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1. INTRODUCTION

We are seeing significant change in the energy market resulted from a mix of evolving regulations, technologies, and customer behaviour. Thus, we are moving towards a new way on how we view, generate, and use energy.

1.1 Goal of this survey

The current survey will try to explore the overall patterns that will form the energy market transformation and the consumer's perspective. The survey aims to evaluate participants' opinions on concept of LEM and LFM, to identify factors and barriers to the progress of local renewable energy development based on the participants' knowledge and what would motivate people to participate in such markets. Additionally, the goal of this survey is to analyse the current market needs, as well as investigate what is driving the energy markets transformation and where it is leading.

The survey focuses in four key aspects:

- Research and analysis of the energy market
- Measure awareness regarding energy market
- Insights on energy market tools and services
- Identify market segments and trends

1.2 Definitions

- **Flexibility:** Flexibility is defined as the possibility of adjusting patterns of generation and consumption in reaction to a signal (price or activation signal) to contribute to different services.
- **Local Electricity Market (LEM):** The LEM is a concept facilitating P2P trading among prosumers that can be a component of the future energy system. The platform is operated by the Local Electricity Market Operator (LEMO), a private competitive entity
- **Local Flexibility Market (LFM):** The LFM is a concept for trade of power on a local level to avoid congestion. As a first option, it can be implemented as an explicit market with a dedicated market platform, that is operated by the Local Flexibility Market Operator (LFMO), a regulated entity. On this platform aggregators can offer flexibility services to the DSO only. As a second option, the LFM can also be implicitly integrated in the LEM. This means, that there is no market platform for the LFM and hence no LFMO. However, for activating this implicit LFM, the DSO imposes locationally varying grid prices to the prosumers. Those can react to this price signals by adapting their load curve and their trades on the LEM accordingly and as a result avoid grid constraints.
- **Distributed Energy Resources (DERs):** DERs typically include controllable loads, distributed generation and energy storage. Therefore, DER means the technical unit that is able to provide flexibility of any kind as a decentralized source.
- **Distribution System Operator (DSO):** DSO is defined as the legal entity responsible for operating, ensuring the maintenance of and, when necessary, develop the electric distribution grid in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.

2. Survey

2.1 Demographics

1. Which category below includes your age?

- 17 or younger
- 18-24
- 25-29
- 30-39
- 40-49
- 50-59
- 60 or older

2. What is your gender?

- Male
- Female
- Other

3. What is your highest level of education?

- No formal education
- High school diploma
- Bachelor's degree
- Master's degree
- Doctorate degree
- Other – Please specify

4. What is your permanent residence country?

- Please specify

5. Which of the following categories best describes your employment status?

- Self-employed
- Full time employment
- Part-time employment
- Retired
- Unemployed
- Other – Please specify

6. What knowledge level do you have about emerging technologies in the energy sector (renewable energy, microgrids, smart meters, blockchain, energy storage technologies etc)?

- Very strong understanding
- Somewhat understand
- Have heard of it, but do not really understand
- No understanding

2.2 Energy transformation insights

7. In your final energy consumption, do you know from where the electricity comes from?

- Power stations burning fossil fuels
- Renewable energy sources,
- Residual Mix
- Nuclear
- I don't know

8. Do you think that your current energy bill is perceived as reasonable in terms of costs?

- 1 – Yes
- 2 – No
- 3 – I don't know

9. Do you think that the risk is higher or lower with energy system based on more centralized energy 'generation'?

- 1- Higher
 - What do you think are the main risks electricity markets based on more centralized generation are facing?
 - Energy availability/Supply risk (e.g. blackouts)
 - i. 1 – No risk
 - ii. 2 – Small risk
 - iii. 3 – Medium risk
 - iv. 4 – High risk
 - Emissions/Air pollution (e.g. Carbon Monoxide)
 - i. 1 – No risk
 - ii. 2 – Small risk
 - iii. 3 – Medium risk
 - iv. 4 – High risk
 - Cyberattack (e.g. using malware capable of deleting data and causing physical damage to industrial control systems)
 - i. 1 – No risk
 - ii. 2 – Small risk
 - iii. 3 – Medium risk
 - iv. 4 – High risk
 - Bulk generation of energy (e.g. generating energy from large-scale projects, security of supply, environmental risks)
 - i. 1 – No risk
 - ii. 2 – Small risk
 - iii. 3 – Medium risk
 - iv. 4 – High risk
 - Risk of unjust pricing schemes (e.g. Fixed, Time-of-Use, Critical-Peak, Real-Time etc)
 - i. 1 – No risk
 - ii. 2 – Small risk
 - iii. 3 – Medium risk
 - iv. 4 – High risk

-
- 2 - Lower
- 3 - The same
 - Why do you think so?
 - *Free text*
- 4 - I don't know

10. In how many years do you anticipate the energy market will be mostly based on Distributed Energy Resources (DERs) (e.g. solar photovoltaic, electric vehicles)?

- By the end of 2021
- By the end of 2023
- By the end of 2025
- By the end of 2030
- By the end of 2035
- Other – Please specify

11. What of the following obstacles for fast adoption of Local Flexibility Markets (LFMs) do you think have the largest impact?

- EU Regulation/Legislation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
- National Regulation/Legislation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
- Insufficient technological design
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
- Public acceptance
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
- Market stakeholder's adaptation
 - a. 1 – No impact

- i. 2 – Small impact
 - ii. 3 – Medium impact
 - iii. 4 – High impact
- Lack of standardization
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
- Lack of interoperability between equipment and stakeholders
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact

12. To the best of your knowledge, are there any resources (i.e. funding/monetary incentives, information material, regulatory incentives) available to promote the development of renewable energy in your country, particularly for small renewable energy producers and citizens?

- Yes
- No
- I don't know

13. To the best of your knowledge, are in your country guaranteed feed-in tariffs set to encourage energy from renewable sources?

- Yes
- No
- I don't know

2.3 Market Change

14. New Suggestion: Do you see a benefit in participating in a local energy community where you can buy and sell electricity from/to local peers/neighbours in an autonomous way (assuming that a Collective Self-Consumption mechanism is part of this Local Energy Community)?”

- I don't see any benefit
- Financial benefit for the prosumers/consumers
- Non- financial benefit for the prosumers/consumers (“green spirit”)
- Benefit for the Distribution System Operator (DSO)
- Benefit for Suppliers/Retailers
- Attractive business opportunities for new stakeholders
- Increased investment in renewables (e.g. PV) and other DERs (heat pumps, battery storage, EV etc.)
- Others - please specify

15. Which of the following statements would you agree to?

In 5 to 10 years...

- All buildings will have some sorts of flexible energy assets (e.g heat pumps, EV charging station, battery storage)
- Most buildings will have flexible energy assets
- Most *new* buildings will have flexible energy assets
- Most households will have flexible energy assets
- Only few buildings will have flexible energy assets
- Other – Please specify

16. Which of the following technologies are you expecting to have the largest effect in the near future on your local energy market?

