GWP2 - gD2.6 Stakeholder acceptance reports involving existing and new barriers

Monitoring stakeholders' acceptance

CO - FUNDED BY
THE EUROPEAN UNION

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement n°268206.

ID & Title :	gD2.6 - Stakeholder acceptance reports involving existing and new barriers		
Version :	V1.0	**Number of pages :**	26

• Short Description

This deliverable gD2.6 is a report about Stakeholder acceptance that involves existing and new barriers.

• Revision history

Version	Date	Modifications' nature	Author
V0.1	05/02/2014	Document initialization	Rafael Cossent
V1.0	16/06/2014	Complete draft for GWP2 comments	Rafael Cossent
V1.0	11/09/2014	Complete draft for TC review	Rafael Cossent

• Accessibility

■ Public	☐ Consortium + EC	☐ Restricted to a specific Group + EC	☐ Confidential + EC

If restricted, please specify here the group

• Owner / Main responsible

Name (s)	Function	Company	Visa
Rafael Cossent		Comillas University	

• Author (s) / Contributor (s) : Company name (s)

Comillas University

• Reviewer (s) : Company name (s)

Company	Visa
CEZ Distribuce, ENEL Distribuzione, ERDF, IBERDROLA Distribucion, RWE, VATTENFALL Eldistribution & RSE	Review validated by Technical Committee on October 21st 2014

• Approver (s) : Company name (s)

Company	Visa
CEZ Distribuce, ENEL Distribuzione, ERDF, IBERDROLA Distribucion, RWE, VATTENFALL Eldistribution	Approved by Steering Committee on October 21st 2014

Work Package ID:	**GWP2**	**Task ID:**	**GWP2.5**

Executive summary

Attaining the goals of the six GRID4EU demonstrations as well as the potential subsequent wide-scale deployment of smarter distribution grids requires the involvement of several stakeholders, besides DSOs. For instance, consumers or DG units may be asked to provide system services or manufacturers may be required to deliver new smart grid technologies. Hence, it is important to identify what are the expectations of other stakeholders involved and why or how they could oppose to the development of the smart grids. The main stakeholders that have been identified comprise the following: regulators, TSOs, consumers, DG operators, equipment manufacturers, retailers, aggregators or software/ICT services providers.

Therefore, the goal of this report was to characterize the viewpoints of different stakeholders, besides DSOs, relevant to the success of the demonstration activities and smart grid deployment. This was done by means of an online questionnaire, designed after reviewing several similar studies previously carried out, which enquired respondents about their opinions about the main components, drivers and barriers for smarter distribution grids.

The survey results show that stakeholders expect smart grids to enhance the efficiency and sustainability of our future power system. The wider adoption of ICTs is frequently mentioned as an essential component of smarter grids. Moreover, stakeholders expect smart grids to benefit end consumers directly and to contribute to meeting energy policy objectives such as energy independence and lower emissions.

Nonetheless, important barriers are envisioned. Despite the fact that implementation costs are indeed seen as a major issue, the most important barriers are considered to be related to inappropriate regulatory frameworks and unclear or insufficient benefits.

The active participation of DG is seen hampered mainly by regulation whereas demand response reportedly needs to overcome unresponsive consumers and ineffective retail markets. Furthermore, demand response is considered to be hindered by very low individual gains. Lastly, EVs are considered to be under developed mainly due to costs and technology-related aspects.

The aforementioned results will be used as an input for scalability and replicability analysis as they allow the identification of potential barriers for the implementation of certain smart grid solutions.

Table of content

List of figures

List of tables

1 Introduction and scope of the document

1.1 Scope and structure of the document

The present document summarizes the work developed within GWP 2.5 that intends to analyze the viewpoint of different stakeholders, besides DSOs, relevant to the success of the demonstration activities. The main tool that has been used to achieve this is an online survey that asked respondents about their views on the main components, drivers and barriers for smarter distribution grids. The qualitative results are used as an input for scalability and replicability analysis as they allow the identification of potential barriers for the implementation of certain smart grid solutions.

The remainder of this report is structured as follows. Section 2, enumerates and describes the main stakeholder groups that are targeted by the survey. In order to support the development of the aforementioned questionnaire, a review of existing surveys with similar goals was performed. This review, which is presented in section 3, yielded a set of guidelines to conduct the design and diffusion of the questionnaire that are presented in section 4. Section 5, which constitutes the core of this document, summarizes the responses and results obtained from the survey. Lastly, some concluding remarks are provided in section 6.

1.2 Notations, abbreviations and acronyms

CHP	Combined Heat and Power
DER	Distributed Energy Resources
DG	Distributed Generation
DSM	Demand Side Management
DSO	Distribution System Operator
EU	European Union
ICT	Information and Communication Technologies
KPI	Key Performance Indicator
NRA	National Regulatory Authority
PV	Photovoltaic
RES	Renewable Energy Sources
TSO	Transmission System Operator

Table 1: Acronyms

2 Stakeholders characterization

Attaining the objectives of the different demos requires the involvement of several stakeholders, besides DSOs. For instance, consumers or DG units may be asked to provide system services or manufacturers may be required to deliver new smart grid technologies. Hence, it is important to identify what are the expectations of other stakeholders involved and why or how they could oppose to the development of the smart grids. The main stakeholders that have been identified are the following:

- National regulatory authorities (NRAs)

The required transformation towards smarter distribution grids may only happen if a clear and stable regulatory framework is in place. On the one hand, regulation should establish the necessary conditions to encourage DSOs, as regulated companies, to adopt new technologies and incorporate the distributed flexibility in network planning and operation while ensuring economic efficiency. On the other hand, regulation should as well align the economic signals perceived by DER with the new requirements.

Regarding the project demos, national regulatory frameworks may limit the implementation of certain solutions or hamper their long-term application. For instance, appropriate distribution grid codes may be required to set the conditions under which DER may deliver system services to DSOs in fair and transparent conditions.

- Transmission system operators (TSOs)

Distribution networks are connected downstream of the national transmission grid which is operated by a TSO. The electricity inflows from the transmission to the distribution level may be significantly altered by demand response and DER flexibility management. TSOs may even purchase ancillary services from DER to support system operation.

Potential barriers related with TSOs may arise during the implementation of the demos as a result of technical requirements imposed on DSOs at the boundary network buses. For instance, DSOs may be required to maintain a certain power factor in the substation connecting transmission to distribution, which can be affected by the implementation of new operational practice in the downstream distribution grid.

- Distributed generation (DG)

The overall energy policy objectives drive large penetration levels of distributed and renewable generation. These generators conventionally perceive little incentive to behave proactively despite the fact that they could potentially provide several services to network operators, due to the inexistence of appropriate regulatory and economic signals e.g. flat feed-in tariffs. However, high amounts of DG may not be efficiently integrated under conventional practices in power systems. Therefore, new interconnection standards and incentives to encourage their active involvement in power systems should be set.

