



*Smart system of renewable energy storage based on **IN**tegrated **EV**s and **bA**tteries to empower mobile, **D**istributed and centralised **E**nergy storage in the distribution grid*

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*It is necessary to include background for the work reported in the deliverable, reasons for choosing a solution, discussion among possible solutions before choosing one, relation to other project deliverables, tasks, and WPs (inputs used, outputs created), as well as concrete conclusions of the documents.*



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## Abbreviations and Acronyms

Basic terms:

Acronym	Description
A-IoT	Autonomous Internet of Things
CF	Charging Facility
DER	Distributed Energy Resources
DSB	Norwegian Directorate for Civil Protection
DSO	Distribution System Operator
ECOM	Existing Energy Communities/Ecosystems
EMS	Energy Management System
ESCO	Energy System Company
EV	Electrical Vehicle
FO	Flexibility Operator
HAS	Home Automation System
IFO	INVADE Flexibility Operator
IoT	Internet of Things
OCR	Optical Character Recognition
PV	Photovoltaic
SOC	State of Charge
TAG	Technical Advisory Group
TSO	Transmission System Operator
V2B	Vehicle-to-building
V2G	Vehicle-to-grid
VPP	Virtual Power Plant
WP	Work Package

Plan specific terms:

Acronym	Activity of Engagement Plan
MON	Monitoring
GDA	General communication & dissemination activities

SUR	Surveys
INR	Information relay
PIE	Participation in events
INT	Interviews
FFC	Face-to face consultations
DEM	Demonstrations
WPE	Workshops and project events
DRF	Document reviews and feedback
TAG	TAG engagement
PPM	Participation in project meetings
EPB	Exploitation partnership building

## Executive summary

This report presents the stakeholder engagement strategy and plan for the INVADE project. A number of different stakeholder groups can greatly influence the project, its outcome and injection of project findings into businesses, among people and in society in general. INVADE has a disruptive and innovative potential. It is important to identify barriers and opportunities, adversaries as well as allies. The right stakeholders can help to leverage and enhance the concept developed and assure that it can create the difference that has been projected in the project proposal. The project needs to engage different stakeholders in diverse ways to secure awareness, feedback and a significant pick-up rate for the results produced. This should create a bridge-head for future exploitation of the results and provide real opportunities for individuals, organizations and societal institutions. To establish the stakeholder engagement plan we have adopted an analytic method first defined by Michael Porter. This assumes that the project has already created an enterprise that is responsible for the development of the INVADE concept and is creating a strategy for a new position in the market to secure future growth. Hence, stakeholders that create rules of operations, establish barriers and operate as gate keepers with respect to market segments must be identified. Stakeholder groups that can offer their alliance, can secure important factor conditions and provide spring boards into the market are equally important, but in the opposite way. The ongoing work in WP9 has been important as the stakeholder analysis requires a tentative business model. The business model in INVADE is still work in progress, but has reached a level that defines a reasonable basis for the work described here. However, the report is meant to be a live document. It will be updated in line with developments both within and beyond the project over the next 10-12 months. What is presented here is the initial version of the stakeholder engagement plan.

## 1 Introduction

This deliverable has been created as a part of task “T3.1 Stakeholders Engagement Plan” in WP3. The principal aim of the work package is to cater for the future capitalization of the R&D results produced. This requires alliances within the consortium

as well as beyond. First priority must be that consortium members are given a chance to capitalize on the results and prosper accordingly. Next to this is the goal to enable stakeholders beyond the project to benefit from the INVADE research effort. Such stakeholders include policy makers, governments, standardization bodies, members of the public sector and pertinent industry, as well as academia and the international R&D community. This defines the context for this report too.

Together with the dissemination effort WP3 should establish broad awareness of INVADE objectives, activities and results. It is essential that the potential of the INVADE project becomes known and that the right stakeholders are attracted and prepared for future pick-up of results of all kinds. With true commitment to the ends of the project stakeholders may help to generate the desired impact.

Exploitation does not start at the end of the project. Time is of the essence. It must be a part of the project throughout and seek spin-off effects whenever possible. However, as results become firmer and proven, the exploitation effort must ramp up. This implies that a bridge from the R&D to business and product development is constructed. Stakeholders may act as both barriers and accelerators for this. Barriers must be removed or overcome. Accelerators must be solicited, maintained and initially managed.

According to the task objective the Stakeholder Engagement Plan will define the perimeter of the INVADE stakeholder community and describe the instruments of their engagement per each project beneficiary. The plan is going to ensure that the project receives:

- Relevant input into the innovation streams of the project with which the stakeholders will be organically linked throughout the life of the project in order to ensure close alignment between the project priorities and the priorities of the stakeholder community INVADE addresses;
- Review and calibration of innovation results and recommendations in order to build the strong support of the stakeholder community around the project's outputs.
- Review and tuning of business and exploitation plan to ensure fast market uptake.

The initial Stakeholders Engagement Plan, which is documented here is the result of early activities in the project. Currently, the plan hinges on several assumptions that must be verified later during WP3. Propositions made are dependent on the final specification of the business models developed, the architecture and system concept

finally targeted and on market developments. The project is meant to be a learning process and WP3 will be receptive to ideas an input from other project partners that see the necessity to change business and market focus or wish to change their targets for future exploitation. Consequently, this document must be maintained during the project. But as it stands hopefully it can yield support for ongoing work in WP9, WP2 and WP4 and serve as a reference that is subject to revisions as the project develops.