- Flexibility from Electric Vehicle chargers that can be controlled automatically
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact
- Solar electricity generation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact
- On-shore wind electricity generation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact
- Off-shore wind electricity generation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact
- Centralised energy storage
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact

- iv. 4 – High impact
- v. 5 – Very high impact
- Distributed energy storage through battery technologies
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact
- Nuclear electricity generation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact
- Natural gas turbine electricity generation
 - i. 1 – No impact
 - ii. 2 – Small impact
 - iii. 3 – Medium impact
 - iv. 4 – High impact
 - v. 5 – Very high impact

17. How much changes do you expect the current energy market to undergo in the near future?

- 1 – No change
- 2 – Little change
- 3 – Medium change
- 4 – Significant change
- 5 – Very significant change

18. What of the following concepts are you expecting to be of high importance in the near future?

- Large-scale centralized fossil fuel power generation
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Large-scale centralized renewable generation
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance

- iv. 4 – High importance
- v. 5 – Very high importance
- Distributed generation
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Local energy systems and infrastructure
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Electric Vehicles
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Smart home
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Off-grid energy solutions
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance

19. What results from changes in business models on the electricity markets do you anticipate to see in the near future?

- More competition
- Expansion of renewable energy
- Shift to distributed generation

- Localisation of the market (e.g. Peer to Peer (P2P) trading)
- More options for consumers to choose from

20. How important will the following capabilities be in terms of the feasibility of energy market business models that include LFM and LEM components?

- Dynamic pricing schemes
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Energy assets management
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Intelligent smart control and pricing optimisation mechanisms
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Customer management
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Operational technologies
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Local energy trading (P2P trading)
 - i. 1 – No importance
 - ii. 2 – Small importance

- iii. 3 – Medium importance
- iv. 4 – High importance
- v. 5 – Very high importance
- Data security and confidentiality
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance
- Privacy
 - i. 1 – No importance
 - ii. 2 – Small importance
 - iii. 3 – Medium importance
 - iv. 4 – High importance
 - v. 5 – Very high importance

2.4 Market Segments

21. In your opinion, which of the following tools and services will boost the profitability and efficiency in use of Distributed Energy Resources?

- Distributed Energy Resources (DERs) profile models (EVs, Hot Water, White appliances, Lighting)
- Load forecasting
- Standardized specifications
- Virtual Energy Storage (VES) Models
- Building-as-a-Battery
- Storage-as-a-Service
- Dynamic pricing schemes
- Flexibility monetization schemes for prosumers and end-users
- Smart energy contracts
- Smart grid monitoring and Active Network Management (ANM) Services
- Local Flexibility Market (LFM) models
- P2P trading in Local Electricity Markets (LEMs)
- Other – Please specify

22. Do you think that real-time metering data is necessary in order to maximize usefulness and success of local energy markets?

- Yes
- No
- I am not sure

23. In your opinion, do you think improved price prediction tools will increase revenue by exchanging flexibility assets within a Local Flexibility Market (LFM)??

- Yes

- No
- I am not sure

24. In your opinion, do you think automated energy agreements could be helpful through use of blockchain-enabled smart contracts?

- Yes
- No
- I am not sure

25. In your opinion, do you think European funds could be oriented to develop technological solutions related to?

- Energy efficient
- Flexibility
- Monitoring and control
- Storage
- Other – Please specify

3. PARITY Market Transformation Survey Outcomes

The survey presented in Section 2 was conducted within PARITY¹, in order to penetrate the market. Market penetration is defined as the process of introducing a new product into an established market when existing or comparable items already exist and capturing market share from competitors².

3.1 Data Collection: Survey with PARITY experts

In this section, the survey performed with stakeholders and end-users is described. The survey tried to explore the overall patterns that will form the energy market transformation and the consumer's perspective. The survey aims to evaluate participants' opinions on the concepts of LEM and LFM, to identify factors and barriers to the progress of local renewable energy development based on the participants' knowledge and what would motivate people to participate in such markets. Additionally, the goal of this survey is to analyse the current market needs, as well as investigate what is driving the energy markets transformation and where it is leading the energy market transformation survey highlights are presented in Figure 1.

The survey was primarily distributed to the PARITY project experts (DSO, Aggregators, Retailers etc). Afterwards, our target group was mixed, including both the PARITY energy experts, as well as experts outside the PARITY project, with a very strong/strong understanding of emerging technologies. The results of this report are based on analysing the data collected from the respondents considering the

¹ PARITY European Project, <https://parity-h2020.eu/>

² "Market Penetration Strategy", Available at: <https://www.lightercapital.com/blog/what-is-market-penetration-strategy-definition-examples>

specific questions. The questionnaire was divided into four sections: (a) Demographics, (b) Energy transformation insights, (c) Market Change and (d) Market Segments.

- **Demographics:** The first section of the survey is related to the audience demographic characteristics. Demographic data enables us to better comprehend particular backgrounds, such as their age, gender, country of residence, education, their knowledge level in emerging technologies in the energy sector and if they are professionally involved in them. By asking such demographic questions in our survey, we gather information about current and potential customers and in turn, help us design a market segmentation strategy to reach the right clients.
- **Energy transformation insights:** The second section aims to explore the overall patterns that will form the energy market transformation,
- **Market Change:** The third section aims to explore participants' experience on LEM and LFM so far, identify factors that might determine who is probable or unlikely to be interested in offering flexibility, electricity or other resources in the local energy market and what would motivate people to participate in such markets.
- **Market Segments:** Finally, the last part of the questionnaire is dedicated to market segmentation related questions, aiming to gain insights on energy market tools and services and identify market segments and trends.

Moreover, the survey was conducted in two phases. During the first phase, apart from the responses to the questions we also received from several participants a set of recommendations and clarification remarks. Thus, we updated the questionnaire based on the feedback received directly from the participants and distributed again during the second phase, in order to enhance our outcomes and enrich the information received already.

The survey was administered to participants within the European countries during the period October 2020 – January 2021. The total responses are 50 and their distribution is the following: Spain (16 responses), Greece (12 responses), Switzerland (10 responses), Cyprus (3 responses), Austria (2 responses), Germany (1 response), Sweden (1 response) and 5 responses where the country is undefined.

