



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773715

Grant Agreement No.: 773715

Project acronym: RESOLVD

Project title: Renewable penetration levered by Efficient Low Voltage Distribution grids

Research and Innovation Action

Topic: LCE-01-2016-2017

Next generation innovative technologies enabling smart grids, storage and energy system integration with increasing share of renewables: distribution network

Starting date of project: 1st of October 2017

Duration: 36 months

D6.2 – Stakeholders, actors and roles, Final Version

Organization name of lead contractor for this deliverable: SIN	
Due date:	30 th of September 2018
Submission Date:	27 th of September 2018
Primary Authors	Sanket Puranik, Iliana Ilieva
Contributors	SIN, UdG, ICOM, EYPESA, JR, UPC
Version	Version 2.0

Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

DISCLAIMER

This document reflects only the author's view and the Agency is not responsible for any use that may be made of the information it contains.

Deliverable reviews

Revision table for this deliverable:		
Version 0.1	Reception Date	26 th of August 2018
	Revision Date	28 th of August 2018
	Reviewers	Iliana Ilieva
Version 0.2	Reception Date	30 th of August 2018
	Revision Date	6 th September 2018
	Reviewers	Iliana Ilieva
Version 1.0	Reception Date	6 th September 2018
	Revision Date	24 th September 2018
	Reviewers	Ilias Lamprinos, Nicos Ioannidis (ICOM), Ramon Gallart (EYPESA)
Version 1.1	Reception Date	24 th September 2018
	Revision Date	25 th September 2018
	Reviewers	Ilias Lamprinos, Nicos Ioannidis (ICOM), Ramon Gallart (EYPESA)

Contributions of partners

Description of the contribution of each partner organisation to the work presented in the deliverable.

Partner	Contribution
UdG	Inputs regarding technological solutions and respective narratives
UPC	Inputs regarding technological solutions and respective narratives
SIN	Lead deliverable in-charge
JR	Inputs regarding technological solutions and respective narratives
ICOM	Inputs regarding technological solutions and respective narratives & internal review
EYPESA	Inputs regarding technological solutions and respective narratives, & internal review
CS	-

Table of contents

Acronyms and abbreviations	4
Executive Summary	6
1. Introduction.....	7
1.1. Objectives	7
1.2. Previous work	7
1.3. Method	8
1.4. Report structure	8
2. Second stakeholder map and engagement forms	9
2.1. Mapping dimensions	9
2.2. Power-Urgency-Legitimacy map.....	9
2.3. Stakeholder engagement forms.....	10
3. RESOLVD innovations and stakeholder narratives	12
3.1. RESOLVD innovations.....	12
3.2. Updated stakeholder narratives.....	13
4. Results, discussions and recommendations.....	19
4.1. Power-Urgency-Legitimacy (PUL) mapping.	19
4.2. General discussion	21
4.3. Stakeholder engagement strategy recommendations	22
4.4. Recommendations for SIG.....	23
5. Way forward	24
References	25

Acronyms and abbreviations

AMI	Automatic Metering Infrastructure
BDL	Reading Data Base
BMS	Battery Management System
BRP	Balance Responsible Parties
BSP	Balance Service Providers
CEF	Critical Event Forecaster
CEPA	Critical Event Prevention Application
DEM	Demonstrations
DMS	Distribution Management System
DPA	Data Pre-processing Application
DRF	Document Reviews and Feedback
DSO	Distribution System Operators
EPB	Exploitation Partnership Building
EF	Energy Forecaster
EV	Electric Vehicles
ESB	Enterprise Service Bus
ESCO	Energy Service Companies
FDA	Fault Detection Application
GDA	General communication & Dissemination Activities
GIS	Geographic Information System
GOS	Grid Operation Scheduler
GW	Gateway
HES	Head End System
IED	Intelligent Electric Device
ILEM	Intelligent Local Energy Manager
IP	Internet Protocol
IPMA	Island Power Management Application
INR	Information Relay
INT	Interviews
LRA	Losses Reduction Application
NTLFDA	Non-Technical-Loss-Fraud Detection Application
MON	Monitoring
PCS	Power Conversion System
PED	Power Electronic Device
PIA	Power-Interest-Attitude map
PIE	Participation in Events
PMU	Phasor Measurement Unit
PPM	Participation in Project Meetings
PQM	Power Quality Monitor
PUL	Power-Urgency-Legitimacy map
REST	Representational State Transfer
SCADA	Supervisory Control and Data Acquisition system
SHA	Self-Healing Application
SUR	Surveys
TSO	Transmission System Operators
UI	User Interface
USB	Universal Serial Bus



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773715

WAMS	Wide Area Monitoring System
WF	Weather Forecaster
WP	Work Package
WPE	Workshops and Project Events

Executive Summary

This report provides results from the stakeholder analysis done under the task T6.1 of work package 6 (WP6). The objective of this report is to give final recommendations on stakeholder engagement strategy and stakeholder recruitment for the stakeholder innovation group (SIG), based upon the stakeholder analysis. The analysis is done using two maps where the stakeholders are mapped across five dimensions. The first Power-Interest-Attitude map was created and presented in the previous report D6.1. In this final version of the report the focus is on updating the stakeholder narratives, creating a Power-Urgency-Legitimacy map, and recommending engagement strategies that fit for different classes of stakeholders based upon the two mappings.

From the analysis it is suggested that DSOs, utilities, and energy communities are the primary stakeholders to be targeted for the exploitation efforts. While these stakeholders should be present in the SIG, other stakeholders which are relevant for creating complete value chain for delivering the RESOLVD solutions should be engaged as well. Special preference should be given to the stakeholders having power and legitimacy. It is highlighted that salient stakeholders could also form competition by adopting innovations competing with the RESOLVD ones. It is, therefore, important to influence such stakeholders, especially those having power, towards adopting the RESOLVD innovations. Further on, this report provides narratives for the various stakeholders, describing the values that the RESOLVD innovations bring. These values are a starting point for creating new business models and will be extensively used in WP6 for creating the business and exploitation plan.

Existing SIG members are well spread over different salient classes. But the SIG does not yet cover all the partner countries and thus an effort should be made to overcome the gap. Furthermore, the report presents the need to target regulators and policy makers in order to tackle possible regulatory barriers for the RESOLVD outcomes.

1. Introduction

1.1. Objectives

The main objective of the stakeholder analysis carried has been to provide understanding on the dynamics between stakeholders and the RESOLVD innovations and to reveal sources of synergy and friction. The current document is expected to form a guideline that can be used during different stages of the project to engage relevant stakeholders for different activities and to generate desired impact on the society. The objectives can be divided into the following sub-objectives:

- Reveal all the stakeholders that could be affected by the RESOLVD innovations.
- Understand the needs, desires and motivations of the stakeholders.
- Map stakeholders across different dimensions to understand their salience to exploitation efforts and impact generation.
- Provide recommendations for stakeholder engagement in the project.

