>I'm putting it in very simple terms.</v>
<v Expert A>It's like the other partner that's left the consortium, etcetera.</v>
<v Expert A>And so why they they had these issues, but in any case that what we are doing here in this project is based on another thing that we've done previously and actually we've done decent the scope of another project which is called positive.</v>
<v Expert A>So you can also take a look if you want is written like this.</v>
<v Expert A>And so in the this this project is a bit different.</v>
<v Expert A>So this project aims on providing energy, renewable energy, local energy to historical cities which cannot implement solar panels, for example, because they are cultural heritage sites.</v>
<v Ronja Julia Suhling>So.</v>
<v Expert A>So you cannot change the facade, though the solutions of energy communities are very interesting because you can put the panels further away and then you are not impacting the statics of the city, but you can still get renewable energy and in the scope of this project we have submitted a proposal for a pilot project for errors, which is the national regulator for energy.</v>
<v Expert A>Uh.</v>
<v Expert A>They have this pilot projects, they work a bit like regulatory sandboxes where you can start off test something that is not directly mentioned in the in the regulation.</v>
<v Expert A>And what we proposed there was to test peer to peer energy trading as one of the things and this is actually is not yet implemented, although this is running for over a year now.</v>
<v Expert A>But we actually hope that this will be implemented quite soon, so this is being done in the city of Evora.</v>
<v Expert A>I don't know if you know it's in the center of Portugal.</v>
<v Expert A>And the well I can explain to you which I think is the the part that you are more interested about how this peer to peer energy trading works and usually this is what people want to understand.</v>
<v Expert A>You are not the first to ask that question.</v>
<v Expert A>So.</v>
<v Expert A>You you can, you cannot infect control where the energy flows within.</v>
<v Expert A>Like I'm not.</v>
<v Expert A>We can speak this outside the context of an energy community, so even if you have a neighborhood, you cannot actually control where the energy flows.</v>
<v Expert A>So it's really hard to do something that some people trying to achieve, which is like in fact peer to peer like your energy is going to your neighbor that's very difficult to do.</v>
<v Expert A>Uh.</v>
<v Expert A>Due to physics right there, you cannot control where the electron flows, so it's what we proposed is to have a financial operation.</v>
<v Expert A>So it's not a an energy operation, it's it's just a financial operation where you measure the based on on your consumption and your neighbor's consumption.</v>
<v Expert A>For example, you measure it you find for each minute period, because that's the the frequency of the smart meters.</v>
<v Expert A>You find what is the surplus of and what is the deficit of the other?</v>
<v Expert A>And then the idea is that financially you pass this this surplus to the one that has deficit and the the big question is how can you do that and are we I we implement it is needs to be within an energy community and the reason for that is because and if you have read about energy communities, you are already familiarized with this for sure, which is energy.</v>
<v Expert A>Communities have this energy sharing coefficients that you can change, though if you to implement a peer to peer on a financial level within an energy community, the only thing that you need to do these have dynamic sharing coefficients that you can change for each minute period and you need to assess which of your Members have surplus, which ones have deficit, and then you adapt the sharing coefficients so that there's no longer surplus and maybe there's no longer deficit or there there is less deficit and this is how it works and the just to expand a bit because this this might be a bit confusing and just to expand a bit on this sharing coefficients component.</v>
<v Expert A>So what?</v>
<v Expert A>How this works is energy communities.</v>
<v Expert A>Uh, every sharing coefficients that right now you can see in the regulation.</v>
<v Expert A>I think you can find it on a fifteen uh.</v>
<v Expert A>It's .</v>
<v Expert A>I'm not remembering exactly, but there's a regulation on energy communities, which I know is the #.</v>

<v Expert A>I just don't remember if it is this year or last year.</v>
<v Expert A>But.</v>
<v Expert A>Right now you can do it or before you could do it in two different ways, you can have it.</v>
<v Expert A>Uh, proportional to your energy consumption. So your?</v>
<v Expert A>Yeah, the way that you are splitting energy is always proportional to the energy consumption of each member.</v>
<v Expert A>Or you could have it fixed, so you would say for example you are always getting % of the energy.</v>
<v Expert A>I'm always getting % of the energy our neighbor is getting %.</v>
<v Expert A>So you can define this fixed very coefficients and what we proposed in in our pilot project is to have these dynamically and if you go to the to this regulation I was telling you about this decree law, you can see that they already mentioned the possibility of having dynamic sharing coefficients in the degree of the only thing is that no one has implemented this these coefficients yet because you need to have a like an IT structure set up to receive this the Dina this sharing coefficients or in the dynamic way.</v>
<v Expert A>Uh, so how these coefficients work is that you sent the the coefficients to the DSO basically.</v>
<v Expert A>So you are a community manager.</v>
<v Expert A>You sent every month at the end of every month you send this sharing coefficients to the DSO, which in Portugal is mostly erit.</v>
<v Expert A>There are others, but in most of the country the DSO is there, which you need to send these coefficients to them.</v>
<v Expert A>They validate they have like a period of validation for these coefficients to check that the the balance of energy is correct and then at the end what they do is they send this information to the retailers, the different retailers and the retailers adjust the building.</v>
<v Ronja Julia Suhling>OK.</v>
<v Expert A>So disabilit how it works and anticipating maybe what is one of your questions is how do people gain money from it?</v>
<v Expert A>Well, for the people that have the energy discounted interview is very obvious, right?</v>
<v Expert A>They they just pay less energy because they're retailers get disinformation.</v>
<v Expert A>But for the people that are giving this energy away, they are not receiving anything in exchange.</v>
<v Expert A>So our goal with one of our goals with this project as well is to create a sort of mechanism that can give some payback to the people that are giving away these energy and the way that we are doing it.</v>
<v Expert A>I'm not an expert, so I I don't want to go very deep in this part, but this like using blockchains and tokens and then you can redeem these tokens from for certain products and stuff like that.</v>
<v Expert A>So it's it's a way that we find A to remunerate the giver and the person that is giving energy, because otherwise this this person did not receive anything because in this is a legal problem basically because if this person would sell energy, this person would have to be a company.</v>
<v Expert A>Not an individual.</v>
<v Expert A>And then you will need to pass the receipt and like if this was a big business, maybe people would be interested in setting up a company and passing receipts to their neighbors.</v>
<v Expert A>But this is when we are talking about peer to peer.</v>
<v Expert A>We are talking about maybe one euro €. of exchange, so it's very small numbers into the no one will create a company and pass receives to receive €. from their neighbor basically.</v>
<v Ronja Julia Suhling>Yeah.</v>
<v Stefan Abadzic>And.</v>
<v Ronja Julia Suhling>So that's that's like a policy issue in the end like, because it sounds like the rules implementing the trading are just not on the same level as the the model or the the project you're working on right now.</v>
<v Expert A>That because they are different rules.</v>
<v Ronja Julia Suhling>Umm.</v>
<v Expert A>One thing is this is a a decree law on the energy sector, but then when you start to talk about this part on the.</v>
<v Expert A>Establishing companies and passing receive, etcetera.</v>
<v Expert A>You are entering like a a business.</v>
<v Ronja Julia Suhling>There's.</v>
<v Expert A>The legal sector, like it's not directly related with the energy sector, is is bigger than that.</v>
<v Expert A>So it's very hard even for theirs, which is the regulator for the energy sector, is very hard for them to have any to make any change on this, because this would have to go like true bolti people, regulators have to go through multiple ministries in the government.</v>
<v Expert A>That will be very, very hard to establish a proper framework that would provide value to the ones that are giving the energy.</v>
<v Ronja Julia Suhling>OK.</v>
<v Ronja Julia Suhling>And you mentioned the integration of the local energy community before on the technical and innovation level and that's something Max is looking into a bit more.</v>
<v Ronja Julia Suhling>So maybe I would give him the word and offer him to ask maybe a bit more question.</v>
<v Ronja Julia Suhling>I'm I know I'm aware of the time.</v>
<v Ronja Julia Suhling>How's it about you?</v>
<v Ronja Julia Suhling>Can we do like more minutes or something?</v>
<v Expert A>Yeah.</v>
<v Ronja Julia Suhling>Or do you have to jump into the next meeting?</v>
<v Expert A>No, no, no.</v>
<v Stefan Abadzic>Nice.</v>
<v Expert A>I don't have more meetings today, so we can we can continue and arrived minutes late.</v>
<v Expert A>So we can continue at least until .</v>
<v Ronja Julia Suhling>Thank you.</v>
<v Stefan Abadzic>OK.</v>
<v Ronja Julia Suhling>That's very nice of you.</v>
<v Stefan Abadzic>Thank you very much.</v>
<v Maximilian Jagiello>Thank you very much.</v>
<v Maximilian Jagiello>Yeah.</v>
<v Maximilian Jagiello>Umm.</v>

<v Maximilian Jagiello>Now we've talked a little bit about the social barriers and the legal regulation barriers and also wanted to know if you in your experience, what would you say, what are the key technical challenges when integrating new Noble Energy sources and local energy markets into the existing grid infrastructure?</v>
<v Expert A>Yes.</v>
<v Expert A>Yep.</v>
<v Maximilian Jagiello>So maybe you could share a little bit of insights if you had like challenges, big challenges in your project integrating it into the existing infrastructure and.</v>
<v Expert A>So one one thing especially this is like my examples are always very particular to to some countries, but they might be a good examples of what can happen.</v>
<v Expert A>For example, in some countries they have a very big problems with grid congestion, so that's a a very big issue that they need to address.</v>
<v Expert A>And that blocks many new projects from happening and this for example, this is the case in the Netherlands.</v>
<v Expert A>If you go to check I don't have specific data, but if you try and Google it you see that they have a lot of grid congestion in the Netherlands and I think this is do not quote me on this but I think that one of the issues is related with the the this scheme that they have the test, a specific name.</v>
<v Expert A>I'm I'm not remembering right now, but where they remunerate people?</v>
<v Expert A>For all the energy that they are producing at the.</v>
<v Expert A>Like basically, uh, he says the name.</v>
<v Expert A>I'm forgetting it.</v>
<v Expert A>And so it's like in the Netherlands, how it works is you have a PV system in your roof, you produce X amount of energy.</v>
<v Expert A>If even if you don't consume that energy, they assume like you have an infinite storage capacity and then they discount this on the energy that you are consuming afterwards, even when your panel is not producing anymore for example.</v>
<v Expert A>So imagine that you produce kilowatt hours during the day.</v>
<v Expert A>You only consumed five of those kilowatt hours during the day, but then at night they discount you.</v>
<v Expert A>The other five that you had produced, so this is a very problematic on on grid congestion in my opinion.</v>
<v Expert A>And I think that they have, they have a lot of discussion ongoing to wins with this scheme because this, for example, in Portugal, this doesn't happen if you don't consume you, you lose it.</v>
<v Expert A>Basically, you can sell it to the grid, but you you will not gain a lot from it and in some cases is not even worth it.</v>
<v Expert A>Uh, so yeah, if you want to ask a question.</v>
<v Maximilian Jagiello>Yeah.</v>
<v Maximilian Jagiello>Umm, nice.</v>
<v Maximilian Jagiello>Nice example from from the Netherlands.</v>
<v Maximilian Jagiello>Another question would be which technological approaches to enhance the integration of Noble Energy sources to you?</v>
<v Maximilian Jagiello>Consider like the most promising.</v>
<v Maximilian Jagiello>Or have there been any technical approaches?</v>
<v Maximilian Jagiello>Regarding like a management system or like a a microgrid development, smart grids and in your experience which you consider like very promising to avoid issues such as grid congestion or anything related to that.</v>
<v Expert A>Yeah, it's, it's, it's exactly what you are saying.</v>
<v Expert A>So this all these solutions that can reinforce the grid and provide more stability to the grid.</v>
<v Expert A>They are solutions that can contribute to to avoid grid congestion.</v>
<v Maximilian Jagiello>Umm.</v>
<v Expert A>Then of course you have as well storage, so if you implement solutions with storage associated, you avoid these problems, but then you have the the issue of cost, so it's it's a sort of a a trade off.</v>
<v Expert A>And so yeah, this is an example of of technical difficulties.</v>
<v Expert A>Yeah.</v>
<v Expert A>So this is it.</v>
<v Expert A>The Netherlands, for example, but there are other countries that have agreed congestion issues.</v>
<v Expert A>And then?</v>
<v Expert A>For example, it, Portugal, we don't have the the exact same issues, so we we still have great capacity.</v>
<v Expert A>Most places like Aldo, there are some projects that are already being restricted due to due to the grid capacity, but in most places you can implement the projects.</v>
<v Expert A>So I think overall there are not many technical difficulties because the solutions are very well developed is like the PV systems are a very experienced system.</v>
<v Expert A>Like in terms of it's in the market for many years.</v>
<v Expert A>People know how they work.</v>
<v Expert A>They are quite easy to install, like even wind turbines.</v>
<v Expert A>You have technical difficulties, maybe because of the size because they are making it very big, right?</v>
<v Expert A>Very big turbines, which I think will will stop to be a trend.</v>
<v Expert A>If you have look into use about the some of winterbane producers they they are mentioning that they will not go for big turbines anymore because they there's been some some issues with the with malfunctions with Victor Abines and like I think.</v>
<v Expert A>Yeah, like the stock market was very impacted in the beginning of the year due to those issues.</v>
<v Expert A>So now they are focusing more on reliability of smaller turbines, but then you have these difficulties of access etcetera.</v>
<v Expert A>But overall the these are very simple technologies to install as long as you have the grid capacity to to receive, uh this yeah, to install this renewable capacity, then of course the only thing you need is or that could enhance is management systems storage system.</v>
<v Expert A>So these sort of systems that can help you fight the the intermittency likes not constant, right?</v>
<v Expert A>So any system that can support you in this part can contribute to to a more renewable energy grid.</v>
<v Maximilian Jagiello>Nice.</v>
<v Maximilian Jagiello>Yeah.</v>
<v Maximilian Jagiello>Thank you for your insights.</v>

<v Maximilian Jagiello>I think we can maybe then move on to the policy and regulation part.</v>
<v Maximilian Jagiello>Again, I think it's quite important for the overall project and maybe you should have fun.</v>
<v Maximilian Jagiello>You want to go ahead and continue with the policy questions or?</v>
<v Maximilian Jagiello>Are you still?</v>
<v Maximilian Jagiello>You're it.</v>
<v Stefan Abadzic>Yeah, I think I have a quick different question before jumping to the policy and regulation.</v>
<v Stefan Abadzic>Uh, so you spoke about having also energy communities in the Netherlands and Italy.</v>
<v Expert A>Thank you.</v>
<v Stefan Abadzic>Do you partner with startups or that are specialized in energy communities?</v>
<v Stefan Abadzic>Or are you also partnering with bigger utilities in those respective countries?</v>
<v Expert A>No, we are actually we are cooperating more with the energy cooperatives in those countries.</v>
<v Expert A>So in all these three countries that we have these demonstrations sites, so Spain, Italy, Netherlands, we have a local energy cooperative because.</v>
<v Expert A>This, like one thing, that's that you can see is a renewable energy.</v>
<v Expert A>Communities are fairly recent concept, so they it started in basically.</v>
<v Expert A>But then if you go and see, you see that some communities claim they are working for more than years, stuff like that.</v>
<v Expert A>And the reason for that is because they work.</v>
<v Expert A>They work.</v>
<v Expert A>They work and they are still energy cooperatives, which it can differ the concepts of how, for example, the the energy cooperative in Portugal compared it does not fit very well into this definition, but a lot of small cooperatives around Europe can fit exactly within these definitions.</v>
<v Expert A>So basically they were doing it before, even though this concept was not very well defined.</v>
<v Stefan Abadzic>Umm, it's very interesting, but also one more other question.</v>
<v Stefan Abadzic>So as we all see through the renewable energies, the whole landscape is changing.</v>
<v Stefan Abadzic>You know, a lot of new startups, for example, also in Germany are emerging and the whole landscape is changing.</v>
<v Stefan Abadzic>So what do you think?</v>
<v Stefan Abadzic>How big of a threat do you think do these new market players pose for such big utilities like EDP and Umm yeah, what kind of changes does EDP have to do in their business models or in the diversifying that in their versifying the portfolio to stay competitive in the future?</v>
<v Expert A>Uh, well, it's an interesting question in these uh, like sometimes when we speak with citizens, it's difficult to make them understand why, for example, EDP is promoting things such as energy communities, which overall will reduce your need to buy energy from the grid.</v>
<v Expert A>So EDP sells energy from the grid?</v>
<v Expert A>Sounds counterintuitive, but I think you are from more on the business part.</v>
<v Expert A>So of course you are experts on this, but I think the the role or the goal of PDP is always to be in leading this sort of innovative technology be be one of the the leading companies in this in this topics and these technologies because.</v>
<v Expert A>Basically, we assume that these changes will happen.</v>
<v Expert A>We don't know if they will happen in the in the near future if they will take some more time to establish themselves, but we know that changes will happen and even if they don't, uh it's it's a small investment to to keep to create a business model around this new technologies.</v>
<v Expert A>But if it works, it's very good to be ahead of competitors because then you can.</v>
<v Expert A>And even if you lose some market, for example, your energy communities are directly competing with the retail and with the retail business.</v>
<v Expert A>But at the same time, they are losing on one side, but they are gaining a new market on the other side.</v>
<v Expert A>And if these changes are already happening, it's better for EDP to weave some business in it than to lose it all per competition, right?</v>
<v Expert A>I know that in business usually use like Kodak case as an example.</v>
<v Expert A>Like they, they didn't move away from the uh, like the old cameras to the digital ones.</v>
<v Expert A>So they lost all their market share because now no one uses these analog cameras.</v>
<v Expert A>So basically it's the same thought process is like we need to know how energy communities work.</v>
<v Expert A>What is the business model around it so that if the market completely changes in that in that way we are already in that market and we already know what to do and how to make a business there and relating with startups that you were talking about, we we work a lot with the startups that TDP, EDP has like acceleration programs for startups.</v>
<v Expert A>So I think it's not you are posing it more like a friend's, etcetera, but sometimes it's more like an opportunity because these startups appear with innovative business ideas with innovative solutions and the DPS funds require required to accelerate these these companies or as the expertise or the market knowledge that they need.</v>
<v Expert A>So we can contribute to the to their developments, while they can contribute also to our business.</v>
<v Expert A>So it's more we see tomorrow on a a cooperation basis than than really as a threat.</v>
<v Stefan Abadzic>Hmm, I understand.</v>
<v Stefan Abadzic>And maybe like as in future outlook, what is your realistic expectation of how the market is, Bill will evolve it.</v>
<v Stefan Abadzic>Do you think it's gonna be more a hybrid model where utilities and energy communities play together?</v>
<v Stefan Abadzic>Or it could be only energy communities or a decentralized complete system.</v>
<v Stefan Abadzic>So what is like your idea or expectation?</v>
<v Expert A>Yeah.</v>
<v Stefan Abadzic>Now everything will involve, even if it's not like % sure yet.</v>
<v Expert A>Uh, yeah, I think no one will can give you % short answer, but in my opinion I think it will be more of a hybrid model.</v>
<v Expert A>For example, I remember listening to like a Director of innovation from you on the the German utility and US stating that they predict and this is was at the European scale.</v>
<v Expert A>I actually tried to find references for what he was saying.</v>
<v Expert A>I was never never able to find any references, so maybe this was more of a feeling that they had inside the company, but they pointed.</v>

<v Expert A>They pointed out that and the day they estimate that % of the the energy generated in Europe in I don't remember exactly the year.</v>
<v Expert A>I don't know if was - or , but you pointed out that about they estimate about % will be generated in by small consumers.</v>
<v Expert A>Basically, these prosumers, though either like individual self consumption or energy communities, these sort of initiatives, uh, so I'm I'm sort of aligned with his words.</v>
<v Expert A>I think he's model on these type of hybrid.</v>
<v Expert A>The decentralized will will continue to exist and as its advantages, I will not go into centralized versus decentralized because there's that's a lots of people have lots of very strong opinions about centralized versus decentralized.</v>
<v Expert A>I think there's benefits to both, and I think the the model that we'll have is is a library model, but for sure I think that this energy communities or something similar will continue to progress in the future because and you can and you can see northern Europe as an example there, they have a a more purchase power there.</v>
<v Expert A>So they they are more aware of this, issues of environment etcetera.</v>
<v Expert A>So they really want to to make the difference by themselves, so they don't want they.</v>
<v Expert A>They are besties.</v>
<v Expert A>Uh, this idea of let the companies, uh make the difference.</v>
<v Expert A>We will do the difference ourselves, so I think we'll see more and more of this type of mentality to appear even on a more southern Europe countries.</v>
<v Expert A>So I think these.</v>
<v Expert A>Local level initiatives will continue to umm uh to grow, so I don't know if it is exactly energy communities or if in two years or three years we'll call it something different.</v>
<v Expert A>But I think the decentralized will continue to grow.</v>
<v Expert A>And yeah, we can see that.</v>
<v Expert A>For example, in Portugal I don't know if you saw like like two or three weeks ago.</v>
<v Expert A>There was a news that came out in the press about.</v>
<v Expert A>Yeah, OK.</v>
<v Expert A>So you saw it.</v>
<v Stefan Abadzic>Yeah, six days now.</v>
<v Expert A>Uh, yeah.</v>
<v Stefan Abadzic>Really cool.</v>
<v Stefan Abadzic>Very cool.</v>
<v Stefan Abadzic>Very also nice for.</v>
<v Stefan Abadzic>For for, I mean it's assigned for the whole world, you know, six days running completely on renewable energies.</v>
<v Stefan Abadzic>That's why you're aiming at right?</v>
<v Stefan Abadzic>Umm is.</v>
<v Expert A>Yeah, yeah.</v>
<v Expert A>But but actually there was another thing that about the growth of.</v>
<v Expert A>Of the decentralized sector in Portugal that they they put out an article on this part and the I think they it increased in two years in Portugal, which is not I think was already counting like the first semester of this year.</v>
<v Expert A>Not entirely sure, but I think it increased five times the capacity installed.</v>
<v Expert A>Of decentralized solar.</v>
<v Expert A>So you in here in DP we can see that as well the the decentralized solar business is is growing a lot is increasing more and more capacities each year.</v>
<v Expert A>So of course these strings don't grow forever, but at least it's a sign that there are some changes being already that are already on course, and that's probably meant that the system will be a bit more decentralized than it is nowadays.</v>
<v Expert A>Please.</v>
<v Stefan Abadzic>Yeah, very, very cool.</v>
<v Stefan Abadzic>And very interesting.</v>
<v Stefan Abadzic>The other is do you still have any questions?</v>
<v Stefan Abadzic>Yeah.</v>
<v Stefan Abadzic>And Filipe, thank you very much.</v>
<v Stefan Abadzic>Do you maybe have any additional thoughts or insights you would like to share with us?</v>
<v Expert A>Uh, no, the you.</v>
<v Expert A>If you're, if you're answers are clarified, then well, hope that I was able to to contribute to your work and feel free to to share it with me when you finish, because I'll be interested to take a look.</v>
<v Stefan Abadzic>Yes.</v>
<v Expert A>And if you go through a our website or something you find something that is of interest to you, you will not.</v>
<v Rachel Sulollari>It's.</v>
<v Rachel Sulollari>Yeah.</v>
<v Rachel Sulollari>So.</v>
<v Expert A>I was telling you that the information is public, but you will not find it information there yet because the information is only public after the European Commission approves it and this process usually takes a long time.</v>
<v Stefan Abadzic>Yeah.</v>
<v Expert A>So I can share it with you, but not the official approved version.</v>
<v Expert A>Uh, but yeah.</v>
<v Expert A>So it will take some time to be in the website, but in any case, we already have some some documentation that might be useful and I'll share that.</v>
<v Rachel Sulollari>Yes.</v>
<v Expert A>As I mentioned, I'll share that with you about the uh, these workshops that we add and that we talked with different people to find their motivations and barriers et cetera.</v>
<v Stefan Abadzic>That'd be very nice.</v>

<v Ronja Julia Suhling>Thank you very much.</v>
<v Stefan Abadzic>Yeah.</v>
<v Ronja Julia Suhling>It was so useful for us to hear you insights and also I at least for me, super motivating to see that it's such a like present topic and quite a big firm.</v>
<v Ronja Julia Suhling>So yeah, thank you for your time.</v>
<v Stefan Abadzic>Yes, thank you a lot for your time.</v>
<v Expert A>Yeah.</v>
<v Maximilian Jagiello>The yeah.</v>
<v Expert A>OK.</v>
<v Stefan Abadzic>Yes.</v>
<v Expert A>So thank you and the will keep in touch via email, OK.</v>
<v Rachel Sulollari>Yes.</v>
<v Stefan Abadzic>Yes, we'll keep in touch.</v>
<v Maximilian Jagiello>Yes.</v>
<v Stefan Abadzic>Thank you.</v>
<v Ronja Julia Suhling>Yes, thank you very much, I E.</v>
<v Expert A>Bye bye.</v>
<v Stefan Abadzic>Have a nice day. Bye.</v>
<v Expert A>You too.</v>
<v Stefan Abadzic>Bye bye.</v>
<v Maximilian Jagiello>Yeah.</v>
<v Maximilian Jagiello>Bye, bye.</v>

Transcript Expert B:

<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>It's all about just back up</v>
<v Rachel Sulollari>Published offices</v>
<v Rachel Sulollari>OK, OK</v>
<v Rachel Sulollari>So and what are your opinion primary motivation for communities to join energy communities?</v>
<v Expert B>Well, the thing to consider is the communities are motivated by various and several factors including significant cost savings or for example, the overall public engagement in sustainable practices, the desire for regional development and the push towards energy independence particularly, I believe there is a strong belief in reducing the environmental impact through renewable energy</v>
<v Expert B>These motivations stem from both the economic and environmental consciousness</v>
<v Expert B>So I would say consumers depend on the public engagement mainly and and this allows the push towards energy independence</v>
<v Expert B>Umm</v>
<v Rachel Sulollari>OK, I'll</v>
<v Expert B>I would like to mention that we talked with different people and through workshops to find their specific motivations and barriers</v>
<v Expert B>So The thing is you can build a perfect solution, but it always depends on the people and what they really want</v>
<v Expert B>So we introduced the approach of workshops to really get like the opinions of the local people and and to build solutions that cater their specific needs</v>
<v Expert B>And and yeah, in the end they work</v>
<v Rachel Sulollari>No</v>
<v Rachel Sulollari>Nice</v>
<v Rachel Sulollari>Very nice</v>
<v Stefan Abadzic>Cool, very cool</v>
<v Rachel Sulollari>Thank you very much</v>
<v Rachel Sulollari>And yeah, you mentioned that you already did some workshops with with consumers to get deeper into motivation and barriers or would you say are like challenges in consumer participation?</v>
<v Expert B>Well, I would say one of the main factors is the regulatory environment and complex bureaucratic processes</v>
<v Expert B>So even if they're consumers want to persist, participate they face like multiple hurdles to participate and it's not that everyone even wants to participate</v>
<v Expert B>So, like the consumers that want to participate, UM are facing hurdles and bureaucratic processes that hamper their participation</v>
<v Expert B>And they lose their interest in participating</v>
<v Expert B>So even the consumers that do want to participate, umm, there are various factors that are, UM, government and other bureaucratic institutions have established that hamper them from participating</v>
<v Expert B>And also I would say the overall integration of the energy systems into the existing grids and also presents some technical complexities, which can be especially challenging when you try to scale your company</v>
<v Expert B>So, UM, yeah</v>
<v Expert B>And regarding the consumer side, also sorry to interrupt and one thing I was just thinking of and was also that you mentioned there consumer and and the hurdles and one thing we encounter on the regular basis is and the high initial costs of investment that can be a deterrent for consumers and especially in southern Europe or Eastern Europe and the consumers are very focused on financial aspects and also the businesses and and the high initial investment costs and they can deter consumers and investors from participating in the first place</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>Thank you very much</v>
<v Rachel Sulollari>Mm-hmm</v>