DG owners could be reluctant to provide system services in case their economic benefits could be significantly reduced or due to other reasons, e.g. CHP units may not modify their electricity production owing to the need to comply with thermal load constraints.

- Consumers

Consumers have traditionally behaved only as network users who demanded a reliable electricity supply at reasonable pricing. Smart distribution grids will bring about new opportunities for consumers to improve the quality of service and new DSM services. This would additionally allow consumers to change supplier according to the products that are more suitable to their specific needs. Furthermore, this could also require them to become more active players in the power sector by participating in demand response programs or by installing microgeneration units (PV, microCHP).

While developing the demos, DSOs may find consumers that are reluctant to modify their behaviour, especially if they perceive scarce benefits from this. Another potential barrier is that consumers may not fully understand or accept the longer-term benefits related with enhanced quality of service.

- Manufacturers of smart grid equipment/providers of software and ICT services

This is a heterogeneous group that comprises equipment manufacturers, providers of software services (IS integrators, software developers, etc.) and providers of ICT services. They will be key stakeholders in the development of new smart grid technologies and solutions. Hence, they should cooperate with network companies towards an effective and efficient large-scale deployment. It is desirable that the solutions developed are open and interoperable to facilitate the transition. Innovative technological developments are required in grid components, DG interfaces, demand response, control centres and smart metering solutions and information and management systems.

Regarding the project work, these stakeholders and DSOs may present divergent views about the specifications and functionalities of devices and solutions. Moreover, in case these are not fully open and interoperable, this could hamper the utilization of devices, ICT systems and software from different agents in the demos.

- Retailers/suppliers/aggregators

Electricity retail markets are not fully developed yet, particularly for small end consumers. Nonetheless, smart metering and new architectures can potentially be drivers of change in this regard. Thus, suppliers will have to meet the growing needs of consumers offering innovative energy and billing services. These services should have some added value for their customers in economic or environmental terms since this is liberalized activity where competition is promoted. Aggregators are a particular kind of retailer, in the sense that they engage in contracts with end consumers to manage their energy consumption, which specialize in gathering distributed flexibility from network users so as to provide system and network services. Hence, retailers and aggregators will become key agents in smart distribution grid with active demand response.

During the implementation of the demos, retailers may be unable to meet the needs of DSOs at a

particular time since these may not coincide with those of aggregators who may find a higher opportunity cost in the delivery of other services. Moreover, given that retailers are the agents that have a more direct relationship with end consumers, they may be unwilling to carry out certain actions which may raise complaints from consumers.

3 Review of previous surveys

In order to determine the contents and format of the questionnaire developed within this project, an analysis of previous surveys serving similar purposes has been carried out. Several previous studies have been identified, showing large variations in terms of the objective of the survey as well as the target groups and respondents. The most relevant studies that have been considered are the following:

- **Pacific Crest survey on smart grids:**

The main objective of this survey (13 questions) carried out in July 2009 was to gather knowledge about the views of relevant utility decision-makers about the deployment of smart grids (drivers, barriers and timing). The target group of the survey comprised people with some responsibilities related with budget spending or technology selection in US electric utilities. Respondents amounted to 20 individuals.

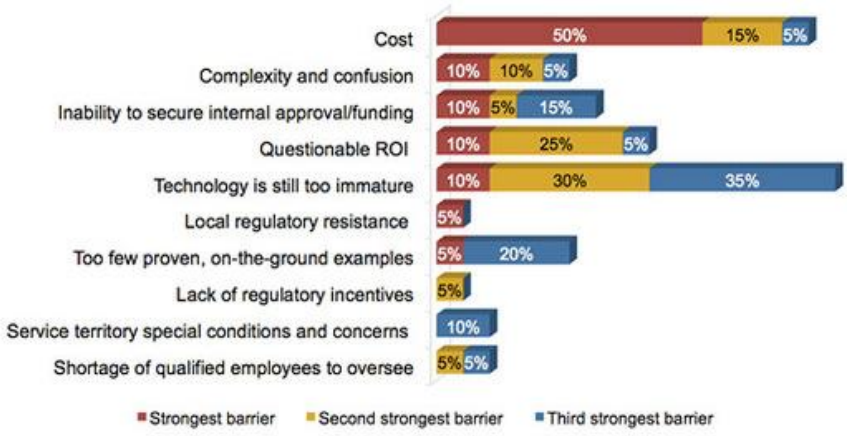

Figure 1: Most relevant barriers to smart grids (Pacific Crest Mosaic, 2009)

The questionnaire mostly comprised closed-form multiple-choice questions and can be clearly divided into three sections. The first one asks for information about the companies which respondents work for and their responsibilities. The core section of the questionnaire addressed topics like drivers, barriers, technologies, regulation or applications. In this section, a high number of possible answers were provided and respondents were asked to provide three answers in descending order of importance. An example of the results obtained is provided in Figure 1. The last section of the survey addressed the time horizons in which respondents expected different pricing schemes or technologies. In this case, a single answer was required.

- **EcoPinion surveys on several topics:**

Ecoalign is a marketing agency specialized in topics related with energy and environment. It has

carried out several surveys that can be relevant for GRID4EU. All these surveys count with 15 to 20 questions and focus specifically on US consumers. The sample comprises 1000 consumers and is designed so as to be representative of the overall US population.

(Ecoalign, 2009) provides insights about the perception of consumers about several concepts frequently used in the media such as energy conservation, clean energy, smart meter, smart grid, etc. in order to test whether advertising and communications are effective. Several types of questions were designed for this, being respondents asked to determine whether a specific definition or adjective fitted a particular term or rating their own knowledge about a particular issue from 1 to 10.

The surveys closer to the aims of this study are those reported in (Ecoalign 2010) and (Ecoalign 2011a), where the consumers' perceptions and attitudes towards smart grids are evaluated. Since similar surveys are available for two consecutive years, it is possible to examine the mind change after some experiences with smart meters in the US. Firstly, the questions address consumers' awareness about smart grids and related concepts. Then, the definition of smart grids is provided before continuing with the remaining questions. Based on this definition, respondents were asked to provide answers about their expectations and preferences for services, communications, etc.

Finally, (Ecoalign, 2011b) explored whether consumers were really willing to have a wider choice and competition in electricity retailing. The first questions of the survey aimed to determine to what extent consumers were actually aware of their possibilities to contract electricity services and how they would describe their current supplier. The remaining questions explored the concerns and the services consumers would be willing to pay more or be more interested in. Most questions were single-answer multiple-choice ones, albeit a few asked consumers to mention the first word that came to their minds about energy deregulation or their local utility.