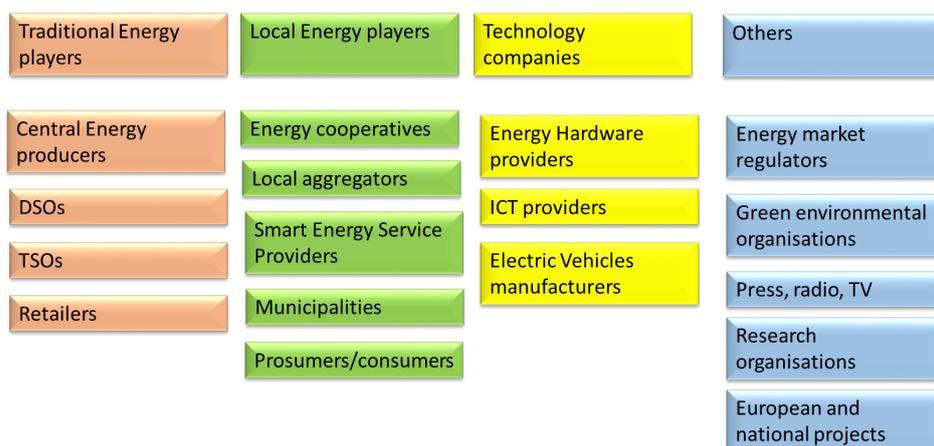
## 2 The stakeholder concept in INVADE

*“A stakeholder is any person or organization who can be positively or negatively impacted by, or cause an impact on the actions of a company.”*

*(Freeman, 1984)*

### 2.1 From the DoA: The essential target groups

As described in the original project proposal the INVADE project is poised to affect a number of core stakeholders from the electricity industry, ICT and manufacturing industry, research communities and public organizations and others, and create an impact for them. Originally potential stakeholders were classified in four different groups as shown in Figure 1.



*Figure 1 Classes and groups of stakeholders relevant for INVADE*

The four classes are the traditional energy players, the local energy players, technology companies and others.

**Central Energy producers** – are traditional players, well positioned in today's energy system. They would gain a role when it is required to deliver energy in times when local production, storage and flexibility systems are not able to cover local demand. The central energy producers will be engaged in workshops, demonstrations and business models presentations especially discussing differed investment possibilities.

**DSOs** – are well established within the context of smart grids and are required to operate the grid in a more flexible way, because even well operated grids can be subject to unprecedented challenges due to new power demanding consumer behavior. EV charging, induction tops and highly intermittent and capacity threatening DERs are among these. DSOs are very central stakeholders for INVADE, because they will be the key operators of flexibility and storage at various levels in the distribution grid. Several DSOs are directly involved in INVADE and a few representatives of different DSOs will be involved in Exploitation Users Group.

**TSOs** – within the electricity grid the TSOs together with the DSOs operate the backbone of today's energy system. By definition, the TSO operates furthest away from the regional and sub-regional systems. They will, however, still be essential in providing the backbone infrastructure and playing a major role in balancing markets when there is a mismatch between demand and renewable production, flexibility and storage.

**Retailers** – will look at the development of storage and flexibility in the distribution grid as a welcome opportunity to integrate renewable energy sources and create new business models around it.

**Public administrations/ municipalities** – are interested in providing their inhabitants with a livable environment and an increased quality of life due to unique energy services. The municipalities will be approached to showcase the INVADE platform, present the demonstrators and trigger an interest in the exploitation potential and wider applicability of INVADE to other use cases relevant for public administrations and municipalities.

**Energy cooperatives** – serving their community members with additional financial benefits, providing quality of life and offering specially designed services. The use case showcasing the renewable energy storage system at the community level will be of specific interest to energy cooperatives.

**Local aggregators** – enabling participation of small units and creating added value by aggregating and finding functioning business model. Aggregators combine a number of smaller entities (e.g., small DERs, storage units) to make them more tangible both on a technical and on a commercial level. These different variations of the aggregator role

and **Virtual Power Plants (VPPs)** require different market access and may draw its energy sourcing from a wide geographical area.

**Local energy hardware providers** – contribute to the project directly because they provide different elements of batteries, bidirectional inverters, V2G chargers, PV panels, smart meters, etc. Depending on the individual functionality of the product and the strategy of the company, local markets may open up new markets for hardware providers.

**ICT Industry** - Technology companies providing ICT solutions operating both locally and globally, especially those companies that provide ICT solutions for the energy business today and/or are involved in smart grid activities are likely to take a leading role in developing the ICT-infrastructure for renewable energy markets. ICT industry is a key stakeholder for making INVADE a success story.

**Manufacturing** –EV manufacturers and battery suppliers will be informed about the project outcome to activate the secondary and tertiary market potential of EV batteries for smart grid flexibility management.

**Research communities** – will be integrated because INVADE objectives, methods, test sites and results should be of great interest to the R&D community within ICT, energy and regulatory agendas. Publications in the form of articles and reports will let the R&D community spot the strengths and weaknesses of the consortium effort and thereby stake out a course for the future that will reinforce and extend the INVADE concepts and will contribute to the European Research area.

**European and national projects** – will be cooperated to benefit from the exchange of knowledge and expertise in the scientific fields and to gain experience from other pilot demonstration sites, both directly serving improvement of the INVADE outcome.

**Energy Market Regulators** – will be consulted to guarantee control and compliance of developments with regulations / laws and to apply standards where possible. The consortium will provide input to them with recommendations and best practices to regulatory and policy agendas.

**Green environment organizations** – will be informed to influence their thinking and help them understand that there are technical solutions that can alleviate or even contribute to the elimination of the climate challenge and directly contribute to a sustainable way of living.

## 2.2 The need for a more specific scope

Although far from exhaustive, the list of stakeholders above includes all the obvious candidates. Yet, for the purpose of WP3 this may not be sufficiently fine grained. Also, this list yields only marginal support when creating a strategy for maximizing the effect of exploitation (and dissemination) to achieve the impact described in the project description. A higher degree of segmentation is needed. Some of the stakeholders might possess certain strategic roles that must be identified. In each of the above groups there will be front runners and laggards. The latter will see little gain in sharing the project's vision and possibly contradict the change that the project results offer. Some will stay inert, almost, indifferent, and be happy just observing what is going on. Others will seize any opportunity to get ahead. Members of the latter group represent important allies for INVADE. The laggards and opposing parties are important too, but in a different way. They must be encountered to understand what barriers they see. This can help create work around.

Some stakeholders may be a competitor in one situation and a partner in another. The business model development in WP9 can determine which role is dominant.

INVADE must also try to spot stakeholders in new and emerging roles. Although hardly visible in the market today, some of them can grow to become the new juggernauts of the future markets. If we compare with the Internet domain, it is sufficient to mention Google and Facebook. They are still in their teens, but already mighty global companies.