Stakeholder analysis is usually done for the new product or service developed by a firm. The RESOLVD project entails development of several novel technologies. This is a challenge and thus the stakeholder analysis provided reflects the overall picture of the outcomes and assesses stakeholders which are most important to generate impact as envisioned in the DoA. The stakeholder analysis related work also forms the first step towards the market review to be done in WP6.

1.2. Previous work

The outcomes presented in this deliverable are part of work carried out in task T6.1. The work builds upon Deliverable D6.1. D6.1 provided motivations and narratives of different stakeholders identified. The stakeholders were mapped across the three dimensions of power, interest and attitude (see Figure 1). Based upon that mapping, the stakeholders were divided into four classes and their potential role in the market pick of RESOLVD innovations was assessed. Finally, a set of recommendations was provided on target stakeholders for the stakeholder innovation group (SIG).

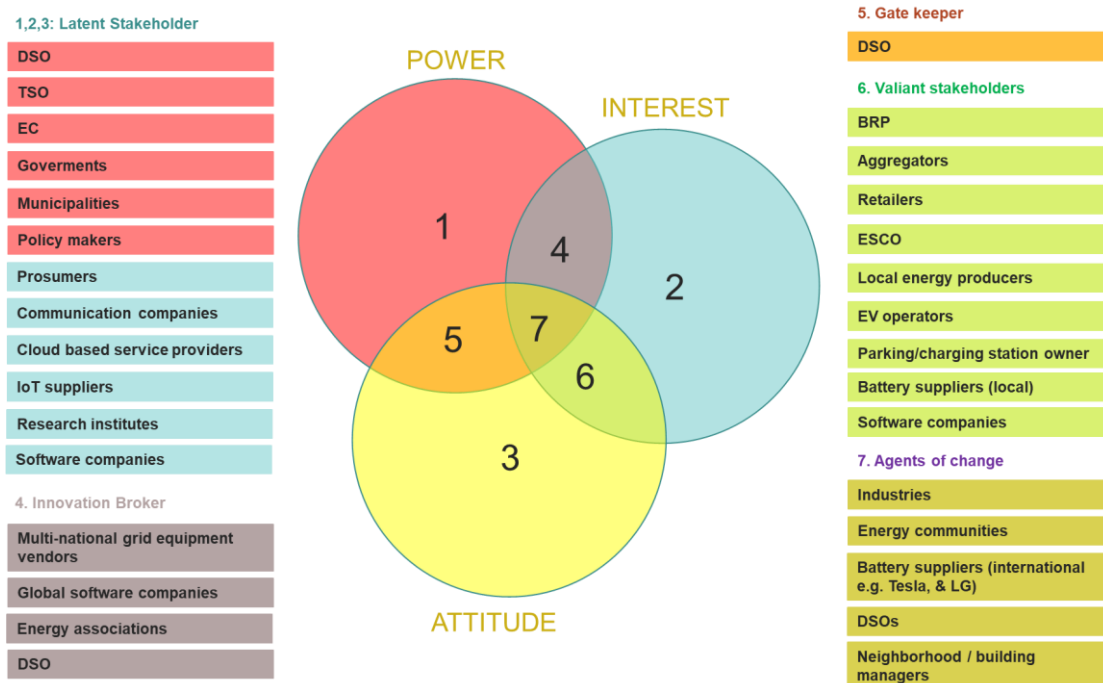


Figure 1: Power-Interest-Attitude map of stakeholders. Source: RESOLVD Deliverable D6.1.

Building upon previous work, this deliverable provides further stakeholder analysis using an additional Power-Urgency-Legitimacy map. Various engagement forms are recognized to form recommendations for the SIG members' involvement and, in general, for exploitation activities.

It is important to note that stakeholder analysis is rather subjective, representing the opinions and experiences of the people doing it. Furthermore, stakeholder mappings are usually done for individual innovations while RESOLVD's objectives point at the development of multiple innovations. In this regard, the present work has been carried out by two researchers at Smart innovation Norway with background in economics and energy systems, who have taken a neutral approach for assessing stakeholders with the aim to create 'market pull' for the various RESOLVD innovations.

1.3. Method

Traditionally, stakeholder analysis has been important to understand the stakeholder-manager relations and how managers deal with different the stakeholders of a firm. In the context of this work, the stakeholder theory has been adapted to understand how market entry of the RESOLVD innovations is affected by various stakeholders and what strategy should be implemented in the exploitation-related activities to support the subsequent market adoption and market entry. Therefore, a 5-stepped approach, as referred to in D6.1, is used (Figure 2). Yet, the work in D6.1 covered only the first 4 steps of the method. In this deliverable a new stakeholder mapping has been carried and then used, together with the previous one, to create an engagement strategy recommendation, thereby completing the 5-stepped method for T6.1. The new map and its dimensions are explained in Chapter 2. During the work process, it was realised that creating a detailed engagement plan will be part of Task T7.2. Thus, the last step of the methodology described here represents the 'Engagement strategy recommendations'. Finally, this deliverable concludes the work done under task T6.1 Stakeholders, actors and roles.



Figure 2: 5-stepped approach followed to achieve the objectives of T6.1

1.4. Report structure

This section summarises the work presented in each of the chapters in the report.

- Chapter 2 provides the theory behind the second stakeholder map and the various engagement forms to be used in the project.
- Chapter 3 gives overview of the innovation outcomes from the project and the updated narratives for various stakeholders identified.
- Chapter 4 shows results from the mapping, discusses its implications and gives recommendations on the engagement forms to be used.
- Chapter 5 discusses the way forward and how outcomes of T6.1 will be used further.

2. Second stakeholder map and engagement forms

2.1. Mapping dimensions

The Power-Legitimacy-Urgency map builds upon previous work done by Mitchell et al. (1997). Mitchell's work relates to traditional project managers and doesn't involve aspect of managing innovations. Therefore, the attributes used by Mitchell to define stakeholder salience are adapted to consider aspects of working with innovation. The theory behind adapted attributes is explained in INVADÉ Deliverable D3.2, while the attributes are summarised in the paragraphs below.

- **Power:** It is defined as the ability of a stakeholder to influence the project's outcomes considering:
 - Ability to affect market pick-up and penetration of the innovation. In this work the parameters considered to assess this are the ability to influence regulations, current market share of stakeholders and geographic presence.
 - Ability to influence design of the innovation.
 - Available working capital and ability to mobilise it.
 - Ability to research and innovate.

Having these parameters, one or more, brings in the attribute of power. In this work the power attribute is qualitatively assessed as present or absent. Picking-up of innovation by such stakeholder, or partnership with such stakeholder, will help in creating market for innovations.