- **DEFG survey on communicating the value of the smart grid:**

The Distributed Energy Financial Group LLC conducted a survey (19 questions) in April 2010 among energy experts about the benefits of smart grids, their allocation among stakeholders and how to raise awareness about these benefits. The 358 respondents comprised many types of stakeholders such as consultants for utilities, government, academics, integrated utilities, local municipal or cooperative electric companies, manufacturers, consumers, etc.

As in other cases, the survey starts with a few questions about the respondents' characteristics. A second block of questions addressed the distribution and understanding of the benefits of smart grids among stakeholders. The third and last set of questions dealt with how to communicate the expected benefits of smart grids to the different stakeholders. The survey combined several types of questions such as rate questions (1-10), open questions with a one-word answer (the results were presented as word diagrams) and ranked questions (from 1st to 5th choice). As an example, Figure 2 shows the results they obtained by asking with a ranked question about the expectations of small consumers from smart grids.

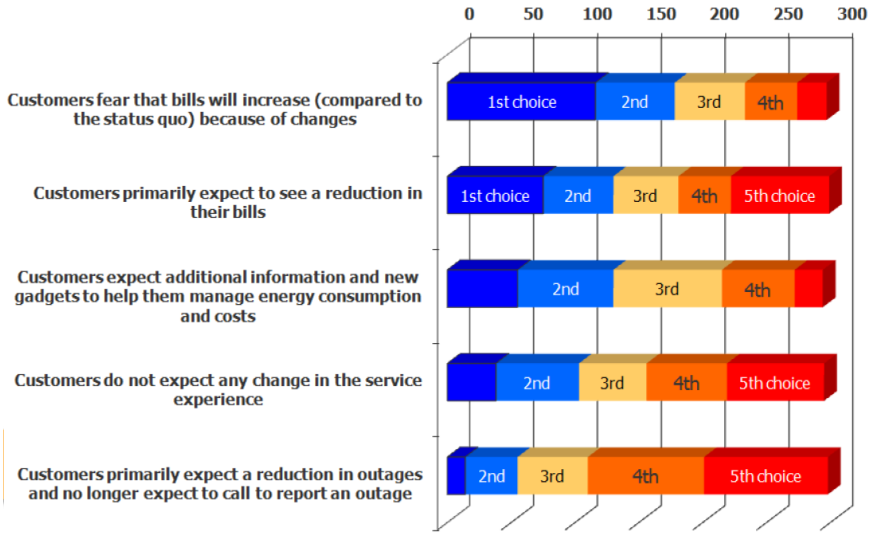

Figure 2: Expectations of small consumers from smart grids (DEFG, 2010)

- **Survey on smart grids regulation. Comillas University:**

The last survey-based study (12 questions with several sub-questions) on smart grids that has been found was developed in a Master Thesis from Comillas University (Arronte, 2010). Although the main focus of this survey was on regulatory issues, some other topics such as barriers, drivers and pilot projects were also analyzed. The survey did not focus on any specific target group, but covered a wide range of stakeholders comprising suppliers, TSOs, DSOs, regulators and independent agents (consultants, researchers, etc.). In total, 35 worldwide responses were obtained, mostly from the US and Spain (24 out of 35), being independent agents and suppliers the most common type of stakeholder (14 and 12 answers respectively).

After a few initial questions to characterize the respondents, the remainder of the survey focused on the expected benefits of the smart grids, the barriers to their development, current regulatory schemes fostering the adoption of new technologies and on-going pilot projects. All questions were importance-type multiple-choice single-answer ones.

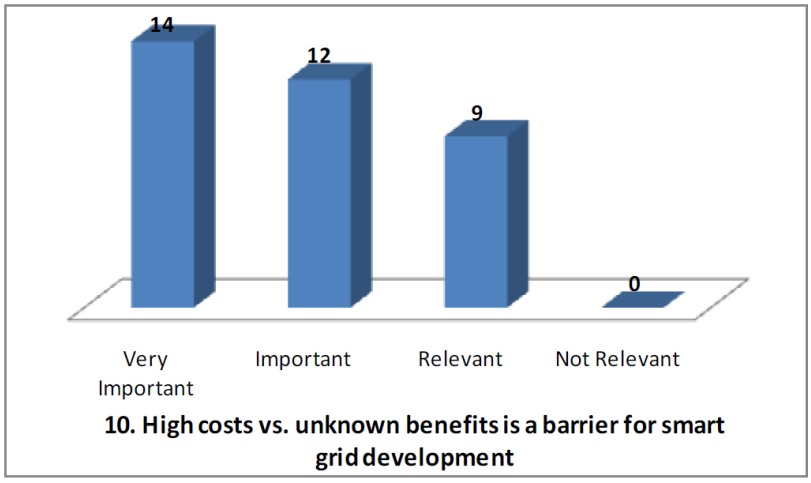

Figure 3: Uncertainty about costs as a barrier to smart grid development (Arronte, 2010)

4 Questionnaire design and diffusion

The previous review has shown that some of the previous surveys were specifically focused on a target group whereas others covered a much wider range of stakeholders. This shows that it is possible to design a questionnaire fit for all the stakeholders that have to be addressed within the GRID4EU project. Moreover, most surveys have been carried out in the US except for (Arronte, 2010) and even in this case US respondents were among the most numerous. Hence, the survey that herein presented constitutes one of the first with a specifically European scope. Finally, all the questionnaires limited the number of questions to less than 20 questions with a closed form or open form with one-word answers. Ranked or preference questions are particularly popular. These guidelines have been followed in the design of the questionnaire presented in this report.

The target groups of the survey corresponded to individuals that are somehow involved in the subject at hand, but may be reluctant to spend much time in fulfilling the questionnaire. Therefore, in line with previous experiences an on-line questionnaire prepared under a user-friendly environment was considered to be the best option. This questionnaire was integrated within the project website and advertised in its main page in order to obtain the highest possible number of responses. Aiming to facilitate the participation, the questionnaire mostly comprises multiple-choice questions where respondents could provide several answers, e.g. what are the benefits expected from smart grids ordered by relevance?, or a single answer, e.g. yes/no questions, rate from 1-10 questions, etc.

The topics to be addressed were determined based on the previous review as well as the objectives of the GRID4EU demos. Firstly, respondents were requested to answer a few questions to characterize them, i.e. type of stakeholder, country of origin or current level of knowledge. Subsequently, the survey turned to obtaining a better picture of the viewpoint of the respondent regarding smart grid components, drivers, benefits and barriers. Lastly, respondents were invited to provide additional comments or suggestions. For further details, the full contents of the questionnaire can be consulted in Annex A of this report.