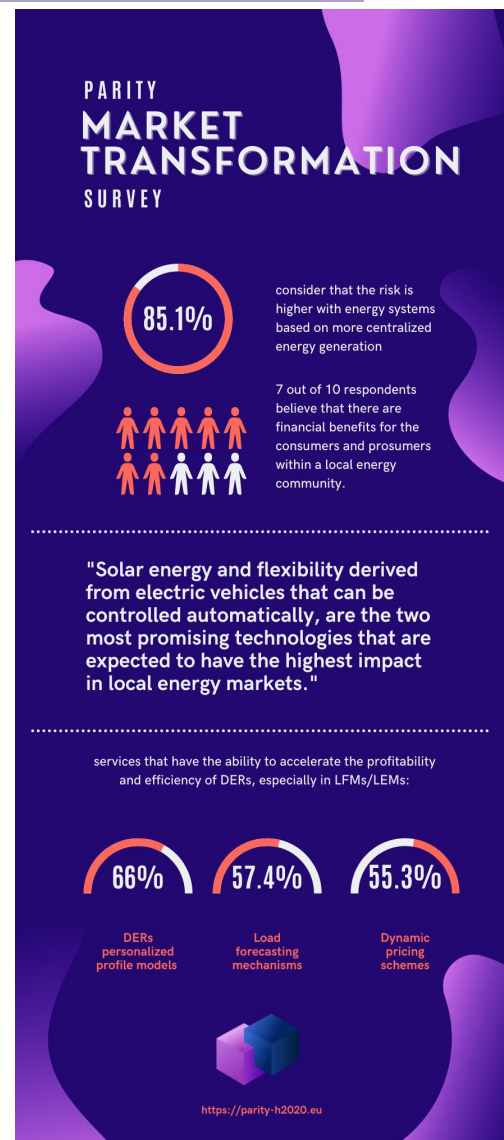


Figure 1: PARITY Market Transformation Survey

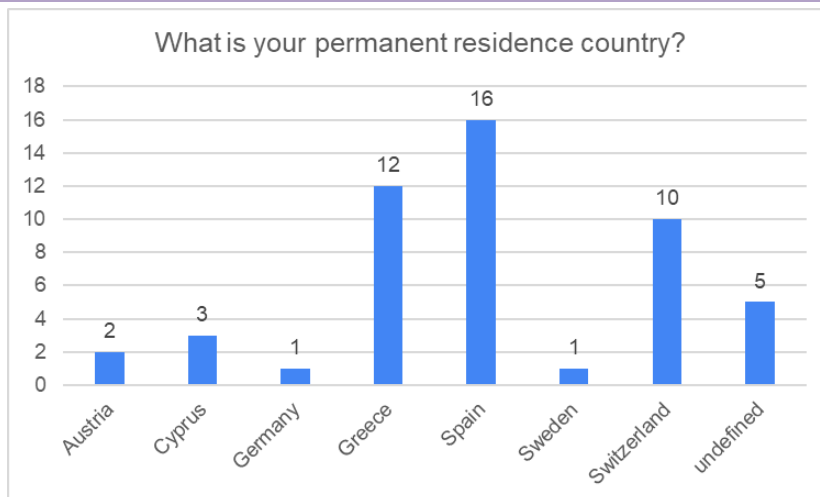


Figure 2: Market survey - Permanent residence country

3.2 Data Analysis: Survey results

The main results related to the energy market transformation and the customers' perspective elaborated from the questionnaire, are presented below. Initially, the background knowledge (i.e., demographics) and the familiarity of respondents with the local energy market technologies analysed. Then, energy market transformation insights, as provided in the answers of the respondents, are shown. It is notable in this questionnaire, that most of the respondents in this survey are coming from the Spanish and Greek market area and it should be remembered that the results reflect quite strongly the vision of the actors in those countries, as presented in Figure 2.

3.2.1 Background Knowledge

This section provides a review of the data collected from the respondents. There are analyses relating to the background of the respondents. The background of the respondents directly influences the outcomes of this type of survey, and thus the division between different types of background should be as flexible as possible.

There are totally 47 respondents, which have answered the part of the questionnaire that is dealing with demographics. The gender of the responders is depicted in Figure 3 and the majority of them male. Figure 4 depicts the age range of survey respondents. Adults between the ages of 30 and 39 are over-represented in this survey sample, young adults ages 18-24 are under-represented, while older people above the age of 60 are not represented at all.

1. Which category below includes your age?
47 responses

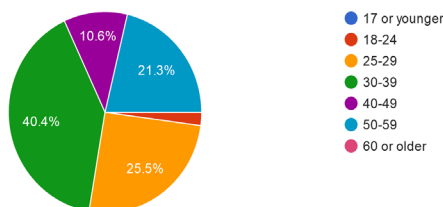


Figure 3: Market survey – Aging demographics

2. What is your gender?
47 responses

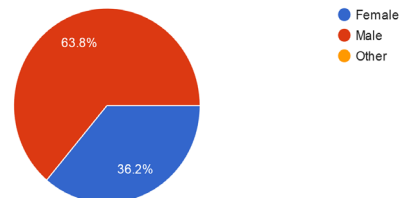


Figure 4: Market survey – Gender demographics

The education background of the respondents can be seen from Figure 5. The majority of the participants hold a Master's degree (55,3 percent), while an important part holds a Doctorate degree (29,8 percent).

3. What is your highest level of education?
47 responses

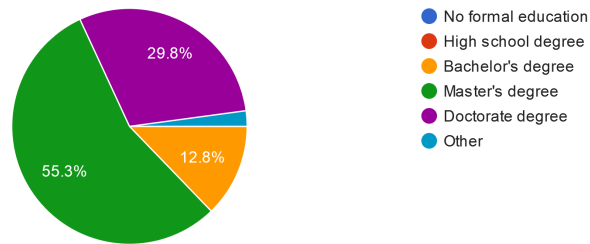


Figure 5: Market survey – Education demographics

An important parameter of the current survey is that most of the respondents have knowledge/experience in emerging technologies in the energy sector, such as renewable energy, microgrids, smart meters, blockchain and energy storage (Figure 6). Specifically, the majority of the respondents (51,1%) has a very strong understanding of such technologies, while only 6,4% of the respondents have heard of them, but not really understand what they are or their benefits.

6. What knowledge level do you have about emerging technologies in the energy sector (renewable energy, microgrids, smart meters, blockchain, energy storage technologies etc)?
47 responses

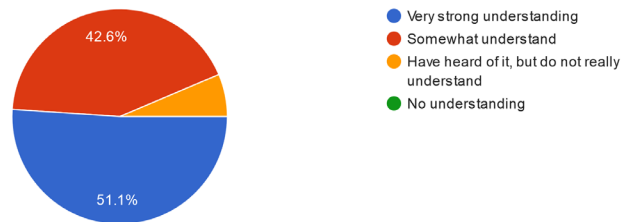


Figure 6: Market survey – Experience in emerging technologies

Regarding the awareness and understanding of emerging technologies, data shows (Figure 7) that national average scores are similar in the different countries, with Spain and Greece lying above the overall mean and Germany and Sweden positioned below.

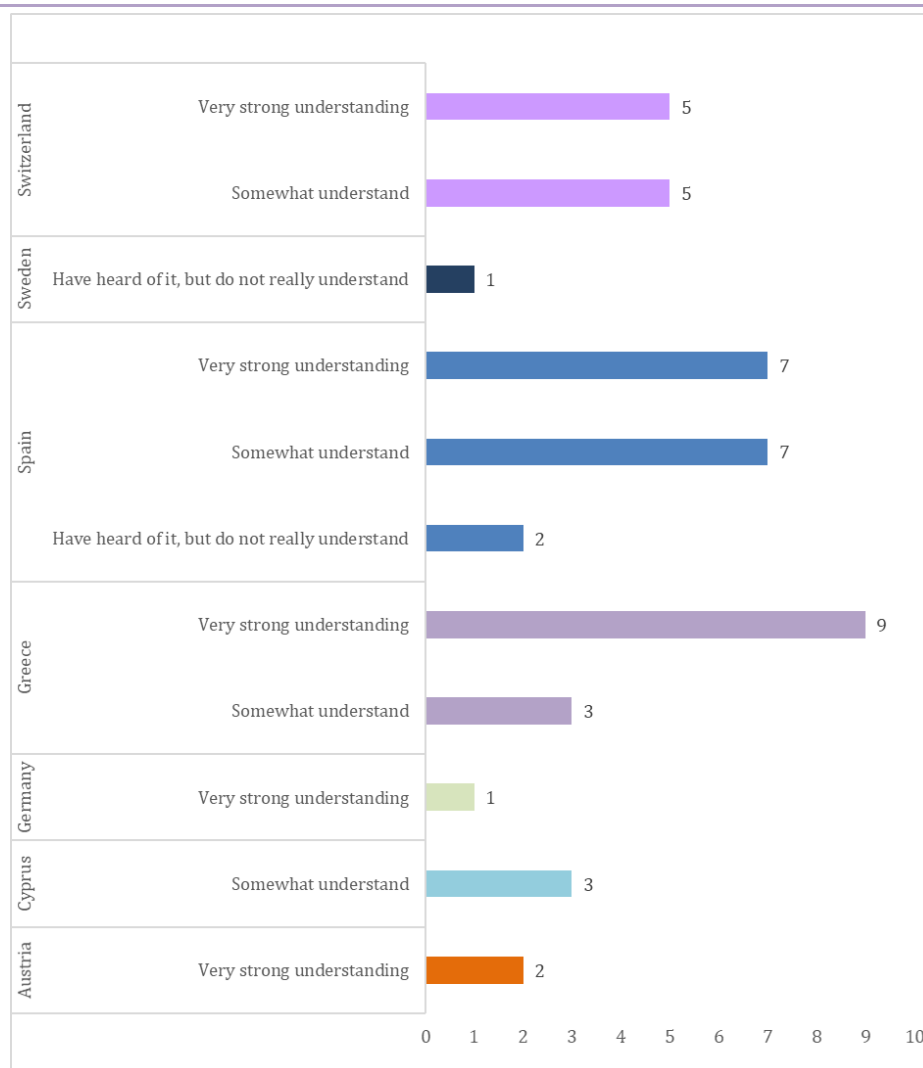


Figure 7: Market survey – Emerging technologies awareness per country

3.2.2 Energy transformation insights

This section provides a review related to the energy transformation the energy market is currently facing. The main focus of this section is to measure the awareness regarding energy market transformation.