- **Urgency:** It refers to how urgently RESOLVD outcomes are needed by stakeholders. Urgency provides opportunity for an innovation to be picked-up by the respective stakeholders. Such stakeholders are natural promoters of the RESOLVD innovations and at the same time could form competition by adopting competing innovations.
- **Legitimacy:** It is, according to Suchman (1995) "a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions". The social system consists of various levels of analysis, most common of which are individual, organisational and societal levels. In simple terms, it is like brand image where a positively perceived stakeholder is going to have legitimacy, while a negatively perceived stakeholder is not going to have legitimacy. An example for this would be renewable energy suppliers having legitimacy while polluting energy suppliers are likely to have no legitimacy in their market actions. Along with this, in a normal scenario, stakeholders responsible for regulations (policy makers and regulators), by virtue of their role in society, also have legitimacy. Support from stakeholders having legitimacy is likely to boost the uptake of an innovation in the market and create confidence in other stakeholders to invest in the innovation.

2.2. Power-Urgency-Legitimacy map

A stakeholder can possess one or more of these attributes (power, urgency and legitimacy). The more the attributes the more significant the stakeholder is. A combination of different attributes will result in difference in the behaviour of a stakeholder towards the innovation. Based upon a combination of these dimensions, the stakeholders can be divided into 7 classes as shown in Figure 3.

- **Dormant stakeholders:** Such stakeholders possess only power. As other attributes are missing these stakeholders remain dormant. Exploitation efforts of the project should consider exploiting power of such stakeholders to benefit market pick-up of the innovations.
- **Discretionary stakeholders:** Such stakeholders only possess legitimacy and their role for the success of the innovation is often ignored. Innovations always face resistance from incumbents and getting acceptance from discretionary stakeholders is an effective way to deal with such resistance. Acceptance from discretionary stakeholders also attracts powerful stakeholders to adopt innovations.
- **Demanding stakeholders:** Stakeholders with only urgency attribute are demanding

stakeholders. Such stakeholders are looking for solutions which can be provided by the innovation. It is important that such stakeholders are identified earlier and are informed about the innovation. Once they realise the potential of the innovation to solve their problem they are likely to adopt it and be the promoters.

- **Dominant stakeholders:** When a stakeholder has power and legitimacy attributes it is classified as dominant stakeholder. As dominant stakeholders do not have any urgency they are likely to play a passive role. However, they should be monitored closely as when the urgency arises they can easily become adopters or promoters of the technology. An important aspect to keep in mind is that if such stakeholders have a negative opinion on the innovation, they are likely to resist its market penetration.
- **Dependent stakeholders:** These stakeholders have legitimacy and urgency but no power. As they lack power they depend upon advocacy of powerful stakeholders. In the cases where regulations are the biggest roadblock for the innovation forming alliances between dependent stakeholders and dormant stakeholders can help in adapting regulations to fit in innovation.
- **Vital stakeholders:** Attributes of both power and urgency make stakeholders vital to the success of the innovation. Adoption of innovation by vital stakeholders is instrumental to market pick-up of the RESOLVD outcomes. Vital stakeholders can also adopt innovation from the competitors and could thus negatively affect impact of project outcomes. Therefore, it is important to follow these stakeholders closely and influence them before they move towards competitors.
- **Definitive stakeholders:** These stakeholders have all three attributes and are high-priority stakeholders. Exploitation activities should channel most efforts to get such stakeholders interested in the project outcomes.

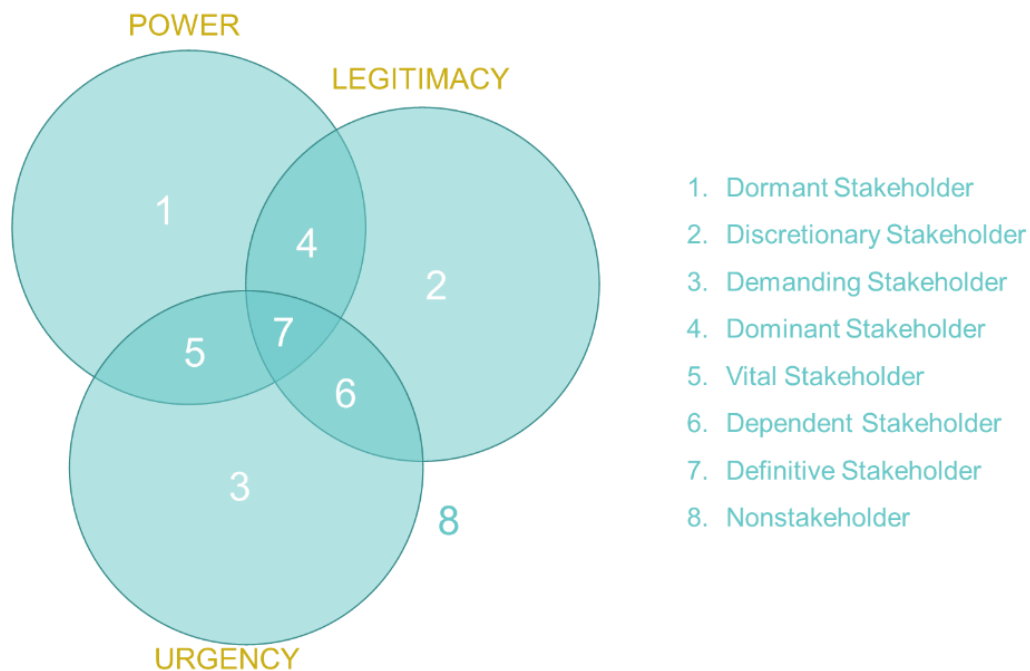


Figure 3: Stakeholder map showing different classes resulting from possession of various attributes

2.3. Stakeholder engagement forms

The final step in the method adopted in this work is the stakeholder engagement strategy. This section identifies various engagement forms which will be used for developing the engagement plan. Different stakeholder classes identified previously and in Deliverable D6.1 require different effort, both in terms of cost and time. Therefore, the engagement form needs to be selected wisely for each class, optimising the resources available. The engagement form ranges from simple project progress communication to strong involvement of stakeholders in workshops (through the

SIG) and possible future partnerships building for exploitation activities. Eleven exploitation forms have been identified for the project and are listed in Table 1.

Table 1: Identified forms of stakeholder engagement.