<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>Ohh my OK very interesting</v>
<v Rachel Sulollari>And do you have like other relevant insights regarding this topic besides what you already mentioned?</v>
<v Expert B>Umm, so you mean like insights about?</v>
<v Expert B>Umm, our project specifically will I could one thing that's always</v>
<v Rachel Sulollari>Or like or like overall, what really say regarding the supportive or the support of the policy or regulatory, do you think this is like an important factor?</v>
<v Expert B>Yeah, definitely</v>
<v Expert B>I would say UM, in the end it always comes to the UM to the implementation and what is needed is supportive and clear and regulation framework that supports uh operation and implementation of local energy markets in order to make them more efficient and to to foster the engagement of businesses</v>
<v Expert B>So there's the issue that sometimes the government likes behind and there are no specific regulations or on the other hand, there sometimes maybe some regulations that restrict peer to peer trade for example</v>
<v Expert B>So you can't even implement a local energy market that uses peer to peer trading, because it's just not allowed in this country and also the the yeah, the overall support of government is missing in in various countries</v>
<v Expert B>So, and tackling this and technical knowledge gaps and social barriers is very essential and also the integration of the sources needs to be facilitated through the policies and uh in a way that is efficient and beneficial for the Community</v>
<v Rachel Sulollari>Oh, nice</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>Very interesting</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>Then one last question for my side, what role does public awareness and education play in the growth of energy communities in this countries and how was this being fostered?</v>
<v Expert B>Well, I would say that the public awareness and education is a central aspect</v>
<v Expert B>So this is it always comes down to the consumer end</v>
<v Expert B>This involves not just the spreading of information, but also demonstrating the tangible benefits of participating in energy communities</v>
<v Expert B>So educational like I've mentioned before, educational initiatives or the community workshops and public engagement campaigns are very effective tools that have proven this in our project, UM, especially to get the to get to the core of what the consumers want and and also to foster the engagement, if you're if you have the feeling that you're able to participate and you're actively engaged to participate, it's a lot more driving force that you actually participate in important decision making and in the overall adoption of local energy markets</v>
<v Expert B>So I think it's very important to promote this sense of incentives and benefits and and also to allow for possibilities to engage the the consumers and the key stakeholders</v>
<v Rachel Sulollari>No, it's very interesting</v>
<v Rachel Sulollari>Thank you very much</v>
<v Rachel Sulollari>It was really insightful</v>
<v Expert B>Yes, sure</v>
<v Expert B>No problem</v>
<v Rachel Sulollari>Alright, so I think Stefan will take over from here</v>
<v Stefan Abadzic>Yes, I would like to take over from now</v>
<v Expert B>Go ahead</v>
<v Stefan Abadzic>Also from my side</v>
<v Stefan Abadzic>Thank you for talking</v>
<v Stefan Abadzic>Thank you for talking with us</v>
<v Stefan Abadzic>I have some questions about the drivers and opportunities in the real time data analytics</v>
<v Stefan Abadzic>So one specific question to you, how do technologies provide real time data analytics and contribute to optimizing energy usage within local energy markets?</v>
<v Expert B>And, well, that's an interesting question</v>
<v Expert B>And I would say The thing is, technologies that provide real time data and analytics are also very critical and we've seen it in our project</v>
<v Expert B>So especially when considering the overall efficiency of LEM's, yes to you have new amounts of data and vast amounts of data that need to be monitored</v>
<v Expert B>And regarding production consumption and also in identifying inefficiencies</v>
<v Expert B>So I would say it's quite a quite a driver that you leverage this new possibilities by real time data analytics and yeah, to increase automatically efficiency and make local energy markets more viable, yeah</v>
<v Stefan Abadzic>Umm yeah</v>
<v Stefan Abadzic>Can you maybe explain like the role of the matter response technology in energy consumption management and also the cost of efficiency during those peak times?</v>
<v Expert B>Yeah, well, this is another interesting aspect</v>
<v Expert B>So demand response technologies</v>
<v Expert B>Umm, portray it?</v>
<v Expert B>Interesting alternative to expensive storage solutions and as they can be used quite flexible</v>
<v Expert B>The only thing is that they need to be integrated efficiently and in a complex network of flexibility options</v>
<v Expert B>So, for example electric vehicles or umm</v>
<v Expert B>Yeah, like the charging infrastructure and also the transport sector, you can</v>
<v Expert B>UM, you can use all of the technologies already that already exists to to allow for like intermittency mitigation, but using it as yeah like little storages you can imagine it like little storages that puffer the electricity and this leads to UM very interesting cost savings in the st place</v>
<v Expert B>And as I mentioned, it is a lot of cheaper than storage solutions, so</v>

<v Expert B>I would suggest the usage of already existing technologies and you need to integrate it efficiently to balance the energy and the grid system during the peak times</v>
<v Expert B>It's</v>
<v Stefan Abadzic>And now I have a question regarding more like the improved access to information and data</v>
<v Stefan Abadzic>Is it for you?</v>
<v Expert B>Yeah, definitely</v>
<v Stefan Abadzic>Umm, I would like to ask first</v>
<v Expert B>See</v>
<v Stefan Abadzic>Yeah, it's, it's a question about customized visualization tools</v>
<v Stefan Abadzic>Sorry, there's some platforms work and</v>
<v Expert B>One my son was just coming and I'm sorry I'm in interview</v>
<v Expert B>Thanks</v>
<v Expert B>Sorry for the interruption</v>
<v Expert B>My yeah and</v>
<v Stefan Abadzic>OK</v>
<v Stefan Abadzic>Yeah, no worries</v>
<v Stefan Abadzic>Say hi to your kid</v>
<v Stefan Abadzic>So how do customized data visualization tool help users in local energy markets?</v>
<v Expert B>Well, The thing is, you have to imagine most of the end users and consumers</v>
<v Expert B>They are not really</v>
<v Expert B>If you or like the overall technology, affinity is not really present in most of the countries for our types of consumers</v>
<v Expert B>So it data visualization is, I would say I'm important aspect to have to facilitate the understanding of information and the data that is available and it is a lot about the data that in theory consumption and also to to better understand how the system works and UM how the processes work</v>
<v Expert B>So I think it's an important step to visualize, visualize data and to to foster the understanding</v>
<v Expert B>And, UM, yeah, a picture says more than words</v>
<v Expert B>So, and it's a good level to improve understanding, definitely</v>
<v Stefan Abadzic>And yeah, regarding that how do like these digital platforms and mobile apps promote the community engagement in energy communities and are they like some specific challenges like trust issues or lack of technical knowledge issues?</v>
<v Expert B>And this is also an important aspect I think</v>
<v Expert B>UM, we have various energy management systems that allow us for collecting and analyzing the data about the usage</v>
<v Expert B>And, umm, we tried to to make use of this data in in our digital platforms and mobile apps</v>
<v Expert B>Like I said, the data visualization and it needs to be deployed in simple end user applications that promote like the overall community engagement</v>
<v Expert B>So if you have a mobile app that shows you your PV panel production and consumption in a simplified way, and also for example from your other participants in the network, so you can exchange information with your neighbor</v>
<v Expert B>For example, I think this fosters also a sense of community and it facilitates the overall engagement and the digital community by providing this easy and accessible access to information and also, for example, educational content</v>
<v Expert B>Umm, the distribution of educational content and also forums for discussion and overall collaboration among the members in our local energy markets, yeah</v>
<v Stefan Abadzic>Umm, very interesting</v>
<v Stefan Abadzic>And also one more question regarding yeah, I'm handling all these many complex interaction at the same time</v>
<v Stefan Abadzic>What is the importance of energy management system in these local energy markets and how do also these technologies provide the real time data and undertakes to contribute to this energy optimization and usage with your local energy markets?</v>
<v Expert B>Well, am I think it's quite simple</v>
<v Expert B>These systems are and very essential to allow us for collecting and analyzing data in the st place about the energy usage and to to also enable better decision making regarding energy efficiency</v>
<v Expert B>So and these tools are an important step and they need to be used efficiently and using it's</v>
<v Expert B>It's all about using making use of the data we we collect and those systems and collect and provide first insights into this data</v>
<v Expert B>So it's, umm, makes things a lot easier</v>
<v Stefan Abadzic>OK Umm</v>
<v Stefan Abadzic>Yeah, I would hand the rest the questions to our colleague Vanya now</v>
<v Stefan Abadzic>Yeah</v>
<v Stefan Abadzic>So I also have a few questions</v>
<v Expert B>And sure</v>
<v Stefan Abadzic>Yes, I think my colleagues, they already did a very good job and asking most of the questions</v>
<v Stefan Abadzic>But there are a few more questions</v>
<v Stefan Abadzic>I would also ask so</v>
<v Stefan Abadzic>Just for our terminology, what is your understanding of virtual power plants?</v>
<v Expert B>And actually The thing is</v>
<v Expert B>We don't use this Switcher power plants so</v>
<v Expert B>Maybe you have been different questions on our project</v>
<v Expert B>We don't really use them and it's probably not relevant in your context</v>
<v Stefan Abadzic>OK, OK</v>
<v Stefan Abadzic>Then yeah, let's go back to the drivers and opportunities</v>
<v Stefan Abadzic>We spoke about to the real time data analytics, we spoke about Ohm</v>
<v Stefan Abadzic>Yeah, I'll trust can be</v>
<v Stefan Abadzic>It can be brought in into communities and the lack of technical knowledge is would you mind a lot?</v>

<v Stefan Abadzic>Elaborating about the economic viability so the scaling of of this whole process and could you also talk a bit about the demand response technologies like can you explain the role of demand response technologies and energy consumption management and cost efficient give like could you elaborate a bit more at this point?</v>
<v Expert B>I'm</v>
<v Expert B>Yes, these are a lot of diverse concepts</v>
<v Expert B>I'm just a little bit confused on the interview guideline you sent me before and where we actually are in the in the overall structure</v>
<v Expert B>I thought we do</v>
<v Stefan Abadzic>The we are, we're now in the drivers and opportunities</v>
<v Stefan Abadzic>These</v>
<v Expert B>But we talked about all of the drivers and opportunities</v>
<v Expert B>I think of them</v>
<v Stefan Abadzic>And we didn't talk about the scaling yet, right?</v>
<v Expert B>Umm and</v>
<v Expert B>I think we should move to the policy part right, especially given the time</v>
<v Stefan Abadzic>OK</v>
<v Stefan Abadzic>OK, then yeah</v>
<v Stefan Abadzic>Could you explain what challenges do permitting and approval processes pause in a stablishing local energy markets?</v>
<v Expert B>Yes, definitely</v>
<v Expert B>The thing is, in our project that we currently operate uh, this very annoying and also it takes a lot of time</v>
<v Expert B>It can be lengthy processes and to to get approval for local engine markets in the st place</v>
<v Expert B>So even if you put a a, if you have a new technology that you want to implement and you are not sure on whether to further innovate in this kind of field of the technology because it is unclear about the precision about the decision making process and how the policies will permit and approve these technologies</v>
<v Expert B>So UM, this lengthy process is can umm yeah they are significant barrier in UM in in innovating innovation</v>
<v Stefan Abadzic>Yes, and UM, maybe also about how we does the absence of the clear frameworks and policies affect adoption of local energy markets technologies</v>
<v Expert B>Yes, this is and I mean in the project we have done and it's also in some countries that we experience that there is instead of a clear barrier, there's the absence of political framework and policies, regulations</v>
<v Stefan Abadzic>And</v>
<v Expert B>So one would think it's it's a good thing that there is an absence, but regarding the research and development and also the project structuring, it's very difficult if there is the absence of clearly goes framework because</v>
<v Expert B>You can't rely on anything you don't have any clear structures, so you don't know when and what direction you can go</v>
<v Expert B>And if you try to like I said, for example, innovate in demand response technologies and there comes a new regulation that prevents demand response from being implemented and you have to, yeah, you can, you have to stop the project and you make a lot of financial losses</v>
<v Expert B>And so it's, I would say it's significantly slows the speed of innovation and creates a uncertainty and ultimately hinders the adoption of innovative solutions</v>
<v Stefan Abadzic>Very nice</v>
<v Stefan Abadzic>They are looking at the time</v>
<v Stefan Abadzic>Let's wrap it up soon</v>
<v Stefan Abadzic>Do you have some concluding thoughts or anything we didn't ask you yet or anything interesting you would like to mention as well?</v>
<v Expert B>UM, yeah, maybe some aspects about the uh, I mean, we've talked about the UM integration and the technical integration of also the availability of information that a little bit I would say and what is important is the clarity and availability of information for the integration, especially about how to utilize the new technologies and how to integrate them into the existing grid</v>
<v Expert B>So every country has a different grid system and there is no or the information is not easily accessible on how to integrate it properly so</v>
<v Expert B>This is another important aspect and also regarding the economic and social aspects of it, say</v>
<v Expert B>One critical concern is that's the community members often like technical affinity and expertise to establish and also to manage</v>
<v Expert B>Umm alliums, which can be mitigated by employing the decision making tools to to support them in that areas and also umm yeah</v>
<v Expert B>Especially when dealing when they have to deal with microgrids or like the technical integration for them, they just like the expertise to effectively implement those</v>
<v Expert B>UM, so even if we employ a new energy community, it's always comes down to the long term operation</v>
<v Expert B>And yeah, it's likes the expertise and the knowledge of skills employees to operate those technologies</v>
<v Expert B>I would say that that's that's it from my side</v>
<v Stefan Abadzic>OK</v>
<v Expert B>If you have any further questions, feel free to to ask and maybe about my recent vacation or about next restaurants in and yeah, Portugal</v>
<v Stefan Abadzic>Yeah, cool</v>
<v Stefan Abadzic>Cool</v>
<v Stefan Abadzic>Yeah, I don't know</v>
<v Stefan Abadzic>Rachel</v>
<v Stefan Abadzic>Stefan, do you have any more questions regarding that?</v>
<v Rachel Sulollari>No, thank you very much again that you took good time to</v>
<v Stefan Abadzic>Yes, thank you very much</v>
<v Expert B>Yeah, I'm really sorry that my son interrupted in the middle of the interview</v>
<v Rachel Sulollari>Don't worry, don't worry, everything is fine</v>
<v Expert B>He's obviously out of his mind, yeah</v>
<v Stefan Abadzic>No worries</v>

<v Rachel Sulollari>Alright then</v>
<v Stefan Abadzic>OK, then let's wrap it up</v>
<v Expert B>Nice Interesting</v>
<v Stefan Abadzic>Thank you</v>
<v Rachel Sulollari>Have a nice day</v>
<v Rachel Sulollari>Bye</v>
<v Rachel Sulollari>Thank you</v>
<v Stefan Abadzic>Have a nice day</v>
<v Expert B>It's</v>
<v Stefan Abadzic>Bye bye</v>

Transcript Expert C:

WEBVTT
<v Expert C>Ask a couple of questions for context</v>
<v Stefan Abadzic>Mm-hmm</v>
<v Expert C>So at SBE you do your like master's thesis in a group</v>
<v Expert C>Is that what we're doing?</v>
<v Stefan Abadzic>Yes Yeah</v>
<v Expert C>OK</v>
<v Expert C>And so you're talking to me as an expert in this area</v>
<v Stefan Abadzic>Mm-hmm</v>
<v Expert C>But what is the like research method that you are using and what are you planning to do with this this interview?</v>
<v Expert C>But just to understand?</v>
<v Stefan Abadzic>OK</v>
<v Stefan Abadzic>So our whole methodology so far looked like that we did a comprehensive literature review</v>
<v Stefan Abadzic>We used a search queries and uh, yeah, there were downs to or Dutra review, which we then did and after that we wanted to do qualitative interviews also with experts in that field such as you to validate what we have found and our literary view basically gave us the opinion that, umm, there is a huge gap between theory and yeah, the practical real world</v>
<v Stefan Abadzic>And that's what we are trying to yeah, basically find out in our thesis and for example, Vanya also analyzed data</v>
<v Stefan Abadzic>Maybe you can say something to about that onion</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>And we also talked to some people actually having hybrid peer to peer markets life and some countries already</v>
<v Ronja Julia Suhling>So it's not just the research side that we are addressing, but we are also trying to get as much insights from the actual business perspective of things</v>
<v Ronja Julia Suhling>So there's a few companies in the UK, some in Slovenia, Portugal as well, and I'm looking into a data set in Estonia from prosumers</v>
<v Ronja Julia Suhling>And I'm just looking at the savings for prosumers and consumers by participating in the local energy market compared to the current market structure, which is power purchase agreements with their utility provider</v>
<v Ronja Julia Suhling>So I'm comparing the savings from the selling of their energy surplus in the current model to and local energy market</v>
<v Expert C>OK</v>
<v Expert C>Chop</v>
<v Ronja Julia Suhling>But maybe we can dig deeper into that part later, as it's just we have one overall thesis which is like the goal to have practical perspectives on the theory that we've just talked about the literature review and then each of us is looking into one more specific field</v>
<v Ronja Julia Suhling>And for me, for example, it's the pricing and I'm using a data set and Max is looking more into the technological side of things</v>
<v Ronja Julia Suhling>Stefan is looking at the business model of utilities and Rachel's addressing the consumer side</v>
<v Ronja Julia Suhling>So we split that up a little bit</v>
<v Stefan Abadzic>Yeah</v>
<v Ronja Julia Suhling>Just to dig deeper in some of the the relevant aspects as it's quite a complex and wide tougher that we choose and found out to be</v>
<v Expert C>OK</v>
<v Expert C>Very nice, very interesting</v>
<v Expert C>Make sure you send me your thesis when it's finished and published online, and I'll I'll take a look</v>
<v Ronja Julia Suhling>Yes, we will do that</v>
<v Stefan Abadzic>Yes</v>
<v Ronja Julia Suhling>Happy to do that</v>
<v Stefan Abadzic>Yeah</v>
<v Ronja Julia Suhling>And you wanna keep going, Stefan</v>
<v Stefan Abadzic>Yeah</v>
<v Ronja Julia Suhling>And go further with the</v>
<v Expert C>Sure</v>
<v Expert C>Go for it</v>
<v Stefan Abadzic>Maybe you would like to start with giving us a quick introduction of yourself and also talk about maybe a project such as communities we have already worked in the field of local energy markets would be very interesting for us</v>

<v Expert C>OK so</v>
<v Expert C>Uh, we'd start, I guess my background is economics and I worked in energy, mostly energy finance, energy market modeling and energy market design</v>
<v Expert C>Uh for something like uh, eight or nine years</v>
<v Expert C>Then I came to Portugal, where I did the PhD, where my PhD is on electricity market modeling again over the long term and incorporating uncertainty and as part of that I worked in a company briefly at as like a visiting researcher called Grid Singularity</v>
<v Expert C>Maybe you've heard of energy with foundation</v>
<v Expert C>Umm, who work on pit to be markets is one of the things they do</v>
<v Expert C>Have you talked to them, by the way, or not?</v>
<v Ronja Julia Suhling>No, we haven't</v>
<v Expert C>OK</v>
<v Stefan Abadzic>No, no, they're in Berlin, right?</v>
<v Expert C>But they might be interesting that that well, they were in Berlin then I'm mostly in Lisbon these days because of the taxes on cryptocurrencies</v>
<v Ronja Julia Suhling>There</v>
<v Stefan Abadzic>Yeah</v>
<v Expert C>And</v>
<v Expert C>Uh, so yeah, I would just briefly with them and you know the main thing is I worked a lot on electricity market modeling and design, not on the peer to peer level, but on the electricity market level</v>
<v Expert C>So I have a lot of, I guess, opinions on how this should work, particularly when it comes to uh, you know, people doing this between their neighbors as opposed to large utility companies that have a trading team</v>
<v Expert C>You know, it's kind of a a different situation</v>
<v Expert C>And so yeah, now we're doing communists where we're going to, we're developing blockchain peer to peer model that we're hopefully going to pilot and four countries</v>
<v Expert C>But regulations probably will get him away, but yeah, that's that's basically the starting point at the moment</v>
<v Stefan Abadzic>That's very interesting</v>
<v Expert C>Ohh and I'm a member of the Global Observatory on peer to peer</v>
<v Expert C>Something</v>
<v Expert C>Something something uh energy</v>
<v Expert C>Transactive, like it's a real mouthful, but we it's a network based on this and we're trying to fund that through Portugal</v>
<v Expert C>Going forward</v>
<v Stefan Abadzic>Umm, yes, very interesting</v>
<v Stefan Abadzic>Yeah, we we also research a lot about peer to peer</v>
<v Stefan Abadzic>Umm, could you maybe elaborate a bit more about peer to peer and yeah, the future potential about peer to peer and UM yeah</v>
<v Stefan Abadzic>If you think that peer to peer is going to be one of those</v>
<v Stefan Abadzic>Yeah Yeah</v>
<v Stefan Abadzic>How it's going to work in the future?</v>
<v Expert C>So specifically, peer to peer, we're we're talking about now</v>
<v Stefan Abadzic>Yeah</v>
<v Expert C>Is that OK?</v>
<v Expert C>So I I I guess the argument you're probably familiar with this</v>
<v Expert C>You know, traditionally we buy energy from energy companies, right?</v>
<v Expert C>So we have a model where we pay utilities through retailers for our energy because that's where effectively the the energy is coming from</v>
<v Expert C>But now when my neighbor has a solar panel, I'm literally using the existing energy that's coming from my neighbor, right?</v>
<v Expert C>My neighbor is the one that's generating it, so it potentially makes sense to align that payments to my neighbor, and it has a number of advantages and that it's a, you know, gives them more incentive to invest in renewable energy</v>
<v Expert C>And we can kind of as we get more advanced devices, we can kind of uh, you know change my consumption behavior to match the local conditions of the kind of local producers because we're kind of in theory kind of trading this, this energy in a in a market</v>
<v Stefan Abadzic>Umm</v>
<v Expert C>You know, again, my backgrounds, economics and economics, we tend to think of and markets as a good way to allocate resources and kind of achieve efficiency</v>
<v Stefan Abadzic>Umm yeah</v>
<v Stefan Abadzic>And with this landscape changing</v>
<v Stefan Abadzic>So prosumers yeah, being able to to trade energy peer to peer like physically but by a blockchain</v>
<v Stefan Abadzic>Ohm</v>
<v Stefan Abadzic>Yeah</v>
<v Stefan Abadzic>The landscape for like big companies, big utilities that traditionally were retailer where the</v>
<v Stefan Abadzic>The pure generator, and so on is completely changing what kind of threads, in your opinion does this post for these traditional business models?</v>
<v Expert C>So the question is, what is the threat to utilities?</v>
<v Stefan Abadzic>Yes, through traditional utilities, yes</v>
<v Stefan Abadzic>And opportunities, yes, some of</v>
<v Expert C>I mean the I guess the yeah, I guess the threat is that you know, well traditionally they act more or less as monopolies and so they have a lot of pricing power and so they make a lot of profits and you know, the the countries that deal with this better tend to deal treat them like regulated monopolies</v>
<v Expert C>Or, you know, you have to be very careful about what's happening in your wholesale retail markets and in practice it's it's very difficult to do umm</v>