Regarding the awareness of the final energy origin, data shows that the majority of the respondents know from where their final energy consumption is coming from, while a small percentage (8,5%) are not aware. As Figure 8 shows most energy consumption is coming from residual mix (59,6%), pure renewable energy sources are coming next with 17%, energy coming from power stations burning fossil fuels represent the 14,9% of the responses, while none of the respondents consumes energy coming exclusively from nuclear sources.

An interesting aspect regarding the origin of the energy consumed nowadays is depicted also in Figure 9, where it is evident how each country mostly consumes energy. At this stage, the authors of this deliverable would like to disclaim that the answers received through the conducted survey are not representative for the involved countries. Additionally, the authors would like to highlight that in order to reach such conclusions we would need the real generation data coming from different countries. From the data coming from the conducted survey, we can say that Sweden, Switzerland, Austria, Germany and Cyprus are moving rapidly towards greener energy consumption since all of the energy consumed is coming either from residual mix or from pure renewable energy sources. On the other hand, Spain and Greece are still consuming some amount of energy coming from power stations burning fossil fuels,

although the majority of the respondents coming from those countries state that their electricity is coming from residual mix.

7. In your final energy consumption, do you know from where the electricity comes from?
 47 responses

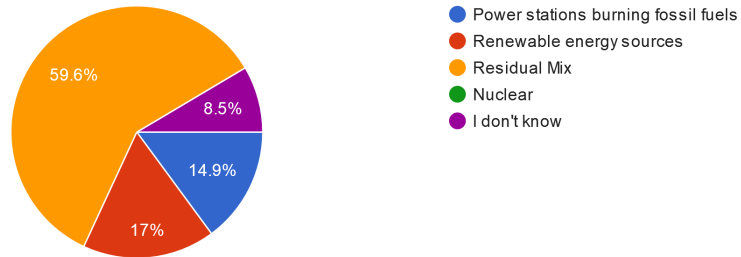


Figure 8: Market survey – Main source of energy consumption

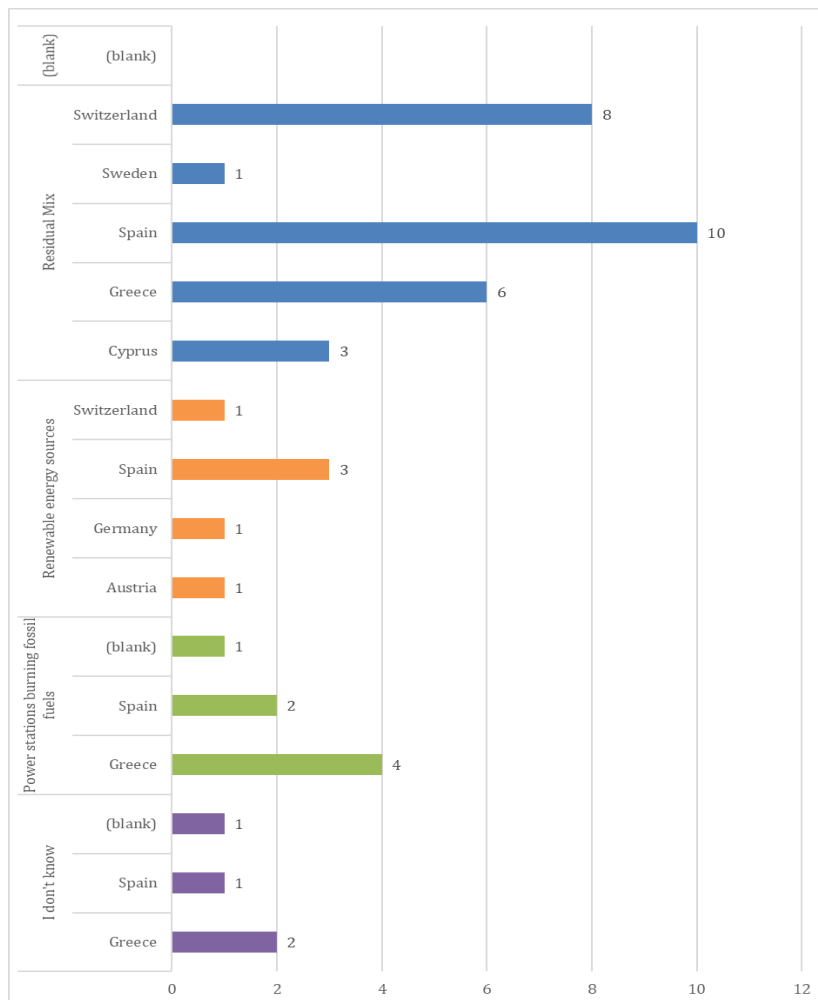


Figure 9: Market survey – Main source of energy consumption per country

Additionally, in relation to their energy bill most respondents state that they are satisfied in terms of costs (51,1%), as depicted in Figure 10. A significant percentage though does not find its current energy bill reasonable (33,3%), while an important part of the respondents does not have a clear opinion in terms of the financial aspects (15,6%). It is worth mentioning though, that as shown in Figure 11, that

the majority of people consuming energy from residual mix are feeling satisfied with their energy bill, while none of them find it reasonable when it comes to energy coming from power stations that are burning fossil fuels.