Who to look out for is related to the scope of the project as well as to market developments. One example is the battery storage manager or the EV fleet manager that could make a significant difference in the market. In fact, the development of new business models suggests that there might be a consolidation of different things that may be controlled by entirely new actors in the energy market. These could include players which have no history in the energy domain too. The new EV fleet manager could in fact be the owner of a parking lot that makes a horizontal integration, and all of a sudden finds himself in an energy market that is undergoing a dramatic transition. Another example could be the traditional fitter company offering electric fitting services for households and industry. With the evolving focus on end-users, EV and DER, such companies are in a unique position to ramp up their business and integrate both vertically and horizontally. With a significant customer base that is regularly maintained on close range (they are actually invited into the house and can judge the standard of the electric system, identify customer needs and give advice) they can demonstrate assets that

many traditional players in the energy market cannot. Moving into the DER and storage market is a small step for them and being part of local markets is similarly easy. The WP3 group has already interviewed one such stakeholder. Then there are the stakeholders that are not defined at all. They currently live a life in a university lab or as an idea in the head of a PhD student. In the energy market that lies ahead we may anticipate emergence of new types of players that have unprecedented existence. This happened in the computer business after the personal computer was launched. It happened after the inception of the Internet and as a part of developments within the telecom industry both before and after the change of the millennial. There are hardly any reasons why this should not be the case. Different and radical trends move forward. They include smart grids, new storage technologies for energy, smart buildings/houses, e-mobility, robots, artificial intelligence, smart city developments, Internet of Things (IoT) and many others that all are entwined and partially accelerated. Again an example – with the introduction of blockchain technologies for recording and managing withdrawals and deposits in a street level battery the chain miner role will suddenly play an important role.

Since INVADE addresses new business models, old school approaches addressing only the traditional list of stakeholders may not hold. There must be imagination to cater for the new arrivals, and this imagination must be cultivated throughout the project. As a consequence, this report tries to cater for the yet unknown and insignificant. This implies continuous maintenance of the content and the initiatives made too in order to define the stakeholder perimeter.

Another important aspect when planning for a high degree of penetration and impact is that we cannot only talk about companies. Although companies are defined by their business model, their strategy, their values and the company culture, they still consist of a group of individuals. The project will address people first and foremost. Members of an organization that exceed particular favorable influence on other members, on the business and the network around are of specific importance.

## **3 Method of approach**

### **3.1 Introduction**

The cluster and competitive analysis model of Michael Porter (Porter 1980, Porter 1985) has served as a principal reference for the work presented. However, Porter's model

was created during a time when no such thing as network markets, platform business models, value networks existed. Hence we have applied other references to compensate for that. These include (Wåge 2016, Tapscott 2016, Stabell 1998, Parker 2016). For the empirical part we have done literature reviews, interviews and surveys that have also involved the project partners. The latter has been important to identify representatives of a particular stakeholder category within a certain country.

Prior to such an investigation a scenario analysis should be performed. A scenario analysis is meant to create a shared perspective of the future that spans both wishful and less optimistic projections. But a scenario analysis is resource demanding, and in the case of INVADE it needs to involve all partners. Ideally representatives of the stakeholder perimeter need to take part too. We have currently suspended that. Instead we have relied on other past projects that relate to INVADE in some ways (Bremdal 2014). However, we intend to carry out such an exercise in a later workshop. Our assumption is that this will yield a better pay off as partners are more confident with their work and a stakeholder group has been established. As a result, the scenario analysis is part of the plan ahead.

### 3.2 Porter's cluster model

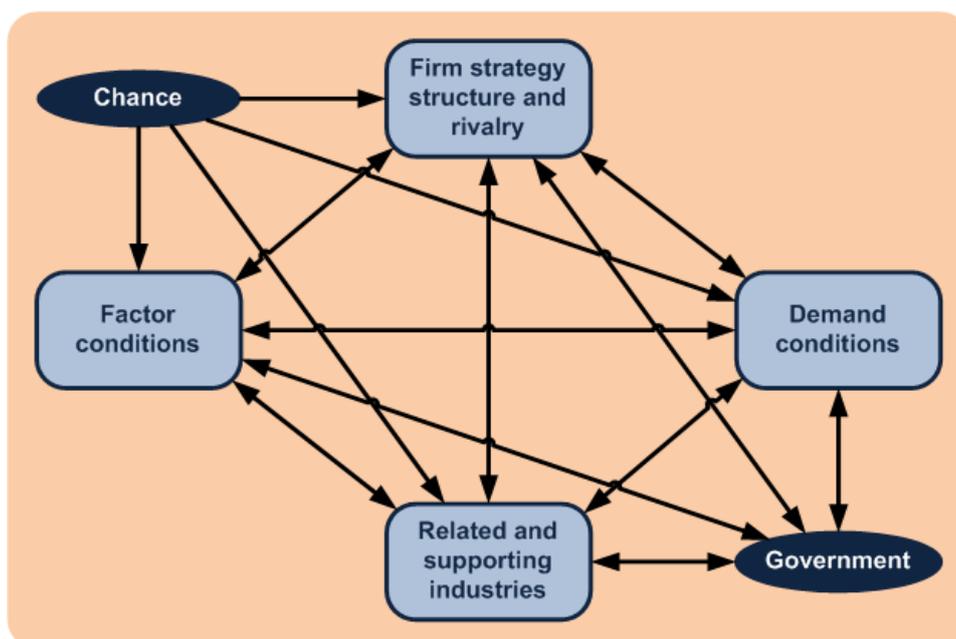


Figure 2 Porter's industrial cluster model

Porter's cluster model is typically depicted as a diamond model consisting of the following mutually interacting elements:

- Firm strategy, structure and rivalry
- Factor conditions
- Demand conditions
- Related and supporting industries

In addition, there are the impacting forces driven by chance and through politics and government regulations. It is also typical to include the impact of culture and public opinion.

### **3.2.1 Firm strategy, structure and rivalry**

This aspect of Porter's model relates first of all to the competitiveness of an arena. Who rules the business scene? That is the most important question that we ask.

The structure of the business domain and the various business strategies and models active in this arena are important. The intensity of the competition between companies and other players can make a big difference and the choice of business model and business strategy is decisive. If the competitive arena is dominated by one or a few companies, these are stakeholders that the project needs to relate to. The successful ones attract financial capital, good employees and government attention. Creating incentives for them could leverage exploitation and yield valuable feedback to the project.