Engagement form	Specification	Abbreviation
Monitoring	Implies following the development in the energy market and smart grid domain closely. It relates to T6.2 Contribution to standards and policy and regulatory agendas.	MON
General communication & dissemination activities	This relates to T7.1 in WP7.	GDA
Surveys	Could be investigations of different sorts to harvest specific answers, e.g., user practices ¹ and regulatory barriers. This exploitation form also relates to T7.2 SIG activities.	SUR
Information relay	Relates to effective networking on social media, communication through newsletters and networking in the physical space, e.g., at conferences. Also related to T7.1.	INR
Participation in events	This is an opportunity to single out important and influential individuals and to pick-up developments as well as news about changes in policies. This will also provide inputs to T6.2 Contribution to standards and policy and regulatory agendas. Examples are conventions, conferences and seminars.	PIE
Interviews	Involves interviews and consultation with key people from the industry and government. SIG member will be interviewed but this kind of engagement is not limited to the SIG. Provides inputs to T6.3 business and exploitation plan. This engagement form will also contribute to standards and policy and regulatory agendas.	INT
Demonstrations	Relates to engaging stakeholders to participate in key pilot demonstration events.	DEM
Workshops and project events	Workshops, seminars and conferences are planned in the project. These are crucial events to engage important stakeholders, like SIG members.	WPE
Document reviews and feedback	Implies requesting feedback and voluntary peer reviewing of papers and deliverables produced to harvest early feedback. Could be related to T6.2 Contribution to standards and policy and regulatory agendas and T7.2 Sectorial and supersectorial impact.	DRF
Participation in project meetings	Invitation directed towards individuals from different stakeholder classes in SIG that can observe and engage in the project discussions on technical, business and project management level.	PPM
Exploitation partnership building	This includes involvement of the project's SIG. The recruitment of members of this group is important. The effort is related to T7.2 Sectorial and supersectorial impact and T6.3 Business and exploitation plan. Can also be related to T6.2.	EPB

¹ As users are considered the actors which will use the RESOLVD innovations.

3. RESOLVD innovations and stakeholder narratives

3.1. RESOLVD innovations

RESOLVD aims to improve the efficiency and the hosting capacity of distribution networks by introducing tools that facilitate flexibility and control of the low voltage grid. To achieve this, many novel technologies are being developed in the project. Each technology will affect stakeholders in different ways. In this sub-section a simplified overview of all the technologies coming out of the RESOLVD project is provided so that readers from different professional backgrounds can have clear view of the outcomes. The outcomes are divided in two categories: devices (hardware) and software applications. Figure 4 shows these categories, while Figure 5 represents the applications being developed under the sub-categories of operation applications and supervision and analytics services. An overall example of system architecture comprising the RESOLVD outcomes is shown in Figure 6. For detailed understanding on functionality and operation of the RESOLVD technologies readers are referred to work presented in RESOLVD deliverable D1.2.

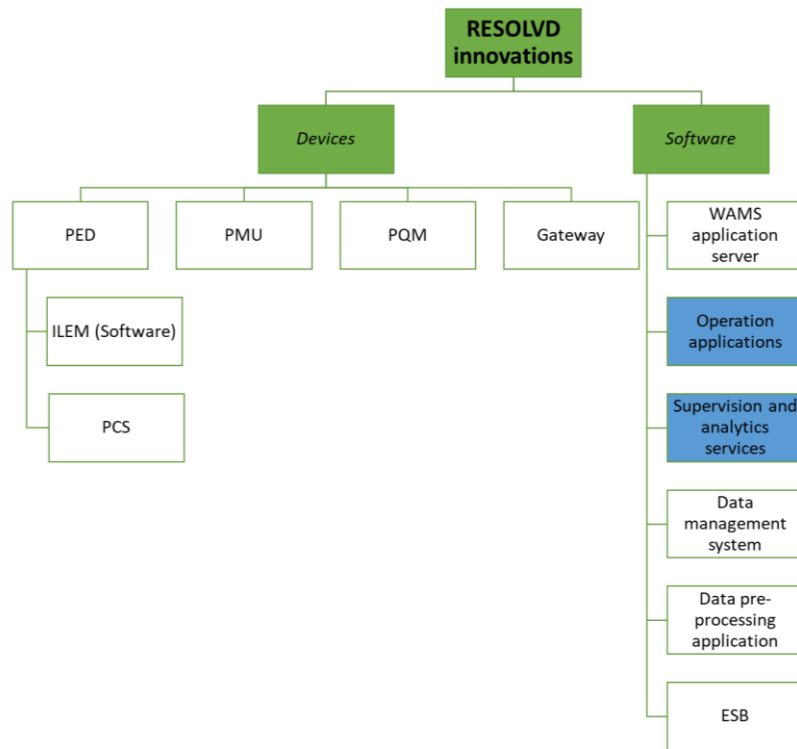


Figure 4: RESOLVD innovations classified in the two categories of devices and software applications. Source: RESOLVD Deliverable D1.2.

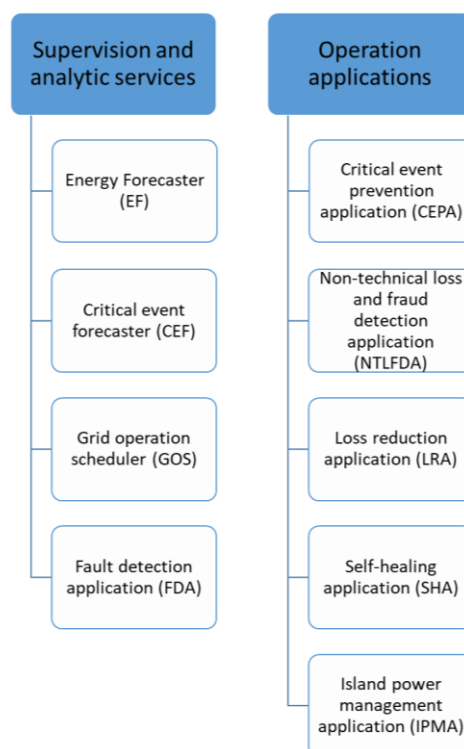


Figure 5: Detailed list of applications being developed under supervision and analytic services and operation applications. Source: RESOLVD Deliverable D1.2.

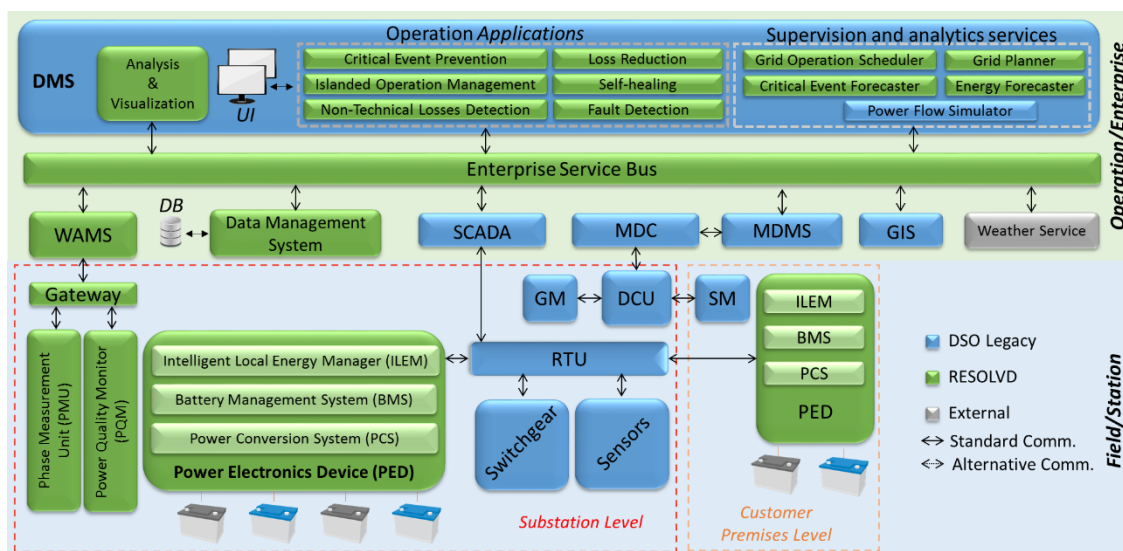


Figure 6: Example system architecture implementation of the RESOLVD innovations. This work is still under progress and final version will be documented in deliverable D1.3.