8. Do you think that your current energy bill is perceived as reasonable in terms of costs?
 45 responses

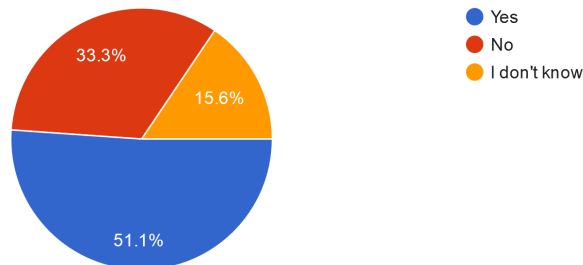


Figure 10: Market survey – Perception of energy bill pricing

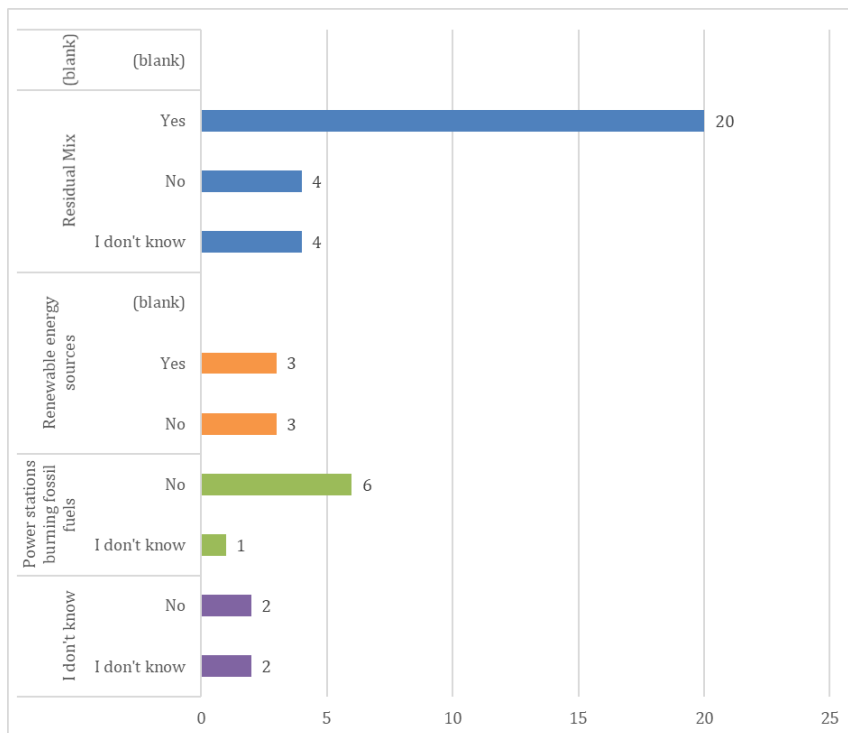


Figure 11: Market survey – Perception of energy bill pricing per country

The large majority of the sample (85,1%) consider that the risk is higher with energy systems based on more centralized energy ‘generation’, compared with the 8,5% of the total sample which thinks is lower and the 4,3% which thinks is the same, as depicted in Figure 12.

9. Do you think that the risk is higher or lower with energy system based on more centralized energy 'generation'?
47 responses

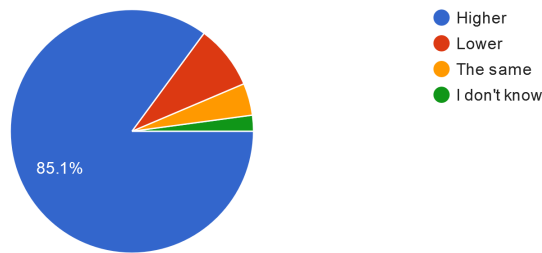


Figure 12: Market survey – Risk in centralized and decentralized energy generation

Trying to identify why the majority of the sample think the risk is higher, we tried to categorize possible risks electricity markets based on more centralized generation are facing. Most of the respondents state that the highest risk in more centralized energy markets are the emissions and/or the air pollution. The second risk in line is identified as medium by the majority of the respondents and is related to the energy availability and supply risk of the centralized markets, while also cyberattack, bulk generation of energy and the risk of unjust pricing schemes are considered as medium risks as well (Figure 13).

9a) What do you think are the main risks electricity markets based on more centralized generation are facing?

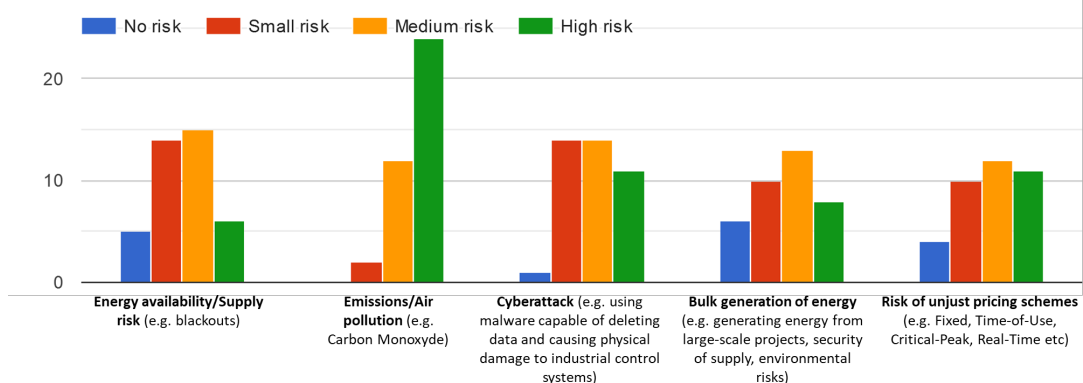


Figure 13: Market survey – Main risks of centralized energy generation

Regardless their belief related to the risk of the more centralized energy markets, the respondents were asked in how many years they anticipate the energy market to be mostly based on DERs such as photovoltaics and electric vehicles. The response was distributed almost equally, making it difficult to extract a clear prediction, as shown in Figure 14. A slightly higher percentage believes that by the end of 2035 the energy market will be based mostly on DERs, although there were some comments from the respondents (5 out of 47 responses) stating that they anticipate it later (2050 onwards) or never. Additionally, as also stated by one participant, DERs (especially EVs) will be widely applied by 2025, but in a rural area, centralised power plants (e.g., hydro, gas) will still play a significant role in electricity production.

10. In how many years do you anticipate the energy market will be mostly based on Distributed Energy Resources (DERs) (e.g. solar photovoltaic, electric vehicles)?
47 responses

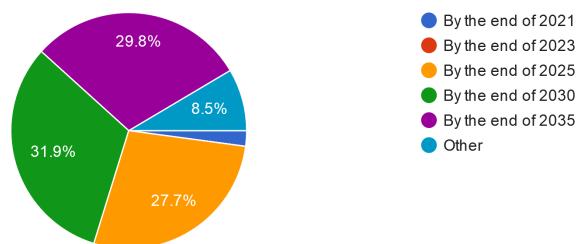


Figure 14: Market survey – Adoption of DERs anticipation

Based on the respondents the aforementioned anticipation is due to the fact that EU and national regulations and legislations are considered as the obstacles having the highest impact in the fast adoption of LFMs, as shown in Figure 15. Insufficient technological design, lack of standardization as well as lack of interoperability between equipment and stakeholders are obstacles that are also having a medium impact as highlighted by most of the respondents. Moreover, the attitude of the market’s stakeholders is also considered to play a key role in the adoption of such markets.

11. What of the following obstacles for fast adoption of Local Flexibility Markets (LFMs) do you think have the largest impact?

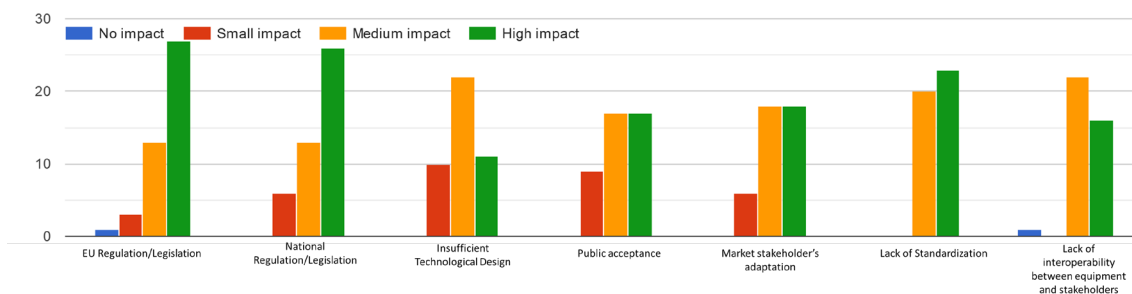


Figure 15: Market survey – Impact of obstacles in the fast adoption of LFMs

Question 12 links directly from the previous question with regards to resources (i.e., funding/monetary incentives, information material, regulatory incentives) available to promote the development of renewable energy in the respondents’ country, particularly for small renewable energy producers and citizens. In the online survey 76,6% said that they are available resources in their country, 17% said that they are not, while a further 6,4% does not have the knowledge to answer, as depicted in Figure 16 and 17.