However, "judo strategies" can be used to circumvent these players. That means using their force and position to leverage alternative or complementary strategies. In cases that there exists no competitive arena, but a monopoly or oligopoly, different approaches must be applied. If the dominating companies obstruct the type of changes that we can expect then the project should invite them into its sphere or leverage their effort to influence rule making with authorities or regulators. This can be a tough call. Consequently, "under the radar" operations could be a better alternative. This means building exploitation and business models that create a new structure bottom-up, taking small steps at a time. The question to be asked then is who could be the partners in such a quest?

An important consideration is the mutual impact between the competitive arena, factor conditions and related industry. Quite often the position of the dominating company in the arena is based on a unique position in terms of sourcing. If you control critical factor conditions a company can dominate and grow. In the energy business this type of

dominance could imply control of energy production and control of transmission and/or distribution.

According to several authors (Porter 1985, Reve 1996, Mintzberg 1983 ) a monopoly with dominance only within a limited territorial region or a country will inevitably come under pressure due to the global impact. In the beginning a monopoly will typically adopt a conserving strategy and build defenses to hedge against alternative approaches and change. Historically, this has a limited potential and such a company will squander its opportunities or come running for help when the pressure becomes too tough. From this follows that the project should relate to the sourcing situation and ask if there are emerging alternatives that could erode the basis for its dominance. If this is true monopolistic stakeholders should be approached. There is nothing more that could change a CEO's mind than an imminent threat to the very reason of its monopoly. In that situation they are also likely to lend an ear to the message that the project has.

### **3.2.2 Factor conditions**

Factor conditions encompasses all aspects of general or specific sourcing. Those stakeholders having a role with regard to factors of importance, their access, their prices and their quality must be identified.

In this context, general sourcing implies access to natural resources, infrastructure, financial capital, human capital, technology and specific expertise. It also implies the pricing of such factors and their quality. In the context of smart grids and energy we would like to emphasize specific factors that are crucial, but not apparently dominant. One typical issue is access to charging stations, their capacity and the quality of service associated with such access. For a transportation companies and e-mobility this is essential. For a chicken farmer and telecom company a reliable supply of power can be very critical too. On a broader level all the new aspects of digitalization and computerization typically associated with smart grid development require new insight and new skills. Knowledge in power electronics and IT-systems are two examples. Colleges and universities are important here. To what extent is such know-how available and at what price? A study of different factor conditions in different domains can identify stakeholders of great importance. The ability to adopt the outcome of projects such as INVADE and to build a business on top of it requires knowledge and access to companies and institutions that can deliver factors of future importance.

### 3.2.3 Demand conditions

Here we primarily ask who have access to the demand side? Who control the channels that allow companies to interact with their customers and customers' customers? Who are able to interpret behavioral trends and future demand? (Gladwell 2002).

Customer needs and customer satisfaction are essential elements of any business activity. Market access and direct access to customers are of great importance. Having close contact with a customer base and understanding their needs and preferences are both crucial. The ultimate customers in the context of INVADE are consumers and prosumers. They are prime stakeholders and the things that they do generate a lot of impact. However, their knowledge of new technologies and their future possibilities may not be obvious to them. Stakeholders that could influence this include media, schools and market players that have regular contact with them, i.e., the electronic company, the electric fitter or plumber and retailers in different industries. The furniture giant, IKEA represents the latter one. Yet, potential demand may not be obvious. Behavioral experts and trend analytics are examples of expertise that helps to understand future preferences. Market psychologists and market analysts have all specialized in this field.

Understanding the end-user needs is essential also for those who reach them directly through different channels. Knowing your customer's customer is absolutely essential. The gatekeepers who control or monitor such channels might be very important stakeholders. The possibility to work alongside demanding customers is important. They set the standard for what is needed. The ICT industry has long been aware of this and applies different strategies to generate attention and interest among different and seasoned users. Smart phone companies like Apple use different techniques to gather both end-user intelligence and to stir and gauge interest in potentially new offers. The game industry is today totally dependent on a group of high notch users who will offer advice and feedback in return for the privilege to test a game before others. Companies that have tried to avoid these kinds of stakeholders have often created a negative public opinion that significantly change the adoption rate of their new products. As a result, many companies, also beyond the gaming industry, establish forums where customers and would-be customers can share experiences and yield feedback. From this it is possible to harvest a rich set of data that can tell something about the tacit needs and preferences of different market segments and therefore also demand conditions. Social media such as Facebook and Snapchat thrive on this.

### **3.2.4 Related and supporting industries**

A network of industries is important to ensure attention among customers as well as authorities. The ability to penetrate the market and assure favorable political support is not created in a vacuum. Stakeholders that partner up laterally or vertically enthrone interest and leverage power. Industries that cooperate in different ways may find it useful to organize shared procurement, engage in common R&D, mitigate risks and create a common lobby that influences authorities and gatekeepers alike. A supply chain consists of many links. How can the various stakeholders leverage their impact on the market and the business environment? By a common reorganization of the chain radical innovation can take place with little investment. In the context of INVADE it is useful to see how suppliers of IoT technologies, home automation systems (HAS), electricity meters, EV can cooperate. In the context of INVADE it should be obvious that buyers of PV panels could be interested in wind generators and batteries too. There are property brokers who are beginning to see the added value of homes that have PV panels and low energy costs. Some even advertise a share in car pools with the sale of an apartment to stir added interest and compensate for the fact that there is a difficulty with parking space. Why should not suppliers of new homes, financial institutions, battery makers, electricians, EV sellers and suppliers of charging equipment cooperate and create a single package for the buyer? Perhaps this might be the best key for many smart grid initiatives that seek a market opportunity. Who are the stakeholders that could relate and cooperate to create a package of seamless offers? How does this relate to INVADE?

### **3.2.5 Government and other authorities**

For the head of a DSO the most obvious stakeholder of this kind is the regulator. Regulators make the rules and define the templates for tariffing and taxes on behalf of the political authorities. The regulators, governors, law makers, the ministers of energy at national and over-national level are all stakeholders that execute power and influence that have a profound impact on all kinds of businesses. Around them there are interest groups and lobbyists that constantly try to exceed their influence upon law makers and others. In the energy world ENTSO-E and GEODE make a few examples. Some environmental preserving interest groups have also raised to this level while others emphasize efforts that try to impact public opinion. United Nation is an example of an international body with significant influential power. The Paris accord in December 2015 is their strongest feat in the field of energy and climate change until this date. Bodies like the Norwegian Directorate for Civil Protection (DSB) are also important. DSB is currently addressing safety and fire protection related to EVs and stationary batteries in homes

and buildings. Their parallel can be found in most European countries. Also, standardization bodies execute power that must be observed. This has already been catered for in the project.