5 Results obtained

A total of 42 responses were collected. This amount of responses is in line with some of the previous surveys described in section 3, albeit somehow in the lower range. Since the goal of this questionnaire was to provide a qualitative input to scalability and replicability analysis, this is considered enough for the project's purposes. Note that contrary to some of the previous studies (e.g. Ecoalign, 2010) performing statistical inference was not required. The remainder of this section summarizes and assesses the main results that have been obtained.

5.1 Characterization of respondents

In order to evaluate the responses, it is first needed to characterize the participants. It can be seen in Table 2 that a wide range of different stakeholders was reached; covering all the types of stakeholders initially identified plus a few others such as consultants and venture capital firms. The number of responses is widely distributed among different groups, being consultants, researchers and manufacturers the most widely represented.

Type of stakeholder	Number	%
Regulator	3	7%
Supplier / Retailer	4	10%
Transmission Company / Transmission System Operator	2	5%
Distribution Company / Distribution System Operator	2	5%
Aggregator	1	2%
Equipment manufacturer	6	14%
Distributed Generation	1	2%
End-user	1	2%
Other:	22	52%
Consultant	8	19%
Research	6	14%
Consumer association	1	2%
Venture Capital firm	1	2%
Public institution	1	2%
Installer	1	2%
Unknown	4	10%
TOTAL	42	100%

Table 2: Characterization of respondents - type of stakeholders

Table 3 shows that stakeholders from up to twelve different countries filled in the questionnaire. The sample is clearly dominated by stakeholders from many of the GRID4EU demo countries. In particular, Spain accounts for more than 30% of the answers.

Country	Number	%
Spain	13	31%
France	4	10%
Italy	6	14%
Germany	4	10%
Sweden	0	0%
Czech Republic	3	7%
Denmark	2	5%
Netherlands	1	2%
Belgium	2	5%
Norway	1	2%
Croatia	1	2%
Finland	1	2%
Portugal	2	5%
Unknown	2	5%
TOTAL	42	100%

Table 3: Characterization of respondents - country

Lastly, respondents were asked to rate their own knowledge about the world of smart distribution grids in a scale from 1 to 10. The results plotted in Figure 4 present a clearly right-tailed distribution (average rating is 7.7 with a standard deviation of 1.7), i.e. respondents reportedly have quite a deep knowledge about the issues discussed in the questionnaire. The major reason for this is presumably that the survey was mostly presented through the project newsletter, web page and dissemination events through which a relatively experienced audience is more likely to be reached.

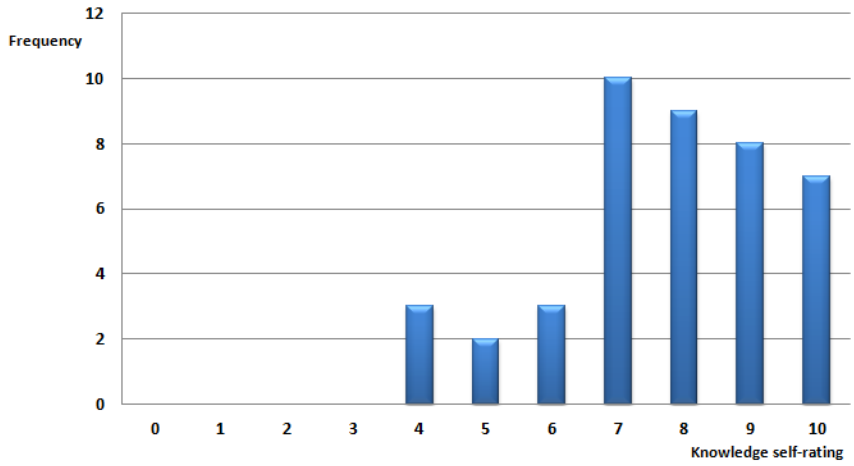

Figure 4: Characterization of respondents - a priori self-rating of knowledge about smart grids

5.2 Analysis of responses

As an introductory question, respondents were asked to state the first word or sentence that they associate with the term smart grid. The answers show a clear tendency to relate smart distribution grids to ICTs and DER, comprising DG, demand response, RES, etc. Other important terms are related to the notion of sustainability, efficiency and future. In Figure 5 the words listed by respondents are represented in a word cloud, where most frequently mentioned words appear in a larger size.

Figure 5: Main word associated with smart grids[1]

Additionally, the survey intended to gather the general expectations that stakeholders have about smarter distribution grids. In order to do this, they were firstly asked about what the most important components of smart distribution grids would be according to their viewpoint. The answers are summarized in Figure 6. The format adopted is similar to that used in (Pacific Crest Mosaic, 2009), i.e. the total length of the bars represent the share of respondents that selected a specific option as an essential component whereas the different portions of that bar show the share of respondents that chose that option as the first, second and third most relevant one respectively[2]. The same format will be used throughout this section.

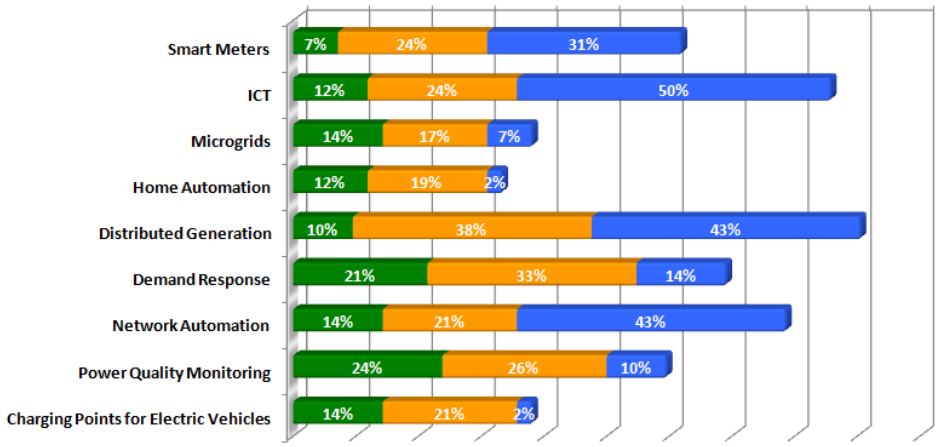

Figure 6: Essential components of smart distribution grids. Blue - 1st option, yellow - 2nd option, green - 3rd option

It can be seen that most respondents list DG, ICT and network automation as the essential components of smart grids. Smart meters are the next component that is most frequently selected as the first option (31% of respondents stated that it was the most essential components of smart grids) which is in fact strongly related to the two next components in terms of importance which are

[1] Word cloud created through the on-line application *tagxedo* available at: http://www.tagxedo.com/app.html

[2] Note that, contrary to the above referenced survey, the shares for 1st, 2nd or 3rd place (vertical summation) do not add up to 100% because several respondents marked more than one answer with the same degree of relevance.

demand response and power quality monitoring. Lastly, microgrids, home automation and charging points for EVs do not seem to be considered as relevant.