<v Expert C>And so, you know, if we're then not buying so much energy from them, but we have more options, you know, that's going to affect their their revenue</v>
<v Expert C>But it we're we're a long way away from the situation where we're replacing utilities, it's more that's some of our energy will potentially come from our neighbors and we can also potentially move uh more towards this sort of energy communities where we're kind of trying to at least replace the kind of retailer part of the utility</v>
<v Stefan Abadzic>Umm yeah</v>
<v Stefan Abadzic>I mean, there are like these numbers until twenty % will be generated by single households and so on</v>
<v Stefan Abadzic>But do you think utilities can be fully replaced like in a hybrid model or for example for powering huge cities?</v>
<v Stefan Abadzic>It still there's still this portunity for bigger utilities, right?</v>
<v Expert C>What do you mean?</v>
<v Expert C>You sit hybrid model a few times</v>
<v Expert C>What do you mean by a hybrid model?</v>
<v Stefan Abadzic>By a hybrid model I mean where?</v>
<v Stefan Abadzic>There are prosumers, but there are also few generators together in a geographical location and they both</v>
<v Stefan Abadzic>Umm</v>
<v Stefan Abadzic>Act in order to support the energy needed in in in that in that grid</v>
<v Expert C>So</v>
<v Ronja Julia Suhling>I think when when vector that we're missing him where he had the the way we defined the the local engine market designs as having the level of control being centralized in a hybrid model</v>
<v Ronja Julia Suhling>So you have to like some form of centralized element where you have for example a community manager or someone from a utility provider, coordinating or managing the the market</v>
<v Expert C>Umm</v>
<v Ronja Julia Suhling>So I think that's one aspect where utility company would be needed</v>
<v Ronja Julia Suhling>Whereas on the other hand, when you look at super decentralized markets, you have blockchain as an enabler where you could potentially just eliminate the central element and have a community being self sufficient</v>
<v Stefan Abadzic>Yeah</v>
<v Stefan Abadzic>Yes, I'm sorry</v>
<v Expert C>That</v>
<v Ronja Julia Suhling>Yeah, I think that's where the understanding maybe that it makes more sense for you to to assess where the role of the utility company can be and which of the two in your opinion is going to be evolving in the future more or have more potential for the future</v>
<v Expert C>Let me ask you a question then</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>So imagine we have a blockchain solution and I have a a market on my blockchain that you know it's decentralized cause it's running on a blockchain and people can interact with it</v>
<v Expert C>Do you consider that fully decentralized?</v>
<v Expert C>Because there's a sense in which there's a Central Market, it's just running on a decentralized blockchain</v>
<v Ronja Julia Suhling>Yeah, I think it depends on the on the market clearing</v>
<v Ronja Julia Suhling>Also, if it's for example auctions and people are having full control over their way, there are Bidding and transacting their energy, then the level of decentralization is quite high</v>
<v Ronja Julia Suhling>Whereas when there's a central marketplace set by, I don't know, smart contracts by rules in the blockchain or by the utility or different aggregator somehow than the level of centralization is a bit higher</v>
<v Expert C>OK</v>
<v Ronja Julia Suhling>Does that make sense in your understanding or are we missing a point?</v>
<v Stefan Abadzic>No</v>
<v Ronja Julia Suhling>Maybe if you're understanding is you're free to correct</v>
<v Expert C>No, no, no, I I I'm interested in your opinion because this is something we discussed sometimes because there is also this additional level of decentralization which is not blockchain and more in control theory about how people can organize and market and agree on prices and dispatch without even the Central Market structure</v>
<v Expert C>It's kind of through gossip protocols where you gossip with your neighbors and eventually a consensus is me</v>
<v Expert C>Uh</v>
<v Expert C>A met without relying on any central connection or you know it</v>
<v Expert C>When we have a market on the blockchain, it's still a central place that everyone can kind of interact with each other and a real decentralized solution</v>
<v Expert C>It's not necessary for me to connect to every single person, but it's kind of like spreads out through a network and there's not a central</v>
<v Expert C>A</v>
<v Expert C>You know it's it comes down to different types of centralization, right?</v>
<v Expert C>And this is like A at a logical centralization, but we're hoping the decentral there's decentralization kind of in control and who who controls that market</v>
<v Expert C>But sorry I a little off topic but</v>
<v Ronja Julia Suhling>Is a very interesting skill to have your opinion on that because like I mean, just to dig into that a little bit deeper, we had some troubles actually finding the right wording per concept, because in literature it's</v>
<v Ronja Julia Suhling>I don't know if it's just our lack of experience over the years because we've just started digging into the topic, but some people use peer to peer and then in the end they mean the peer to peer trading because peers are active and they say it's decentralized</v>
<v Ronja Julia Suhling>But then it's still coordinated by the utility</v>
<v Ronja Julia Suhling>Do you agree with that and where do you see those clear lines?</v>
<v Expert C>No, no, this</v>
<v Expert C>Well, it took menology there's no clear lines and people use different words for all sorts of things, but and what you're describing, it's most likely that they started out wanting to do something decentralized and had to take more and more</v>

<v Expert C>Kind of simplifications until they they ended up something that's not decentralized, but even in terms of just the definition of the terms like, umm, as one of the things he's global observatory really tried to do is like OK, we have a really enlarged international collection of experts</v>
<v Expert C>Let's try and agree on what exactly where the boundaries lie between these terms and what each one of them meets</v>
<v Expert C>But then at the end of the day, that's just, you know, well, it's it's IEA backed</v>
<v Expert C>So it's like has some weight behind it but</v>
<v Expert C>Uh, you know, it's still something people will use the terms differently differently</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>That's also good to know for us because we've we've for our work, defined it in being decentrally coordinated</v>
<v Ronja Julia Suhling>But then maybe we have to like refine it because it's still relies on a blockchain</v>
<v Ronja Julia Suhling>It's just more independent from, yeah, utility company for example, whereas there's hybrid models and there's still market clearing done by a central utility or something</v>
<v Ronja Julia Suhling>Do you think this hybrid model, as we called it where utilities playing a crucial role in clearing the market, in coordinating it, is going to be the most dominant in the future or where do you see?</v>
<v Ronja Julia Suhling>For exam</v>
<v Expert C>But so tell me a little bit more about what the utility is doing and they why is the?</v>
<v Expert C>Why is the utility clearing the market?</v>
<v Expert C>I guess I don't understand</v>
<v Ronja Julia Suhling>I think it depends on the market models</v>
<v Ronja Julia Suhling>I think we've read different papers where there's different different market designs done and then some</v>
<v Ronja Julia Suhling>The central utility has, like still still coordinating the market</v>
<v Ronja Julia Suhling>Or is allowing or is matching the prices, for example from bias and sellers and appear to peer market</v>
<v Stefan Abadzic>Umm</v>
<v Stefan Abadzic>And it's also not like completely clear in, at least for me, why it is always the case</v>
<v Stefan Abadzic>Is that because of the regulations?</v>
<v Stefan Abadzic>I don't know</v>
<v Stefan Abadzic>Maybe could you have an answer to that?</v>
<v Stefan Abadzic>So because of regulations and contracts with these regulations or why is it that they still have these?</v>
<v Stefan Abadzic>Yeah</v>
<v Stefan Abadzic>You earlier also mentioned Monopoly in that case</v>
<v Expert C>And OK, so I guess this a few things going on</v>
<v Expert C>All right</v>
<v Expert C>So, like if we if we ignore the peer to peer thing and we just start with electricity markets, typically there's always a market operator in that there's someone running this market that people can bid and buy and sell them energy from right and not always the case</v>
<v Expert C>And actually, now that I think about it, some markets have more of a a bilateral system where people negotiate directly</v>
<v Expert C>But uh yeah, the there tends to be a market operator and at some point and if not most countries are moving in this direction and that market operator is supposed to be really independent and neutral usually like a government agency</v>
<v Expert C>It's just like running this central repository for people to to buy and sell on a a (via basis and positive</v>
<v Expert C>The reason for that is that you know we have to make sure the demand and the supply of electricity kind of matches at all points in time, right?</v>
<v Expert C>So it's kind of, it's useful if there's a central place that's seeing this is all the demand and this is all the supply of electricity Right?</v>
<v Expert C>And then we can make sure it matches</v>
<v Expert C>It's not essential, but it's kind of useful, uh?</v>
<v Expert C>If it's not, then people like bilaterally agree their traits</v>
<v Expert C>And then they have to supply it all to someone</v>
<v Expert C>Uh, that's going to make sure that it all kind of adds up and then rebalance things if it does</v>
<v Expert C>So I I guess when we have a local electricity market where thinking about the same kind of model where someone is like operating this market, uh, but for me it doesn't necessarily need to be a utility like it could be, uh, an energy community that could be a blockchain in which this this market sits</v>
<v Expert C>But you know, it's it's unlikely the case that an energy community is gonna be completely self sufficient</v>
<v Expert C>And so at some point, we're, like interacting with this wider grid and we're kind of buying exists electricity or selling our existence</v>
<v Expert C>Sorry, does that make sense?</v>
<v Ronja Julia Suhling>That makes experiments sense</v>
<v Stefan Abadzic>Yes, yes</v>
<v Ronja Julia Suhling>Thank you for your time and giving more clarity</v>
<v Ronja Julia Suhling>And maybe one quick follow up question</v>
<v Expert C>Right</v>
<v Ronja Julia Suhling>You talked about the energy supply and demand being imbalance at all times</v>
<v Ronja Julia Suhling>That means that you are looking at the physical layer where the actual energy flows and the grid has to be stable at all times and also at the financial layer where the pricing is done right?</v>
<v Expert C>Yeah</v>
<v Ronja Julia Suhling>So in your desk</v>
<v Expert C>I mean, it's on the physical layer as where everything has to match, right? Yeah</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>Yes, exactly</v>
<v Ronja Julia Suhling>But we talked to some companies and they just</v>

<v Ronja Julia Suhling>Detach those things and just use the centric grid which is used by utilities and just allow prosumers to just put their surplus energy into the grid and then just have a mix of energy in the grid, but only do like a financial market on top</v>
<v Ronja Julia Suhling>Aside from the Central Market and then don't have the physical layer connected with the financial layer, does that make sense for you?</v>
<v Expert C>Uh, yes</v>
<v Expert C>And that's kind of that is the way it kind of works because it just is no</v>
<v Expert C>So if I sell energy to my neighbor, there's no real sense of which we know where the energy that I sell goes, right?</v>
<v Ronja Julia Suhling>No</v>
<v Expert C>It just goes into the the grid right?</v>
<v Expert C>And and all energy is like this</v>
<v Expert C>We don't know where any of these electrons go, right?</v>
<v Expert C>And so, you know, the metaphor is like, it's like a swimming pool</v>
<v Expert C>And some people are pouring in buckets of water and some of them taking them out</v>
<v Expert C>But we don't know where whose water went to who, right</v>
<v Stefan Abadzic>Mm-hmm</v>
<v Expert C>So again, why having a kind of somewhat a central place is kind of useful to kind of, uh, make this happen</v>
<v Expert C>But yeah, the this generally not a lot of connection between the the financial</v>
<v Expert C>Transactions and the the physical cause the especially in the local electricity market because my solar panel is going to generate energy when it's sunny, like it doesn't change my baby too much</v>
<v Expert C>But ideally what we're trying to do is get to a future situation where I have some devices with demand response that will kind of switch off or on depending upon kind of local energy conditions based upon these kind of financial signals</v>
<v Ronja Julia Suhling>Thank you</v>
<v Stefan Abadzic>Umm</v>
<v Ronja Julia Suhling>That's the that's very relevant for us to, to clarify also from your side that that's the way it's working right now</v>
<v Ronja Julia Suhling>UM, I would say I have the one more question because we were talking about press earlier and I think it's matches</v>
<v Ronja Julia Suhling>The topic we were talked about right now, what is your experience in your experience or in your opinion, the way to go when it comes to pricing?</v>
<v Ronja Julia Suhling>Do you think I mean some models I've looked at have auction mechanisms where buyers and sellers put their Bidding or asking price and then the prices are matched through I gyms</v>
<v Ronja Julia Suhling>Approximating their price, taking the average whatever, there's different options out there</v>
<v Ronja Julia Suhling>But in your opinion or what do you think is the way to go when it comes to the pricing mechanism in the future?</v>
<v Ronja Julia Suhling>What do you think most applicable in practice?</v>
<v Expert C>But uh, so it it depends a little bit on what you're doing, what the problem is and when you're reading it to things of a engineer or an economist, wrote the article that you're reading</v>
<v Expert C>And so at, engineers tend to think about pricing algorithms, things like this, right?</v>
<v Expert C>But when you go and buy a T shirt, what is the pricing algorithm?</v>
<v Expert C>That set the price of that T shirt</v>
<v Expert C>It's not set by an algorithm that's supply and demand, right?</v>
<v Expert C>And so we tend to think if it's really a market prices are an outcome of the market of the kind of supply and demand</v>
<v Expert C>And the way we kind of do that in this, uh, in a centralized way is with like an auction, particularly like a double auction</v>
<v Ronja Julia Suhling>Umm</v>
<v Expert C>Umm, but this is kind of like a very econ level is very similar to people trading individually and deciding prices between each other</v>
<v Expert C>You know, we should be kind of trying getting to the same sort of solution of this supply and that this demand and that sets prices</v>
<v Ronja Julia Suhling>OK</v>
<v Expert C>Uh, the things get more complicated if people</v>
<v Expert C>Uh, a not so at this requires that when people offer energy or offer to buy it, that's supplying a price at which they are willing to buy and willing to sell</v>
<v Expert C>Umm, there's a requirement for like a auction system and then even within that this kind of like boundary conditions where you get like a gap between buy and sell and any price in between is consistent with a perfectly competitive market outcome</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>It's just kind of it's kind of like a welfare transfer</v>
<v Expert C>And then sometimes you can put a pricing algorithm in there</v>
<v Expert C>If you're building an economic model, you just assume whatever is convenient for you</v>
<v Expert C>It's the uh, you know, things like this</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>Thank you</v>
<v Ronja Julia Suhling>So just to clarify it either there's like a price that forms through demand and supply or you can incorporate the ask and bid prices that prosumers or sellers sell for the set the for themselves in the price funding mechanism, right?</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>But so uh, buyers and sellers are submitting bids and offers to this marketplace and the marketplace clear spits and offers to end prices like an outcome</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>Basically, we find the price that's consistent with usually it's, uh, Maxim</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>Well, then there is maximizing self social welfare, but all of their equivalents that you see are kind of doing that in some way</v>
<v Expert C>Sometimes it's maximizing the total amount traded, et cetera</v>
<v Ronja Julia Suhling>Yeah</v>

<v Expert C>And this these are like shortcuts that are trying to do the same thing and that, but there are you see different if you read peer to peer papers you see things like bargaining algorithms that set price and you see things like this</v>
<v Ronja Julia Suhling>OK</v>
<v Expert C>This is more in a uh, either in a more centralized situation or it's sometimes the case that like, OK as a community we built a solar panel and we're gonna share the energy to everyone</v>
<v Expert C>How do we decide the the different places, prices, people?</v>
<v Expert C>Are going to use and it's also the case you have to be very careful when you're reading a paper</v>
<v Expert C>Is the thing that they are proposing?</v>
<v Expert C>Are they trying to model the situation so they're making an assumption about something that would reflect a market price?</v>
<v Stefan Abadzic>Mm-hmm</v>
<v Stefan Abadzic>Umm</v>
<v Ronja Julia Suhling>No</v>
<v Expert C>Or are they proposing a pricing algorithm that would run and decide prices in practice, and very often what we're trying to do is we're OK, we put this pricing algorithm because the idea is it should reflect what is happening in a real market and but also engineers seem to think about this in a different way</v>
<v Expert C>And uh, it</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>They're the ones that need to be, you know, suggesting pricing algorithms, right as a</v>
<v Ronja Julia Suhling>Yeah, that's exactly where we stand right now because we've seen that</v>
<v Ronja Julia Suhling>And then we talked to companies and everything</v>
<v Ronja Julia Suhling>So there's like some gap that we're right now trying to to fill of cool</v>
<v Ronja Julia Suhling>So that's clear from my side</v>
<v Ronja Julia Suhling>I'm going to give the word to the team</v>
<v Ronja Julia Suhling>I think Rich has not spoken yet</v>
<v Stefan Abadzic>Yes</v>
<v Rachel Sulollari>And yeah, you</v>
<v Ronja Julia Suhling>Maybe she will run, so if the topic a little bit away</v>
<v Rachel Sulollari>Yeah, already mentioned that you want to set up communities and like to different countries, right?</v>
<v Rachel Sulollari>But the like regulatory authorities are slowing down this process</v>
<v Rachel Sulollari>Can you maybe elaborate more on that?</v>
<v Rachel Sulollari>What is the role of the policies and the regulation frameworks and what are like barriers to the adoption of LEMS?</v>
<v Expert C>Yeah, this uh, definitely lots and practice and it depends upon what you want to do</v>
<v Expert C>And so there's the LEM side, and there's the blockchain side, both which have different regulatory barriers</v>
<v Rachel Sulollari>Yes</v>
<v Rachel Sulollari>But</v>
<v Expert C>Umm, but so on the the local energy market side</v>
<v Expert C>Uh, so one of the countries we're trying to do, a Spain, imagine this</v>
<v Expert C>And so in Spain, if I have a solar panel and I want to say who the money from that solar panel like the generation should go towards, there's like a a sharing coefficient, right?</v>
<v Rachel Sulollari>Yes, OK</v>
<v Expert C>And like OK, % went to this person, % went to</v>
<v Rachel Sulollari>The</v>
<v Expert C>This goes to this person right now in Portugal because of pressure to make these pairs of things peer to things possible, at least in their sandbox</v>
<v Expert C>We can like, have an electricity market run like a peer to peer market and afterwards we can tell the utility, OK, pretend the solar panel gave this much to this person and this patch to this person because that's the outcome of our peer to be a market</v>
<v Rachel Sulollari>OK</v>
<v Expert C>My understanding is that in Spain you have to provide these sharing coefficients one month in advance, so you have to decide who the power is going to a month in advance, which just means it can't be determined by appear to be a energy market</v>
<v Expert C>Umm, so these tend to just be little regulatory things that</v>
<v Rachel Sulollari>That's</v>
<v Expert C>You know, I I'm usually doing a higher level of research that I can ignore these things because I can assume in the long run these things can change</v>
<v Rachel Sulollari>Umm</v>
<v Expert C>But it's now that we actually have to implement them in these countries</v>
<v Expert C>These are the things that are gonna get in the way</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>And do you have like best practice examples in like some countries where you say you can like implement that more easily for example like you have it in Portugal now you mentioned that it's a little bit easier to do this with the coefficient</v>
<v Expert C>It I mean</v>
<v Rachel Sulollari>Do we have like one when you say is like the most visible one for local energy market?</v>
<v Expert C>So that's a good question</v>
<v Rachel Sulollari>Umm</v>
<v Expert C>We have a a research track that's looking into this, but it it's not something that I like</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>I say I mostly just ignore this because I'm interested in the higher level market design and we assume that eventually we can get the regulations in line to make something useful and but she had, uh, you know</v>
<v Expert C>But one thing that's</v>
<v Expert C>A more useful in the US compared to Europe is that you have nodal electricity markets, right?</v>
<v Rachel Sulollari>Yeah</v>

<v Expert C>So that are you familiar with this like term?</v>
<v Rachel Sulollari>Alright</v>
<v Expert C>So and Portugal, there's like a price for electricity, right?</v>
<v Rachel Sulollari>Yeah</v>
<v Rachel Sulollari>Umm</v>
<v Expert C>What if there's some price for the whole of Portugal, but the value of electricity and Portugal changes a lot of place to place? Like some places?</v>
<v Rachel Sulollari>Yeah OK</v>
<v Expert C>There's tons of generation and it's hard to transmit it to other places, right?</v>
<v Rachel Sulollari>That</v>
<v Expert C>But it's like a it's a regulatory decision to say we're gonna have one price for all of Portugal, whereas in the US, they don't make their assumption they have nodal pricing</v>
<v Rachel Sulollari>OK</v>
<v Expert C>So the price of energy is different at each point in time at each geographic location</v>
<v Rachel Sulollari>OK</v>
<v Expert C>And So what that means is that if you build a solar panel in one of these areas where prices is high, you can gain that benefit, whereas in Portugal you have to sell your energy from your solar panel like it's like all energy is the same, whereas geographically it has different values</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>Umm, maybe the others</v>
<v Rachel Sulollari>Do you have more additional question on the regulatory frameworks?</v>
<v Rachel Sulollari>Because right now I'm doing analysis on like the consumer side and looking what are like barriers for them</v>
<v Rachel Sulollari>Do you have maybe like one like regulatory things that are like only from the consumer point of view barriers and not like for the overall local energy markets implementation, do you have like something in mind?</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>But from the consumer, the consumer point of view is the biggest I gap by thousand miles</v>
<v Expert C>And the the question is the following</v>
<v Expert C>Do people want this?</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>This is not what this we don't know</v>
<v Rachel Sulollari>Yeah</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>And uh it who, like we are trying to study this and the then the then you have to explain to people what is this and there's like a million different ways you could define how this energy market works but as a starting point people don't want to be</v>
<v Expert C>Uh, you know, trying to sit there, energy prices at different times of the day, no one wants to try and figure this out, right?</v>
<v Rachel Sulollari>But do you think that's because of the lack of the knowledge and information and awareness of like the benefits of local energy markets like because it's such a complex topic and people are like not really aware of the benefits and don't want to elaborate more on that?</v>
<v Rachel Sulollari>Or do you think that it's not really sure?</v>
<v Rachel Sulollari>Really, people want to trade their energy</v>
<v Rachel Sulollari>Umm</v>
<v Expert C>I think that the benefits probably don't outweigh the complexity costs of trying to think of trying to understand this like we're busy</v>
<v Expert C>We have limited time</v>
<v Expert C>Uh, there's very limited time I can spend figuring out something that's gonna save me € per month</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>You know, like it's OK, just my brain space cannot be allocated to that</v>
<v Rachel Sulollari>It's</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>So it it's whether those benefits are great enough to outweigh those costs and how can we bring those costs down as much as possible to make it as easy as possible to join, because a lot of the benefits are really like at the system level, not at the individual consumer level</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>Thank you very much</v>
<v Expert C>Sure</v>
<v Stefan Abadzic>Yes, just given the time, I would</v>
<v Stefan Abadzic>Uh</v>
<v Stefan Abadzic>Ask Max to to, uh, go ahead</v>
<v Maximilian Jagiello>Yeah</v>
<v Maximilian Jagiello>I have like a few questions regarding the more technical aspects</v>
<v Rachel Sulollari>Yeah</v>
<v Maximilian Jagiello>One would be, I guess it's also heading in the direction of policy and regulations</v>
<v Maximilian Jagiello>What you consider like the key SuccessFactors regarding technological innovations and elems in terms of standardization, interoperability, interoperability and scalability?</v>
<v Maximilian Jagiello>Umm so that like there's like no basic framework for and the technical implementation of LEM's, UM, and what do you think are like the key SuccessFactors to ensure like easier deployment, easier or more standardized protocols, communication between LEM's and yeah</v>
<v Expert C>And so communication between elems is like we're still a long way away from kind of needing that</v>

<v Expert C>That's like long term goals and and that's the kind of point at which you need maybe some standardization, but until that point in time to me, I'm not</v>
<v Expert C>Uh, I I wouldn't be too much worried about the standardization of how these markets work</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>Like I guess I'm a free market economist</v>
<v Expert C>People can offer different solutions that they they work or they work, don't work</v>
<v Expert C>People use them, but the the part that's tricky from a technology point that could do with standardization is that</v>
<v Expert C>Like you say, we have this this financial market where we're trading energy and then I need to know what people actually did right and how much energy they actually used</v>
<v Expert C>Right</v>
<v Maximilian Jagiello>Umm</v>
<v Expert C>And so that comes from the energy meter Right?</v>
<v Expert C>And there's there's very different levels of do we have access to that?</v>
<v Expert C>What level of detail does it provide and and how do we provide it it it has to be provided in a way that's</v>
<v Expert C>Uh</v>
<v Expert C>Kind of tamper proof, because otherwise you could say ohh I'm supplying tons of energy to this market</v>
<v Expert C>Give me lots of money, you know?</v>
<v Maximilian Jagiello>Umm</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>Uh, so this getting the information on people's uh it energy</v>
<v Expert C>Production and consumption and transmitting it to the market, it is needs standardization and it's hard and the even trickier part is like if we go to the level of I have some automated device that if you pay if prices get high enough, it will switch off my fridge for half an hour or whatever</v>
<v Maximilian Jagiello>Umm</v>
<v Expert C>How?</v>
<v Expert C>But you know my meter at my house sees how much energy I'm using</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>Like, OK, maybe my switched off, but something else turned on and they cancelled out</v>
<v Expert C>Like, how do I know that person definitely switched off their fridge?</v>
<v Expert C>How do I know that person genuinely reduced the amount of energy that using?</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>That's like a very hard problem to to verify that that happened if they bid that into the market</v>
<v Expert C>The market cleared that they should do that</v>
<v Expert C>How do we make sure they actually did that?</v>
<v Expert C>It's tricky</v>
<v Maximilian Jagiello>OK</v>
<v Maximilian Jagiello>So you would say like one of the most essential challenges is like the data collection and like the level of detail or like the depth of detail regarding the data being collected in order to ensure like optimization demand, supply balancing is actually working out effectively and so</v>
<v Expert C>But making sure that people did what they said they would do according to the market</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>And so The thing is, you know, we need access to that data, not just the utility</v>
<v Expert C>And if that's data is automated demand response in terms of switching off, umm, like the fridge or something?</v>
<v Expert C>That's not even something that utility has any access to at the moment</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>Like no one has that information, there needs to be a way for that to feed that data to the market</v>
<v Expert C>So what?</v>
<v Expert C>What happens is the market comes up with some solution and then you always need to go after the fact and see OK what actually happened?</v>
<v Expert C>Cause solar generation is not gonna be exactly what we expected</v>
<v Expert C>People's use is not gonna be what expected and we need to kind of balance up versus what the market originally tried to clear and that that step requires like data to be available and that data to be trustworthy</v>
<v Expert C>It can't be tampered with</v>
<v Expert C>And because you can make money by lying, basically, and then there's the privacy concern</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>Like if this is really publicly available, when people are seeing uh, exactly what you're doing with energy and your house like maybe that's the problem</v>
<v Maximilian Jagiello>And probably also like regulations regarding data collection and publication or use of data, especially in countries such as Germany</v>
<v Maximilian Jagiello>I guess it's like one of the most influential Issues in that subject</v>
<v Maximilian Jagiello>OK</v>
<v Maximilian Jagiello>Thank you</v>
<v Expert C>Right</v>
<v Expert C>Right</v>
<v Maximilian Jagiello>And different</v>
<v Expert C>That's a whole additional level, you know</v>
<v Maximilian Jagiello>Yeah</v>
<v Ronja Julia Suhling>I have</v>
<v Maximilian Jagiello>Umm, I think we can move on to a few general questions or what would you say running?</v>