### 3.2.6 Chance

Every business venture is subject to the element of chance. A sudden incident could change the future prospects of a lively business overnight. Extreme weather, fire, act of terrorism, accidents and sudden health issues among top management could be devastating not only for a single enterprise, but an entire industry. A prime example is the Fukushima catastrophe that literally changed the prospects for the entire European nuclear industry. The Deep Water Horizon<sup>1</sup> event in the Mexican Gulf had a formidable impact on BP's business and shook the whole oil and gas industry. In terms of a particular business the strategists would assess how exposed it is to unexpected events. The idea is to determine the robustness and resilience of a business and what stakeholders there are to support and to contain an incident. The type of stakeholder solicited would be medical aid, fire corps, police, military as well as engineering and insurance companies.

In the context of smart grids, susceptibility to hacking of ICT systems, privacy intrusion, breakdown of communication systems, sabotage and floods (like New York in the fall of 2012<sup>2</sup>) are highly relevant. IT security is particularly important. There are multiple references on how smart meters and demand response programs have seriously been affected due to public distrust. An unfortunate incident can wipe away all confidence in the type of technology that INVADE is contemplating and ruin the results of months and years in confidence building.

Fire prevention related to incidents involving lithium-ion batteries and similar addresses comparable things. Are there stakeholders that can contribute to new preventive solutions? Does emergency assistance exist that can reinforce trust and rapidly reestablish confidence in the solutions that INVADE wants to promote? Advice and

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<sup>1</sup> [https://en.wikipedia.org/wiki/Deepwater\\_Horizon](https://en.wikipedia.org/wiki/Deepwater_Horizon)  
[https://en.wikipedia.org/wiki/Deepwater\\_Horizon\\_explosion](https://en.wikipedia.org/wiki/Deepwater_Horizon_explosion)

<sup>2</sup> [https://en.wikipedia.org/wiki/Effects\\_of\\_Hurricane\\_Sandy\\_in\\_New\\_York](https://en.wikipedia.org/wiki/Effects_of_Hurricane_Sandy_in_New_York)

support from that end could be extremely valuable in terms of both system development, exploitation, business development as well as marketing.

If accidents become reality and important stakeholders are hurt who can help to reduce the harm, avoid liabilities or sooth the pain? Insurance companies provide an obvious answer, but also suppliers who could possibly offer guarantees of some sort are of relevance. Airlines and travel agents which offer low fare tickets with no flexibility typically provide an opportunity to buy insurance against possible illness, which makes people unable to fly on the scheduled date of departure. Risk reduction generates confidence in a scheme. Even coverage for the unlikely event of an airline going bankrupt can be purchased as part of the bundle offered to the potential passenger.

But chance poses not only threats. The concept also encompasses extraordinary or unexpected opportunities. For the renewable industry Fukushima<sup>3</sup> was a gift. How well were they prepared to step up and exploit the chance? What stakeholders were there to help? When a breakthrough in new technology opens up is the enterprise agile or sluggish? These characteristics could imply dramatic growth or decline. How are the INVADE partners and others positioned for a market breakthrough in lithium-air battery technology? Lithium-air batteries have energy density per kilo close to that of petroleum? What about new applications of graphene? What about applications

### **3.2.7 Culture**

Cultural differences could have a significant impact on how businesses are perceived and how well they are able to operate in a given region or country. Language issues, traditions, religious variables as well as ethnicity cannot be ignored. Even subtle differences can have a profound impact. In terms of energy multiple studies have been carried out. Bremdal (2014) have previously outlined some fundamental aspects that should be observed when introducing smart grid technologies. They sum up social-psychological research conducted over years. In short energy use can typically be related to people's desire to maintain or even improve their life style. Life style can again be divided into elements such as comfort, convenience, cleanliness and multiple forms of security (Shove 2003, Hargreaves 2013). Even coziness defines an axis in the life style space (Aune 2007). However, the perception of what is convenient, comfortable, secure, clean and cozy varies. The Scandinavian form of coziness stand out as

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<sup>3</sup> [https://en.wikipedia.org/wiki/Fukushima\\_Daiichi\\_nuclear\\_disaster](https://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster)

extraordinary compared to other countries (Aune 2007). It involves a cubby hole experience in the private home with special lightning, the right temperature, music, food and entertainment that demands extra energy loads, especially during winter. This life style might seem odd to the Mediterranean citizen who might be more extravert and outgoing and therefore require different energy support. A study comparing Japanese and Norwegian use of indoor lighting is another example (Wilhite 1996). While Norwegian preferred soft low-level illumination during dark winter evenings with multiple loads the Japanese felt more comfortable with a single fluorescent light in the ceiling.

Cleanliness and the perception of privacy is also an issue. In the Western world the daily shower has become a standard reference for personal hygiene. Although modern dermatology tells us that frequent showers could destroy a bacteria culture that a healthy body is dependent on, many households use showers in the morning, after work, after sports, after gardening and as part of the evening ritual before going to bed. This keeps the boiler busy. But this specific routine might appear foreign or even odd to other cultures. In Germany and some states in the US the introduction of smart meters has been met with public resistance due to arguments of privacy intrusion. Yet, in Scandinavia similar initiatives have mostly been met with a yawn.

Culture also relates to gender. Do you use the same arguments to convince a female CEO compared to a male one? Certainly, differences when it comes to decision making among consumers and prosumers regarding interest, acceptance and use of smart house and smart grid technologies have been detected (Hargreaves 2013, Bremdal 2014). The subtle difference between husband and wife in a household can have profound effect on any initiative to promote demand-response programs, roof top PVs and batteries. So who are the stakeholders that the project needs to address in order to embrace the cultural aspects? Psychologists, sociologists and anthropologists are certainly candidates. In NTNU the project has body of expertise signed up. But more are needed.

### **3.2.8 Public opinion**

Public opinion means a lot. As pointed out above some smart meter programs have suffered as public opinion has worked against them. On a more general scale the perception that Man is the cause of many climate issues is beginning to sink in. It colors the political agenda and multiple coffee table talks across Europe are dedicated to the topic. More and more put emission control on top of their list of concern. This is greatly helped by interest groups such as Zero, Greenpeace, WWF and others. The common

denominator is the need to reduce the use of fossil energy for transportation, heating and electricity.