When asked about the benefits that are expected from the smart grid (see Figure 7), respondents have clearly identified the efficient integration of DG as the most important one. A more efficient network planning and operation also seems to be widely expected from smarter grids. Next, two types of benefits have been repeatedly selected among the top ones. On the one hand, respondents identified different aspects that directly related to end consumers such as cheaper electricity, new services for consumers or enhanced load flexibility; and, to a lower extent, better quality of service or better information of consumers' behaviour. On the other hand, the contribution of smart grids to energy policy objectives such as lower emissions and enhanced energy independence seems to be widely recognized as well.

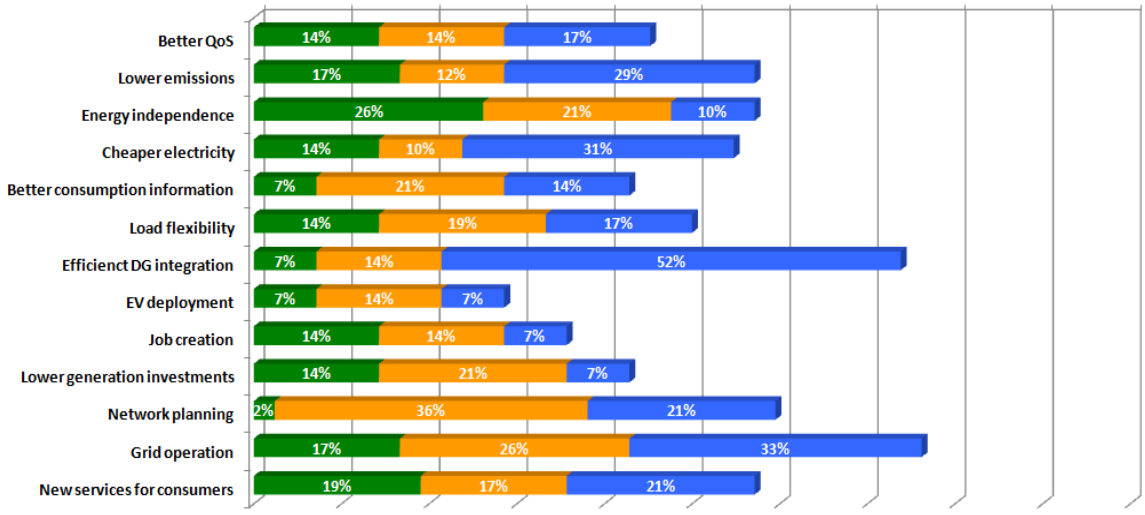

Figure 7: Expected benefits of smart distribution grids. Blue - 1st option, yellow - 2nd option, green - 3rd option

However, attaining the aforementioned benefits from smart grids is not a straightforward task. Hence, the survey enquired about what the most relevant barriers to smart grid deployment would be. As shown in Figure 8, the cost of deployment is indeed one the major hurdles. However, inappropriate regulation and the fact that the benefits are unclear (or the extent to which the expectations would be materialized in practice) are actually considered to be more relevant than the costs themselves. Additionally, the lack of standardization and the fact that consumers behave passively seem to be considered a relevant barrier but generally less important that the ones previously mentioned. Lastly, respondents did not put a very strong emphasis on other factors that are frequently mentioned as important barriers such as the lack of technological development or technology readiness and data privacy issues.

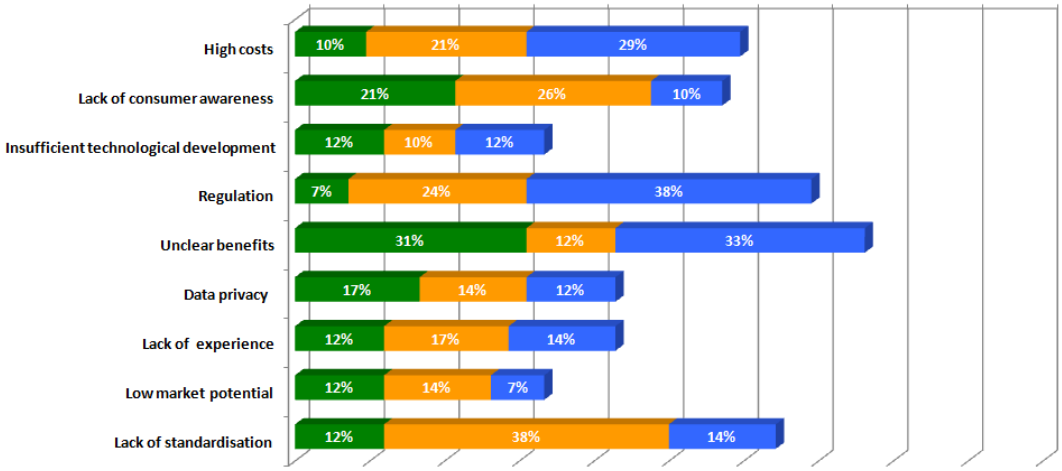

Figure 8: Barriers to smart distribution grids. Blue - 1st option, yellow - 2nd option, green - 3rd option

In previous questions, DG has been clearly identified as one of the main drivers for smart grids. Therefore, it is important to understand the kind of barriers that must be faced to attain its active participation needed to exploit its flexibility potential. The survey participants have unequivocally pointed out that regulation and related issues (insufficient compensation or inappropriate design of support schemes) are the main barrier to be faced in this regard. In a second degree of importance one may find other non-technical issues, especially the fact that DSOs do not trust DG (although this could be changed through suitable regulatory mechanisms). Lastly, it can be seen that purely technical aspects are far from being considered the major difficulties.