<v Ronja Julia Suhling>Yeah, I have one question that you mentioned before that just kept like I was thinking about it still you said the the main benefit is not at the consumer level</v>
<v Ronja Julia Suhling>Can you maybe elaborate a bit more on that?</v>
<v Ronja Julia Suhling>That's</v>
<v Expert C>Uh, well, you know the the issue is that for example, transmission is super expensive and a traditional energy is generated somewhere far away</v>
<v Expert C>But even wind, hydro, it's far away that the great benefit of solar is that it's right on our house, right or it's right in our cities</v>
<v Maximilian Jagiello>And</v>
<v Expert C>And so it solar now is cost efficient anyway, but even before that, on a like whole system cost point of view, it's a very cost efficient</v>
<v Expert C>But you know the consumer doesn't particularly reap in any benefit from that</v>
<v Expert C>It's just that the system as a whole, we don't have to build more transmission</v>
<v Expert C>And the way that we fund transmission expansion is like very kind of uh</v>
<v Expert C>Not in lane, particularly in line with our use of the transmission system</v>
<v Expert C>So it's kind of like all consumers as a whole get a charge</v>
<v Expert C>So like if I build a solar panel and it means less transmission is built, all consumers in the country will save money</v>
<v Expert C>So the amount that I personally save is like tiny, tiny, tiny uh</v>
<v Expert C>Whereas you know my incentive to install that solar should be more in line with its its benefits to the system as a whole</v>
<v Ronja Julia Suhling>Yeah, so this this money that is saved on a tiny level for each consumer or prosumer but then adds up looking at a wider scope that's then like a proper threat for companies like retailers like wholesale retailers or utilities, right, because their revenue is gonna be decreased in a way then correctly or</v>
<v Expert C>But so transmission is a always a regulated monopoly</v>
<v Expert C>So whatever their costs are, they're allowed to recover them in charges to consumers</v>
<v Ronja Julia Suhling>Hmm</v>
<v Expert C>Basically they make a fix like they get to make % return on whatever they do</v>
<v Expert C>They can't make more money</v>
<v Expert C>Can't make less?</v>
<v Ronja Julia Suhling>OK</v>
<v Expert C>Have you know so?</v>
<v Expert C>This is a very not particularly threatened uh</v>
<v Expert C>Area that the issue is that if this happens a lot and people have a lot of solar panels, then they're not using a lot of energy from the grid, right?</v>
<v Expert C>And so when we try and charge these like big huge transmission costs, dividing it by the energy used, it's only the people that don't have solar panels that are paying for it, which tends to be like poorer people, basically</v>
<v Expert C>And this is one of the the issues that they have in Spain that</v>
<v Expert C>People with, you know, only wealthy people could build solar panels and then less and less people were paying for the kind of total social costs</v>
<v Expert C>And so that was concentrating on less wealthy people and kind of, you know, the real like</v>
<v Expert C>That's the issue</v>
<v Expert C>Uh, you know the distribution issue, right?</v>
<v Expert C>And distribution of benefits</v>
<v Ronja Julia Suhling>Yeah, I think you have not thought about that point</v>
<v Ronja Julia Suhling>That's on super interesting for like, overall, like social welfare optimization</v>
<v Expert C>That</v>
<v Ronja Julia Suhling>If you decrease like the OR like increase the cost for grid usage for like super people, that's kind of the contrary way to go</v>
<v Ronja Julia Suhling>Thank you for explaining that</v>
<v Ronja Julia Suhling>Uhm, I think looking at the time I would propose to wrap it up, do you from your side still have anything that you've not said yet that you think would be relevant for us that you want to share?</v>
<v Expert C>I I have a question but</v>
<v Ronja Julia Suhling>Yes</v>
<v Expert C>OK, let me ask the question again</v>
<v Expert C>So you've been studying this?</v>
<v Expert C>My great question is if this is a good idea and if consumers are going to want this, what do you think?</v>
<v Expert C>Do you think consumers are going to want this?</v>
<v Expert C>Is your, are your parents going to want to be trading energy with their neighbors?</v>
<v Ronja Julia Suhling>I mean from my opinion, I think it has to have a super easy construct</v>
<v Stefan Abadzic>We've been yearly</v>
<v Ronja Julia Suhling>We've talked to one company where they just have monthly contracts with consumers where they decide monthly on like their their rates</v>
<v Ronja Julia Suhling>And I think then it can work because like the, I think the the benefit like even if it's just a small financial benefit compared with the advantage of having renewable and green energy is what's, in my opinion, gonna sell the thing</v>
<v Ronja Julia Suhling>But I'm not sure</v>
<v Ronja Julia Suhling>Maybe right to be flipped into that deeper</v>
<v Ronja Julia Suhling>Maybe you want to</v>
<v Stefan Abadzic>Umm</v>
<v Rachel Sulollari>Yeah, I would say the same</v>
<v Rachel Sulollari>And also also maybe like in communities you have like community pressure and you want to be a part of the community</v>
<v Rachel Sulollari>So I think there's also a big topic in like smaller towns or villages</v>
<v Rachel Sulollari>And yeah, that's what Ronja said</v>

<v Rachel Sulollari>Is, I think, the sustainability part</v>
<v Rachel Sulollari>It's gonna be a huge incentive and it should be as easy as possible</v>
<v Rachel Sulollari>As you mentioned before, people are I think, not really aware of</v>
<v Stefan Abadzic>No</v>
<v Rachel Sulollari>For all that complexity, and don't want to get to that and to in deep topic and I think it should be as as easy as possible and then maybe it could be something that increased the adoption of consumers participating in that</v>
<v Expert C>OK</v>
<v Stefan Abadzic>Yeah, I think in the end, uh, people want warm showers and cold beer from their electricity and yeah, competencies in that case must be learned new</v>
<v Stefan Abadzic>And I don't know what the consumer adoption will be</v>
<v Stefan Abadzic>We're researching in that, but I think it's a very interesting question</v>
<v Expert C>The only thing I would say about your comment is when you said must be what you meant is like would be better if</v>
<v Stefan Abadzic>Yeah</v>
<v Expert C>But uh, because people have the option typically not to do that</v>
<v Expert C>Then if it's better for them, personally, I think they're not good</v>
<v Expert C>And what?</v>
<v Ronja Julia Suhling>So you think giving the consumer the choice is the way to go</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>I mean I I think, yeah, I think it has to deliver benefits for consumers, but I I think that as your colleague mentioned, I think it's not gonna be the case that everyone understands this, particularly if it's working on a blockchain, it's gonna be more of a social pressure because you know, we all use the Internet</v>
<v Expert C>I mean, how many people know how DCIP actually works?</v>
<v Expert C>No one really does</v>
<v Expert C>Right</v>
<v Expert C>And so it started about really understanding perfectly</v>
<v Expert C>But you know, if we can show benefits and there's some sort of social group effect, hopefully at the move as one this direction</v>
<v Expert C>But actually one other thing to think about is that, you know, one of the ways these markets tend to work is the price changes throughout the day, right prices</v>
<v Expert C>And the reality is that this is very important and this is true</v>
<v Expert C>That price is very different</v>
<v Expert C>Sorry, electricity has different prices throughout the day, but as in our homes, we don't face that like we don't know</v>
<v Expert C>Some of us have dual tariffs, cheaper at night, but otherwise we don't know</v>
<v Expert C>And in New Zealand, where I'm from, they had retail companies that started doing this, like giving you directly like you can go to an old utility or you can come to us and will give you really cheap energy</v>
<v Expert C>But it changes by price of the day depending upon the house sale market, that dear is the overall people would save money</v>
<v Expert C>But basically, people hated the kind of spikes and price they got</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>Like I put my washing machine on at this time and then by chance there was an electricity market</v>
<v Expert C>Who knows what and energy was like?</v>
<v Stefan Abadzic>Mm-hmm</v>
<v Expert C>Triple the price and people would just do annoyed by that that they they left these services so</v>
<v Stefan Abadzic>No</v>
<v Ronja Julia Suhling>Yeah, it's interesting that you say that because I, Stefan and you were at Web summit like a few weeks ago and talked to some people also about this topic because we just tried to reach out to people and one person from Australia or New Zealand shopping this app called Ember</v>
<v Ronja Julia Suhling>I think where they saw like the sun and like the weather forecast and then the specific prize</v>
<v Ronja Julia Suhling>And he also proposed that to me</v>
<v Ronja Julia Suhling>So that's interesting that you mentioning that as well</v>
<v Ronja Julia Suhling>And on top I read that the European Commission is making dynamic prices mandatory from on, so I guess that's gonna provide some transparency on on pricing as well</v>
<v Ronja Julia Suhling>No, I guess that's also gonna gonna influence this dynamic at least</v>
<v Expert C>I I hadn't heard that, but it depends very much what is mandatory and what they mean by dynamic pricing, but like</v>
<v Ronja Julia Suhling>Yeah, very true</v>
<v Stefan Abadzic>You</v>
<v Ronja Julia Suhling>Yeah OK</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>You know, real exposure to wholesale prices is like and I think consumers don't want even if overall they ever benefit just the you know, we're much more focused on losses than gains, right, so</v>
<v Ronja Julia Suhling>Yeah, and also convenience probably is like a big factor at one point because it's another thing that you have to coordinate for yourself, I guess</v>
<v Ronja Julia Suhling>Yeah</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>And that's The thing is like this additional mental load worth the benefits and, you know, and my personal life, my middle load is way too much and something has to have a real high benefit for me to pay any attention to it, you know</v>
<v Ronja Julia Suhling>For like a few year</v>
<v Ronja Julia Suhling>A month?</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>Thank you very much for your like opinion and views on that</v>
<v Stefan Abadzic>Mm-hmm Yes</v>
<v Maximilian Jagiello>Maybe just</v>

<v Ronja Julia Suhling>I'll see forget like this whole construct of different different models</v>
<v Expert C>OK, John</v>
<v Ronja Julia Suhling>Thank you</v>
<v Maximilian Jagiello>One question you you can also answer like super briefly regarding like the overall wrap up in your opinion, what do you consider like the most promising or critical future research avenues?</v>
<v Maximilian Jagiello>I mean, you've done a lot of research and and probably talked to a lot of people, but what we would your opinion be on like the most promising fields at heart of a little bit of like the consumer few you think that the consumer view is gonna be a lot of important in the future</v>
<v Maximilian Jagiello>Are they like other research avenues you would consider critical?</v>
<v Expert C>Uh, I mean, that's really the main thing to me</v>
<v Expert C>Like you know, we did this literature reviews</v>
<v Expert C>You have like two technical papers</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>They all say something completely different and all over different solutions like the technical solution</v>
<v Expert C>I mean it's solvable, but the number of papers that are trying to figure out if people want this and then even if you look at them, did they really explain what this will mean in the persons life?</v>
<v Maximilian Jagiello>Umm</v>
<v Expert C>They didn't</v>
<v Expert C>They just gave them like ohh, this is what a blockchain is and this is trading energy with your neighbors</v>
<v Maximilian Jagiello>Yeah</v>
<v Expert C>OK, so it's nice, but not exactly what it means for you</v>
<v Rachel Sulollari>But</v>
<v Expert C>That that's the research missing, and that's the critical success</v>
<v Expert C>If this will work or not and maybe it doesn't, because maybe people don't want it</v>
<v Rachel Sulollari>The</v>
<v Rachel Sulollari>The</v>
<v Expert C>But you know at the moment above me I have solar panels and EDP steals the energy when I don't use that solar like they sell it to someone else and I get no money for it</v>
<v Ronja Julia Suhling>You get money for it in Portugal</v>
<v Expert C>But it you get nothing, you get nothing</v>
<v Expert C>And every time I go to EDP, I complain about this but the the they don't say anything but so anything that's OK</v>
<v Expert C>There's an alternative where you can sell your energy will force EDP to kind of like, you know, approve in that direction, I hope</v>
<v Rachel Sulollari>Yeah, true</v>
<v Maximilian Jagiello>Yeah, yeah</v>
<v Rachel Sulollari>Yeah</v>
<v Ronja Julia Suhling>But didn't like I in Germany for example you have concepts like net metering or power purchase agreements with your utilities where they just confirm that they are gonna purchase surplus energy for a specific price or you meter is just running back backwards in a way where you can just make sure that you consume everything that you were producing</v>
<v Rachel Sulollari>That</v>
<v Expert C>But so that I don't know how much you've covered this, but like net metering doesn't work right, like it doesn't make sense it it works</v>
<v Rachel Sulollari>Yeah</v>
<v Rachel Sulollari>Yes</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert C>And the value of that energy at those different points of time is going to have different values, right?</v>
<v Expert C>And the way it works at the moment is that as a consumer I supply a lot during the day when energy prices are high and then I take back at night when energy prices are low</v>
<v Expert C>So as a consumer, I'm ripped off the rest of the utility</v>
<v Ronja Julia Suhling>Hmm</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>So it's about the</v>
<v Expert C>But as we get but as we get more and more solar that will reverse and there will be too much solar in the day and utilities are not going to accept this</v>
<v Rachel Sulollari>It</v>
<v Expert C>That OK, you're generated too much on the day when energy is useless</v>
<v Expert C>And now I have to give you energy at night</v>
<v Rachel Sulollari>Yeah</v>
<v Expert C>They're bettering is not going to work</v>
<v Rachel Sulollari>True</v>
<v Ronja Julia Suhling>Yeah, yeah, that makes sense</v>
<v Expert C>And</v>
<v Ronja Julia Suhling>So that's because of the dynamic crisis that as well</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>Fair</v>
<v Stefan Abadzic>Mm-hmm</v>
<v Rachel Sulollari>Yep</v>
<v Ronja Julia Suhling>Then storage solutions are flexibility like measure is come into place I I assume</v>
<v Expert C>That's right</v>
<v Rachel Sulollari>Hmm</v>

<v Expert C>So an alternative is to have a battery in your house, but it's kind of expensive and and you know again it's there's like technical solutions, but they do their benefits and complexity, you know, make up the the, the, the, the small benefits that you tend to be talking about</v>
<v Ronja Julia Suhling>Now, yeah</v>
<v Rachel Sulollari>Yeah, good friend</v>
<v Expert C>Said yeah</v>
<v Expert C>OK</v>
<v Stefan Abadzic>Very nice</v>
<v Ronja Julia Suhling>I guess we can run our own</v>
<v Stefan Abadzic>Honestly, very, very nice</v>
<v Ronja Julia Suhling>Already</v>
<v Stefan Abadzic>I think we all cleared a few question marks in our heads</v>
<v Rachel Sulollari>Again you inside</v>
<v Stefan Abadzic>Uh, because it's such a complex topic</v>
<v Stefan Abadzic>And as you said, some papers are saying this</v>
<v Stefan Abadzic>Some papers are saying that, but I don't know</v>
<v Stefan Abadzic>There is, like, not everything</v>
<v Stefan Abadzic>Yeah, I don't know</v>
<v Stefan Abadzic>Defined clearly and thank you</v>
<v Stefan Abadzic>Thanks a lot for that</v>
<v Expert C>No, no problem</v>
<v Maximilian Jagiello>Umm, no</v>
<v Ronja Julia Suhling>Also thinking for you</v>
<v Expert C>So if you get if you get stuck on something, feel free to send me a questions by email</v>
<v Ronja Julia Suhling>That's perfect</v>
<v Expert C>And yeah, make sure you send me your thesis when you're all done</v>
<v Stefan Abadzic>We will</v>
<v Ronja Julia Suhling>We will</v>
<v Expert C>So good luck</v>
<v Expert C>I'm interested to see what you find</v>
<v Ronja Julia Suhling>Yes</v>
<v Rachel Sulollari>Thank you very much</v>
<v Ronja Julia Suhling>Thank you for your critical questions towards us</v>
<v Ronja Julia Suhling>I think it made us like, rethink some of the things that we structured right now</v>
<v Ronja Julia Suhling>So I guess that's also very helpful</v>
<v Rachel Sulollari>Yeah</v>
<v Stefan Abadzic>Yeah, no</v>
<v Rachel Sulollari>Thank you</v>
<v Expert C>OK, right</v>
<v Ronja Julia Suhling>Perfect and see</v>
<v Expert C>So thanks very much and good luck</v>
<v Maximilian Jagiello>It's have a good</v>
<v Ronja Julia Suhling>Thank you</v>
<v Stefan Abadzic>Next, yes Thank you</v>
<v Stefan Abadzic>Bye bye</v>
<v Rachel Sulollari>Team I</v>

Transcript Expert D:

WEBVTT
<v Ronja Julia Suhling>So</v>
<v Ronja Julia Suhling>Perfect</v>
<v Ronja Julia Suhling>There we go</v>
<v Expert D>Umm</v>
<v Expert D>Umm</v>
<v Expert D>Mm-hmm</v>
<v Ronja Julia Suhling>Umm, so a quick introduction from our side maybe umm, I don't know how much you remember so, but I'm imagining you spoke with quite a many people at Web Summit and so we are writing our master thesis at the Nova Business School in Lisbon over the topic of local energy markets</v>
<v Expert D>Mm-hmm</v>
<v Ronja Julia Suhling>So your company is super interesting for us because it's one of the companies actually having a business that is working with that concept and implementing PHP writing</v>
<v Ronja Julia Suhling>So maybe you could give us like a quick introduction to your company, like how you define the local energy market and maybe also short introduction to yourself</v>
<v Expert D>Well, uh, it's not contract was uh, it was created in </v>
<v Expert D>Yeah, the is it, the company was created more, but the activities start started in </v>
<v Expert D>We are a normal energy company that you anyone that any like any company that you are paying bills to</v>
<v Expert D>But our business model is different</v>

<v Expert D>Our business model is different in a sense that normally the energy company they buy electricity from producers nuclears call whatever and they sell you that this energy they buy at beautiful for example, they sell you at and but our business model is different in a sense that we we put you, we put producers and consumers directly in our in our platform and they trade between themselves</v>
<v Expert D>So the price we did, we do not define the price, it's the they define the price they were there is like in the platform there is a like a set of producers each produce an X quantity with the offering at at one price and consumers they pick whatever they want</v>
<v Expert D>Of course they know the source</v>
<v Expert D>This is energy solar energy</v>
<v Expert D>This is wind and uh, all of them were renewable</v>
<v Expert D>But also consumer can of can also offer</v>
<v Expert D>For example, they can say I want for example my one MW at this price and the producer can fill this demand</v>
<v Expert D>So it's the prices are delegated between themselves</v>
<v Expert D>We just do the settlement</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>Thank you for explaining</v>
<v Ronja Julia Suhling>That's so it's like a bilateral bidding mechanism basically, right?</v>
<v Expert D>Yeah, it's not bidding</v>
<v Expert D>It's not bidding, it's just a marketplace</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>Thank you</v>
<v Ronja Julia Suhling>And the trades you're referring to, the frequency of the threads</v>
<v Expert D>Sorry</v>
<v Ronja Julia Suhling>Maybe you can explain us a bit more the frequency</v>
<v Ronja Julia Suhling>So like usually the offers of the energy are they daily or for an hour or monthly or yearly?</v>
<v Ronja Julia Suhling>OK</v>
<v Expert D>It's it's at least for a month, at least for a month, and you can go uh, whatever in the future</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>You you want to go, but the the the minimum is one month</v>
<v Expert D>You can say that I need to, for example the A customer</v>
<v Expert D>Can we we have our machine learning and AI behind and we can know at ± % error</v>
<v Ronja Julia Suhling>Umm</v>
<v Expert D>How much energy you're gonna need in the next hour in the next month, in the next three months or whatever if we know and we provide you with this information and you as a customer, you can pick from different for example producers until you fill your need until you feel % of your need</v>
<v Expert D>For example, you bought % of your need from this from this producer</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>At this price and then you, but % from this producer up is now % of your need for the next period and it and also we also supply you energy as an energy supply</v>
<v Expert D>If there is a mismatch or whatever, or we didn't buy or whatever, it's not that you're gonna not</v>
<v Expert D>You're not gonna get any any energy</v>
<v Expert D>You will still get be supplied with energy, but at not prices that you negotiated</v>
<v Expert D>It will be at the market price</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>And the market price is set by your company or is it then the average?</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>But the market price, the market price is like is all over the U go there are by exchanges in Hungary</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>I think in Germany there is also, so yeah</v>
<v Ronja Julia Suhling>OK, so um, you talked about the um providing energy</v>
<v Expert D>Umm</v>
<v Ronja Julia Suhling>Maybe I will hand over to Max because he's more interested on the grid operational side and also the implementation of trades, so maybe he's keen to ask something, or maybe I just caught him by both surprised</v>
<v Ronja Julia Suhling>Maybe you can explain</v>
<v Maximilian Jagiello>No baby</v>
<v Maximilian Jagiello>And as I said, like a a few questions because I'm looking at the grid integration and the and the infrastructure and I wanted to ask you if you in your experience had any major challenges when integrating your platform or your?</v>
<v Expert D>No</v>
<v Expert D>Well</v>
<v Maximilian Jagiello>Technologies into the existing infrastructure and if so, what mitigation said just did you?</v>
<v Expert D>Well, in the beginning, because it was new to to the world like and you know that anything new is like scary</v>
<v Expert D>So, and it's all based on blockchain and we are energy company with</v>
<v Expert D>So if since we are the energy company, we are by definition, we are highly regulated, we need to have licenses to produce a provide electricity at all</v>
<v Expert D>And so on</v>
<v Expert D>But at the beginning, yes, we we got all sort of audit and verification and and all of this and then they they understood that this is the future, this is the future</v>
<v Expert D>Energy shouldn't be centralized</v>
<v Expert D>Does that answer your question?</v>
<v Stefan Abadzic>Max, I think you're still muted</v>

<v Maximilian Jagiello>Sorry</v>
<v Maximilian Jagiello>Yeah, yeah, definitely</v>
<v Maximilian Jagiello>Maybe also considering other technologies and in general and technology innovation in general, which technological approaches to enhance like the grid stability, would you consider the most promising considering that peer to peer trading umm means a lot of bilateral energy flows and and help you encountered any technologies or approaches to and to mitigate the intermittency of renewable energies and maybe we could be a company</v>
<v Expert D>Well, well, the energy is already the technology is already here, which is the blockchain</v>
<v Expert D>It's a revolution in a sense that you can keep track of your of your transactions, and it's all transparent</v>
<v Expert D>Producers know where their energy is going</v>
<v Expert D>Consumers also know from where they get the energy, so the the technology is there and we are</v>
<v Expert D>We didn't reinvent the wheel, but we are using the wheel in a new disruptive way because the grid is there, the blockchain is there, we just use both Of course</v>
<v Expert D>Uh, there are some</v>
<v Expert D>Some, let's say uh no</v>
<v Expert D>How there is somehow no how how to do this?</v>
<v Expert D>Because if it was easy, everybody would have done it</v>
<v Expert D>And trust me, it's not easy behind</v>
<v Expert D>We have a team of engineers and all of this, but this is our know how we know how to do this and that's that constitute our competitive advantage and also it's it's more I I can say that it is more legal revolution than than a technology technological revolution</v>
<v Ronja Julia Suhling>Yeah, we had that topic with the the legal regulations as well because we are all from Germany and Germany</v>
<v Ronja Julia Suhling>Sometimes it's very strict with when it comes to innovation and new things, especially implementing them</v>
<v Ronja Julia Suhling>Um and yeah, how?</v>
<v Ronja Julia Suhling>Like, how do you think policies and regulations influence your business model?</v>
<v Ronja Julia Suhling>Like, which challenges did you face?</v>
<v Ronja Julia Suhling>Maybe you can explain a bit more</v>
<v Expert D>Well, the the technology, the the legal framework is challenging, yes</v>
<v Expert D>But we don't see it as a threat, but rather as a shield, as a barriers to entry to uh to new competitors</v>
<v Expert D>So we know that we we know the game, we we know the rules</v>
<v Expert D>So we we accept the play by the rules and we know that not not everybody can accept this and this</v>
<v Expert D>What? What?</v>
<v Expert D>What is the good for us?</v>
<v Expert D>I know among the the regulations are are tough</v>
<v Expert D>Yes, we have to deal with this</v>
<v Expert D>I mean for example, we we spent a months and months to get the license in the in Croatia, it is what it is</v>
<v Expert D>We have a a I mean we have the guts to do it</v>
<v Expert D>Not not like anybody else</v>
<v Expert D>And we are also agile</v>
<v Expert D>We know how to adapt, not like the big old Elin utility companies</v>
<v Expert D>They are very, very, very rigid</v>
<v Expert D>We are actually we are still a startup</v>
<v Expert D>Uh</v>
<v Expert D>Though we have a % Now to employee, we are we are still a startup, at least in our mind</v>
<v Expert D>We are still a startup in a sense that we are agile and we adapt to whatever legal, technological, anything that can add to the value chain</v>
<v Expert D>We embrace it with no without any hesitation</v>
<v Ronja Julia Suhling>No, you mentioned um competitive advantage and the business model</v>
<v Ronja Julia Suhling>And I think Stefan is actually looking quite into it in detail</v>
<v Ronja Julia Suhling>I think he's going to take over now</v>
<v Stefan Abadzic>Yes, hello</v>
<v Stefan Abadzic>Yeah</v>
<v Stefan Abadzic>So my first question is actually one more time regarding your customers and do you have customers as a household or do you also have energy companies that are buying energy from you to basically put it back into the grid?</v>
<v Expert D>No, no</v>
<v Expert D>We have, we have the our customers are too out by nature are two producers of energy</v>
<v Stefan Abadzic>Umm</v>
<v Expert D>They are our customers of the platform because they sell their energy in our platform</v>
<v Expert D>We provide the service for them and the consumers of energy</v>
<v Expert D>They are also our customers in a sense that they are using this platform to to get to acquire energy or we can supply them with the energy and those customers can be household can be companies, uh, can be whatever like any any physical or natural person</v>
<v Expert D>Uh, we don't distinguish between, but we we don't the uh, we don't sell</v>
<v Expert D>I mean the we don't, our business model is by nature do not cross paths with the traditional utilities</v>
<v Expert D>We don't sell them electricity</v>
<v Stefan Abadzic>OK</v>
<v Stefan Abadzic>OK</v>
<v Stefan Abadzic>But yeah, wish to emerging trends with renewable energies</v>
<v Stefan Abadzic>What do you think?</v>
<v Stefan Abadzic>What kind of threat does it pose for the centralized model and also for big utilities to maybe stay competitive in the future?</v>
<v Expert D>Well, you you all have seen the energy prices</v>
<v Expert D>How much they how large the they soar the the the last year, the last year, uh</v>