There are multiple stakeholders currently involved in forming the public opinion about renewable energy and initiatives that can lead to drastically reduced consumption of fossil fueled energy generation. Such stakeholders could be the best allies of the INVADE project as they typically reach out to all, including politicians, consumers, suppliers and regulators. A priori, journalists, editors, bloggers, lobbyists and interest groups are candidates that should be kept close to the project.

### **3.3 Porter's competitive model**

#### **3.3.1 Introduction**

Porter's competitive model (Porter 1985, Reve 1996) has been used to identify stakeholders that could promote or try to demote the business model developed in INVADE (see Figure 3). The cluster analysis looked at contextual parameters that must be observed. The competitive model is meant as an instrument to enhance and promote the business model and the system derived at in the INVADE project.



Figure 3 The five forces in Porter's competitive model

The questions asked are simply;

1. Who are the candidates that could be early and subsequent adopters of the business model and system developed?
2. What parties can be seen as beneficiaries, promoters and competitors of the final result?

The most important stakeholders according the model depicted in Figure 3 can be categorized according to 5 main categories. Each of them will be explained in the following.

- Customers
- Suppliers
- Competitors

- Intruders
- Substitutes

However, to identify principal candidates in each category we must anticipate a future enterprise that has picked up the business model developed in the project or a derivative of this. As the work in WP9 has not been concluded no firm conclusions can be drawn about customers, suppliers or competitors. Therefore, the names proposed in each category must be considered possible exemplars only.

### **3.3.2 Customers**

Who are the customers? Although these are the people or companies that pay for the products and services that are sold, few explicit references are made to this group of stakeholders in literature and at conferences focused at energy or even smart grids. When this happens, the references made are often blunt and addressed with the fuzzy expression “market”. However, the market is diverse. Successful approaches to this group of stakeholders need to be diversified. Hence representatives from different segments should be considered. Diversification follows sociographic, demographic and geographic boundaries. In the smart grid domain some research has precipitated that stresses this. For instance, Toft (2013) showed that there were subtle differences between Swiss, Danish and Norwegian consumers with respect to adoption of new technology and the way they translated climate concerns into action. Loock et al. (2011) identified similar differences. Funk (2016) points out the importance of age and makes a clear distinction between the millennial generation and older generations. Bremdal (2014) has documented through the study of actual sales records and sales initiatives that age and gender specific differences can be decisive when offering energy related HAS.

Even though the immediate customer might be a company or a cooperative of energy users it is still the individual consumer who constitutes the terminal point of the value chain and pays the final bill. Without approval of the individual energy consumer or prosumer, the cooperative or company in the middle will be able to succeed in the long term. The common target for novelties are the Early Adopters. Our approach should, however, define a wider scope to support the developments in the project and eventually the exploitation effort. Using Gladwell (2002) as reference we should focus on the following stakeholders representing the customer side. At first glance they may seem one-sided focusing on individuals only, but they also refer to companies that have

adopted strategies and roles that are similar. Thus, it is recommended to look for members of the following categories:

- Innovators
- Early Adopters
- Connectors
- Mavens
- “Salesmen”

### **3.3.3 Innovators**

As INVADE aims to break frontiers Innovators can be very important. On an individual level these are customers or potential customers that tend to change a service or a product to fit a particular purpose that they have in mind. It typically starts with a hack or a different use, often far apart from the product’s original purpose. If such signs are picked up early it could provide important input to both research and product development. It signals a novel connection between one particular need and a product or service feature that should be followed up. Companies that fall into this category typically apply established products in a novel way to get “the job done” without calling product development. One example could illustrate this. When some people started to use smart phones as note taking devices in meetings instead of transferring scribblings on a flip-over page it was a signal for OCR (optical character recognition) makers to produce apps that could transfer the content to MS Word. Innovators have a practical sense that can be exploited early in the project.

### **3.3.4 Early adopters.**

Early Adopters are those that pick up new things early and thrive on being first, sometimes at a cost and risk that would scare the average consumer. Among the early adopters we need to find the “champions”. Those are the people or companies that invest a lot of effort in making things work. Early adopters could be extremely important in harnessing a new product or create a show case for a new idea. The Beta testers of game producers such as Blizzard and Funcom belong to this category. Early adopters are prime candidates for exploitation.

### **3.3.5 Connectors**

Individuals that can be called Connectors are typically fueled by altruism. They thrive on sharing information about novelties through an extensive personal network. With the existence of social systems like LinkedIn and Facebook more people than earlier can call themselves Connectors to some degree. However, it depends on how they manage it and how they maintain it. The group that INVADE should be looking for are the ones that thrive on news about novelties and pass them on to a very large group of people and companies. The energy related equivalent of the popular “pink bloggers” are the ones that we should engage. As many would know, a number of young females have raised from oblivion by sharing personal experiences and tastes related to fashion, new cosmetic products, novelties related to pregnancy and child raising. These bloggers have gained an enormous impact and many companies have since long discovered that. The enterprise version of the Connector type is a customer that shares its experiences through massive networking and exposure being proud of its relationship with its supplier. Cooperatives can be natural Connectors.

### **3.3.6 Mavens**

Mavens include a kind of customers that are extremely market oriented and know a lot of details about specific products and market opportunities. For a new product, Mavens will be sure to solicit Early Adopters first and find out about their experiences. Sometimes they are Early Adopters too, because they are unhappy with other alternatives. They are also extremely conscious about value for money and are readily willing to share their knowledge about the market and other products. An offer accepted by a Maven is a breakthrough. Final approval by a Maven means that the offer has been seriously compared to other things and found worthy. A Maven company is an enterprise that can be associated with quality, a professional customer that scrutinizes the market and picks the suppliers that they are sure can deliver. In return Mavens. are willing to share an enormous amount of valuable information about their needs and their own customers.

A testimonial from such a person or company can make a huge difference. At the same time the systematic approach applied in testing and using whatever has been introduced, even prototypes, can yield important feedback and comparable references.

### **3.3.7 Salesmen**

Salesmen are champions of promotion. Here we are not addressing the profession, but a personal, inherent part of a person’s character. According to Gladwell (2002) some are

borne salesmen. They are the type of people that create a congregation of followers simply because they say or use things in a way that have a persuading effect on others. They build trust and confidence in new things and new solutions without the big words. They have an ability to manage problems when they arise.