3.2. Updated stakeholder narratives

To reveal the attributes of stakeholders it is important to understand what their needs and desires are. It is clear from the previous sub-section that different stakeholders would find different technologies relevant for their businesses. Narratives and motivations of different stakeholders were analysed in D6.1 to reveal the attributes which stakeholders are expected to possess. Further, relevant technologies for each stakeholder were also identified. As the project has progressed, relevant technologies and narratives have evolved as well. This sub-section provides

updated stakeholder narratives. The stakeholder narratives and motivations explained in Table 2 form the basis for mapping the stakeholders. It should be noted that the RESOLVD technologies, when implemented as a whole package in the LV grid, would provide indirect benefits in form of reduced electricity prices which will be a result of higher renewable integration, better grid management and better grid observability. Such indirect benefits have not been highlighted in the following table.

Table 2: Stakeholder motivations and narratives.

Stakeholders	Motivation	Relevant technologies	Narratives
DSO	<ul style="list-style-type: none"> High resolution grid monitoring Better grid management /reliability Delaying upgrade investments 	All	The whole RESOLVD solution as a package provides multiple benefits to the DSO together with new business opportunities. The benefits to the DSO are provided in detail in Deliverable D1.1.
BRP, BSP	<ul style="list-style-type: none"> Minimise imbalances 	PED	BRP have financial obligation to maintain production/consumption as committed in the market. BRP have contracts with the TSO for this obligation. In occurrence of imbalances, fines are levied or BRP take services from balance service providers at a cost. Flexibility facilitated through the PED could be used to reduce the imbalances at transmission levels when several PEDs are managed collaboratively.
Aggregators	<ul style="list-style-type: none"> Utilise on flexibility 	PED, Software applications (EF)	Aggregators can benefit by providing flexibility services to the DSO. This can be done by owning PED with storage to provide flexibility using storage and by scheduling loads as required from the DSO. Aggregators can own storage themselves or manage their customers' storage via PED. EF offers a possibility to plan resources better and aggregators can maximise profits from their services. EF services can be requested from the DSO or be accessed directly (e.g., SaaS or licence). By supporting integration of more renewable energy RESOLVD could reduce electricity prices in the market as well, however these are indirect benefits.
Retailers	<ul style="list-style-type: none"> Better information for making trading decisions New tariff possibilities 	Software applications (EF)	EF can equip retailers with better forecasts of both generation and demand, thereby enabling them to trade more efficiently and provide best prices to customers. Two ways of delivering value: 1) as service from the DSO or 2) direct access (e.g., SaaS or licence).

Energy service companies (ESCOs)	<ul style="list-style-type: none"> Increased customer interest for investment in local storage/local generation 	PED, Software applications (EF)	PED with storage could allow ESCOs to provide flexibility services and increase the quality of services they offer. By providing flexibility the payback period of investments can be reduced (like investments in storage or rooftop PV). Direct benefit exists only when the ESCO decides to venture in providing flexibility services. Otherwise benefits are indirect and the ESCOs would most likely partner with other relevant stakeholders for providing services to the DSO.
Local energy producers	<ul style="list-style-type: none"> Improved integration of renewable energy - increased profitability 	PED, Software applications (EF)	PED with storage can help in storing excess generation. PED can also allow effective grid connection of local energy producers in rural areas. EF offers opportunity to plan resources in efficient manner, improve profits by bidding in the market more accurately and a higher level of local energy integration using load scheduling.
Energy communities	<ul style="list-style-type: none"> Increased consumption from local energy resources Improved grid reliability Economic benefits from flexibility Possibly lower electricity price/grid tariff 	PED, Software applications (EF), all outcomes (when they manage their own grid)	Relevant technologies enable local energy communities to better manage their resources, both generation and demand. Efficient management could also lead to reduced electricity tariffs. Such technologies provide information on when to activate flexibility using both storage and load scheduling. PED will enable energy communities to provide flexibility services to the DSO. Providing service from storage will lower the payback period on battery investment. An energy community can own PED, request specific services from platform owned by the DSO and directly use some applications (e.g., SaaS or licence). A special case is envisioned where a community manages its own grid. In this special case it can own the whole package of RESOLVD technologies.
Neighbourhood managers	<ul style="list-style-type: none"> Attractiveness through green profiling and innovative energy solutions Possibility to trade energy flexibility assets 	PED, Software applications (EF, demand profiles), WAMS	Similar to energy communities. PED with storage is also beneficial while operating in isolated mode as ILEM can ensure the supply to a neighbourhood. WAMS has data analytics capability which provides information on future events. This information could be beneficial while scheduling consumption, and production (if it exists) and to avoid critical events. This could also minimize electricity bills. Such benefit requires, however, further investigation.

Construction enterprises	<ul style="list-style-type: none"> • Attractiveness through green profiling and innovative energy solutions • Using renewable energy in construction activities 	N/A (Not their core business)	Planning together with the DSO on their energy requirements could support renewable integration and reduce bottlenecks arising in the grid due to construction activities. These are all indirect benefits and such stakeholders would not themselves invest in any of the RESOLVD technologies as energy is not their core business. They are good candidates to become business partners with project beneficiaries directly involved in the energy business.
Parking lot owners (or charging station owners)	<ul style="list-style-type: none"> • Lower peaks resulting in lower connection charges • Lower energy costs 	PED	By investing in PED and storage they can reduce peaks and thus reduce connection charges. Smart charging, using software applications, can reduce their electricity bills. Most likely actual management of charging will be outsourced to charge point operators as charging management is not the parking lot owners' core business.
Charge point operators (responsible for smart charging)	<ul style="list-style-type: none"> • Better management of flexibility available from EVs 	Software applications (EF), PED, WAMS	They can invest in PED and storage (or only PED if storage is owned by parking owners) and manage their loads better. V2G is also possible. Information provided by WAMS could be beneficial for scheduling charging of EVs and to avoid critical events. As such this could minimise electricity bills for charge point operators. The economic feasibility for such stakeholders to invest in WAMS needs further investigation. EF and WAMS services can be requested from other parties (like DSO or energy communities). EF can also be accessed directly (e.g., SaaS or licence).
EV fleet operators	<ul style="list-style-type: none"> • Increased opportunities for providing flexibility available from EVs • Green profiling 	N/A	Smart charging enabled by the RESOLVD technologies can help reduce their energy costs. However, as this is not their core business they are likely to partner up with charge point operators.
Prosumers	<ul style="list-style-type: none"> • Higher integration of self-generated electricity • Better information for making decisions on investments in renewables • Possibly lower electricity price/grid tariff 	PED, Software applications (EF)	The PED can be an attractive innovation for larger prosumers or for collectively operating prosumers. The narrative replicates the one of energy communities.