12. To the best of your knowledge, are there any resources (i.e. funding/monetary incentives, information material, regulatory incentives) avail...for small renewable energy producers and citizens?
47 responses

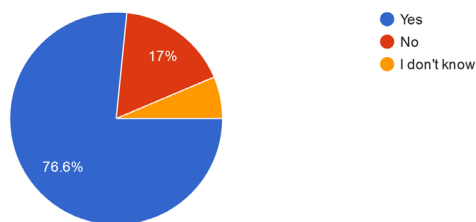


Figure 16: Market survey – Available informative resources

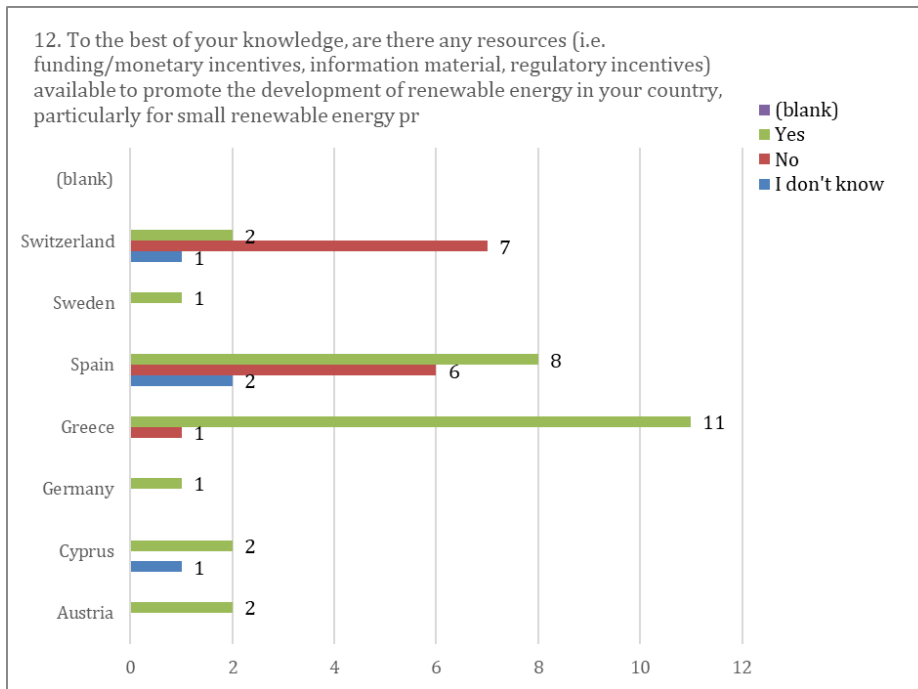


Figure 17: Market survey – Available informative resources per country

Additionally, to the available resources, in the online survey 59,6% said that they are feed-in tariffs in their country, to accelerate investment in renewable energy technologies by offering long-term contracts to renewable energy producers, with the majority of them being present in Greece and Spain. Although, there are countries that do not provide such policy mechanisms, considering the 31,9% of the respondents who answered “No”. The majority of them are coming for Switzerland, as shown in Figure 18 and 19.

13. To the best of your knowledge, are in your country guaranteed feed-in tariffs set to encourage energy from renewable sources?

47 responses

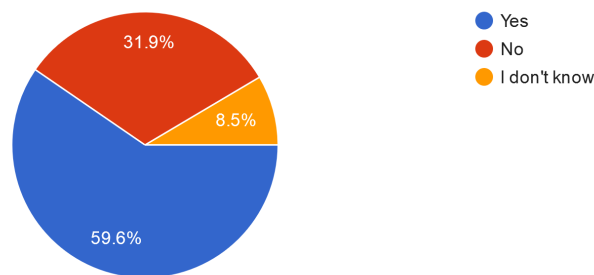


Figure 18: Market survey – Feed-in tariffs for encouragement

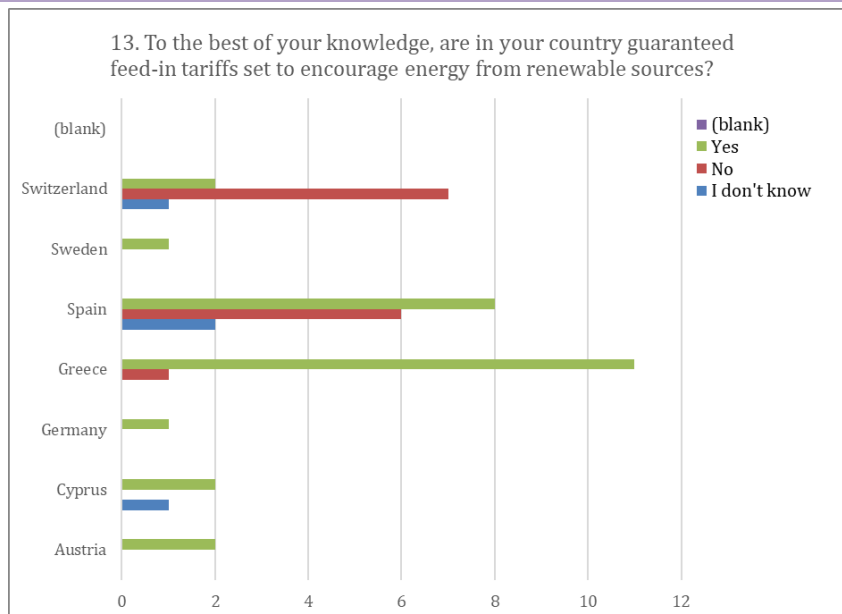


Figure 19: Market survey – Feed-in tariffs for encouragement per country

3.2.3 Market Change

Moving on to the next section of the survey, it is becoming evident that a number of changes have taken place within the global energy market. Thus, this section provides a review related to the energy market change, evaluating the participants’ opinions on the concept of LEM and LFM, and focusing on what would motivate people to participate in such markets.

Since local energy communities are entering the hype, the adoption of peer-to-peer (P2P) electricity trading will turn individual consumers from passive to active managers of their networks. Such a marketplace can relieve constraints on the growing system and offer an alternative to costly grid reinforcements. The above statement is proved also through the survey, considering that 70,2% of the respondents believe that there are financial benefits for the consumers and prosumers within a local energy community (Figure 20). Additionally, a 66,6% percentage thinks that there are attractive business opportunities for new stakeholders, while another 66,6% find it reasonable to participate in such markets due to the increased investment in renewables (e.g., PV) and other DERs (heat pumps, battery storage, EV etc.).

Do you see a benefit in participating in a local energy community where you can buy and sell electricity from/to local peers/neighbours in an a...echanism is part of this Local Energy Community)?”
47 responses

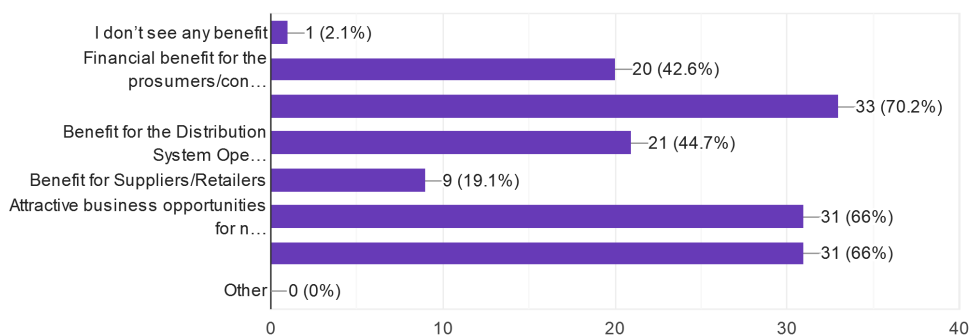


Figure 20: Market survey – Participation in local energy community benefits

As most of the respondents agree that there is a significant financial benefit for the prosumers, it was necessary to investigate in how many years it is anticipated to have some sort of flexible energy assets established in new or existing households. 54,3% of the sample stated that most new buildings will have some sort of flexible assets established, 23,9% believes that most buildings (new or existing) will have some flexible assets, while only 8,7% thinks that all buildings will provide such capabilities (Figure 21). The above statements are relevant to all countries that participated in the survey, with Spain taking the lead in the belief that most new buildings will provide such capabilities in 5 to 10 years from now. Although, a significant 13% coming primarily from Sweden and Greece, and secondary from Spain thinks that only a few buildings will have some sort of flexible energy assets (Figure 22).