### **3.3.8 Champion team of customers or would-be-customers**

It should be an ambition of INVADE to connect with stakeholders in each group and somehow let them mutually link too. This connection process is likely to create a team of champions of very high value. In a network market (Parker 2016) members of this group will be crucial in order to recruit other users and thus cause the necessary tipping point for effective exploitation and future growth.

### **3.3.9 Suppliers**

In a network market the suppliers represent the other side. Who comes first, the supplier or the customer, is a “chicken and egg” problem. Parallel engagement can be necessary. In the traditional market, supplier density, sourcing and relationships with the providers are more emphasized. In the context of INVADE suppliers who can reinforce the business model are the ones to look for. Tying up with the right IoT oriented companies, producers of intelligent gadgets, suppliers of more efficient solar panels and high density batteries could accelerate work on both objectives as well as business models. The question that must be asked at this time is who can these be.

### **3.3.10 Competition**

What is the competitive context for the results anticipated in INVADE? Are there parallel projects that could steal attention from INVADE? Mapping these will be an important exercise. How innovative and agile are existing players? In what ways do they represent the historic tradition in the electricity domain? Have they made their entry from the energy side or from the IT side? Laggards could eventually be transformed into customers, while aggressive IT companies which may have adopted a vision similar to that of INVADE may have to be watched carefully. In the best case they could become interesting partners offering tangibles that could be complementary to that eventually offered by INVADE.

### **3.3.11 Intruders**

The current energy industry is undergoing a transition due to new technologies, government policies, dramatic price variations for crude oil, excess supply of brown coal and an ever growing solar and wind industry. Old barriers have eroded and the whole industry lies open for what is typically called Intruders. In fact, INVADE has the potential to give birth to one or two intruders. WP3 will pursue such opportunities if possible. However, it also makes sense to look out for other R&D projects and similar initiatives that can leap in from the sideline and upset the foundations for the business model developed in WP9.

### **3.3.12 Substitutes**

As mentioned before, multiple technological streams push old boundaries in different directions, sometimes in parallel, sometimes crossing paths. Elements from each can be combined, rearranged, substituted and recombined again. INVADE can be found in the cross stream between a few of these developments and it is important to monitor the technology domain very carefully or have someone carry out that service. Sudden breakthroughs can make some of the work that is undertaken obsolete. Other innovations may offer complementary elements that could speed up work and make exploitation in INVADE much easier. Stakeholders that offer substitutes must be considered both competitors and potential partners. Companies and other major projects are prime candidates in this category.

## **3.4 Forms of stakeholder engagement**

A part of the method adopted has been to identify the means available to leverage the exploitation effort. Some will require more effort and costs compared to others. As a result, they may not be applied very liberally. Hence these means must be applied wisely so as to generate the best feedback and the highest level of awareness. The idea is to create an engagement plan that can optimize resources for the best possible impact. The scope of engagement stretches from simple broadcasting to raise awareness and have individuals and companies approach the project and follow its developments. At the other end, it includes strong involvement of people with knowledge of the market or key individuals from companies that could become important partners in future exploitation.

Table 1 Engagement activities listed in order of degree of stakeholder commitment

<b>Activity</b>	<b>Specification</b>	<b>Abbreviation</b>
Monitoring	This implies following the development in the energy market and smart grid domain closely. It relates to Task 9.1 too – Review of state-of-the-art and Task 9.3 Local policy and implications of regulations (new and old)	MON
General communication & dissemination activities	This relates to Task 2.1 in WP2 and basically	GDA
Surveys	This could be investigations of different sorts to harvest specific answers, e.g. user practices and behavior analysis. Must draw on work in Task 3.2 Stakeholder analysis and Task 9.2 User practices and behavior analysis. It will also be related to Task 3.6 Engagement with municipalities, communities and DSOs	SUR
Information relay	This relate to effective networking on social media and in the physical space, e.g. at conferences. Networking must be target specific and conscious. Also related to Task 2.1 and Task 2.2 Digital media	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. Also important to influence such developments and policies. This will be related to Task 2.4 Participation in EUC events, Task 3.8 Contribution to Policy and Regulatory Agendas. Task 3.9	PIE

	Contribution to standards will also be associated with this. Examples are conventions, conferences and seminars.	
Interviews	Related to Task 9.2 User practices and behavior analysis. This will be related to Task 3.8 Contribution to Policy and Regulatory Agendas too	INT
Face-to face consultations	This encompasses Task 3.4 Face-to-Face Consultations and Dedicated Workshops It will be related to Task 3.8 Contribution to Policy and Regulatory Agendas	FFC
Demonstrations	It will also be related to Task 3.6 Engagement with municipalities, communities and DSOs	DEM
Workshops and project events	In order to harvest feedback and to influence developments trends. Related to Task 2.5 Project Events and Task 3.4 Face-to-Face Consultations and Dedicated Workshops	WPE
Document reviews and feedback	This implies requesting feedback and voluntary peer reviewing of papers and deliverables produced to harvest early feedback. Could be related to Task 3.9 “Contribution to standards”. It will also be associated with, Task 3.4 Face-to-Face Consultations and Dedicated Workshops, Task 3.8 Contribution to Policy and Regulatory Agendas 3.6 Engagement with municipalities, communities and DSOs	DRF
TAG engagement	This relates specifically to Task 2.3 Technical Advisory Group, Task 3.8	TAG

	Contribution to Policy and Regulatory Agendas,	
Participation in project meetings	Invitation directed towards individuals from different stakeholder groups that can observe and engage in the project discussions on both technical, business and project management level. Related to Task 2.5 Project events.	PPM
Exploitation partnership building	This includes involvement of the project's Exploitation Users Group. The recruitment of members of this group will be very important. The effort is related to Task 3.5 Exploitation User Group. It will also be related to Task 3.6 Engagement with municipalities, communities and DSOs. This will be related to Task 3.8 Contribution to Policy and Regulatory Agendas and Task 3.9 Contribution to standards will also be associated with this	EPB

## 4 A tentative business model

### 4.1 Introduction

A business model describes how an enterprise creates value for its customers in a sustainable way. It describes what services and products are offered in return for a revenue stream generated within a specific market and economic regime and impacted by social, cultural, political and different contextual factors. All these provide a rationale for the existence of that enterprise.