Industries/ commercial buildings	<ul style="list-style-type: none"> Higher integration of self-generated electricity Better information for making decisions on investments in renewables and on demand response activities Efficient management of facilities - reduced electricity costs Green profiling 	PED, Software applications (EF, all - special case when they manage their own network), WAMS	Dependent on the size but the narrative is similar to the one for energy communities.
RESOLVD pilot	<ul style="list-style-type: none"> (To be categorised as users /beneficiaries) 	All	Same as for the DSO.
Hardware suppliers	<ul style="list-style-type: none"> Capitalise on new technologies coming out of RESOLVD New and advanced technologies in their portfolio 	PED, PMU, PQM, gateway	Self-explanatory. These can also be competitors to the RESOLVD technologies.
Battery manufacturers/ suppliers	<ul style="list-style-type: none"> Increase in battery sales 	PED	The RESOLVD solutions will be a market facilitator for different batteries to realise their potential in the future smart grid. The ILEM, which is a top-layer management of the PED, could be used in other PED types. Apart from this, the PED could be a solution for integrating second life batteries coming from the electromobility or stationary fields. More services from batteries means more revenues, thus making batteries a good investment case and further increasing market demand.
Software companies/ data analytics firms	<ul style="list-style-type: none"> Capitalise on new/improved software New products in their portfolio 	WAMS, Software applications	Self-explanatory. These can also be competitors to the RESOLVD technologies.
Communication companies	<ul style="list-style-type: none"> Capitalise on new technologies coming out of RESOLVD 	Gateway, WAMS	Self-explanatory. These can also be competitors to the RESOLVD technologies.
Cloud based service providers	<ul style="list-style-type: none"> New market opportunity 	Data analysis, data management system, WAMS	Self-explanatory.

IoT suppliers	<ul style="list-style-type: none"> • Increase in market size 	N/A (Not their core business)	Ability to sell flexibility will increase demand for IoT equipment. And more IoT means more sources of flexibility. There are no direct benefits and IoT suppliers will probably not invest in any outcomes but most likely partner up with other stakeholders.
European Commission	<ul style="list-style-type: none"> • Achieving the climate goals/reducing carbon footprint • Reduce dependency on fossil fuels 	N/A	No commercial interests
Governments	<ul style="list-style-type: none"> • Green profile • Contribute to climate goals • Decrease dependency on fossil fuels 	N/A	No commercial interests
Municipalities	<ul style="list-style-type: none"> • Green profiling • Become sustainability role model 	N/A	No commercial interests
Policy makers / regulators / standardisation bodies	<ul style="list-style-type: none"> • Getting insights to new technologies for management of the local grid 	N/A	No commercial interests
Associations in the energy sector	<ul style="list-style-type: none"> • Using RESOLVD solutions to improve grid monitoring and grid efficiency 	N/A	Such associations could learn about new market developments happening in the smart grid domain. Successful innovations can be disseminated across the associations' members who could then benefit from the solutions. Further, such associations could help in standardising the technologies across all the countries they operate in. No commercial interests
Research institutions	<ul style="list-style-type: none"> • Know state-of-the-art of grid management systems • Further the research in the respective field 	All	Understanding state-of-the art and further advancing the RESOLVD technologies. Potential spin-outs from partner universities.
TSO	<ul style="list-style-type: none"> • Better grid management /reliability • Receive balancing services at lower cost 	All	Could enable DSO and energy communities to provide balancing services to the TSO. TSO can collaborate with DSO on better terms. Using the RESOLVD technologies TSO could request high resolution grid information and flexibility. The technologies provide flexibility to DSO and ability to manage flexibility efficiently. This helps TSO as they can avoid having more flexibility resources in reserve. TSO receive benefit indirectly from DSO and thus will not directly invest in the technologies.

4. Results, discussions and recommendations

4.1. Power-Urgency-Legitimacy (PUL) mapping.

Based upon the narratives and market information gathered about stakeholders they are mapped across the three dimensions. The result of this mapping is shown in Figure 7. Table 3 provides the analysis behind the mapping of the various stakeholders identified.

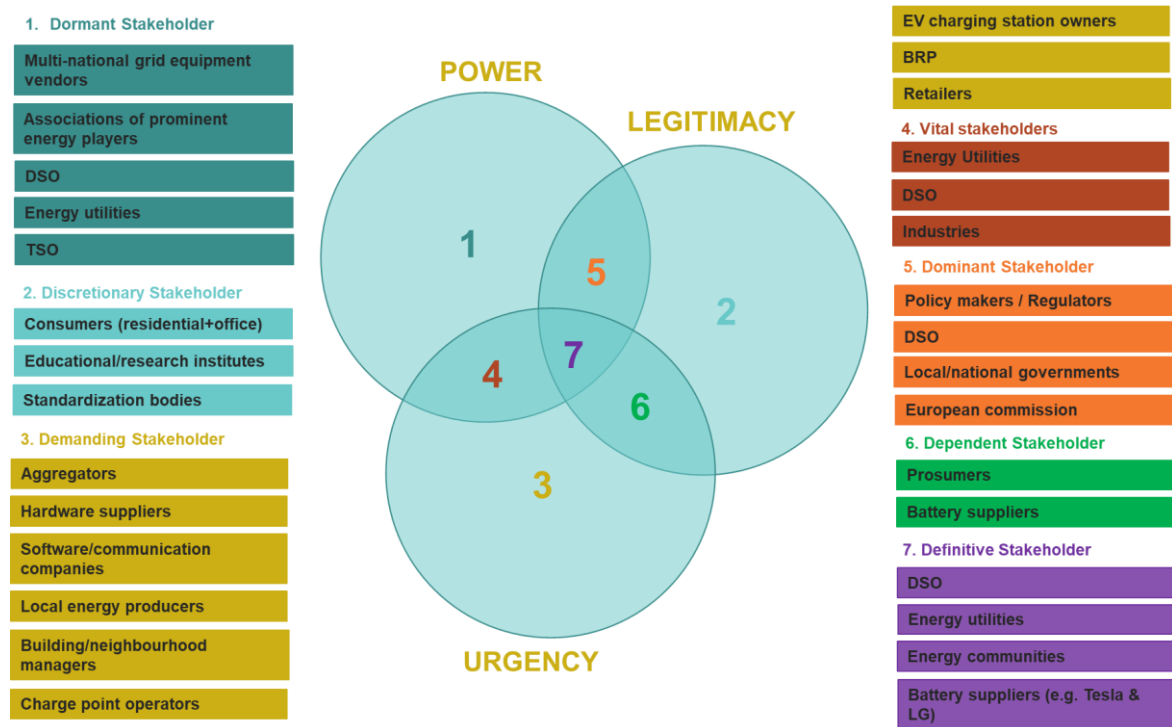


Figure 7: Stakeholder mapping across the attributes of power, legitimacy and urgency