15. Which of the following statements would you agree to? In 5 to 10 years
46 responses

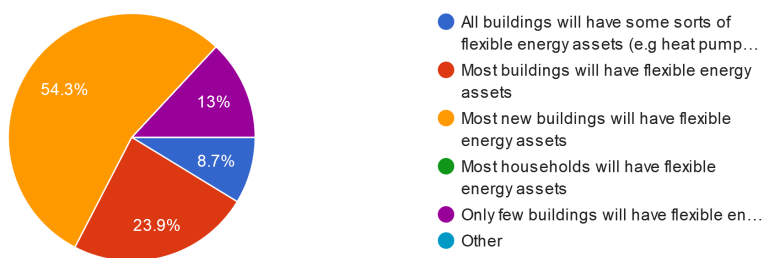


Figure 21: Market survey – Adoption of flexible energy assets within households

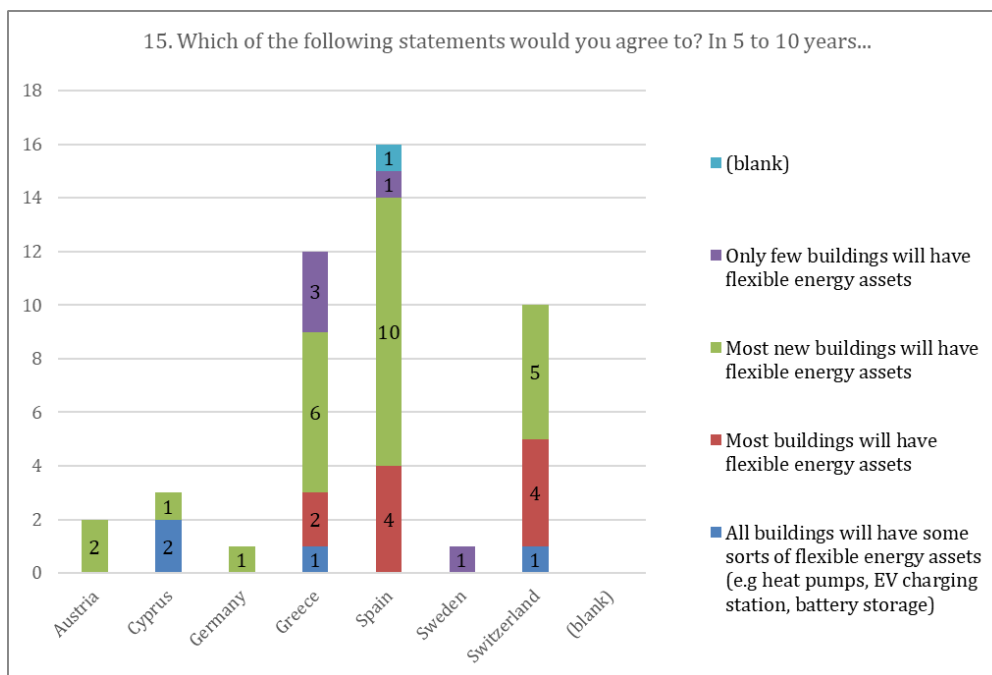


Figure 22: Market survey – Adoption of flexible energy assets within households per country

As derived from the responses, solar energy and flexibility derived from electric vehicles that can be controlled automatically, are the two most promising technologies that are expected to have the highest impact in local energy markets, along with the distributed energy storage through battery technologies, which is coming in third place (Figure 23). On the other hand, off-shore wind electricity generation, nuclear electricity generation and natural gas turbine electricity generation is forecasted to have no impact at all.

16. Which of the following technologies are you expecting to have the largest effect in the near future on your local energy market?

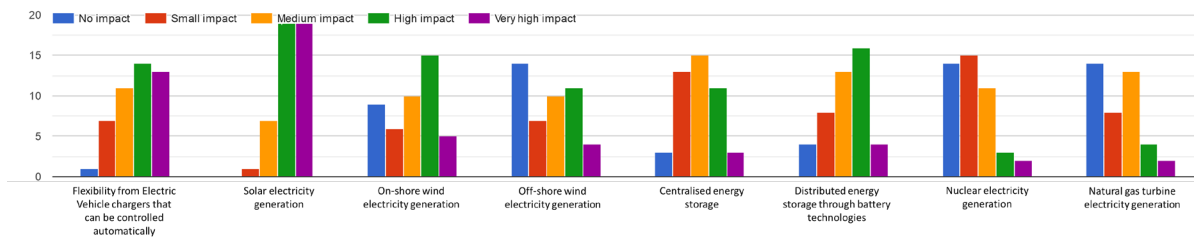


Figure 23: Market survey – Most effective technologies in LEMs

Nevertheless, the current energy market is expected to undergo significant change in the near future, as the 41,3% of the respondents agree that the market will have a significant change, while the 23,9% agree to have a very significant change (Figure 24).

17. How much changes do you expect the current energy market to undergo in the near future?
46 responses

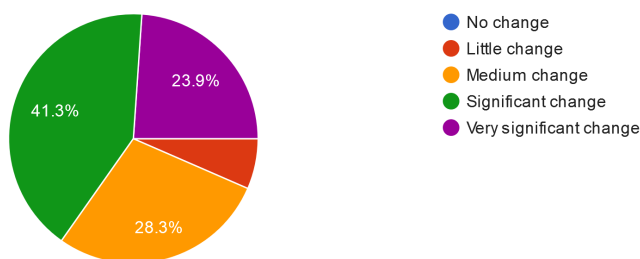


Figure 24: Market survey – Anticipated changes in the energy market

The most important concepts that are foreseen to change the current energy market are the electric vehicles, the large-scale centralized renewable energy generation as well as the distributed energy generation (Figure 25). Local energy systems and infrastructure were characterized as of medium importance, while the majority of the respondents agree that large-scale fossil fuel power generation will have no importance at all in the near future. From the above outcomes, it is obvious that we are moving rapidly in a distributed and renewable enabled energy market that will mostly be based on solar energy generation and flexibility that will come from electric vehicles' chargers.

18. What of the following concepts are you expecting to be of high importance in the near future?

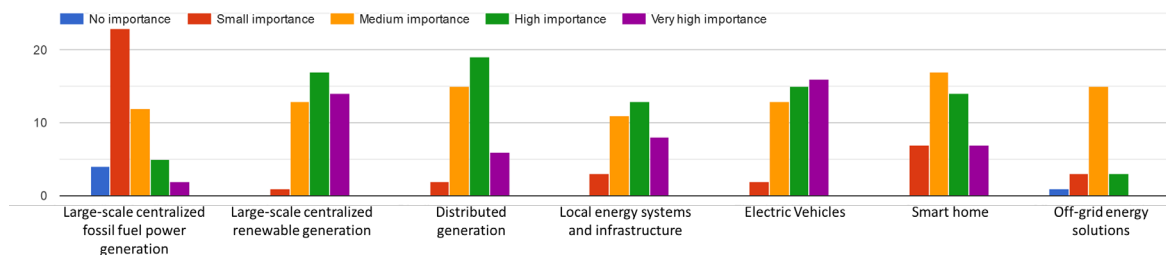


Figure 25: Market survey – Technologies of high importance for the next years

In regards to the changes in business models on the electricity markets, 85,1% of the sample anticipates the expansion of renewable energy, 68,1% the shift towards distributed generation and a significant 53,2% anticipated more competition to take place between different energy providers (Figure 26).