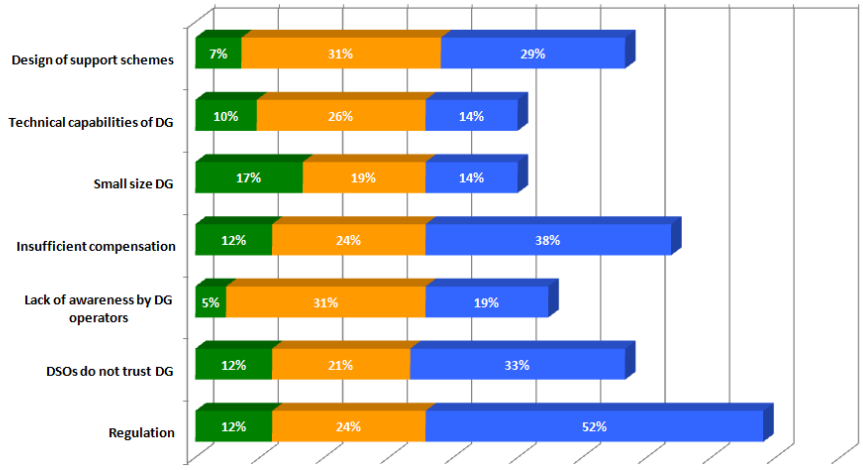

Figure 9: Barriers to an active DG contribution. Blue - 1st option, yellow - 2nd option, green - 3rd option

In addition to DG and RES integration, the involvement of end consumers and the development of load flexibility are also considered key. Figure 10 summarizes the answers of stakeholders when asked about the factors that may prevent consumers to react to price signals. The results suggest that the efforts should be focused on two main directions: consumer engagement and improvement of the functioning of retail markets. The former would be needed to enhance the consumers' awareness of the retailing alternatives and overcome their reluctance to modify their behaviour. Of

course, a better functioning retail market that provides consumers with cost-reflective prices may facilitate this. Notwithstanding, a question that remains unanswered is whether even if we had a perfectly operative retail market and fully aware consumers, the fact that potential (individual) gains are very low would still hinder demand response (nº 1 barrier).

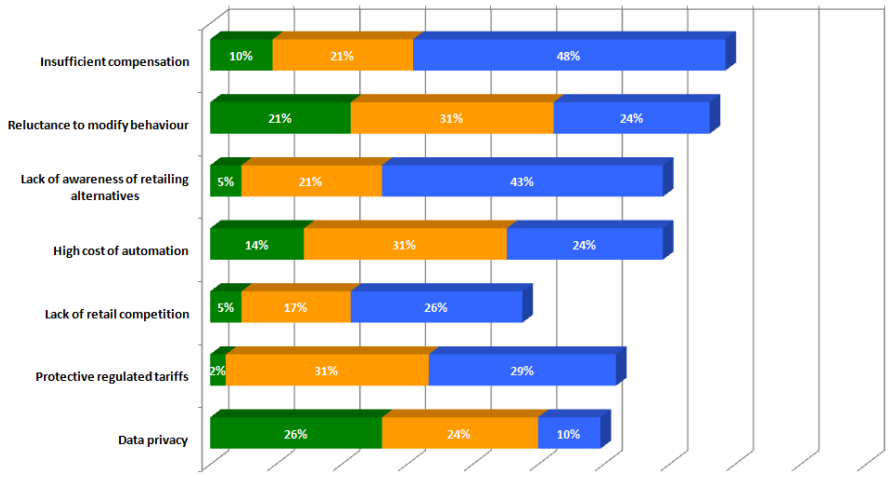

Figure 10: Factors preventing demand response. Blue - 1st option, yellow - 2nd option, green - 3rd option

It is noteworthy that despite the fact that home automation was not considered a key component of smart grids (see Figure 6), it is indeed deemed to be an important obstacle to demand response. The reason for this may be that respondents think that demand response will be hardly achieved without some degree of automated response. Furthermore, once again it is seen that data privacy, in spite of being generally relevant, is not widely considered as a top barrier.

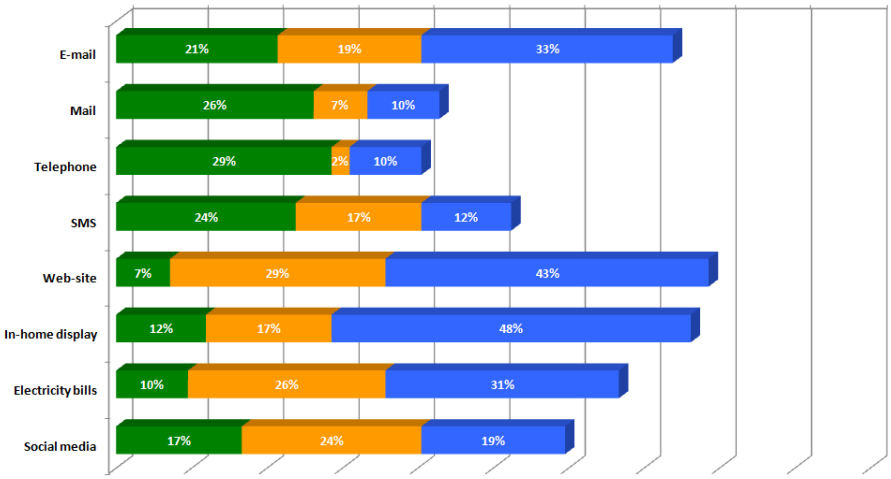

Figure 11: Best means to communicate with end consumers. Blue - 1st option, yellow - 2nd option, green - 3rd option

Nonetheless, consumer engagement requires defining some means to communicate with them, particularly agents such as retailers of aggregators. This is why the survey tried to identify the most suitable way to do this (see Figure 11), according to the stakeholders. Not surprisingly, participants

believe that electronic communication through a web site of via email would be the most suitable. In line with this, social media is not discarded at all by the respondents. Among the more conventional means of communication, which may be essential to reach those consumers not used to accessing the internet on a regular basis, electricity bills seem to be largely favoured over SMS, telephone or postal mail. Finally, it must be highlighted that 48% of respondents selected in-home displays, such as the ones to be used in demo 6 or demo 3, as the main means of communication with end consumers.

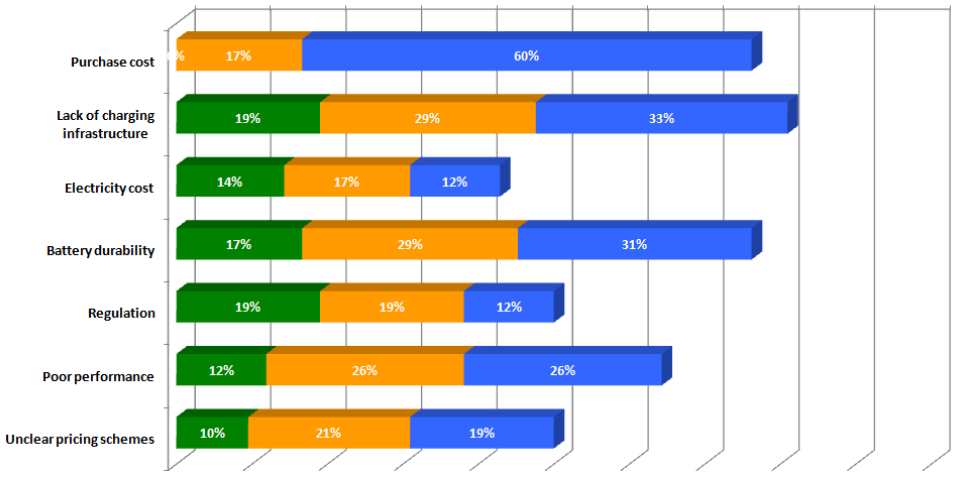

Figure 12: Barriers to EV adoption. Blue - 1st option, yellow - 2nd option, green - 3rd option