<v Expert D>The centralization of of energy is is, is, is intrinsically as a threat because it was it constitute a single point of risk</v>
<v Expert D>But if you decentralized, let's say if you have problem here, the rest is still working</v>
<v Expert D>But if you centralized if there is a problem in the center, everybody everything goes down</v>
<v Expert D>So yeah, but by the way in uh, in Sun contract through our companies, because we are a group we we we cover the whole value chain of</v>
<v Expert D>Of or supply chain of of the process in a sense that we also installed solar panels</v>
<v Stefan Abadzic>Umm</v>
<v Expert D>So, so people, I mean companies for example, we have companies, we have a Japanese company in Slovenia</v>
<v Expert D>They they installed the they have two factories in two separate cities</v>
<v Expert D>They have felt solar panels in one cell in the in one factory and they consume from it and the access they are consuming it in another factory in another city in real time</v>
<v Expert D>That's what our competitive advantage here we we we make the, I mean whoever produces energy, we make a master of his own energy, he can do whatever he want</v>
<v Expert D>He wants with it</v>
<v Stefan Abadzic>OK, um to to stay competitive in the future</v>
<v Stefan Abadzic>Uh, what does your future outlook look like?</v>
<v Stefan Abadzic>What?</v>
<v Stefan Abadzic>How do companies have to adapt to stay competitive in the future, and what do you think?</v>
<v Stefan Abadzic>How the market dynamics will play out like in what way in which direction they will go?</v>
<v Expert D>Well, the threats in the market is is we see it as a as an opportunity for us because everyone now is to even in in COP or or I mean we are going more and more toward decentralization of energy because the they know it's risky to keep centralized</v>
<v Expert D>Of course there is some</v>
<v Expert D>Some regal illegal framework that we need to obey to, but the this risk constitutes an opportunity for us and about the future</v>
<v Expert D>We are going out, uh, both physically and virtually</v>
<v Expert D>We are expanded in both senses physically in a sense that we are expanded to other countries</v>
<v Expert D>For now, we will we will start operations in in Croatia, uh and in Estonia</v>
<v Expert D>Probably those are physical</v>
<v Expert D>We are expanded physically and virtually in a we are with the we are launching in April in March, in March, we are doing another evolution in the energy sector, which is based on NFT</v>
<v Expert D>Now we are creating NFT's that represent real world assets</v>
<v Expert D>Real world solar panels and the holder of the NFT is entitled to whatever that NFT that underline solar panel is produced</v>
<v Expert D>Let's say if the holder of the NFT lives in a country where we are electricity provider by license, he can use that energy produced in his house</v>
<v Expert D>Let's say for example Stefan your live in a in Slovenia for now for example, and you live in an apartment, you cannot install solar panels, right?</v>
<v Expert D>Because you live in an apartment, you can just buy those NFT's and room you are using the energy</v>
<v Expert D>It's like you have your personal power plant in your pocket because you those uh NFT's are liquid</v>
<v Expert D>You can sell them back on our in the secondary market</v>
<v Stefan Abadzic>Umm</v>
<v Expert D>Uh, yeah, that's our our new uh revolution to, to, to</v>
<v Expert D>To the word of energy</v>
<v Stefan Abadzic>OK</v>
<v Stefan Abadzic>Thank you very much</v>
<v Expert D>And if you and if you're not, you are not living in a country where we are electricity provider, you can still buy those NFT, and that energy is sold in our peer to peer energy trading platform</v>
<v Expert D>Here there is the synergy between the two platforms and the revenue goes to to the holder of the wallet of of the NFT</v>
<v Stefan Abadzic>Hmm, maybe you can also give us one example</v>
<v Stefan Abadzic>I don't know if you can, but uh or allowed to, but how many customers?</v>
<v Stefan Abadzic>The producers, but also consumers</v>
<v Expert D>That's it</v>
<v Stefan Abadzic>Do you already have on maybe also on this one specific area?</v>
<v Expert D>I can tell you that we are saying we have now in Slovenia , Bill, Bill in the platform, but the the the more detail is a little bit classified</v>
<v Stefan Abadzic>OK, OK</v>
<v Ronja Julia Suhling>I imagine</v>
<v Ronja Julia Suhling>Thank you still for giving us an insight into your business</v>
<v Ronja Julia Suhling>I imagine the whole concept of blockchain and NFT's and everything</v>
<v Ronja Julia Suhling>I imagine it's not being easy to understand for some consumers</v>
<v Expert D>Yeah, yeah, yeah, we we have in our communication, we have the we have this not only we need to communicate about the service, but we need to educate people believe we need to tell them that there is another way to do things</v>
<v Expert D>It's not the way that you've been doing</v>
<v Expert D>Have been done now since I don't know years</v>
<v Expert D>So yeah, we have this obligation and duty</v>
<v Expert D>We'll we, we we like to to educate people</v>
<v Expert D>We like this</v>
<v Ronja Julia Suhling>It's also a good topic</v>
<v Ronja Julia Suhling>It's innovative</v>
<v Ronja Julia Suhling>It's a new it's for the best benefit of the environment and the customers</v>
<v Ronja Julia Suhling>So I imagine it's staying cool</v>
<v Rachel Sulollari>Yeah</v>

<v Ronja Julia Suhling>I would give Rachel the opportunity to ask some question because she's looking into the consumer side, so maybe she knows a bit more what to ask you</v>
<v Rachel Sulollari>Yeah</v>
<v Rachel Sulollari>And maybe you you mentioned right now the lack of knowledge about PP trading in the consumer side and what strategies have you like implemented in your company to educate them?</v>
<v Expert D>Well, uh, the the strategy</v>
<v Expert D>Uh</v>
<v Expert D>Up until now, we we didn't go</v>
<v Rachel Sulollari>No</v>
<v Rachel Sulollari>OK</v>
<v Expert D>We didn't go viral by choice because we have enough demands, you know, even by word of mouth, we are we have ,</v>
<v Rachel Sulollari>OK Umm</v>
<v Expert D>Now we just started a communication very, very recently</v>
<v Rachel Sulollari>Umm OK</v>
<v Expert D>I mean very recently and it was a strategic choice because we want to expand, but we want we don't want to rush things, we want to go slow, slow, slowly, slowly</v>
<v Expert D>Now we we we started to to put the to go to conferences to go to talk shows and TV's and all of this in local markets to tell the world that there is an alternative</v>
<v Rachel Sulollari>Umm</v>
<v Expert D>There is an alternative of the way to of you do things and it's been happening</v>
<v Expert D>It's been working since </v>
<v Expert D>It's not like we don't have any background or we don't have any proof of concept</v>
<v Expert D>If the proof of concept he was in in , now we are in growth stage</v>
<v Rachel Sulollari>Umm</v>
<v Expert D>But failed in some way</v>
<v Expert D>I don't know where they failed because I don't have any inside</v>
<v Expert D>Maybe some people</v>
<v Expert D>Some companies failed in the legal side</v>
<v Expert D>Some company fade failed in the commercial side</v>
<v Expert D>Some companies fade in the technical side, but we are we were fortunate enough to make it</v>
<v Expert D>Now we are grown in the growth stage</v>
<v Expert D>Yeah So</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>So and what would you say is like the main motivation driving customers to engage in your platform?</v>
<v Rachel Sulollari>So what would you say is like the main advantage, besides the economic part?</v>
<v Expert D>Well, it is all based on renewable energy</v>
<v Rachel Sulollari>OK, so you</v>
<v Expert D>So yeah, because in you the in your utility, do you know where where you come your energy coming from?</v>
<v Rachel Sulollari>No</v>
<v Expert D>There's no way we can know there's a unless you physically install solar panels that you know that this is my electricity</v>
<v Rachel Sulollari>Umm</v>
<v Rachel Sulollari>Umm</v>
<v Expert D>There is no way you can know where from where energy coming from with us you not only you know, but you actually you choose which one and you and you are choosing your price</v>
<v Expert D>It's not like at the end of the month you get a bill that you are surprised by the, you know, in advance</v>
<v Rachel Sulollari>Yeah, sure</v>
<v Rachel Sulollari>OK, nice</v>
<v Rachel Sulollari>And maybe last question you said you mentioned before like the trust is like a major barrier for overall PP trading</v>
<v Rachel Sulollari>How does one construct build like trust among customers?</v>
<v Rachel Sulollari>How do you convey?</v>
<v Expert D>Well, that's that's the whole point of centralization</v>
<v Expert D>You do not need to trust one entity</v>
<v Rachel Sulollari>Umm</v>
<v Expert D>That's the beauty of blockchain</v>
<v Rachel Sulollari>OK</v>
<v Expert D>If we meet a new Rachel, we engage into a transactional the blockchain</v>
<v Expert D>Uh, you don't need to trust me</v>
<v Rachel Sulollari>Yeah, sure</v>
<v Rachel Sulollari>But do you think customers like are are afraid that they will not get like enough electricity?</v>
<v Rachel Sulollari>I mean, uh, electricity, electricity</v>
<v Rachel Sulollari>Such a big topic and sensitive topic for many people</v>
<v Expert D>Well, yeah</v>
<v Rachel Sulollari>And do you see that customers are afraid because of that or are they not really concerned?</v>
<v Expert D>Customer I I get your point, but you are missing one point is that we are electricity company</v>
<v Rachel Sulollari>Yeah OK</v>
<v Rachel Sulollari>Yeah, true</v>
<v Expert D>We are already electricity company, so it's like you are the pain your utility bills</v>
<v Rachel Sulollari>Umm yeah</v>
<v Expert D>We are just doing things differently</v>
<v Rachel Sulollari>OK, nice</v>

<v Rachel Sulollari>Alright, OK</v>
<v Rachel Sulollari>Last question, maybe I am, what do you say?</v>
<v Rachel Sulollari>How do the like regulatory framework affect the adoption of PP trading means maybe specially right now in creation and Slovenia?</v>
<v Rachel Sulollari>And are they like incentives or do you see it more like as a barrier for consumers or do you think consumers are not affected at all?</v>
<v Rachel Sulollari>It's only a problem or challenge for your company</v>
<v Expert D>I mean, there are some challenges</v>
<v Expert D>There are some challenges, yes</v>
<v Expert D>But as I said, we don't see them as the as threats</v>
<v Rachel Sulollari>Umm</v>
<v Rachel Sulollari>Umm</v>
<v Expert D>The only I mean one of the major things that we we look into the legislations before we go into a company into a new country is that if in that country the electricity provider is it a monopoly of the state or free or a free market, if it's a monopoly of the state, we cannot go</v>
<v Rachel Sulollari>How?</v>
<v Expert D>If it's remarked there is a good chance that the legal framework is at least is not blocking us</v>
<v Rachel Sulollari>OK</v>
<v Expert D>Of course it's it</v>
<v Expert D>It it each country has some details that we need to obey and maybe, maybe even tweak some some something in the business model or how we do things or how how the team is structured or yeah</v>
<v Rachel Sulollari>Umm</v>
<v Expert D>But as long as it's not a monopoly of the state, like in Malta, for example, in Malta, we cannot go, we cannot go because there's simply they have one electricity company that is owned by the state and by the law you cannot the compete with it</v>
<v Expert D>So you</v>
<v Ronja Julia Suhling>Umm</v>
<v Rachel Sulollari>OK</v>
<v Expert D>Yeah, in the, I don't know, I think in Portugal is possible in Germany, definitely possible, yeah</v>
<v Rachel Sulollari>Thank you very much</v>
<v Ronja Julia Suhling>Yeah, I I have a one question regarding that</v>
<v Ronja Julia Suhling>Because you said in some countries it's not possible, but in the countries you are operating, how is the grid infrastructure like the actual energy grid where the electrons flow?</v>
<v Ronja Julia Suhling>Is it government owned?</v>
<v Expert D>Yeah</v>
<v Ronja Julia Suhling>How are the usage allowances and how do you?</v>
<v Expert D>So yeah, yeah, sure there are users allows allowance</v>
<v Ronja Julia Suhling>Umm</v>
<v Expert D>We pay for to use the grid like any other electricity company because the grid is owned generally either by the state or by PPP, where I mean, how do I say it?</v>
<v Expert D>A private Public Partnerships or all of this, those are big, very, very big and heavy investments</v>
<v Expert D>So it's not just for electricity provider to do it</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>So we just using it and we pay for it</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>Yeah, yeah</v>
<v Ronja Julia Suhling>So you fit in the renewable energy into the whole main grid and then take the same amount out, but it's not a complete separate grid infrastructure, right?</v>
<v Expert D>No, no, no</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>OK, that's what I thought</v>
<v Ronja Julia Suhling>Cool</v>
<v Ronja Julia Suhling>And maybe like a quick closing opportunity for you, maybe you have any additional thoughts or insights that you would like to share which we've not covered yet?</v>
<v Expert D>Uh, you guys?</v>
<v Expert D>Uh, you the you ask?</v>
<v Expert D>All kind of questions</v>
<v Expert D>No, I don't know</v>
<v Ronja Julia Suhling>Yeah, I'm trying to most of</v>
<v Expert D>I mean, yeah, as I said, we are now focusing on our growth</v>
<v Expert D>I I would like all always to close things by by by the future</v>
<v Ronja Julia Suhling>Very nice</v>
<v Expert D>Uh</v>
<v Ronja Julia Suhling>No</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>Both, as I said, physically and virtually, if I said virtually, but it's also backed by physical, which is not only a revolution in the, in the, in the, in the energy sector, but also in the blockchain itself, because the NFTS as you may, I don't know if you are familiar with the NFTS are monkey faces and useless pictures that were sold for millions and now they work and they don't work anything</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>But our NFTS are backed by a real world solar panel that is actually produced in energy</v>
<v Expert D>We are</v>
<v Expert D>So you are turning energy sand the sunlight to our SNC token</v>

<v Expert D>So yeah, and</v>
<v Ronja Julia Suhling>Yeah, that's a super cool transition was like a real life application, right?</v>
<v Expert D>Yeah</v>
<v Ronja Julia Suhling>Like Superman</v>
<v Expert D>And yeah, and that physical, I mean what we are doing here</v>
<v Expert D>Uh is like we are even in in the on the verge of creating a whole new financial system</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>Also, because people the holder of those NFT are earning passive income, right?</v>
<v Expert D>But they are just sitting in their houses and they are earning revenue</v>
<v Ronja Julia Suhling>With the value from the created energy, right?</v>
<v Expert D>So what if we created a credit card for them that they can pay with their, with their, with their energy, with their I mean the energy sold of course or or imagine people with excess of SNC token can lend can can learn to other people and the collateral is the NFT itself, because the NFT represent a real world solar panel that is generating revenue</v>
<v Ronja Julia Suhling>Yep</v>
<v Expert D>So it can be collateralized, so it's not only about energy, it's go</v>
<v Expert D>It goes beyond that</v>
<v Stefan Abadzic>Umm</v>
<v Ronja Julia Suhling>Yeah, that's a very interesting future outlook</v>
<v Ronja Julia Suhling>I've not thought about it like that</v>
<v Ronja Julia Suhling>To actually make it like a whole new trading market, including different things than just solar panels and energy, but actually like transferring it to credit cards or maybe like the electrical vehicle structure like charging and receiving money from charging station</v>
<v Expert D>Yeah, you can</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>The blockchain is opening a whole new possibility for the world, just the the people are sadly focusing on like out of the I mean the I mean the the bad things about blockchain or or or the meme coins and all of this</v>
<v Ronja Julia Suhling>No</v>
<v Ronja Julia Suhling>Yeah</v>
<v Expert D>But but what is more important is the technology itself and we are using and we are in the few among the few companies in the blockchain work who has a real economy behind because yeah, we because we are not just a let's say a blockchain or crypto company like flying out on the air</v>
<v Ronja Julia Suhling>No</v>
<v Expert D>We are built on top of a real in real economy and not any economy</v>
<v Expert D>It's like it's the renewable energy which is already boomed by itself</v>
<v Ronja Julia Suhling>Yeah</v>
<v Ronja Julia Suhling>Thank you so much for your explanation</v>
<v Ronja Julia Suhling>I think that's it from your from our side</v>
<v Ronja Julia Suhling>Thank you very much for your insights</v>
<v Ronja Julia Suhling>It's super interesting for us to see your view on the innovative market design that is actually live already</v>
<v Ronja Julia Suhling>So that's super valuable for us</v>
<v Expert D>Thank you</v>
<v Ronja Julia Suhling>So yeah, thank you for your time</v>
<v Expert D>Thank you</v>
<v Ronja Julia Suhling>It's just and Rachel marks</v>
<v Ronja Julia Suhling>You wanna say something or?</v>
<v Stefan Abadzic>Yes, thank you very much for your time</v>
<v Expert D>Thank you</v>
<v Maximilian Jagiello>Thank you for your time Yes</v>
<v Expert D>Thank you guys the IT</v>
<v Ronja Julia Suhling>Thanks and don't understand your week and</v>
<v Expert D>Thank you and good luck with your thesis</v>
<v Rachel Sulollari>Thank you very much</v>
<v Ronja Julia Suhling>Thank you very much</v>
<v Ronja Julia Suhling>You have</v>
<v Maximilian Jagiello>Like</v>
<v Ronja Julia Suhling>That's that's the</v>
<v Expert D>Yeah, sure</v>
<v Expert D>Yeah, sure</v>
<v Stefan Abadzic>And yeah, if we have any questions, can we just text you? Um, OK</v>
<v Stefan Abadzic>Thank you</v>
<v Ronja Julia Suhling>If I</v>
<v Expert D>Yeah</v>
<v Expert D>Thank you Bye</v>
<v Rachel Sulollari>Bye</v>
<v Ronja Julia Suhling>Bye</v>
<v Stefan Abadzic>Hello</v>
<v Maximilian Jagiello>Bye bye</v>
<v Maximilian Jagiello>Have a good day</v>

Transcript Expert E:

WEBVTT
<v Expert E>As we have only ,, that's an Anglophone Muhammad empty</v>
<v Expert E>My local energy markets super shifting and muram minus tamarind, PhD</v>
<v Expert E>Some kaitu the about US</v>
<v Expert E>Team are considered as my energy communities</v>
<v Expert E>We can local energy markets offer and client focus of weakening the trading algorithm and for local energy markets</v>
<v Expert E>Almost</v>
<v Expert E>That's them</v>
<v Expert E>It had to download this</v>
<v Expert E>Look this via on Ashton local energy market offboard hub in in London, Social Swansea, hillside fairways, ones need Swansea</v>
<v Expert E>Swansea, and then once we're from and above average number of</v>
<v Expert E>Yeah, right there and loading</v>
<v Expert E>This up convert the theory devil on Silver Lake</v>
<v Expert E>Umm are gonna proxy those problem?</v>
<v Expert E>That's if you sparse comma after</v>
<v Expert E>Umm, depends on him and the sorts versions</v>
<v Expert E>Absolution</v>
<v Expert E>Honor because if you will pull yada yada seem local in Market Trader initiative went Podemos or Iron and storm up slack?</v>
<v Expert E>Will not gutemann lifespan</v>
<v Rachel Sulollari>OK</v>
<v Expert E>Elf</v>
<v Expert E>Dim team a harbour Aish total nonsense</v>
<v Expert E>Promote yet bananas in the industry</v>
<v Expert E>So in the view done sudden file which has not been and actually in position as team manager phones</v>
<v Rachel Sulollari>Umm</v>
<v Expert E>Why it teams this is only storm on the gas handle in Deutschland is the Schwarz began because if you from command umm a learning Smith in Italian March took two nishmat in Luca and map it harbors light</v>
<v Expert E>That's why those noise in them by now</v>
<v Expert E>The buttons format the MK</v>
<v Expert E>Consulting of local and mark the Kumar and equals entitled Startups type was about </v>
<v Expert E>Number other Lizzy locale in a Gmail actor and energy communities</v>
<v Expert E>And enacting</v>
<v Expert E>That's left in their fights</v>
<v Expert E>And it goes to their full practice rights in Deutschland candy from our direct files though</v>
<v Rachel Sulollari>OK, I'm trying to finish it up like that</v>
<v Expert E>Actually, the wall is right here</v>
<v Expert E>The Schwarz and instructions CD locale and</v>
<v Expert E>Things</v>
<v Expert E>Energy communities allowed and dutchland it's this letter</v>
<v Expert E>No, no, no</v>
<v Expert E>Conference pregnant</v>
<v Expert E>So shouldn't</v>
<v Ronja Julia Suhling>Yeah, you don't understand</v>
<v Rachel Sulollari>OK, Stier and hello the nation</v>
<v Ronja Julia Suhling>I'm over Naman and then on the first sentence right</v>
<v Ronja Julia Suhling>I'm out of clean, but via which on the literature review comma I don't understand Sofia Uncharted China modello on fascina paper angle shot on sembten offenders these against the terminology within Ashley gets to fashion with some bones are unfun bar on the umm they asked tuned US fishing marked the approaches in fashion and Magnus and given given us and unfriended my flight some question</v>
<v Ronja Julia Suhling>And that's like everything, everything</v>
<v Ronja Julia Suhling>I'm abstracting that because like this, pushing the levels and centralization good</v>
<v Ronja Julia Suhling>I'm actually channel often on peer to peer trading, so modality mechanism, Mahan on danger to Sabah or he</v>
<v Ronja Julia Suhling>You have mark modeller</v>
<v Ronja Julia Suhling>Division definitely had central organizations and central clearance and Rudan market operator with much better utility companies</v>
<v Ronja Julia Suhling>MIT mission on data level and it's analysis triggers matters</v>
<v Ronja Julia Suhling>So mensin or?</v>
<v Ronja Julia Suhling>Isn't that thing even perspective?</v>
<v Ronja Julia Suhling>Deflect fear</v>
<v Expert E>As you have to make to its quasi, I'm leveled at its central is young just Italian</v>
<v Expert E>Marked mission is Moscow ordered</v>
<v Ronja Julia Suhling>You know which is</v>
<v Expert E>Is Inamul Adong escaped fashionista as well and to have enough voice of plastic end of the month?</v>
<v Ronja Julia Suhling>The yeah</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>And don't like direct mail of the</v>
<v Ronja Julia Suhling>Found we had some test</v>

<v Ronja Julia Suhling>Sudan, as in too deep, does mark models invert and does Marc design does of language and praxis and traffics in this as well?</v>
<v Ronja Julia Suhling>Boshe my support on children</v>
<v Expert E>The reason Weber Deutschland during the Eggman</v>
<v Ronja Julia Suhling>As a, but it's trading</v>
<v Ronja Julia Suhling>That's really neat, fun and regularly in oskin in the city</v>
<v Ronja Julia Suhling>And passing the items and something mark their budget</v>
<v Expert E>OK</v>
<v Expert E>But the end after date sightings soon, but it sounds on senior and Advan Soto their mark</v>
<v Expert E>This one figured harm</v>
<v Expert E>The swimming of people</v>
<v Expert E>English talk to harm you can handle</v>
<v Expert E>I'm allerdings an additional shift</v>
<v Expert E>Diesels aren't of local community even and austausch it's musliman hundreds, and it's kind of fun sharing model</v>
<v Expert E>So I know he's Alhassan, and mutualist medicia mukhlis as my locale</v>
<v Expert E>Also relation</v>
<v Expert E>Nothing</v>
<v Expert E>That's vanished</v>
<v Expert E>Bunch Quan come down to your onwards and discouraged, Moglichkeiten added city of both garden</v>
<v Expert E>But I think it is a subtitle here</v>
<v Expert E>Even the bulk of your tubulin built this year of about, and it's even vinegar</v>
<v Expert E>Last time something Golden, Kraftwerk and she, Monica, Angela about winning</v>
<v Expert E>Or is a bullet list of everyone else collects and</v>
<v Ronja Julia Suhling>OK</v>
<v Ronja Julia Suhling>Thank you</v>
<v Ronja Julia Suhling>And uh, the had also and items that Carson regularly really does</v>
<v Ronja Julia Suhling>It's inner Venus versus give to some software and the</v>
<v Ronja Julia Suhling>Research given has the gyms and video that song fund local energy market</v>
<v Expert E>As well new tool and it's not active</v>
<v Expert E>Rooms that song as well the enum done using MacIntyre, traded in demand</v>
<v Expert E>Keep this automata algorithm via puberty, where installati counters from Nets but never come to us for an interrupt</v>
<v Expert E>There can come to us from energy</v>
<v Expert E>Varun Comptus flashed for an in House Hilton</v>
<v Expert E>It's an adversary feel only cleared fragen</v>
<v Expert E>Want to own a good negusa stand at his year long with so and that kind of scallion?</v>
<v Expert E>Kim says gun schools of fog is there</v>
<v Expert E>Martinez energy communities and</v>
<v Ronja Julia Suhling>And then after one bus, the headset and that's on the these studies master potential</v>
<v Expert E>As they entered their updates and Harrison is is when you energy communities from the store</v>
<v Expert E>To this</v>
<v Expert E>To them, they blow myself like them, and this might be going Monica community</v>
<v Expert E>So that's an Easter facility, no matter the, it's fine</v>
<v Expert E>This is Ann model does this and has a good</v>
<v Expert E>Not sure yet, but this is absolute scallions figures</v>
<v Expert E>Umm</v>
<v Expert E>If I move to the system I'm in, a dog companies sign vendidas as a service</v>
<v Expert E>Unbeaten and then the phone via</v>
<v Expert E>That's in the market for health, liberg Mainshaft Lieber House, Comanche, Libertador, filibuster</v>
<v Expert E>Taylor, they're beating the solution as a service</v>
<v Expert E>We causing a software and we have noise after von</v>
<v Expert E>We instead and see love, and we have no the apogee and thermolysis have been service and hunger</v>
<v Ronja Julia Suhling>Umm yeah, just I think of inside your links flag model</v>
<v Ronja Julia Suhling>Yeah, discarded consumer and as pardon saying Max</v>
<v Ronja Julia Suhling>And going and villas</v>
<v Ronja Julia Suhling>Then I'm gonna phone here</v>
<v Maximilian Jagiello>Yeah Comes close, nonessential</v>
<v Maximilian Jagiello>Talk about this</v>
<v Maximilian Jagiello>I'm just looking has and basic fact one versus the Andreas and so much better scallions</v>
<v Maximilian Jagiello>Escape causative as a last another aspect that you had in an EDI markets</v>
<v Maximilian Jagiello>I feel Sanderson like a given Sanderson order from platform operator</v>
<v Maximilian Jagiello>Local energy markets</v>
<v Maximilian Jagiello>Scallions</v>
<v Maximilian Jagiello>It's nothing and another not</v>
<v Maximilian Jagiello>My closer shift to give since Dylan, that doesn't say anything as it</v>
<v Expert E>Doesn't quickly Asthma</v>
<v Expert E>Guns</v>
<v Expert E>Basic uh, criterions was we einfuhrt kind manage of the Schwarz hashtag</v>
<v Expert E>Carter was locale Imagemakers and the size this information he was assuming</v>
<v Expert E>You don't mentioned PhD Mukhlis Vinish Technik</v>