Table 3: Analysis related to stakeholder mapping

Stakeholders	Mapping assessment
DSO	DSO are usually monopolies in the region they operate in. This brings the attribute of power to them. Depending upon how they are perceived by the customers, i.e., gaining or missing legitimacy, they can be dormant or dominant stakeholders. DSO which face challenges with increasing renewable energy share or have to invest in grid upgrades would have urgency and would be vital stakeholders. DSO which have all the attributes are definitive stakeholders and most crucial ones to target for exploitation purposes. As discussed in D6.1, if DSO are traditional and adverse to innovation they could potentially slow down the market uptake of the RESOLVD innovations.
BRP	If incentives, as discussed in Section 3.2, are realised, then BRP would have an attribute of urgency and would be demanding stakeholders.
Aggregators	The same explanation as for BRP.
Retailers	The same explanation as for BRP.
ESCO	If they venture in flexibility business, then the same explanation as for BRP. Otherwise they are not a stakeholder.

Local energy producers	The same explanation as for BRP.
Energy communities	As they are well organised they have power, and as they represent an entity of citizens, they have legitimacy as well. As energy communities may want to be independent of the grid and manage their energy needs they would be looking for solutions like the ones offered by RESOLVD and thus would also have an attribute of urgency (if incentives are strong enough). Energy communities are expected to have all three attributes and thus represent definitive stakeholders.
Neighbourhood managers	They have similar motivations as energy communities and would like to have RESOLVD solutions (not all) to benefit their business. Thus, it is expected that they will have urgency. As such they fall into the class of demanding stakeholder. Depending upon size, they could also attain legitimacy and be dependent stakeholders. Usually such stakeholders lack power.
Construction enterprises	Such entities usually have power owing to high investments and ability to mobilise resources. Flexibility is not their core business, but they could be an important partner of other stakeholders, like BRP or DSO.
Parking lot owners (or charging station owners)	They will have urgency as they would like to optimise energy consumption and connection costs.
Charge point operators (responsible for smart charging)	They will have urgency as they could provide better services to their clients.
EV fleet operators	They will have urgency as the RESOLVD technologies could optimise energy consumption of their fleet. EV fleet operators would most likely not invest in RESOLVD outcomes themselves but could partner with charger point operators or parking lot owners.
Prosumers	Prosumers are similar to consumers but with the addition that they might want to maximise self-consumption. With help of the RESOLVD innovations such utilisation of generation can be maximised, and prosumers would thus be having urgency to benefit from it. With urgency and legitimacy, they would be dependent stakeholders.
Industries/commercial buildings	Using RESOLVD outcomes they can optimise their consumption (also production if any). There is also a benefit from delaying grid upgrades for these stakeholders. Thus, they are likely to have an urgency dimension. Further, they have power which is local, i.e., they have power to take decisions in the premises they own, and therefore ability to influence investment decision in their premises. Thus, they are vital stakeholders. Also, as they are profit seeking enterprises, convincing them to invest in RESOLVD innovation would be comparatively easier than convincing other stakeholders. In addition, big industries would have more power. These are potential customers of the RESLOVD innovations and should be engaged so as to prevent them from adopting competing technologies.
Hardware suppliers	With market demand being created for novel hardware coming out of RESOLVD, such stakeholders would develop urgency to adopt the innovation and benefit from its market opportunity.

Battery suppliers	PED has the potential to increase the value of storage and this could generate urgency among battery manufacturers to adopt some outcomes of the RESOLVD project. Currently, batteries are seen as a green solution and battery manufacturers have positive image in the society. This provides them with an attribute of legitimacy. Having urgency and legitimacy battery suppliers are classified as dependent stakeholders. Some of the multi-national suppliers - like Tesla because of their market presence - also have power. Such stakeholders would then move to become definitive stakeholders.
Software companies/ Data analytics firms/ Cloud based service providers	The same assessment as for hardware suppliers but the target RESOLVD outcome here would be software.
Communication companies	The same assessment as for hardware suppliers, but the target outcome here would be communication related components of the RESOLVD innovations.
European Commission	The EC has elements of power as well as legitimacy. Both attributes provide an element of authority to the stakeholder. The EC is a dominant stakeholder and thus a crucial one.
National and local governments	In similarity to the EC, these stakeholders have both power and legitimacy.
Policy makers/ regulators	These stakeholders have both legitimacy and power and thus are dominant stakeholders.
Associations in the energy sector	Being an association of powerful energy players brings in power.
Research institutions	They have legitimacy only.
TSO	Like DSO, TSO have power. However, RESOLVD deals with the LV grid which is not under the scope of TSO to manage. TSO have to collaborate with DSO if they want certain RESOLVD technologies to be implemented in the LV grid.

4.2. General discussion

Considering the above presented work, a number of discussion points related to the RESOLVD stakeholders, their importance for the successful exploitation strategy, and vital market and regulatory aspects can be stressed upon:

- From both PUL and PIA maps (see Figure 1), DSO, energy communities and energy utilities have come out to be the most salient stakeholders.
- Battery suppliers (multi-nationals like Tesla and LG) having power, legitimacy and urgency are definitive stakeholders and agents of change. Main benefit to their existing business is foreseen through the PED. Thus, such stakeholders should be actively engaged and kept aware about the progress of the project. Local battery suppliers do not have power and thus are dependent stakeholders.
- Regulatory issues could be a major roadblock in achieving required impact and could also thwart market entry of some innovations. This makes it important to engage policy makers and regulators with the project. It is suggested that regulatory barriers are identified early in the project. Innovations facing regulatory barriers should be adapted to fit within the regulations. This could also mean reducing some functionality for the time being. In parallel, efforts need to be made with policy makers to influence updating of existing policy so that novel innovations fit regulation and are able to deliver the full-scale functionalities they are designed for.
- Market pick-up is facilitated when powerful stakeholders adopt the outcomes or when support from such stakeholders is obtained. Stakeholders having only power lack will to

adopt or support innovations in the early stage. Thus, to mobilise them, it is necessary to spend resources and develop other attributes in them. Alternatively, alliances could be formed between stakeholders having power and stakeholders having other attributes.