Despite the fact that much expectation has been created, EVs constitute another type of DER whose full potential is yet to be developed. The questionnaire tried to evaluate the reasons for this scarce adoption of electric mobility. Figure 12 shows that the most relevant perceived barriers in this case are not related to regulation but to the technology itself. Thus, stakeholders seem to believe that cost reduction and improving the performance of EVs and batteries are the key topics. Furthermore, the lack of a widely deployed charging infrastructure that would facilitate the use of EVs is also seen as a very important hurdle. However, this leaves many open questions: who should deploy this infrastructure, who should operate it, who should pay for it or whether a mandated and regulated deployment is necessary.

Finally, respondents could provide some more general comments about the topics dealt with in the survey. One of them provided an alternative definition for smart grids that stressed the need to guarantee stability with a minimum overload for communications. Nonetheless, most of the additional remarks mentioned different issues that respondents considered that were not fully addressed in the questionnaire.

Among the essential components of the smart grid, distributed storage and the use of data analytics from smart meters have been identified. Concerning the drivers and expected benefits for smart grids, some respondents mentioned that smart grids could allow improving the performance of the system enhancing the link between DSOs and TSOs and strengthening the relationship with end consumers and enforcing their rights. Lastly some additional barriers were raised by respondents. For instance, the conservatism from DSOs was seen as the main barrier for the deployment of smart grids by one respondent whereas another considered this to be the high cost

of ICTs for remote connections. Similarly, EVs were seen hampered by range anxiety (again related to the performance of these vehicles) and the need to deploy a large number of charging points for private charging.

6 Conclusions

Distribution companies are obviously the main actor to be involved in the development of smarter distribution grids. However, the participation of other stakeholders is essential to the achieve the changes envisioned, as the GRID4EU demonstrations have proven. These include, among others: regulators, consumers, DG units, manufacturers, TSOs or retailers. In order to analyze the viewpoints of these stakeholders on different topics, a survey was carried out after performing a review of existing studies with similar objectives. The results obtained have been presented in this report.

As an introductory question, participants were asked to mention the first word that came to their mind in relation to smart grids. The answer clearly showed that stakeholders tend to associate smart grids either to its main components and drivers (ICTs, RES, DG, DER) or to its expected outcomes (efficiency, sustainability, future). This is consistent with the results of the subsequent questions. Stakeholders consider ICTs, DG and network automation as the most essential components of smart grids. Moreover, the most important benefits that respondents expect smart grids to bring about comprise an efficient integration of DG, a more efficient distribution network planning and operation and benefits for end consumers (reduced bills or new services). Additionally, respondents seem to consider smart grids able to contribute significantly to energy policy objectives such as energy independence and lower emissions.

These results confirm that DG is one of the major drivers for smart distribution grids and that stakeholders expect consumers to perceived immediate benefits from their implementation. It is important to highlight that the goals of the six GRID4EU demonstrations perfectly address these expectations. Nonetheless, GRID4EU demos comprise additional aspects related to smart distribution grids such as islanded operation and energy storage. The reason why these issues are specifically mentioned by fewer respondents are presumably that they are not considered to be as relevant at the moment or because they could be seen as enablers of other such as improved quality of service or an efficient DG integration. In fact, demonstrators apply energy storage either to provide consumers with better continuity of supply (demo 6) or to increase the DG hosting capacity of the distribution grid (demo 4).

Respondents acknowledge that the deployment of smarter distribution grids presents important challenges. In this regard, implementation costs are one of the main barriers reported. However, inappropriate regulation and the fact that benefits, in terms of amount and allocation, are unclear seem to be considered as much more important than costs themselves.

The questionnaire tried to find out the viewpoints of stakeholders concerning the major difficulties faced by the most important types of DER. Firstly, the active contribution of DG is seen hampered mainly by regulatory issues rather than technological factors, although enhancing the interaction between DSOs and DG units is also deemed relevant. On the other hand, stakeholders replied that

in order to develop demand response, further work would be mostly needed in achieving a more successful customer engagement and a better retail market functioning. Notwithstanding, the fact that individual gains from demand response may be very low is a chief concern raised by stakeholders. Lastly, according to the survey results, the prime reasons for the scarce adoption of EVs are related to technological features such as purchase costs and performance.

Assessing the reported barriers, it can be concluded that stakeholders have highlighted the need to place a strong emphasis on regulatory aspects as well as customer engagement. It is noteworthy that this conclusion is very similar to those obtained in a similar questionnaire carried out among DSOs and presented in the GRID4EU deliverable gD2.5. Notwithstanding, DSOs seem to give technological aspects such as standardization, interoperability and technology maturity a much stronger relevance than the broader group of stakeholders. These will be a key input to perform subsequent scalability and replicability analyses of the tested smart grids solutions.

7 References

7.1 Project Documents

List of reference document produced in the project or part of the grant agreement
[DOW] – Description of Work
[GA] – Grant Agreement
[CA] – Consortium Agreement

7.2 External documents

Arronte, Nacho. 2010. “Smart Grids Benchmarking”. Master Thesis, Universidad Pontificia Comillas. July, 2010. Available at: http://www.iit.upcomillas.es/docs/TM-10-004.pdf

DFEG, 2010. “Online survey summary: Communicating the value of the smart grid”. Conducted by Distributed Energy Financial Group LLC. April 2010.

Ecoalign, 2009. “Green gap redux: green words gone wrong”. Ecopinion survey report, Issue 6. October 2009.

Ecoalign, 2010. “Separating smart grid from smart meters? Consumer perceptions and expectations of smart grid”. Ecopinion survey report, Issue 8. May 2010.

Ecoalign, 2011a. “Consumer cents for smart grid”. Ecopinion survey report, Issue 12. May 2011.

Ecoalign, 2011b. “Resurgence for retail electricity choice and competition?”. Ecopinion survey report, Issue 11. April 2011.