<v Expert E>When Technik that is out of the box, so to make list of headers ever installion kernels and I'm sticker and you stick tools are inflation would be unchain or Anna</v>
<v Expert E>Bluetooth forbidden?</v>
<v Expert E>That's what he does with sticks to you, remembered us, inquiring Dennis</v>
<v Expert E>And so that would scalable and done was this will truly signed foodie town Namer on food you want to name these unbeaten and when we don't have the</v>
<v Expert E>Of scalable platform</v>
<v Ronja Julia Suhling>Thank you</v>
<v Ronja Julia Suhling>It's fundamentally catch breaking</v>
<v Ronja Julia Suhling>Um, we are MIT</v>
<v Ronja Julia Suhling>Sachin manage his anger</v>
<v Ronja Julia Suhling>Danish Bauman fun vessel My view reports and to asset Cardiff on I'm with your item Monad Kush Prachan and Irish problem</v>
<v Ronja Julia Suhling>Um, it does all of us in the related field does only fair and we're not Andre, Baroness</v>
<v Expert E>Umm, in that heart funding mechanism, which was have been boss English near this vinegar comparison of Naufragio understood consult soon on to pay her off</v>
<v Expert E>Annabeth</v>
<v Expert E>Mia Habib, causing one year lived</v>
<v Rachel Sulollari>It doesn't send</v>
<v Ronja Julia Suhling>What does the sun facilitating MIT einem model would kind as a wooden the energy anguish password or the standard effect?</v>
<v Ronja Julia Suhling>This woman, doctors and anger having fun</v>
<v Ronja Julia Suhling>And I'm not meeting</v>
<v Expert E>Uh Deutsche net Lesia in Aggie Kostan from their community for here</v>
<v Expert E>Egal of Phil English by sudani</v>
<v Ronja Julia Suhling>OK</v>
<v Rachel Sulollari>And</v>
<v Ronja Julia Suhling>Thank you mission Eval community participation</v>
<v Rachel Sulollari>You know and mention by the implies and balance and Asia</v>
<v Rachel Sulollari>And if I'd like that, they needed a good price on to this continent</v>
<v Rachel Sulollari>The Prosumenten weak lightest in organization alpha and ours as a in the diagram with the mental burden due to consummate</v>
<v Rachel Sulollari>And that's that</v>
<v Rachel Sulollari>They have that are not trained as a bitter swagger nonmetals in mental burden is when it comes to mental and then yeah, we can manage</v>
<v Expert E>Is that of the influence of alganon?</v>
<v Expert E>This is an active a mental burden out and financial burden and asthma installations Custom</v>
<v Rachel Sulollari>You know</v>
<v Expert E>Card for meter</v>
<v Expert E>It easy on Carter is a snitched correct</v>
<v Expert E>Weirdest was angled as well</v>
<v Rachel Sulollari>Umm</v>
<v Expert E>You make the economy scallions face and does grata and steini mapped it envied a noir Bensenville Venezuelan benzonia school analytics</v>
<v Expert E>And he's along with one was on a snack</v>
<v Expert E>Design</v>
<v Expert E>But the stuff to sacked what haven't heard from the courtroom master in their own geebung excess tier D analogy website</v>
<v Rachel Sulollari>Umm, I wouldn't</v>
<v Expert E>Yeah</v>
<v Rachel Sulollari>Yeah, and communities no harm is not valuable, OK?</v>
<v Expert E>What do you load is a shocking community?</v>
<v Expert E>Mostly only owning</v>
<v Expert E>It look high concern is kind of our Community scheme</v>
<v Expert E>So instead he keeps the way here</v>
<v Expert E>It kind of unneeded solution been on its own</v>
<v Rachel Sulollari>Umm</v>
<v Expert E>Port of Mount as well as the family is diverticulitis</v>
<v Expert E>For the eight on performing Langham</v>
<v Expert E>What you cannot studion on Twitter, and this model offers they cannot impersonate screen community</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>And then it occurred and normally cost</v>
<v Rachel Sulollari>And then I'm just better than the Chinese in English, right?</v>
<v Rachel Sulollari>And off button most of them than the regular</v>
<v Rachel Sulollari>Let's English and regulatory frameworks and comment on that in the Internet with the not engage of your the infrastructure for the grids in the past I would have the and the scenario saying</v>
<v Expert E>As it does when anemically card this month, it's not gonna be lost</v>
<v Expert E>Not paying the grid freeze the energy Calvin or two HD locale and zukan</v>
<v Expert E>If it's in, someone needs to do their own accomplishments</v>
<v Expert E>Active and consistent flight uh</v>
<v Expert E>Load less in the end?</v>

<v Expert E>No, I'm a courtside disruptions in Ukraine and then I'm Costa about the go to losing coverage of the phone</v>
<v Expert E>That's good for seeing the modella</v>
<v Rachel Sulollari>OK Umm</v>
<v Expert E>If clauber niche in demand or can make this besters</v>
<v Rachel Sulollari>OK</v>
<v Rachel Sulollari>And you could put Stefan, whether Gamora</v>
<v Stefan Abadzic>Yes, they're gonna um, those for the customer, but energy as a service</v>
<v Stefan Abadzic>And the training, you know, cuffed bottom bus clubs to invite Fern and Visa HT to confirm we had in traditional utilities</v>
<v Stefan Abadzic>Does your strong might just by and and so</v>
<v Expert E>As a nod to comfortably as massive Anna I've ever done, the name of the triggers and the and the triggers and the consumer as</v>
<v Expert E>Now, and Zukunft the together his noise concepts head, is this energy as a service on that for meals and platform on that, because the scheffield what does Hank Williston and part of an opioid crisis as it does this failure utilities, unbeaten Varden does is, doesn't it also flavor human variable?</v>
<v Expert E>If it was in the Adrian unbeaten, I'll do my Mohandas Nova Simison</v>
<v Expert E>As was good filler and agility for only beaten milk list, unattractive variable Tarifa</v>
<v Expert E>And that's Canon</v>
<v Expert E>Better energy communities can also puts in</v>
<v Stefan Abadzic>Umm</v>
<v Stefan Abadzic>Wouldn't um gonna ready revenue streams detailed channel it's pure generator that's retailer devnya communities uncooked either there's a lag off</v>
<v Stefan Abadzic>So I'm Dahab zebra pure generator with quasi dividia of vinegar, Orda comma Suzanne</v>
<v Expert E>Dissolved in Gringo, Vern, in in your clothing, Zuma</v>
<v Expert E>If you would about us the answer, the unbeatable glaze blobs, but soon as soon as this would errors or centralized the size</v>
<v Expert E>Distributed generators, Amir distributors, those women about Mazuma was fun</v>
<v Expert E>Connection point and life</v>
<v Expert E>What's going I?</v>
<v Stefan Abadzic>No, no</v>
<v Stefan Abadzic>As a push bunt, uh put some, some human could too</v>
<v Stefan Abadzic>Mhm</v>
<v Ronja Julia Suhling>Ich will einfach mal übernehmen, wir haben vorher geredet über in den nächsten Jahren ändert sich das nicht so viel und wenn, dann wird das danach passieren</v>
<v Ronja Julia Suhling>Wir haben auch geredet über Dörfer hauptsächlich oder ländliche Regionen</v>
<v Ronja Julia Suhling>Wie ist denn deine Einschätzung in Städten, weil unsere Erfahrung nach wann das jetzt immer eher kleine Communities vielleicht Dörfer, allerdings nicht Städte, in denen dann lokal generierte Energie getradet wird?</v>
<v Ronja Julia Suhling>Hast du da Erfahrungen schon gesammelt und Projekten, die in Städten passieren?</v>
<v Ronja Julia Suhling>Nicht glaube dieses Brooklyn Market</v>
<v Expert E>Genau</v>
<v Ronja Julia Suhling>Die Blind Study war ja auch in der Stadt, vielleicht kannst du da ein bisschen erklären, wo die Hindernisse oder Talentes liegen?</v>
<v Expert E>Ja, das Problem Michael gibt es in der Stadt</v>
<v Expert E>Ich war auch Teil von einem Projekt in Thüringen, was auch in einer Stadt war</v>
<v Expert E>Ein großes Problem ist einfach, dass du die Menge an Energie nicht vor Ort erzeugen kannst, weil die Fläche nicht hast</v>
<v Expert E>Für die erneuerbaren Energien wenn wir jetzt davon ciao, wenn wir jetzt davon reden, dass wir vielleicht auf nukleare Aktoren noch gehen und sagen wir sind schon übel und nehmen die zu, dann mag das gelten, aber wenn wir jetzt erstmal nur von Sonne, Wind, Wasser reden, dann haben wir einfach die geographischen Gegebenheiten in der Stadt weniger, dass wir hundert Prozent Versorgung machen können</v>
<v Expert E>Das heißt, es wird immer einfach nur nen prozentualer Anteil der Energie auch vor Ort erzeugt und damit wird der ganze Business Case von Communities halt abgeschwächt</v>
<v Expert E>Ich sehe es nicht als unmöglich an, aber ich denke, dass die Erzeugung dann einfach an anderen Orten stattfindet</v>
<v Expert E>Die Städte können Anteile an Solarparks kaufen, Anteile an Windkraftanlagen</v>
<v Expert E>Windkraftanlagen und ob du jetzt in der Ostsee stehen und die Community in München ist, dann ist es halt Trading, aber es wäre auf jeden Fall möglich</v>
<v Expert E>Wir müssen uns von diesem ist wirklich vor Ort die gleichen physischen Elektronen, die verschoben werden, einfach verabschieden dann</v>
<v Ronja Julia Suhling>Das ist ein interessantes komplett, was du gerade ansprichst, weil wir haben wie vorher auch welche erklärt hat mit Firmen geredet, die auch lokale Energiemärkte P Model Modelle anbieten, gesprochen und sind auch darauf gekommen, dass dieser dieses physische leer in der Praxis gerade in diesem Film nicht etwas wird, sondern dass das ein Trading ist, wo ein Preis ausgehandelt wird oder festgelegt wird</v>
<v Ronja Julia Suhling>Und die physische Flow der Energie in dieses Hauptnetz eingespeist wird?</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Wird das heißt, es ist separiert, dann einfach</v>
<v Ronja Julia Suhling>Du hast jetzt aber auch davon gesprochen, dass es physisch trotzdem funktionieren kann</v>
<v Ronja Julia Suhling>Dieser Local energiemärkte oder diese Local Communities, mit denen du jetzt arbeitest, ist das dann verbunden?</v>
<v Ronja Julia Suhling>Also ist dann physisch ist leer und Financially verbunden oder ist das dann trotzdem noch so, dass das nur ein virtuelles Trading ist?</v>
<v Expert E>Also was heißt verbunden?</v>
<v Expert E>Sie sind näher aneinander dran als im virtuellen Trading in Städten wirklich verbunden miteinander sind sie nur auf bilanzieller Ebene</v>
<v Expert E>Dass man halt sagt hinter dem Ortsnetztransformator gemittelt über das Jahr oder die Summe übers Jahr gesehen gibt %, der ist Verbrauchs und das ist in Minuten schritten irgendwie abgedeckt</v>

<v Expert E>Aber der hundertprozentige Übereinstimmung Nein, die gibt es auch auf lokaler Ebene nicht, man selbst in den Minuten kannst immer noch Leistungsspitzen geben, die Halt vom Netz abgedeckt werden, anstatt dass sie jetzt gerade von der Sonne oder im Winter abgedeckt werden</v>
<v Ronja Julia Suhling>Mhm, viel davon ist ja auch mit dem tatsächlichen, verbrauchen den tatsächlichen Konsum der Haushalte verbunden</v>
<v Ronja Julia Suhling>Das benötigt ja eine sehr stark ausgebaute Meeting Struktur</v>
<v Ronja Julia Suhling>Was ist deine Erfahrung?</v>
<v Ronja Julia Suhling>Also funktioniert das?</v>
<v Ronja Julia Suhling>So sind die fein genug, dass man wirklich sagen kann ja okay, das Trading ist auch so abgelaufen in der Realität wie das auf dem Papier passiert ist, oder ist eine große Diskrepanz?</v>
<v Expert E>Also das Trading ist in meiner Fahrung immer aggregiert auf irgendeiner gewissen Ebene und meistens halt die Minuten, weil man die Werte darunter, auch wenn man sie hat nicht nehmen möchte, weil die Berechnungen zu kompliziert werden</v>
<v Expert E>Das heißt von einer gewissen Abstraktion ist derzeit immer da und ich denke, die ist auch in Zukunft da also selbst wenn wir auf Sekundenwerte runtergehen, wird es ja immer noch eine Abstraktion sein</v>
<v Ronja Julia Suhling>Ja, ne klar okay und?</v>
<v Ronja Julia Suhling>Wir haben jetzt vorher auch noch kurz Wind und Hydro erwähnt, gerade ist das, was du jetzt in der Bring hast, aber auch Solar basiert, richtig</v>
<v Ronja Julia Suhling>Mhm</v>
<v Expert E>Wird das meiste ist in der Tat Solar es gibt ma selten Projekte, die auch irgendwie ne Schere in einem Windkraftpark haben, aber das meiste ist in der Tat Solar also in New York hatten sie diese kleinen Windkraftanlagen, die auf dem Parkplatz von dem Supermarkt war?</v>
<v Expert E>War aber das war eher so zu Show</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Ja, das heißt die die Rolle, die irgendwie diverse Energiequellen spielen, ist eher gering, weil ich meine Solar hat, ja dann doch eine sehr volatile, also man generiert ja nur tagsüber Energie, das heißt die Idee zu sagen okay, wir haben irgendwie inkludieren Wind und Hydro oder anderen Übel Energy so ist das in dieses Konstrukt würde ja dieses Problem der würde Latino Energie erstmal auch irgendwo fixen oder ist da doch speichermöglichkeit der einfachere Weg?</v>
<v Expert E>Also zumindest mit giert werden würde das Problem wenn wir einen Mix von Renault Bles haben in meiner Erfahrung sind die andere Nobels einfach noch nicht in and consume Hand</v>
<v Expert E>Das heißt, das ist schwierig auf Community Ebene zu sagen, darauf konzentrieren wir uns auch noch</v>
<v Expert E>Der einfache Weg ist erstmal mit der Solarenergie anzufangen, weil die einfach schon and Consumer Hand ist größer, also nicht größtenteils, aber öfter als die anderen</v>
<v Expert E>Viele machen es dann wirklich so oder so sagen Sie, nehmen Speicher dazu</v>
<v Expert E>Die meisten die Prosumenten sind, haben wir inzwischen auch Speicher teilweise haben die Communities dann wirklich noch Community Speicher sind quartiersspeicher</v>
<v Expert E>Aber dass sie auf hundert Prozent eigen</v>
<v Ronja Julia Suhling>Ja ist ja vielleicht auch was?</v>
<v Ronja Julia Suhling>Ja</v>
<v Expert E>Autarky komm, das ist sowieso selten also also Überproduktion machen sie häufig eine Überproduktion und dann einspeisen und sagen, wir sind hundert Prozent autark und dann irgendwo ja, übrigens haben wir zu den und den Zeiten immer noch so viel aus dem Netz bezogen</v>
<v Ronja Julia Suhling>Ja ja, ich meine, das macht ja vielleicht auch sind dann diese funktionierenden Infrastruktur und trotzdem noch zu benutzen?</v>
<v Ronja Julia Suhling>Und die Investments dann also, das muss sich ja immer rechtfertigen, dass man investiert in Speicher oder in neue neue Quellen, ja gerne max</v>
<v Maximilian Jagiello>Keine Ahnung, ja, ich wollte auch kurz einmal noch einen Haken ich war mir nämlich die Rolle von Innovationen und noch ein bisschen genauer an und wollte da gerade fragen ich meine bei MS läuft ja der Großteil über Innovationen sind ja tierungs Algorithmen, Plattformen, Smart, Girls, Speicherlösungen usw und teilweise sind die technischen Lösungen der schon ziemlich Advents</v>
<v Maximilian Jagiello>Advents</v>
<v Maximilian Jagiello>Aber du hast ja gerade auch davon oder fahren davon gesprochen, dass es in der Realität meistens was ihr wichtig ist, DAS eher simpel gehalten wird?</v>
<v Expert E>Mhm</v>
<v Maximilian Jagiello>Was oder wo siehst du oder so die die kritischen Punkte, an denen man ansetzen müßte, um halt diesen Hebel von Innovationen zu nutzen und halt Lim zum Beispiel noch erfolgreicher zu machen oder noch zugänglicher zu gründen, auch vielleicht aus praktischen Erfahrungen, die du da gesammelt hast bisher</v>
<v Expert E>So ein wirklich großes Hindernis, erstmal die End Konsumenten zu gewinnen, dafür, dass sie was Neues mitmachen, dann noch über das Hindernis hinweg, dass sie vielleicht in Zähler umbauen müssen, dass sie gegebenenfalls in der PV Anlage investieren</v>
<v Expert E>Da hast du schon mal % aller Personen verloren, wenn du über diesen Anfangsschritte hinweg bist und die Leute quasi ihren bei ihnen gemacht haben gesagt haben sie haben erst mal ihre Infrastruktur, dann ist das Ganze eigentlich nicht mehr schwierig</v>
<v Expert E>Schwierig dann brauchst du nur noch ne schöne App mit einem einfachen Front End, wo sie hübsche Daten sehen und möglichst groß halt</v>
<v Expert E>Ihre Einsparung sei es Co Einsparungen Autarkiegrad Geldeinsparung</v>
<v Expert E>Ah in der praktischen Erfahrung ist wirklich der erste und schwierigste Schritt, bringen die Leute überhaupt dazu, mitzumachen, überzeugt davon, dass sie was davon haben und meistens wollen sie Geld haben am Ende?</v>
<v Maximilian Jagiello>Ja, ok ja das stimmt und wenn du jetzt gefragt werden würdest in also Zucker research akademisch und aber auch Innovationen, was wären so Lösungsansätze für Innovationen, die du besonders zukunftsträchtig siehst oder wo du der Meinung bist?</v>
<v Maximilian Jagiello>Dann lohnt sich auf jeden Fall noch Kapital reinzustecken also sei es jetzt research technisch oder in Bezug auf dann reale Investitionen</v>
<v Maximilian Jagiello>Gibts da irgendwie?</v>
<v Maximilian Jagiello>Ja</v>
<v Expert E>Das sind spannende Frage also, was ich mir in den meisten Projekten bisher immer gewünscht hätte, wäre so Plug and Play von irgendwie Mieter Software im Sinne von du musst keinen Termin machen du musst nicht darauf warten, dass die Leute kommen, sondern du hast

vielleicht eine Klemme, die steckst du, um dein Hauptanschluss im Haus rum und da kommen die Daten raus und die sind eigentlich Rechtsform perfekt dauert Minuten kann jeder machen</v>
<v Expert E>Mhm</v>
<v Expert E>Für uns Softwareunternehmen</v>
<v Expert E>Unternehmen wer einfach die Umsetzung von der sehr einfachen ab wichtig es gibt, es gibt verschiedenste ab, dass da draußen in verschiedenen Schwierigkeits graden</v>
<v Expert E>Da kann man sich eigentlich was zusammen klicken, aber es gibt noch keine, von der die Leute wirklich sagen, sie sind überzeugt, ist einfach schwierig</v>
<v Expert E>Wir wissen auch noch nicht was will denn die breite Masse haben?</v>
<v Expert E>Lokalen Markt breite Masse ist noch nicht im lokalen Markt, sind einfach schwierig rauszufinden, wie diese App aussehen sollte</v>
<v Maximilian Jagiello>Ja</v>
<v Maximilian Jagiello>Und vielleicht noch</v>
<v Expert E>Und er mag Mechanismus viel zu kompliziert bei jedem einzelnen Projekt, wo ich war einfach viel zu kompliziert und probiert es allen Recht zu machen, probiert selbst Merit Order ist für die meisten zu kompliziert, also man probiert es vielleicht Algorithmen, die noch handeln für die Leute da rein zu nehmen</v>
<v Expert E>Nach preisobergrenzen preisuntergrenzen Average preisen soll im Monat nicht über das gehen mein will mindestens so viel sparen wir uns den Anteil an lokaler Energie haben</v>
<v Expert E>Alles fair und alles schön, aber bitte beschränken auf maximal eher Kategorien, in denen die Leute ihren Mehrwert sehen</v>
<v Ronja Julia Suhling>Der</v>
<v Maximilian Jagiello>Guten Tag, ja, ganz kurz würde sagen, beschränken dann eher in Bezug auf das Verständnis von den Leuten also das ist immer noch erklärbar bleibt oder?</v>
<v Maximilian Jagiello>In Bezug auf die Umsetzbarkeit und Integration dann in die Infrastruktur von Konsequenz, Algorithmen und Plattformen</v>
<v Maximilian Jagiello>Ja</v>
<v Expert E>Verständnis von den Leuten also Infrastruktur und Umsetzbarkeit kannst du kompliziert machen, aber der Endkunde kommt damit nicht klar</v>
<v Ronja Julia Suhling>Es ging jetzt gerade um die Faktoren als Einfluss in das Market Design</v>
<v Ronja Julia Suhling>Im Endeffekt ist das also wir haben vor Tagen mit einem Professor bei uns an der Partneruni gesprochen</v>
<v Ronja Julia Suhling>Gesprochen Scott heißt der, ich weiß nicht dann aber was sagt der sich auch mit ihrem Energiemärkten und Logic befestigt?</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Und er meinte in einem natürlichen ökonomischen Markt bildet Nachfrage und Angebot den Preis und hat damit eben gesagt, dass das eigentlich sehr simpel approach ist, diese Energiemärkte eben zu generieren, wo man sagt okay, es gibt so viel Überschuss und es gibt so viel Nachfrage</v>
<v Ronja Julia Suhling>Daraus bildet sich ein Preis, der beeinflusst wird, vielleicht dann unter dem zentralen Markt Preis liegen muss, den man am Hauptnetz bekommen würde und vielleicht sich auch für die Verkäufer von Energie lohnen muss</v>
<v Ronja Julia Suhling>Das heißt über irgendwelchen alternativ Verträgen mit Einspeisung, Verträgen oder so sein muss</v>
<v Ronja Julia Suhling>Was ist deine Meinung zu so einem zu einem Ansatz?</v>
<v Ronja Julia Suhling>Ist das zu simpel oder ist das also ich meine, es ging ja gerade um simpler Ansätze muss man da wirklich dann die die einzelnen Meinungen der einzelnen participants damit einnehmen, wenn man im Endeffekt doch ihnen günstigeren Preis hat und das ja eigentlich schon Argument genug ist?</v>
<v Expert E>Ich würde absolut mitgehen mit der mit der Argumentation von ihren Scott die Frage ist wie bildet sich denn der Preis ja?</v>
<v Expert E>Angebot und Nachfrage bilden den Preis aber wie nach Madrid oder wird EIN einzelnes Angebot zu einer einzelnen Nachfrage weiß ich nicht</v>
<v Expert E>Participants Gruppen zugeordnet wird der Preis nach höchsten, Bitte niedrigsten mittleren Average</v>
<v Expert E>Da gibt es halt unglaublich viele Möglichkeiten</v>
<v Expert E>Also ja ne Theorie ich mit, aber das löst die Frage, wie der Markt mich und das muss aussehen soll leider nicht</v>
<v Ronja Julia Suhling>Ja, das ist ein sehr guter Punkt</v>
<v Ronja Julia Suhling>Habt ihr solche Mechanismen umgesetzt, wo du sagst okay, das funktioniert besonders gut?</v>
<v Ronja Julia Suhling>Besonders also bezogen auf den den Preis jetzt wo du sagst das hat Potential auch wirklich zu funktionieren, weil es simpel genug ist, umsetzbar zu sein, aber trotzdem also, dass irgendwo die Waage findet oder die Balance findet</v>
<v Expert E>Also in der Tat in den meisten Projekten wird am Ende doch ne merrit Order umgesetzt, weil das einfach am effizientesten für Energiemärkte zu sein scheint</v>
<v Expert E>Ich hatte auch mal ein Projekte, waren wirklich nicht viele, die haben gesagt, sie machen so direkte Smashing also immer wenn Angebot reinkommt, wird das eingeordnet zu den ganzen Offers und dann wird halt geguckt, zu welches passt und die können auch prozentual erfüllt werden, das auch möglich für einen kontinuierlichen Markt, aber wenn wir bei dem Minuten schritten bleiben, dann tut die meisten eigentlich, oder?</v>
<v Ronja Julia Suhling>Okay, das ist ja schonmal auch irgendwie und a weil wir haben jetzt auch super viel gelesen</v>
<v Expert E>Ja</v>
<v Ronja Julia Suhling>In der Theorie und es gibt unglaublich komplexe Marktmodelle mit der Flexibility, dann noch mit reingenommen wird und dem Preis und dem Preis und dem Trading</v>
<v Ronja Julia Suhling>Trading und dann gibt es einen parallelen Flexibility Markt irgendwo man noch irgendwie anbieten kann, dass man seine Waschmaschine als Stunden später anmacht oder so was die Komplexität halt extrem erhöht und die Einsparung dann halt also jetzt unserer Erfahrung nach den Gesprächen auch irgendwie nicht so ganz rechtfertigt</v>
<v Ronja Julia Suhling>Deswegen weißt du sehr interessant zu sehen, was da musst du denn?</v>
<v Ronja Julia Suhling>Einschätzungen dazu ist also auf jeden Fall das</v>
<v Expert E>Aber also ich würde sagen, die Marie Order vorherrscht Barkeit</v>
<v Expert E>Wer auch immer das Nomen dazu ist, also das Marie oder vorherrscht, liegt einfach daran, dass die Leute aus der Energiebranche das gewöhnt sind</v>