- Electricity consumers and prosumers are sources of legitimacy. Making them aware about the benefits of the RESOLVD innovations is likely to draw attention of powerful stakeholders. Stakeholders having legitimacy can thus strategically help in engaging powerful stakeholders.
- Stakeholders having urgency can provide market entry to the innovations by adopting them. Thus, vital stakeholders should be strategically engaged so that they adopt the innovations. Demanding stakeholders should be actively updated on the project's progress. The vital stakeholders are those who would generate demand for the RESOLVD innovations while demanding ones are mostly those who will supply solutions based upon RESOLVD innovations. It is also important to regularly monitor such stakeholders as by adopting/developing competing products/services these could also become competitors. It is, therefore, important that stakeholders having urgency pick-up adopt the RESOLVD innovation at the earliest. This will strengthen market position of the innovation against possible competitors and facilitate further market growth.
- Some of the demanding stakeholders derive indirect benefit from the innovations and thus would become promoters of the outcomes. Such stakeholders should be kept updated with key project progress and outcomes on regular basis.
- To take benefit from the RESOLVD outcomes dependent stakeholders (like prosumers) would depend on other stakeholders (like DSO or energy communities). Similarly, to commercialise on novel technologies coming out of the project, local battery suppliers are dependent on demand from other stakeholders.
- Endorsement by discretionary stakeholders is likely to build confidence in the innovations. Research organisations should be actively engaged using dissemination activities.
- Two stakeholder maps are created in task T6.1. Both maps reveal different characteristics of the stakeholders. Thus, both maps should be used before targeting stakeholders for any type of project activities. As such, D6.1 and D6.2 are expected to serve as a guideline for further exploitation activities and for the creation of the business plan.
- The work done in this task has specific significance for the exploitation and business plan development. However, this deliverable should also be used as a reference document while targeting stakeholders for communication and dissemination activities. In the engagement form, stakeholders for such activities have been highlighted.

4.3. Stakeholder engagement strategy recommendations

The higher the number of attributes, the higher the importance of a stakeholder in the exploitation activities. More resources should be spent on engaging high salience stakeholders. Based upon the two mappings different engagement strategies are proposed for different stakeholder classifications (Table 4 and Table 5).

Table 4: Stakeholder engagement recommendation based upon PUL map.

Stakeholder classification	Engagement forms (Shown in Table 1)
Dormant	MON, WPE, DEM, GDA, INR, PIE
Discretionary	SUR, INR
Demanding	INR, GDA, DEM, SUR
Dominant	DEM, INT, MON, PIE, EPB
Vital	PIE, EPB, FFC, MON, WPE, INR, PPM, SUR
Dependent	EPB, WPE, INR, SUR
Definitive	INT, SUR, EPB, WPE, INR, DEM, MON, DRF, PPM

Table 5: Stakeholder engagement recommendation based upon PIA map.

Stakeholder classification	Engagement forms (Shown in Table 1)
Latent	MON, DEM, GDA, INR, WPE, SUR
Innovation broker	SUR, INR, DEM, EPB, PIE

Gate keepers	MON, INR, GDA, DEM
Valliant	DEM, INT, MON, PIE, EPB, WPE
Agents of change	SUR, EPB, WPE, INR, DEM, MON, DRF, PPM

4.4. Recommendations for SIG

The whole value chain behind establishing digitalised LV grid involves stakeholders from hardware and software suppliers to complete solution providers. Successful market uptake of the RESOLVD innovation requires adoption of technologies by various stakeholders at different levels. Thus, while recruiting SIG member, priority should be given to stakeholders with high salience but at the same time it should involve others which are important to cover the whole value chain of the digital grid. As resources are limited, to manage stakeholders the engagement form should be carefully chosen. Stakeholders having highest salience should be involved in more engagement forms and managed closely. While others, having low salience, should be engaged reasonably. For example, a progressive DSO should be engaged by involvement in workshops (related to both technical and business development), exploitation partnership building, surveys, participation in meetings, and document reviews. While demanding stakeholders like hardware suppliers should be just managed with information relay, demonstration and surveys. Table 4 and Table 5 should be used while engaging different SIG members for different exploitation activities.

From the performed analysis DSO, utilities, and energy communities should be primary targets for the SIG, which would be interested in the whole package of RESOLVD outcomes. These stakeholders are also the ones creating demand for the project innovations. However, such stakeholders could also be the toughest to engage and could become strong competitors if they invest or develop solutions like RESOLVD. Technology providers (hardware, software and communications systems) are important in the whole value chain and thus should also be targeted. As identified previously, to remove regulatory barriers it is important to engage policy makers and regulators.

So far eleven SIG members have been recruited and the list is provided in Table 6. As evident, the SIG is already a good mix of relevant stakeholders, however these are mostly from Spain. Further efforts should be made to involve salient stakeholders (especially DSO and energy communities) from all partner countries.

Table 6: SIG members recruited so far in the project.

No.	Organization	Type of stakeholder	Country
1	EERA JP Smart Grids	Association of 250 research organizations and universities	-
2	PEUSA	Utility	Spain
3	Inycom	ESCO	Spain
4	Catalan Energy Agency (ICAEN)	Association of energy players, key policy influencer	Spain
5	GE (Power)	Technology provider	Global (Spain)
6	Bassol Energia	Utility	Spain
7	Prat rubi	Law experts	Spain
8	Batteri Retur	Technology provider (used batteries)	Norway
9	ORMAZABAL	Technology provider	Spain
10	SONEN batteries	Technology provider (batteries)	Spain
11	Energienetze Steiermark GmbH	DSO	Austria

5. Way forward

This analysis should be referred to as a guiding document for engaging stakeholders for different project events in the future and to recruit new members for the SIG. Different SIG activities will be planned based upon the provided analysis. Thereby, this work forms an input to T7.2 Sectorial and supersectorial impact.

The motivations and narratives presented in Table 2 discuss values which are of interest for different stakeholders. The values are an important starting point for creating business model canvases (BMC). The BMC will be used further in WP6 to create feasible business models for crucial stakeholders.

Further, it is important to have stable stakeholder network and partnership to deliver solutions involving different innovations. Based upon the stakeholder analysis, stable stakeholder network for different project partners would be identified in task T6.3. Recommendation on stable stakeholder network would be part of the exploitation and business plan. In addition, strategies to protect the innovations from competitors will be explored further and will be part of the exploitation and business plan. Not less important, communication activities could also benefit from the stakeholder analysis and be streamlined to target specific (based upon the mapping) classes of stakeholders.

Finally, as it is common in the market that stakeholders change their strategy with time, the stakeholder maps will be updated on regular basis to record movements of stakeholders in the market.

References

Mitchell, R.K., Agle, B.R. and Wood, D.J., 1997. *Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts*. Academy of management review, 22(4), pp.853-886.

INVADE Deliverable D3.2, 2017 *Stakeholder Analysis* [online] Available at: <https://h2020invade.eu/deliverables/> (Accessed: 24 June 2018).

RESOLVD Deliverable D1.1. *Use cases definition* [online]. Available at: <https://resolvd.eu/documents/> (Will be available to download once accepted by EC).

RESOLVD Deliverable D1.2. *Functional and operational requirements* [online]. Available at: <https://resolvd.eu/documents/> (Will be available to download once accepted by EC).

RESOLVD Deliverable D6.1. *Stakeholders, actors and role* [online]. Available at: <https://resolvd.eu/documents/> (Will be available to download once accepted by EC).

Suchman, M.C., 1995. *Managing legitimacy: Strategic and institutional approaches*. Academy of management review, 20(3), pp.571-610.