Pacific Crest Mosaic Smart Grid Survey, 2009. Summary from Smart Grid News Web (Accessed March 2012):

http://www.smartgridnews.com/artman/publish/Key_Players_Utilities_News/Pacific-Crest-Survey-Tracks-Smart-Grid-Progress-1227.html

http://www.smartgridnews.com/artman/publish/Technologies_Demand_Response_News/Survey-Demand-Response-Increasingly-Driving-Smart-Grid-Spending-1360.html

http://www.smartgridnews.com/artman/publish/news/Survey-Cost-Remains-Primary-Barrier-to-Smart-Grid-1398.html

http://www.smartgridnews.com/artman/publish/Key_Players_Utilities_News/Surprise-Advanced-Control-Cited-As-Top-Smart-Grid-Application-1470.html

http://www.smartgridnews.com/artman/publish/article_1520.html

http://www.smartgridnews.com/artman/publish/Technologies_Communications/Survey-Communications-More-Important-Than-Smart-Meters-1566.html

http://www.smartgridnews.com/artman/publish/Technologies_Communications_News/Utilities-Cite-Communications-as-Priority-in-Smart-Grid-Phasing-1610.html

http://www.smartgridnews.com/artman/publish/Technologies_Communications_News/Mesh-Networks-Is-Communications-Winner-in-Utility-Survey-1645.html

http://www.smartgridnews.com/artman/publish/Technologies_Security/Security-the-Most-Important-Standard-Utilities-Say-1666.html

http://www.smartgridnews.com/artman/publish/Technologies_Metering/Survey-Cost-Per-Meter-Drives-AMI-System-Selection-1676.html

http://www.smartgridnews.com/artman/publish/End_Use_Electric_Transportation_News/Survey-Utility-Execs-Forecast-EV-Demand-on-Grid-1714.html

http://www.smartgridnews.com/artman/publish/Business_Planning_News/Survey-Most-Utilities-Looking-at-TOU-Pricing-and-Demand-Programs-by-2012-1751.html

Annex A: Stakeholders questionnaire

Introductory text:

Smart electricity distribution grids constitute an essential element in the achievement of the energy efficiency and carbon emissions reduction objectives. Nonetheless, significant research, development and demonstration work is still needed for smart grids to become a reality.

The GRID4EU project will carry out large-scale demonstrations in six different countries in order to test innovative system concepts and technologies that will help us remove some of the barriers to the smart grids deployment and the achievement of the 2020 European goals.

However, the materialization of smart distribution grids involves a wide range of stakeholders. Therefore, it is of the utmost importance for us to take into account the viewpoints of all the agents involved, including consumers, generators, manufacturers, regulators, suppliers, IT companies, DSOs, etc. Consequently, we would like you to assist us in this challenging task by filling in a short questionnaire about your understanding and expectations of smart distribution grids. We estimate this will take you no more than 15 min. The questionnaire is completely anonymous and your answers will be treated with complete confidentiality.

To answer the questionnaire, please click here.

In the name of the GRID4EU consortium, we would like to thank you in advance for your time and support!

Questions:

1. **What is your role, or your company's, in the world of smart distribution grids?**

   Options: Regulator, Supplier/retailer, aggregator, TSO, DSO, Equipment manufacturer, DG, consumer or representative, other (please specify)

2. **From what country do you play this role?**

   Open answer

3. **What would be the first word that comes to your mind when thinking about smart distribution grids?**

   Open answer, 1 word

4. **Please, rate from 1 (very poor) to 10 (expert) your current knowledge about smart distribution grids.**

   Options: a number from 1 to 10

Please read the following description of the concept of smart distribution grids before continuing with the questionnaire.

The European Smart Grid Task Force defines Smart Grids as electricity networks that can efficiently integrate the behaviour and actions of all users connected to it — generators, consumers and those that do both — in order to ensure an economically efficient, sustainable power system with low losses and high quality and security of supply and, safety.

5. **What of the following do you think are essential components of a smart distribution grid? Please, choose 5, numbering your answers from 1-5 being 1 the most important component and 5 the least important one among your choices.**

   Options: Smart meters, information and communication technologies, microgrids, home automation, distributed generation, demand response, network automation, power quality monitoring, charging points for electric vehicles.

6. **According to your viewpoint, select the most important benefits you expect from smart distribution grids. Please choose 5, numbering your answers from 1-5 being 1 the most important benefit and 5 the least important one among your choices.**

   Options: improved quality of service, lower carbon emissions, higher energy independence, cheaper energy bills for consumers, enhanced information about consumer behaviour, more flexible consumers, efficient integration of DG, facilitate the development of the electric vehicle, creation of new jobs, diminish the need to build new power stations, more efficient distribution network planning, more efficient grid operation, new energy services for end-consumers.

7. **According to your viewpoint, what do you think would be the best way to communicate with consumers about energy consumption and smart grid developments? Please choose 3, numbering your answers from 1-3 being 1 the most important benefit and 3 the least important one among your choices**

   Options: e-mail, mail, telephone, SMS, web-site, in-home display/energy box, electricity bills, social media.

8. **According to your viewpoint, what are the most important factors that hinder the deployment of smart distribution grids? Please choose 5, numbering your answers from 1-5 being 1 the most important benefit and 5 the least important one among your choices.**

   Options: High cost of technologies, lack of consumer awareness, insufficient technological development, lack of appropriate regulation, insufficient or unclear benefits, data privacy and protection problems, lack of real-life experience, the reduced potential market for new technologies makes it unattractive to develop them, lack of standardisation.

9. **According to your viewpoint, what are the most important factors that may prevent distributed generation from actively supporting distribution network operation? Please**

choose 3, numbering your answers from 1-3 being 1 the most important factor and 3 the least important one among your choices.

Options: Inappropriate design of support schemes for renewables and cogeneration, scarce technical capabilities of these generators, small size of these generators, insufficient economic compensation for distributed generation, lack of awareness by DG operators, distribution companies not trusting DG, inappropriate regulation.

10. **According to your viewpoint, what are the most important factors that may prevent consumers from reacting to electricity price signals? Please choose 3, numbering your answers from 1-3 being 1 the most important factor and 3 the least important one among your choices.**

Options: insufficient economic compensation, reluctance to modify their consumption behaviour, lack of awareness of retailing alternatives, high cost of automation technologies, insufficient competition at retail level, the existence of protective regulated tariffs, data privacy and confidentiality issues.

11. **According to your viewpoint, what are the most important factors that may prevent electric vehicles from developing? Please choose 3, numbering your answers from 1-3 being 1 the most important factor and 3 the least important one among your choices.**

Options: high purchase cost, inexistence of adequate charging infrastructure, high cost of electricity, uncertainties about durability of batteries, unclear regulatory framework, poorer technical performance than conventional vehicles, lack of appropriate pricing schemes.

12. **If you would like to add any further comment or suggestion, please provide it below.**

Open answer

This is the end of the questionnaire. Thank you very much for your time and support. If you wish to know more about the GRID4EU Project, we kindly invite you to visit our website at http://www.grid4eu.eu/.