<v Expert E>Sind das ist einfach ein guter Mechanismus, der wird als effizient gesehen und alle Leute aus seiner G Branche kennenlernen, hat niemand bewiesen, dass das für lokale Märkte der beste Mechanismus ist</v>
<v Expert E>Mhm</v>
<v Expert E>Ja also</v>
<v Ronja Julia Suhling>Da war auch ein interessanter Insights, dass das vielleicht dann auch ein Punkt ist, wo man vielleicht auch meine Vergleiche ziehen müßte und sagen, dass das funktioniert dann am besten ja auf jeden Fall interessant, wahrscheinlich auch dann stark abhängig von den Bedingungen des Marktes, oder?</v>
<v Ronja Julia Suhling>Also gibt ja nicht eine Solution wahrscheinlich überall, am besten ist</v>
<v Expert E>Klar und hängt auch von der Umsetzung ab</v>
<v Expert E>Ist das ein Markt, wo zum Beispiel der grüne Gedanke mit Reinspielt, das heißt, die Leute sind nicht nur aufs Geld aus offener oder aus ist, sondern sagen ne ein Teil von meiner Nutzen Funktion ist auch Co Einsparung da müsstest du das mit rein rechnen und dann wäre der einfache Merrit Order schon wieder nicht möglich, dann müsstest du das irgendwie in Kosten umrechnen</v>
<v Expert E>Umrechnen damit wird die Marie oder machen kannst</v>
<v Expert E>Ich bin kein Spieltheorie Experte, ich hab mich mal ein bisschen daran versucht, also es ist unglaublich schwierig</v>
<v Ronja Julia Suhling>Ja, wir sind da auch bisschen zerbrochen, teilweise in den Paper nicht zuzugeben</v>
<v Ronja Julia Suhling>Manche waren schon sehr komplex, aber halt unglaublich interessant, also gerade gesagt Dinge wie Co siehst du das als großen Driver in der Adoption, oder ist dann der finanzielle Aspekt vielleicht doch eher ausschlaggebend für Leute und mitzumachen?</v>
<v Expert E>Also für die Masse ist auf jeden Fall der finanzielle Aspekt ausschlaggebend für die Early Adopters</v>
<v Expert E>Ist es sowas wie Anteil grüner Energie und Co?</v>
<v Expert E> Einsparungen auch</v>
<v Expert E>Aber das sind halt auch die Leute, die typischerweise über dem Median Einkommen liegen</v>
<v Ronja Julia Suhling>Ja, wo wir wieder bei der sozialen Ungleichheit von vorher werden, ja</v>
<v Expert E>Ja, und dann ist die Frage warum können wir nicht die Regierung zu Subventionen bringen?</v>
<v Expert E>Ich meine nuklear Energie wurde lange genug subventioniert, Erneuerbare wurden auch sehr lange subventioniert</v>
<v Expert E>Energiemärkte also lokale und Energy Communities könnte dann auch Sophie installiert werden?</v>
<v Ronja Julia Suhling>Du hast das vorher am Anfang mal angesprochen, ich meinte dann ja das das erstmal zur Seite legen, vielleicht können wir das noch mal kurz Adressen und kurz auf die Regularien eingehen und zu schauen was wäre denn wirklich nötig?</v>
<v Ronja Julia Suhling>Was was muss sich da ändern, dass das umsetzbar ist vielleicht im Vergleich Deutschland und dann im Gegenzug in Österreich, wo das zum Beispiel schon durchgesetzt ist du meinst jetzt ist gibt es in Deutschland so noch nicht?</v>
<v Ronja Julia Suhling>Ist dann Regularien, die den Verkauf von Energie verbieten oder was?</v>
<v Ronja Julia Suhling>Wie genau sieht das aus?</v>
<v Expert E>Loom in Deutschland Energie zu verkaufen, brauchst du halt gewisse Zertifikate das überhaupt machen darfst</v>
<v Expert E>Du musst dich zertifizieren, muss so und so ne Grenze erreichen EC</v>
<v Expert E>In Österreich haben Sie das aufgeweichten haben gesagt in Energy Communities dürfen die Energy Communities auch Energie verkaufen</v>
<v Expert E>Das ist erlaubt</v>
<v Expert E>Du der Netzbetreiber muss das Mitmachen?</v>
<v Expert E>Dadurch ist schon relativ viel gewonnen, also in Österreich kann gerade jeder Mensch sagen, ich Gründe</v>
<v Expert E>Eine Energy Community, der muss im Endeffekt nur ein Verein anmelden, da gibt es quasi Formulare, die musst du ausfüllen</v>
<v Expert E>Dann ist der Netzbetreiber verpflichtet, dir dein intelligenten Zähler einzubauen</v>
<v Expert E>Innerhalb von Wochen oder so was die nie schaffen, also die Grenze reißen, die immer und dann kannst du mit Energie handeln nach deinen Vorstellungen</v>
<v Expert E>Es gibt keine Vorschriften, wie der Marktmechanismus sein muss</v>
<v Expert E>Du musst, du darfst nicht kommerziell interessiert sein, also es muss immer gemeinschafts gemeinnützig sein</v>
<v Expert E>Das ist eine gute Umsetzung, also einfache, vor allem einfache, gute Umsetzung, die auch einfach jetzt schon zu ungefähr Energy Communities in Österreich geführt hat</v>
<v Ronja Julia Suhling>Die die Zahl ist mir neu</v>
<v Ronja Julia Suhling>Sehr gut, dann können wir uns auf jeden Fall auf die </v>
<v Expert E>Also letztes Jahr waren es ich hab einfach mal aufgerundet ich muss zugeben ich habe die aktuelle Zahl nicht, also sind garantiert, aber quoted mal lieber ?</v>
<v Ronja Julia Suhling>Danke bringt heute schon die Zahl von mir nein, das ist also sehr schön, dass das so ein gutes Projekt, das jetzt stellt, sich für mich die Frage wenn jetzt Energy Communities erlaubt sind, wo ist dann die Abgrenzung von Energy Communities also ab wann ist es kommerziell und ab wann ist es denn Community Rektor?</v>
<v Ronja Julia Suhling>Also wer kontrolliert ist und woran macht man das Fest?</v>
<v Expert E>Ist in der Tat eine relativ weiche Grenze also in Österreich, haben sie extra diese Koordinationsstelle für</v>
<v Expert E>Ich weiß nicht, wieso heißt Koordinationsstelle?</v>
<v Expert E>Stelle für Energy Community kann sogar sein, dass sie heißt müßte mal googeln, wie sie genau heißen eingesetzt, die haben halt irgendwie Mitarbeiter oder so und alle Energy Communities gehen über die</v>
<v Expert E>Österreich ist ein kleines Land, da funktioniert das</v>
<v Expert E>Ja, in Deutschland würde das nicht funktionieren, dafür sind wir einfach zu viele</v>
<v Expert E>Dafür ist das Land zu groß</v>
<v Ronja Julia Suhling>Ja, das heißt Deine Einschätzung ist, dass das Konzept ist, das sich in kleinen Ländern primär erstmal durchsetzen könnte, bevor er dann große Industrieländer beziehungsweise flächenmäßig und ein oder mäßig große Kinder danach folgen können</v>
<v Expert E>Ich würde jetzt nicht sagen unbedingt kleine Länder, das bietet sich halt an, aber begrenzte</v>
<v Expert E>Begrenzte Summen aus Menschen und möglichen Teilnehmern ob man die jetzt auf Länder begrenzt oder sagt Hey, ich bin ganz die auf die Region Rostock oder so ist ein bisschen egal, aber da bei uns der Energie im Bundes Hand liegt, werden wir das nicht so einfach begrenzen können</v>
<v Expert E>Also da müssen die Länder ja das Mandat kriegen, dass sie ihre Energy Provider selbst zertifizieren können und da wird die Bundesnetzagentur sich wahrscheinlich nicht zu überreden lassen</v>
<v Ronja Julia Suhling>Das stimmt vermutlich nicht</v>

<v Ronja Julia Suhling>Das heißt, das lerne Veränderungen, die man in Deutschland auf jeden Fall bräuchte und umzusetzen</v>
<v Ronja Julia Suhling>Gibt es noch andere Punkte?</v>
<v Ronja Julia Suhling>Die Regularien sind die das aufhalten, also sagen wir mal, das wäre jetzt erlaubt</v>
<v Ronja Julia Suhling>Gibt es andere Dinge, die passieren müssen, um das wirklich umsetzen zu können?</v>
<v Expert E>Ne der eine Punkt sind natürlich die Meetingstruktur, also die muss umgesetzt sein</v>
<v Expert E>Sein derzeit ist es sehr schwierig, den intelligenten Stromzähler zu bekommen, wenn man einen haben will, entweder der Netzbetreiber Rollend rollt den gerade bei einem aus oder man wartet irgendwie Monate gefühlt weiß jetzt nicht ob Monate wirklich aktuell sind, wenn du die Infrastruktur nicht aus Boss mit den Energy Communities gar nicht erst Anfang</v>
<v Ronja Julia Suhling>Das heißt deine Meinung?</v>
<v Expert E>Aber einfach mal tschuldigung einfach mal die Erlaubnis, überhaupt lokal handeln zu dürfen und sei es nur beschränkt auf Kilometer oder so, wenn man das einfach mal festhält</v>
<v Expert E>Und die</v>
<v Expert E>BNA Bundestag</v>
<v Expert E>Nee, weil Gemeinschaft für Bundesnetzagentur wie heißen die denn genau die probieren wir das ja die Lobby in die ganze Zeit dafür, dass wir die Energie kann mir nicht umsetzen können</v>
<v Expert E>Also es gibt schon Gesetzesentwürfe, aber die sind halt sehr kompliziert und spezifisch lassen das so oft genossenschafts Ebene zu, wenn es schon eine Energiegenossenschaft gibt, kann man die Nutzen, um dann auch noch eine Community aufzubauen und so</v>
<v Maximilian Jagiello>Auch das</v>
<v Ronja Julia Suhling>Mhm okay, das macht auf jeden Fall Sinn</v>
<v Maximilian Jagiello>Kleines medizinischen Frage das gerade angesprochen wie Littering oder Infrastruktur ist ja auch so, der der allererste Schritt irgendwie nach der Bereitschaft von den Konsumenten was würdest du sagen?</v>
<v Maximilian Jagiello>Also einfach nur ganz kurz ist sowie essentielle Infrastruktur, die man braucht um eben ne NRW Community zu ermöglichen, also intelligenter Zähler auf jeden Fall aber gibt es dann noch mehr, was sonst sagen dieser Mdp an einer lokalen Energy Community ist?</v>
<v Expert E>Also zum Anfang brauchst du erstmal nur Verbrauchs und Erzeugungsdaten und wenn du die hast, dann kannst du virtuellen Handel aufsetzen, wenn gewisse Auflösung mit gewisser Qualität</v>
<v Maximilian Jagiello>Okay also</v>
<v Expert E>Aber wenn du das hast von Teilnehmern, dann kannst du einfach mal den Handel aufsetzen fertig</v>
<v Maximilian Jagiello>Ja, und das läuft dann also das läuft dann trotzdem über das normale Netz oder so die die Datenstruktur wird sozusagen nur für den Smart Metern erfasst und das Netz muss jetzt nicht extra ausgebaut werden oder also?</v>
<v Maximilian Jagiello>Ja</v>
<v Expert E>Nee, das ist ein rein virtueller Handel erstmal so ein rein bilanzieller Handel</v>
<v Maximilian Jagiello>Genau ja</v>
<v Expert E>Wir ändern ja nichts an dem physischen Schluss, das ist ja noch einen ganzen Schritt weiter dann</v>
<v Maximilian Jagiello>Ja ja</v>
<v Maximilian Jagiello>Alles klar?</v>
<v Maximilian Jagiello>Danke</v>
<v Ronja Julia Suhling>Ja, es ist auf jeden Fall interessant, also die Städte, zu denen von der</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Nach Jahren Jahren würdigt hast du angefangen zu forschen, das auf jeden Fall unglaublich viel und wir hatten irgendwie auch noch so in die Zukunft angeschaut was du glaubst, wo das Potenzial ist oder ob es andere Modelle gibt, die vielleicht eher umgesetzt werden in der Zukunft</v>
<v Ronja Julia Suhling>Vielleicht kannst du dann noch ein bisschen, vielleicht fällt dir was ein, was du als noch teilen kannst</v>
<v Expert E>Also ich vermute, dass der Ansatz von den Energy Communities erstmal die lokalen Märkte, also den lokalen Märkten voraneilen wird</v>
<v Expert E>Das ist manchmal, sagt wir, erlauben irgendwie diese Communities, die auf irgendeine Art und Weise Energie miteinander teilen können, dass man dann Marktmechanismus ran setzt, mit dem man dann vielleicht noch zwischen den Leuten handelt, ist wahrscheinlich erstmal ein zweiter Schritt</v>
<v Ronja Julia Suhling>Mhm</v>
<v Expert E>Der erste Schritt ist erstmal zu sagen wir ermöglichen wirklich diesen lokalen Ausgleich und</v>
<v Expert E>Dann ist es von mir aus die Energy Community, den nach außen hin auftritt als einen Erzeuger oder Sophie ne kundenanlage die halt auch nach außen auftritt, wie ein Zeuge und in der innerhalb der Kundenanlage, also innerhalb der Community kannst du die Energie dann verteilen</v>
<v Expert E>Dann verteilen nach Sharing nach Investitionsaufwand einfach gleich verteilt nach wurde</v>
<v Expert E>Aber ich denke, das wird der erste Schritt sein, und damit ist dann auch so ein gemeinnütziger Gedanke damit drin da wird erstmal noch nicht viel Geld mitgemacht, sondern da geht es dann erst mal um die ideellen Werte und die Vereine und dann werden halt die</v>
<v Expert E>Energieunternehmen nach und nach darauf kommen, dass sagen wir müssen Business Modelle schaffen, weil sonst ein großer Teil nicht alles die ganzen derzeitigen Geschäftsmodell laufen</v>
<v Expert E>Laufen weiter war ein großer Teil der Geschäftsmodelle wegfallen, könnte in Zukunft</v>
<v Expert E>Und dann jetzt halt doch, um zu schauen, welche Business Modelle auf lange Zeit im grünen Bereich sind und dann auch mal fair</v>
<v Expert E>Bisher noch niemanden positive Business Case gefunden für lokale Danke Merkel</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Ja ja, das sind toll haben mit einem Unternehmen aus Lowenien gesprochen, die so ein Keeping Markt Life haben, aber im Endeffekt sind deine eigene Idee Company, die haben halt riesen Parks und verkaufen dann halt die Energie und sagen das ist halt P Trading, weil du kannst halt mit dem Producer direkt reden und das dann auch ein super Riesen kommerzieller Producer ist</v>
<v Ronja Julia Suhling>Das hat auch nochmal ein anderer Ansatz irgendwie ist als so eine kleine Community mit sehr lokal und selbst notierte Energie wollen jetzt noch eine Frage gerade eingefallen, die ich vielleicht noch zu erstellen würde</v>

<v Ronja Julia Suhling>Ich hatte mir für meinen also jeder von uns hat es unter Part in der Thesis und ich hatte mir einen Datensatz angeschaut mit prosumer Daten, wo eben genau haushaltskonsum und Prosumer pro Stunde drin ist außer Konsum und Produktion Entschuldigung bräuchten drin ist und dieses Modell waren aber alles prosumenten</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Das heißt, jeder Marktteilnehmer hatte eine Solaranlage, was dazu geführt hat, dass sie selbst also selbst consume natürlich super gut war, aber gar nicht mehr so viel Markt stattgefunden hat</v>
<v Expert E>Klar</v>
<v Ronja Julia Suhling>Wenn man sich jetzt die Adoption von Menü Bild anschaut, steigt ja gerade sehr stark, siehst du da das heißt Problem aber siehst du da vielleicht einen Grund dafür, dass das vielleicht in Jahren so viel Selbstkonsum gibt, das vielleicht gar nicht mehr so viel Trading Volumen da sein wird oder ist das überhaupt gar kein Gedanke, der in diesem Konzept berücksichtigt ist?</v>
<v Ronja Julia Suhling>Mhm</v>
<v Expert E>Nee, das ist ein sehr wichtiger Gedanke, es geht immer darum, dass du halt nen gemischtes That in den Communities hast, also wenn du viele Haushalte mit Solaranlagen hast, hast du entweder noch welche drin die gar nichts haben</v>
<v Ronja Julia Suhling>Mhm</v>
<v Ronja Julia Suhling>Ja</v>
<v Expert E>Reine Konsumenten sind oder du hast halt ne Sporthalle drin Freibad, nen Gewerbe, irgendeinen industriellen Konsumenten ist überhaupt noch handeln kannst, wenns industrieller Konsument ist, bestimmt dann natürlich einfach die Marktpreis oder auch ein Produzent der sagt ergibt mir dann noch was raus aber du brauchst halt eine gewisse Durchmischung</v>
<v Expert E>Mischung ansonsten wird um die Mittagszeit nicht getradet</v>
<v Ronja Julia Suhling>Ja</v>
<v Expert E>Alles eingespeist das Netz denkt sich auf einmal ach du meine Güte Leistungsspitze hier was ist denn los?</v>
<v Expert E>Und dann hast du halt abends nachts gar nix und dann wird einfach wieder aus dem Netz bezogen, also das Macht die Belastung von unserem Übertragungsnetz einfach nur schlimmer</v>
<v Ronja Julia Suhling>Ja, das heißt sowieso das schon sagen, dass</v>
<v Ronja Julia Suhling>Ne Variante in den Marktteilnehmern sehr wichtig ist für dieses ganze Konzept sanktionieren klar</v>
<v Ronja Julia Suhling>Ja, okay, das heißt man</v>
<v Expert E>Ja, also entweder ausreichende Speicher, Möglichkeiten eine Variante in den Marktteilnehmern am besten beides zusammen oder halt die Möglichkeit, Demand Side Management auf großer Ebene einzusetzen</v>
<v Ronja Julia Suhling>Ja, wo wir dann wieder bei irgendwelchen Smart Metern sind und seinen Kühlschrank wie Steuern oder seine Maschinen oder das Auto nur da laden, wenn halt gerade Überschuss ist</v>
<v Ronja Julia Suhling>Wir haben auch so ein bisschen</v>
<v Expert E>Trotzdem wird meine Wäsche dann nicht aufgehängt, wenn sie mittags gewaschen wird</v>
<v Stefan Abadzic>Ja</v>
<v Ronja Julia Suhling>Ja, oder?</v>
<v Ronja Julia Suhling>Wenn man vielleicht das Auto dann noch drauf und kann nicht lernen kann oder so also das Modell angeschaut wurde ich v also Auto Kapazität, um zum Speicher Ausgleich benutzt wird aber es hat auch für unser Thema, wo wir sagen, wir wollen, dass möglichst realitätsnah machen halt auch noch ein Setting zu weit weg ist sehr interessant</v>
<v Expert E>Funktioniert ja nur, wenn Zweitwagen ist ne, wenn du sagst ja ok zumuten nehm ich halt den Diesel noch da steht</v>
<v Expert E>Ja</v>
<v Ronja Julia Suhling>Ja, oder wenn Fahrrad oder so auch irgendwie nicht so ganz praxisorientiert zumindest jetzt noch deswegen ist auf jeden Fall sehr interessantes</v>
<v Ronja Julia Suhling>Jetzt sagst das sehr viele verschiedene Teilnehmer müssen ist auf jeden Fall glaube ich was wir nochmal durchsichtigen müssen genau magst</v>
<v Ronja Julia Suhling>Du hattest noch eine eine Frage ich glaube, oder kann es sein?</v>
<v Maximilian Jagiello>Genau ich wollte vielleicht einfach mal generell also ist eine relativ offene Frage so zum Abschluss vielleicht noch mal, also die positiven Aspekte sind der wahrscheinlich allen bewusst an der Ausbau von lokalen Energiemärkten und erneuerbaren Energien aber jetzt speziell am Konzept rdms</v>
<v Maximilian Jagiello>Rdms was wären so die kritischsten Punkte, die du am Konzept siehst?</v>
<v Maximilian Jagiello>Kommt vielleicht dann fahre mit dem also in der Lage und Zukunft also was wären so Aspekte, wo du sagst, das könnte longer eher schwieriger werden?</v>
<v Maximilian Jagiello>Das kommt dann vielleicht noch mal ein bißchen anderen Entwicklungen im Vergleich auch zu anderen Ansätzen</v>
<v Maximilian Jagiello>Jetzt irgendwie keine Ahnung mit wäre Energie oder also ganz anderes, also ein kritischer Blick auf Lim das wären da so Aspekte, die dir einfallen würden, wenn in der Zukunft</v>
<v Expert E>Also du meinst quasi neben Regulatorien und der Tatsache, dass sie einfach nicht kein positive Business Case bisher haben und deshalb wahrscheinlich nicht umgesetzt werden?</v>
<v Maximilian Jagiello>Genau ja</v>
<v Expert E>Also kritisch ist es das so ne Entwicklung eigentlich von unten nach oben kommen sollte, was man sagt Hell EMS bringen den Leuten unten am meisten</v>
<v Expert E>Eigentlich sollte daran interessiert sein</v>
<v Expert E>Jetzt gerade probieren wir halt durch regulatorische Änderungen wieder von oben Framework überzustülpen, weil wir merken die Bewegung kommt nicht von unten, wenn wir sagen, der Markt regelt sich schon, würden wir einfach abwarten und sagen okay, schauen wir mal, was passiert irgendwann werden die Leute schon danach schreien</v>
<v Expert E>So lange wollen wir nicht warten und wir gehen jetzt auch quasi ein Framework vor das sagt Bitte mach keine lokalen Märkte so nach dem Motto</v>
<v Maximilian Jagiello>Mhm</v>
<v Expert E>Schwieriges Thema</v>
<v Expert E>Was ich noch als kritisch sein?</v>
<v Expert E>Also Investitionskosten komme ich einfach nicht drum herum, das immer öfter zu erwähnen sie müssen halt so gering wie möglich keit sein nicht nur nicht nur monetär, sondern halt auch vom psychischen Aufwand her</v>
<v Expert E>Wieviel muss ich darüber nachdenken, wieviel Zeit muss ich damit täglich wöchentlich monatlich verbringen?</v>

<v Maximilian Jagiello>Ja, also das sagen die Knackpunkte sind wirklich letztendlich dann Wirtschaftlichkeit für Betreiber und Nutzer und eben diese interest Faktor also Konsumenten erstmal dazu gewinnen überhaupt teilzunehmen</v>
<v Expert E>Ja</v>
<v Maximilian Jagiello>Was sind wo die wichtigsten Hebel, die Ems in Zukunft dann voranbringen oder halt irgendwie okay danke, auf jeden Fall</v>
<v Rachel Sulollari>Aber so zu frage noch würdest du dann auch sagen das möglich die Wirtschaftlichkeit?</v>
<v Rachel Sulollari>Der Knackpunkt ist bei den Konsumenten oder auch auch kennt ja ein bisschen auf die, die ist einfach fehlt, dass die Leute einfach noch wirklich zu wenig wissen haben</v>
<v Rachel Sulollari>Über Local Energy Market und das auch wahrscheinlich nochmal mit einem Plus oder sagst würde ich wie du von meinem % schon verloren, weil Instructor fehlt und die diesen erstellen West nicht machen wollen?</v>
<v Rachel Sulollari>Mhm</v>
<v Expert E>Ich würd sagen die aus die beiden Aussagen schließen sich nicht aus, also klar, die UNS fehlt, dass die Leute überhaupt interessiert sind, aber selbst wenn sie ihr wert sind und sich sagen okay, ich verdiene nix dadurch und ich muss meine Zeit reinstecken würden Sie nicht machen</v>
<v Rachel Sulollari>Ja, ja, ja, okay</v>
<v Rachel Sulollari>Okay</v>
<v Ronja Julia Suhling>Ich</v>
<v Expert E>Mhm</v>
<v Stefan Abadzic>Ich hätte noch ne Frage, du hast ja deine Consulting im K Consulting richtig und du kannst hattest du auch local Communities und Local Energy Market Unternehmen, die sich da oder Startups, die sich da ja bisschen spezialisieren möchten, kannst du ein bisschen was dazu sagen und wie genau du den dabei hilfst?</v>
<v Stefan Abadzic>Also fänd ich super interessant</v>
<v Expert E>Also im Endeffekt sind das meiste Softwareunternehmen die sagen, sie probieren das als Service an den Markt zu bringen</v>
<v Expert E>Bringen Sie suchen nach Pilotprojekten sie suchen nach richtigen Umsetzungsprojekten und sie probieren das Ganze</v>
<v Expert E>Ganze Local Energy Market Konzept irgendwie Plattform fähig zu machen, das heißt, sie sind meistens noch irgendwo finanziert</v>
<v Expert E>Diese Unternehmen und die brauchen Personen, die Ihnen sagen, wie sie am besten ihre Software an den Markt bringen, im Sinne von einmal die Kontakte in der Energie Welt haben einmal die in helfen, möglichst den Marktmechanismus zu vereinfachen, worauf die Leute im Feld achten wollen, auch einfach bei Market Research helfen, Kontakte zu Installationsunternehmen haben und die sagen Hey hier, wir könnten dann nochmal helfen und in die Politik, die die Lobby Arbeit unterstützen also</v>
<v Expert E>Ich leide auch einfach viele Workshops für potentielle Kunden, um den überhaupt zu erklären was sind diese lokalen Energiemärkte?</v>
<v Expert E>Was wäre der Mehrwert?</v>
<v Expert E>Ich red jetzt die ganze Zeit davon, dass er wird schwer ist aber es gibt natürlich auch die andere Sicht was was wäre der Mehrwert für euer euer Unternehmen, wenn ihr das anbieten würdet, warum solltet ihr die Software dafür auch noch einkaufen?</v>
<v Stefan Abadzic>Okay, ja super spannend, ja also dieses realistische Bild bekommen und dann gleichzeitig?</v>
<v Stefan Abadzic>Diese beratende Tätigkeit also das finde ich super spannend auch generell</v>
<v Expert E>Ja also es ist ein super spannendes Thema</v>
<v Expert E>Es ist noch nicht so weit, dass ich sagen würde, diese diese Beratung ist auf die nächsten Jahren stabil</v>
<v Stefan Abadzic>Sch</v>
<v Expert E>Is Berufsfeld, sondern wer weiß, was sich halt langsam herausbildet</v>
<v Stefan Abadzic>Mhm</v>
<v Ronja Julia Suhling>Ist ja auch wichtig dann irgendwie das, was man als Erfahrung gesammelt hat</v>
<v Expert E>Ja</v>
<v Expert E>Ja</v>
<v Ronja Julia Suhling>Auch der Innovation wegen weiterzugeben und Projekte halt auch irgendwie weiterzutreiben also das glaube ich auch ein ganz großes Argument, dann da irgendwie zu schauen, dass man, wenn man schon in seinem Konzept sich auskennt oder mit beschäftigt, dass das dann auch so weit getragen werden kann wie irgendwie möglich in den Bedingungen, die man gerade hat also ja</v>
<v Expert E>Also ein Anteil, den ich öfter mal gemacht habe, jetzt, im letzten Jahr in der Tat nicht mehr so häufig war auch einfach so, Nationen durchzuführen, wo Unternehmen gesagt haben hat die und die Daten werden die und die möglichen Konsumenten wie würde sich das lohnen?</v>
<v Expert E>Wie wären denn die Käppis für wenn wir das in den und so weiter?</v>
<v Expert E>Ne?</v>
<v Expert E>Communities aufteilen</v>
<v Stefan Abadzic>Mhm</v>
<v Ronja Julia Suhling>Ja, okay, ja, sehr spannend</v>
<v Ronja Julia Suhling>Ich glaube, dass wir erstmal mit Input gefüttert sind, das ist auf jeden Fall sehr informativ und sehr interessant</v>
<v Ronja Julia Suhling>Gibt es noch irgendwas, was sie vielleicht noch Vorschub lassen?</v>
<v Ronja Julia Suhling>Meint Ja schau dich vielleicht nochmal an, vielleicht Dinge, über die wir noch nicht gesprochen haben oder weil wir haben viel abgedeckt aber</v>
<v Expert E>Habt ihr euch einfach mal ein Paar von den Startups angeguckt?</v>
<v Expert E>Die Energiemärkte umsetzen, so weiß ich nicht einfach eine Echnaton der Grid Singularity, die man so direkt findet, wenn man Google wie die das machen, das sind doch komplett unterschiedliche Ansätze</v>
<v Stefan Abadzic>Wer wird?</v>
<v Ronja Julia Suhling>Ja, also, wir haben uns Grid Singularity angeschaut</v>
<v Stefan Abadzic>Ja, die sind jetzt nach Lissabon gezogen wegen Texas of Crypto und der in Scott hat tatsächlich schon mit dem wir gesprochen haben</v>
<v Stefan Abadzic>Mit dem Professor der hat tatsächlich dort gearbeitet in Berlin, als sie noch in Berlin war</v>
<v Expert E>Mhm</v>
<v Ronja Julia Suhling>Genau wie hieß das zweite Unternehmen, dass du, dass du Kinder</v>