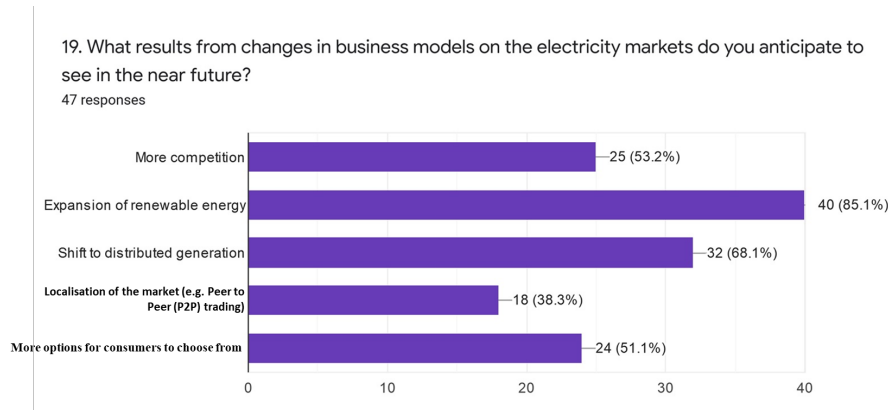


Figure 26: Market survey – Anticipated changes in the business models

In relation to the different capabilities in terms of the feasibility of the energy market business models, the majority of the respondents agree that smart control, dynamic pricing optimization mechanisms, efficient management of the energy assets as well as data security and confidentiality are of high importance (Figure 27).

20. How important will the following capabilities be in terms of the feasibility of energy market business models that include LFM and LEM components?

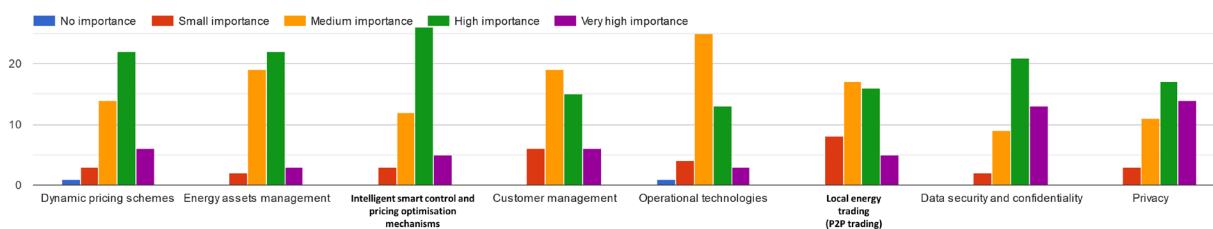


Figure 27: Market survey – Feasibility of business models that include LFM/LEM components

3.2.4 Market Segments

At the final stage of this survey, the sample was asked questions related to energy market tools and services. Thus, this section provides a review related market segments and possible trends.

The survey’s participants were asked to indicate which tools and services they think may boost the profitability and efficiency in use of DERs. As it was anticipated considering the abovementioned outcomes, the majority of the respondents believe that DERs personalized profile models (66%), load forecasting mechanisms (57,4%), dynamic pricing schemes (55,3%) and smart energy contracts (51,1%) are the services that have the ability to accelerate the profitability and efficiency of DERs, especially in LFM/LEM (Figure 28).

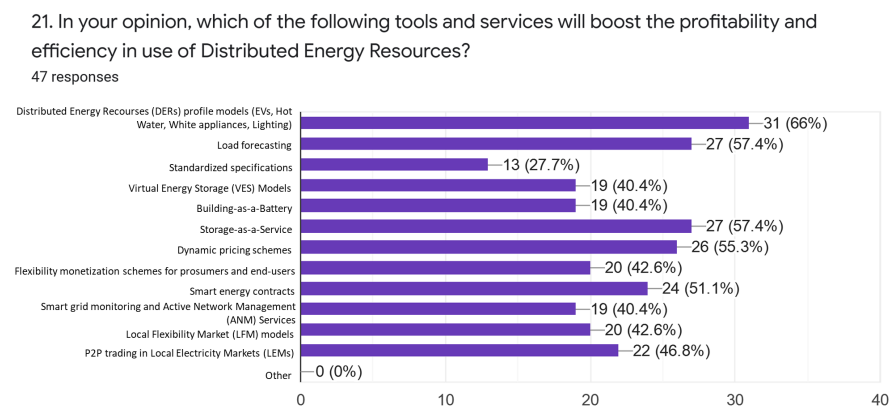


Figure 28: Market survey – Services that will boost the profitability and efficiency of DERs.

Additionally, apart from the aforementioned services, 87,2% of the sample strongly believe that real-time metering data is necessary to maximize the usefulness of LFMs/LEMs (Figure 29), while another 74,5% thinks that price prediction tools will increase the revenue by exchanging flexibility assets within such markets (Figure 30).

Moreover, considering that smart energy contracts have the ability to accelerate the profitability and efficiency of DERs, the respondents were asked if they find blockchain enabled smart contracts useful for that matter. 66,7% of the sample responded yes, leading to the outcome that blockchain technology and smart contracts specifically is a promising technology and could be a trend within local energy markets in the next years (Figure 31).

22. Do you think that real-time metering data is necessary in order to maximize usefulness and success of local energy markets?
47 responses

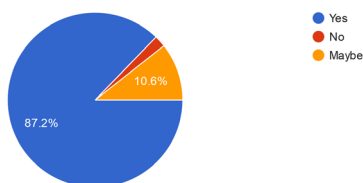


Figure 29: Market survey – real-time metering insights

23. In your opinion, do you think improved price prediction tools will increase revenue by exchanging flexibility assets within a Local Flexibility Market (LFM)??
47 responses

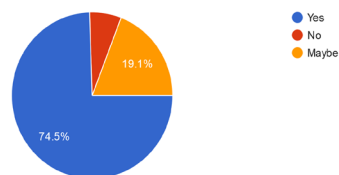


Figure 30: Market survey – Price prediction tools insights

24. In your opinion, do you think automated energy agreements could be helpful through use of blockchain-enabled smart contracts?
45 responses

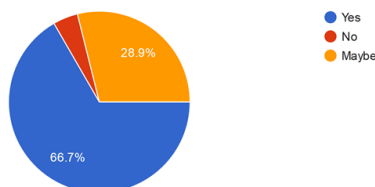


Figure 31: Market survey – Blockchain based agreements insights

Finally, since European funding schemes are considered an important parameter in the acceleration and development of technological solutions the survey participants were asked their opinion regarding what should be the focus in the future. Based on the responses, European funds should be primarily related to energy efficiency solutions (73,3%) and flexibility solutions (71,1%). Additionally, energy storage (68,9%) along with energy monitoring and control (64,4%) are functionalities that should also be focused and investigated more extensively (Figure 32).

25. In your opinion, do you think European funds could be oriented to develop technological solutions related to?
45 responses

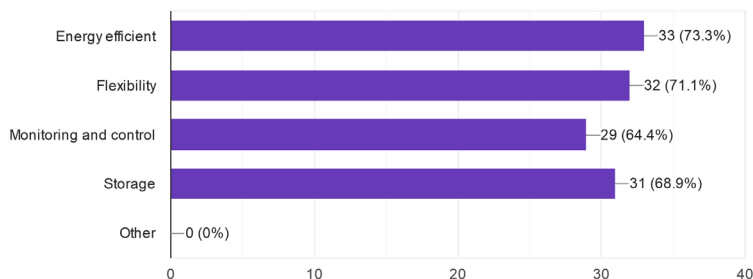


Figure 32: Market survey – Orientation of European funds