<v Expert E>Echnaton EXN at ON</v>
<v Expert E>Die Kommissar Schweiz sind stark in der Schweiz und in Österreich unterwegs</v>
<v Ronja Julia Suhling>Schauen wir uns auf jeden Fall nochmal an, wenn wir uns noch irgendwann in deruk angeschaut</v>
<v Expert E>Nee, sagt mir nichts</v>
<v Ronja Julia Suhling>Ich weiß nicht, ob dir das was sagt, Ich glaube, die haben uns ein bisschen mehr fokussiert auf so Solar Parks und so, aber das war auch im Kontakt, der uns weitergeleitet wurde</v>
<v Ronja Julia Suhling>Und sonst noch paar mal Film mit Ihnen nicht anfangen, aber ja also mal gespannt, wie sie das Geschäftsmodell weiterentwickeln wird, auf jeden Fall</v>
<v Maximilian Jagiello>Ganz kurz an den Zusammenhang vielleicht noch so eine Mini fragen würdest du sagen, das macht dann Sinn, weil der sagst du die mit einer der größten Hürden ist halt diese investitions Kosten für die Kunden und ich habe jetzt zum Beispiel oder bin immer noch bei weiß nicht, ob die ENPAL was sagt</v>
<v Expert E>Mhm</v>
<v Expert E>Mhm</v>
<v Maximilian Jagiello>Deutschland ist ja im Grunde genommen und genau das, dass sie sagen Solaranlagen mieten für Jahre rundum sorglos Paket, einfach Planungen, alles Maintenance wird von Apple übernommen</v>
<v Maximilian Jagiello>Wann würdest du sagen, dass wir dann zum Beispiel einer Projekt, um beides irgendwie zu hebeln, also halt einmal die Kunden zu gewinnen?</v>
<v Expert E>Mhm</v>
<v Maximilian Jagiello>Für RENEWABLE energy es, indem man ihn halt so ein sorglos Paket anbietet und dann halt diese Lage drauf baut und gleichzeitig aber auch dann Marktteilnehmer zu gewinnen, um dann halt eben kleinere Communities aufzubauen und also man hat halt weil das direkt an einer Stelle willst du sagen, das wäre vielleicht ein zukunftsträchtiges Modell, das sich so weiter ausbauen könnte, oder?</v>
<v Maximilian Jagiello>Mhm</v>
<v Maximilian Jagiello>Ja</v>
<v Expert E>Könnte ich mir vorstellen, also wenn die zu Ihren Solaranlagen noch im Speicher und quasi den Zähler anbieten und den Zugang zu der App für den lokalen Markt und sagen Hey, du bezahlst auch maximal das, was du Einsparst zum Beispiel, dass sie sagen, also das Risiko liegt auf unserer Seite, ihr werdet auf jeden Fall by oder besser rauskommen</v>
<v Maximilian Jagiello>Mhm</v>
<v Expert E>Ja, da würden viele Leute mitmachen</v>
<v Maximilian Jagiello>Okay</v>
<v Maximilian Jagiello>Danke</v>
<v Expert E>Gerne wann kommt eure Masterarbeit denn raus?</v>
<v Expert E>Wird die veröffentlicht, darf man die lesen nachher oder was macht ihr damit?</v>
<v Rachel Sulollari>Ja, wir geben die nächste Woche ab</v>
<v Expert E>Sehr gerne schickt mir ein Link, wenn es soweit ist</v>
<v Rachel Sulollari>In der nächsten Woche und dann hab ich im Januar haben wir unsere Defense Mendes die wichtige praktisch soweit ich weiß, wir können dich gerne darüber updaten genau super, gerne machen wir sehr gerne, dann würd ich sagen vielen, vielen Dank, dass du dich eine ganze Stunde für uns genommen hast</v>
<v Stefan Abadzic>Ja</v>
<v Rachel Sulollari>Auch super spontan, das war super, super Insightful für uns also es hat uns sehr weitergeholfen, auch einfach nochmal diese allgemeine Verständnis zu stärken oder nochmal irgendwo anzuknüpfen und wir gemerkt haben, dass ein bisschen als fehlt also vielen Dank dafür und wir melden uns, sobald die Arbeit fertig ist und schicken dir nochmal alles zu</v>
<v Expert E>Sehr gerne viel Erfolg damit ich hab euch auf jeden Fall gutes Thema ausgesucht</v>
<v Expert E>Wir mal gespannt ob ihr euch im Berufsleben dann auch wieder begegnet</v>
<v Ronja Julia Suhling>Pause</v>
<v Rachel Sulollari>Dir auch?</v>
<v Stefan Abadzic>Wir auch</v>
<v Expert E>Schönen Tag euch noch?</v>
<v Ronja Julia Suhling>Dankeschön ciao</v>
<v Rachel Sulollari>Sehr cool, danke, schönen Tag, tschüß</v>
<v Stefan Abadzic>Jo Ciao vielen Dank</v>
<v Maximilian Jagiello>Ciao ciao</v>
<v Rachel Sulollari>Muss diese Aufzeichnung beenden?</v>

Transcript Expert F:

<v Stefan Abadzic>Genau möchtest du kurz ein bisschen was über dich erzählen, dein Background, ja deine deine Position auch bei ENPAL und genau schieß einfach los.</v>
<v Expert F>Klar kann ich kurz machen, ja ist bestimmt interessant, wenn ich euch kurz eine kleine Intro zu meiner Position geben, Unternehmen und auch bisschen zu unserem Unternehmen selbst also wir sind ja ein deutsches Energie Startup und seit auch ein deutsches Unicorn und mittlerweile geht es auch ziemlich gut.</v>
<v Expert F>Also Solaranlagen und generell erneuerbare Energien sind ein super wichtiges Thema, besonders in den letzten Jahren, wenn man sich die Entwicklung hin so anschaut und ich bin jetzt seit dabei.</v>
<v Expert F>Also auch schon ein gutes Weilchen.</v>
<v Expert F>Mittlerweile bin ich hör doch Business Development in dem Laden und es gefällt mir auch richtig gut also ich finde es super nice, dass man nen Ökonomik aber auch eine seine Bility Impact hat, also dass man dann was arbeitet, was auch n ziemlich guten Side Effect sondern ich manchmal hat und dass wir ebenso Division haben, so globale Energie Communities aufzubauen, die eben dezentral geregelt sind und sich eben da nichts and untereinander den Strom verteilen genau.</v>
<v Stefan Abadzic>Ja cool und wie genau unterscheidet sich jetzt zum Beispiel euer bis Modell genau von dem zentralen oder von von Utilities?</v>
<v Stefan Abadzic>Also was, was macht ihr anders?</v>

<v Expert F>Also wir sind noch nicht so weit, dass wir wirklich nen, dass wir wirklich lokaler Energie Märkte aufbauen oder Energie communities, das ist noch so ein bisschen Visionen zum einen, weil halt eben in Deutschland die Regulatorien noch so sind, dass du dich zum Beispiel als allein als Kunde bei uns also unser Geschäftsmodell ist ja das Vermieten von Solaranlagen.</v>
<v Expert F>Wir nehmen Kunden sozusagen die Investitions führen, indem wir jetzt sagen, Jahre Mietvertrag und übernehmen auch Planungen.</v>
<v Expert F>Maintenance entstand Haltung, Versicherung, alles das Problem dabei ist zum Beispiel dann auch schon, dass Kunden, die einfach nur viel interes benutzen und das Energie ins Netz einspeisen müssen, sich schon als kleinen Gewerbe meine ich anmelden, ist also schon die erste Hürde, die wir natürlich versuchen, den Kunden so gut wie möglich zu nehmen, ist in meinen Augen richtig und braucht auf jeden Fall Reformen, um das Ganze zu beschleunigen.</v>
<v Expert F>Und deswegen sehe ich auf jeden Fall noch großes Potenzial.</v>
<v Expert F>Ich meine andere Länder sind schon ein Stückchen weiter und erlauben den den Handel von Energie sei es auf in in finanziellen Konstrukten oder auf virtuellen Marktplattformen.</v>
<v Rachel Sulollari>Okay.</v>
<v Expert F>Plattformen aber genau Deutschland ist noch Limited to self consumption Land.</v>
<v Expert F>Das ist auf jeden Fall noch ein Faktor, den der sich ändern müsste.</v>
<v Stefan Abadzic>Okay.</v>
<v Expert F>Schau.</v>
<v Rachel Sulollari>Einmal ganz kurz, schon mal reingrätschen du meinte schon, dass Regularien eine kleine Barriere sind für Konsumenten und ihr versucht, wieder so ein bisschen dazu helfen, das zu überwinden.</v>
<v Rachel Sulollari>Inwiefern macht ihr das also, wie kriegt ihr das hin?</v>
<v Stefan Abadzic>Mhm.</v>
<v Rachel Sulollari>Mit Hilfe von mehr Knowledge und Information also, dass dieses bürokratische Leiter gemacht wird, indem Leute überhaupt klargemacht wird, wie das ganze funktioniert oder habt ihr andere Hebel?</v>
<v Expert F>Also zum einen natürlich haben wir mehrere Leute, die aktiv damit beschäftigt sind, Lobbyismus zu betreiben und die Politik?</v>
<v Expert F>Ich sag so bisschen in ***** zu treten.</v>
<v Expert F>Da tolle Regulatorien raus zu kitzeln, die uns eben das Leben einfacher machen und natürlich dem Klimawandel helfen.</v>
<v Expert F>Und zum anderen versuchen wir grundsätzlich bei and all alles möglich simple zu halten, also vom Service Offering bis hin zum End Produkt versuchen wir die Kommunikation und auch das generelle die Interaktion mit dem Kunden so einfach wie möglich zu halten deswegen halt doch einmal das komplett integrierte Service Offering, also wenn es immer das Grad Paket Miete.</v>
<v Expert F>Der Kunde muss sich einfach nur bei uns melden und ab da übernehmen wir für ihn den Prozess und gehen aktiv auf ihn zu, wenn wir was brauchen von ihm und erklären dann dann auch genau, was wir brauchen.</v>
<v Expert F>Wie sowas brauchen also?</v>
<v Expert F>Ich denke, das ist auf jeden Fall ein wichtiger Hebel, um Kunden das Leben so einfach wie möglich zu machen.</v>
<v Rachel Sulollari>Ja.</v>
<v Expert F>Oft ist es nämlich dann so, dass Kunden neben dieser investitions würde halt einfach nicht wissen, wie das alles funktioniert und warum sie was machen müssen.</v>
<v Expert F>Deswegen versuchen wir daher den Kunden diese Hürde zu nehmen und einfach nur sie einfach nur das Wissen zu lassen, was Sie wissen wollen oder brauchen und den Rest übernehmen wir im Hintergrund genau.</v>
<v Rachel Sulollari>Der cool ey du meine schon ihr wollt diese Hürde der ersten indischen Investment Cost überwinden, indem ihr die P Anlagen als rennt anbietet.</v>
<v Expert F>Ja.</v>
<v Expert F>Also.</v>
<v Rachel Sulollari>Wie lange ist denn so ne Lebensfähigkeit von so einer PV Anlage also das heißt, dass ich ja müssten die Kunden durch die pis wieder zurückgeben oder wie?</v>
<v Rachel Sulollari>Wie läuft das Ganze ab?</v>
<v Rachel Sulollari>Sind, dass man sich abzahlt.</v>
<v Expert F>Ja, das ist eine gute Frage, also zu der Lebensdauer von tivi Anlagen würde ich sagen ich kann mich technisch nicht super gut aus, aber ich meine, die beträgt eben ungefähr Jahre bis Jahre.</v>
<v Rachel Sulollari>Mhm.</v>
<v Expert F>Bei guter Instandhaltung bestimmt nach Richtung Jahre.</v>
<v Expert F>Deswegen haben wir uns irgendwann darauf geeinigt oder festgelegt, die Mieter Jahre auf Jahre zu beschränken und gleichzeitig unsere Versprechen eingeführt, das nach Jahren noch % Leistungsfähigkeit bestehen muss.</v>
<v Expert F>Ansonsten wird die Anlage ausgetauscht.</v>
<v Rachel Sulollari>Ah cool.</v>
<v Expert F>Und genau um.</v>
<v Expert F>Oder, beziehungsweise?</v>
<v Expert F>Das war die zweite Frage nochmal du meintest?</v>
<v Expert F>Genau ja.</v>
<v Rachel Sulollari>Nach den Jahren Jahre werden ja die betriebliche Anlage gemietet, gehört sie dann nach den Jahren Kunde, ist so eine Art App Bezahlung.</v>
<v Expert F>Genau ja, also die Anlage muss eben diese % erfüllen und dann kann dann von den Kunden symbolisch für einen Euro abgekauft werden, gehört dann auf den Kunden und läuft dann eben noch - Jahre weiter.</v>
<v Rachel Sulollari>Könntest du uns vielleicht noch so Vergleich ziehen, mit wieviel die Kunden monatlich oder im Jahr durchschnittlich für dann Miete zahlen?</v>
<v Rachel Sulollari>Ja.</v>
<v Expert F>Ja also das kann natürlich auf die Größe der Anlage und auf die, dass DAS Service Offering an also wir haben ja mittlerweile Anlagen, dann kamen Speicher dazu.</v>
<v Expert F>Home Box, die das Ganze dann die Schnittstelle sozusagen zu Smart Home bildet und eben die die App ermöglicht, die dann super simpel die Benutzung, also den Verbrauch und die Einsparungen darstellt.</v>
<v Rachel Sulollari>Mhm.</v>

<v Expert F>Dann haben wir noch eine Wallbox eingeführt und mittlerweile auch ne Wärmepumpe, also ein komplett integriertes Offering, mittlerweile die einfachsten Angebote von kleine Anlage ohne Speicher, ohne Wallbox sind meine ich bei um die € monatlich Mhm?</v>
<v Rachel Sulollari>Com.</v>
<v Expert F>Es ist also es ist natürlich natürlich ist es teurer als ganz, ganz normaler Stromvertrag, ein bisschen in in erster Linie aber super spannend, wird's dann halt auf die lange Frist also sobald sich die Anlage dann halt, sobald die Anlage abgezahlt ist mit der Miete und weiterläuft, wenn man das noch mit einbezieht und dann eben super Hebel sind halt auch e Autos, dann kommt ein Auto hat und überschüssige Energie nicht in den Speicher schließen lassen muss, sondern einfach in seinem e Auto.</v>
<v Rachel Sulollari>Mhm.</v>
<v Expert F>Spart er sich dadurch halt wirklich?</v>
<v Rachel Sulollari>Okay.</v>
<v Expert F>Also kann der Tarif auf jeden Fall günstiger werden als ein reiner Stromtarif und ja, besonders haben die Gaspreise anschaut und Benzinpreise mittlerweile.</v>
<v Rachel Sulollari>Super, das heißt Modell super, danke dir, ich würd mal weitergeben.</v>
<v Expert F>Doch Frau.</v>
<v Stefan Abadzic>Ja, vielleicht noch mal ein paar Fragen zum zum Business Model, also das echt schon super spannend erklärt aber ein zentraler Aspekt, den ich noch von dir herauskitzeln möchte, ist genau wie sich Utilities in der Zukunft aufstellen ist nun, welche Challenges du bei denen siehst und welche Vorteile ihr über gegenüber Challenges hat gegenüber der Titties ab sorry.</v>
<v Expert F>Ja, also vielleicht mal generell zu Situationen, wo wir herkommen ich meine, die Teletubbies in unseren traditionellen Energiemarkt waren natürlich die zentrale Rolle.</v>
<v Expert F>Es war super simpel.</v>
<v Expert F>Alles Strom kommt aus dem Kraftwerk, wird über die Transmission Distribution Netz an den Kunden weitergeleitet.</v>
<v Expert F>Kunde hat einfach einen ganz normalen Stromtarif durch erneuerbare Energien und jetzt Unternehmen wie soll die eben Solar Panels ausbauen und erneuerbaren Energien vorantreiben?</v>
<v Expert F>Ist natürlich kommt eine gewisse Komplexität hinzu, weil halt Strom local generiert wird und dezentral dadurch muss halt das Netz einmal ausgebaut werden.</v>
<v Expert F>Da ist die Frage Wer übernimmt das?</v>
<v Expert F>Bleiben die Kosten für Netzausbau, Smart, Grid usw?</v>
<v Expert F>Mhm machen, dass sie Utility SH, auch wenn sie in erster Linie wahrscheinlich erstmal Review verlieren werden.</v>
<v Expert F>Ich meine, ähm, unseren Part könnten theoretisch auch Titties übernehmen, sind aber wahrscheinlich nicht innovativ genug ausgerichtet, um so schnell zu reagieren und dann so Mini in Miniprojekten?</v>
<v Expert F>Dann zum Beispiel jetzt dieser Anlage als Mietmodell zu verkaufen an Kunden.</v>
<v Expert F>Andererseits, glaube ich ist es auch super wichtig, dass Utilities mit klein und Unternehmen zusammenarbeiten, um eben da so gewisse Synergien herzustellen, wie gesagt Unser, unser Kunde speist auch ins ins Netz ein.</v>
<v Expert F>Als wir profitieren natürlich auch von smarten Netzen, deswegen ist natürlich super wichtig, dass wir da mit den Mitteln Utilities zusammenarbeiten, um eben unsere innovative Projects mit reinzubringen.</v>
<v Expert F>Und die eben zu kombinieren mit den Ressourcen und dem bisschen, das eben diese transnationalen Großunternehmen haben, genau um irgend langfristig dann erfolgreich zu sein und ich denke, eine relativ werden sich auf jeden Fall mehr Ausrichtung ausrichten in Richtung des Service Angebote auch also wir jetzt wieder zum Beispiel ich denke, das wird langfristig noch n Faktor werden, das generell diese Sortierung der Industrie veranstaltet und eben mehr integrierte und komplette Lösungen auftreten.</v>
<v Expert F>Werden diese diese Informations und investitions würde halt nehmen genau.</v>
<v Stefan Abadzic>Mhm ja genau du hast JA gerade gesagt also viele werden innovative Business Modell der Like Energy Service und Richtung platformer Projekte gehen.</v>
<v Stefan Abadzic>Ja.</v>
<v Stefan Abadzic>Wie siehst du da so genau die Zukunft?</v>
<v Stefan Abadzic>Also was muss genau, ähm, sichergestellt werden, damit das adoptiert wird?</v>
<v Expert F>Wann ist jetzt erlaubt von unseren Kunden?</v>
<v Stefan Abadzic>Und von Konsumen auch, aber auch generell.</v>
<v Expert F>Ja, ich glaube Mr.</v>
<v Expert F>Gattung ist auf jeden Fall auch die Politik und halt eben so das generelle Framework ich mein alles an lokalen Energiemarkten baut irgendwo auf nem Legal Framework auf, also dann dieses Modell kann noch so innovativ sein oder die Technologie Advents, wenn dieses Framework hält es grundsätzlich einfach nicht erlaubt oder nicht so ermöglicht, wie man sich das vorstellt.</v>
<v Expert F>Es ist halt einfach gesagt blöd also ich denke mal langfristig wird sich das bestimmt anpassen und annähernd nur am Anfang ist also auf jeden Fall feststellbar, dass da so ein Liebes gab.</v>
<v Expert F>In der Geschwindigkeit von Politik und Innovationen auf jeden Fall besteht also Innovation ist immer schneller als Politik, die reagiert dann wieder träge auf Neuerungen das Konsumentenverhalten hat sich auch schon wieder geändert.</v>
<v Expert F>Da muss die Politik auf jeden Fall immer wieder nachziehen und das ist halt teilweise ziemlich langsam.</v>
<v Expert F>Deswegen gibt es noch wenig fördermodelle oder irgendwie das generelle Innovations.</v>
<v Expert F>Und Investitionsumfeld ist noch ziemlich.</v>
<v Expert F>Ziemlich mau würde ich mal sagen.</v>
<v Expert F>Es gibt keine keine richtigen Instand, ist eben von der Politik kommen, um beispielsweise diese Investitionskosten.</v>
<v Expert F>Ich meine, wir haben ja auch Investitionskosten.</v>
<v Expert F>Die Technologien sind alle super teuer.</v>
<v Expert F>Zwar effizient, aber halt eben super teuer und deswegen muss da glaub ich noch mehr von der Politik kommen, um eben diesen Ausbau voranzutreiben.</v>
<v Expert F>Auch in Bezug auf Grid, also Netzausbau?</v>
<v Stefan Abadzic>Ja.</v>
<v Expert F>Der zentrale Aspekt ist eben von ermöglichen vom Technischen ermöglichen von diesen ganzen Technologien, aber auch die Konsumenten Seite also Kunden müssen auch andere zu sehen und müssen auch.</v>

<v Expert F>Educate werden über die über die Vorteile im Klimawandel muss nochmal bisschen stärker in den Fokus gerückt werden und darf jetzt halt auch noch an Initiativen und so ein bisschen dieses Empowerment von Gründen, dass sich diese aktiven Rolle im Wandel eben noch mehr bewusst werden und ein bisschen aktiver einbringen.</v>
<v Expert F>Da halt einmal die Technologien, die das ermöglichen, diese Community und Forums Austausch und halt, aber auch die direkte Kommunikation mit mit Consumer Nja.</v>
<v Stefan Abadzic>Okay, spannend und wie Profile die Consumer, um da einfach generell ihre Motivation zu verstehen.</v>
<v Expert F>Wenn jetzt eine witzige Aktionen über Weihnachten, wo wir einfach ganz viele Briefe an Kunden verschickt haben und kleine Geschenke zum Beispiel also hatten wir wirklich.</v>
<v Expert F>Das war so ein kleiner Marketing itiative direkte Kommunikation also einfach wirklich von uns direkt an die Kunden, also an Neukunden haben wir verschiedene Pakete geschickt mit Fliegern mit irgendwie kleinen Mini Info Broschüren, um eben aufmerksam zu machen.</v>
<v Expert F>Eben müssen auch sagen, dass das relativ gut funktioniert, also klar, wenn man irgendwo Werbung sieht.</v>
<v Expert F>Im Internet ist das natürlich noch mal was anderes, als wenn man die Tür auf macht und dann liegt ein Brief von nem war das jetzt irgendwie eine innovative Lösung anbietet und irgendwie so n Mini Origami Haus da drin ist mit einer Solar Platte drauf oder so?</v>
<v Expert F>Also ich glaube, das bleibt dann noch mal mehr in Erinnerung.</v>
<v Expert F>Deswegen glaub direkte Kommunikation ist auf jeden Fall ein guter Hebel und denke, dass man da auch wirklich eng mit den Kunden zusammen arbeiten wollte, um eben dann die wirklichen Preferences und Knackpunkte rauszufinden, auch dann in Bezug auf die Umsetzung.</v>
<v Stefan Abadzic>Ja, Oh.</v>
<v Expert F>Was ist Kunden wirklich wichtig?</v>
<v Stefan Abadzic>Und noch vielleicht eine vorletzte Frage.</v>
<v Stefan Abadzic>Ja, was ist so aus deiner Sicht?</v>
<v Stefan Abadzic>Die Jahres Jahres Vision nicht nur für n paar, aber generell für für die Zukunft des Energiemarkts.</v>
<v Stefan Abadzic>Weil also einfach nur aus was mich sehr interessiert ist ja, dass durch diesen ganzen Local Energy Market und Energy Community push auch gerade so bei Utilities der Need als Ritter und als pure Generator nicht mehr so stattfinden wird.</v>
<v Expert F>Kannst.</v>
<v Stefan Abadzic>Und das könnt ihr ja dann sein, dass genau dieser Part durch eben diesen Pusch ja verloren geht oder ersetzt werden kann, oder?</v>
<v Expert F>Ja, spannende Frage, auch muss ich erst mal kurz ne kaufen Tablette nehmen.</v>
<v Expert F>Ähm, also ist natürlich super interessant, wie sich das Ganze entwickeln wird.</v>
<v Expert F>Ich denke mal, es wird dann noch in eine ganz bunte Mischung geben an an Konstrukten neue Business Modelle werden natürlich entstehen.</v>
<v Expert F>Mhm Innovationen spielt eine zentrale Rolle.</v>
<v Expert F>Wie du gesagt hast, so traditionelle Unternehmen und Systeme werden halt eben massiv Challenge to durch eben Klimawandel.</v>
<v Expert F>Das hat immer wichtiger, wird deswegen denke ich, dass da auch die Geschwindigkeit in Zukunft nicht abnehmen wird, sondern eher zunehmen und wenn dann auch eben die Politik voll mit einsteigt.</v>
<v Expert F>Ich glaube ich, das kann echt eine gute Richtung gehen und klar, die Unternehmen müssen sich müssen sich natürlich auch neu ausrichten.</v>
<v Expert F>Nicht nur die Politik, auch die Unternehmen selbst müssen natürlich da eng mit dran bleiben und zum Beispiel Teller, die Halt eben bisher einfach Strom verkauft haben, am Kunden also Strom eingekauft, geschoben, Kunden verkauft das wird natürlich in Zukunft je erfolgreicher wir sind das so weniger erfolgreiche werden natürlich die Rita Mhm.</v>
<v Expert F>Das müssen sie natürlich auch sich im Klaren werden, deswegen ich denke, dass Rita und generell diese Producer, also Kraftwerke You Producers, wie man auch sagt, dass die natürlich in Zukunft dann mehr als Backup Lösungen denke ich implementiert werden und dann eben in in Peak Load oder Peak Load Times, dann halt zum Einsatz kommen, wenn halt eben die ich mein will nur Lena.</v>
<v Stefan Abadzic>Mhm.</v>
<v Expert F>Dies sind charakterisiert durch natürlich Realität, und wenn es jetzt mal ne Woche dunkel ist das Licht blöd, dann braucht man auf jeden Fall auch langfristig noch der kann Lösungen, die da dann das das Netz aufrecht halten können und ich denke mal, das ist eben deswegen genau deswegen langfristig mit den aktuellen Technologien auf jeden Fall noch zu Hybrid Lösungen kommen wird die halt einfach in der realen Welt sein.</v>
<v Stefan Abadzic>Mhm.</v>
<v Expert F>Die Mosterei will Option Sinn und das da so eine gewisse Harmonie Halt stehen muss aus neuen, investiven, dezentralen Approaches, die eben stabilisiert werden durch traditionelle traditionelle Strukturen, die sich aber neu ausrichten, um diesen Wandel mit aufzunehmen genau.</v>
<v Expert F>Ja.</v>
<v Stefan Abadzic>Ja, danke ja cool hat sonst noch irgendjemand eine Frage?</v>
<v Stefan Abadzic>Sonst würde ich sagen, dass Rapid ab es war super, super, spannend.</v>
<v Stefan Abadzic>Aha, ja, gut, dann vielen Dank und ja, dir noch einen schönen schönen Tag obwohl Weihnachten.</v>