WP9 is currently addressing different tentative business models to be considered in INVADE. A business model suggests important stakeholders that must be targeted and pieces of a strategy to reach them. The stakeholder plan developed in WP3 is thus dependent on this. However, the work in WP9 will not be concluded before this report is

due. WP9 partners also need to adjust to developments in other work packages before concluding their work. This is naturally a disadvantage for the task harboring the creation of this report. But we believe that the weakness can be contained to a large extent. The plan presented here will be subject to maintenance during the course of the project. This implies that as work in WP9 proceeds WP3 will be picking-up changes and concepts developed and use them in the maintenance effort in T3.1.

## 4.2 The Flexibility Operator

INVADE centers around a concept that has been named Flexibility Operator (FO). The aim of the FO is to consolidate multiple flexibility resources and leverage these for the benefit of different users who are in demand for congestion control, self-balancing and optimal use of their resources from an environmental and economic point of view. DSOs, retailers/aggregators and even prosumers/consumers are typical beneficiaries. Prosumers/consumers could be households, buildings, municipalities, cooperatives and others. Simply put, the FO is a service provider. But it is also more than that. From the INVADE proposal the FO needs to recruit and engage resources that it does not fully control or necessarily own. Yet, it needs to orchestrate this for the benefit of all involved. This implies a broker capability. This further means that value generation arises from networking (Stabell 1998) more than the traditional value chain. This is a working hypothesis at this time, but a strong one. Connecting those who can provide flexibility for a given purpose, at a given time and for a specified duration to satisfy the needs of a specific user lies at the heart of the mission that the FO needs to accomplish. The real-time requirement can be severe. From this follow two important requirements:

1. Connections need to be supported by ICT technology to allow FO to effectively meet demand with sufficient supply.
2. Efficient data flow must be secured so that hardware controlling loads or feeds can be deactivated or reactivated in different ways based on call initiated from those who wish to secure such a benefit.

The FO thus deals mostly in data and information and less in energy. However, the energy flow needs to be monitored. Power peaks and troughs need to be understood. State of charge (SOC) levels need to be monitored and consumption and production patterns analyzed for multiple purposes. The FO relies on standardized protocols and the emerging concept of Internet of Things (IoT) to make the necessary connections. Currently this is almost built from scratch in the project. However, as IoT advances on

multiple fronts, the future oriented FO may avoid the engineering of the basic platform that allows such connections. It may simply be sufficient to consolidate different options through plug and play as human individuals do today through social media and by means of their smart phones. The underlying infrastructure is intact and sufficient to support the value network model right away (Parker 2016). In fact, this broker operation will be centered in a network market where connections made can be supported by long term financial instruments or hyper fast settlements supported by short-term, fixed or negotiated fees. As a broker the FO operates a hub that controls the network. The hub supports the exchanges in the market that in turn will trigger the changes. What is important to note is that its configuration can be very dynamic. The number of active members in such a network can vary, but there is always a possibility to recruit more participants at either side of the network. Hence, it is a vibrant ecosystem where the initiation of transactions and use of resources are determined by its participants. The resources (energy, storage space, PV panels etc.) related to these transactions are assets that only in special cases would belong to the FO. It is the signal and information exchange associated with this that constitute the core of the FO operation. However, this information exchange does not imply only conveyance of data and exchange of ON/OFF signals. The FO refines and modulates the stream of information in multiple ways. That is where its unique value contribution lies. It uses historical data to offer new contract templates for use of the network participants, it may modulate and split signals so that a request for 1 MW flexibility is automatically turned into 1000 x 1 kW requests for different participants or members. A request for 500kW peak reduction for 2 hours might be translated into 6000 upstream requests that calls for a 500W deactivation for 10 minutes every hour. The FO blends data harvests generated from the network itself with external data related to weather, traffic, events etc. to create a basis for proactive operations and optimal utilization of the resources hooked to the network. This type of information exchange and information management constitute the core expertise of the FO. To follow the basic principles of a value network the business model should then observe the following:

1. The resolution of the network must be high and it must demonstrate critical mass: It must be easy to make connections between the demand side and the supply side at any time and for any purpose. Critical mass implies sufficient capacity and suggests redundancy. It also creates a barrier against shunting, meaning that it is better for two or more participants to achieve its ends by using the broker function rather than establish something on their own.

2. Transaction costs must be low: FO prospers on volume. Its maximum bandwidth should be exploited and frequent use will harness both customer engagement and revenues<sup>4</sup>.
3. The network must be supported by a Yellow Pages that allows rapid and easy access between the supplier and the user. In the old days, this used to be the telephone directory. Search functions on the Internet fulfill the same type of role. In an IoT architecture with a fixed set of devices and network participants a list of possible connections can be prepared by the FO in advance. However, the nature of the future IoT opens for a more dynamic concept where devices such as load controllers or charging spots may sign up with a network like that offered by a FO on its own. It is the parallel to a user that signs in on a conference call or connects with a group on Facebook. The difference being that the devices do this on their own and share their IP address accordingly. This calls for a systematic and regular update of the Yellow Pages

### **4.3 The tentative business model in WP9**

The proposed business model currently under development in WP9 is shown in Figure 4 through Figure 8. It shows the FO in the middle as a hub in the whole system. In spite of the fact that the FO should be capable of addressing a whole portfolio of local loads, storage units and feeds, it is anticipated here that many of these will be already organized in existing communities. These could be an aggregator (both commercial and technical), an ESCO or a EV-community such as Nissan or Tesla. Consequently, the FO ties up with such. The proposed model makes a distinction between the professional flexibility service providers and customers (right in Figure 4) and the non-professional (left in Figure 4). As explained earlier, the real value offered is the consolidation of multiple flexibility sources that could be harnessed to serve both DSOs and TSOs if necessary. A current weakness with this model is that it depicts only a major buyer of flexibility provided in the system. This is going to be changed. Each of the parties on the left and the right-hand side are all potential customers of flexibility too. This could be to assure

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<sup>4</sup> However, there may exist a significant asymmetric relationship between use of the network and the revenue stream. Experiences from the Internet shows that many players operate with zero transaction costs due to the fact that higher traffic attracts other players that through their engagement cross-subsidize the basic exchanges that take place e.g. Facebook, Google.

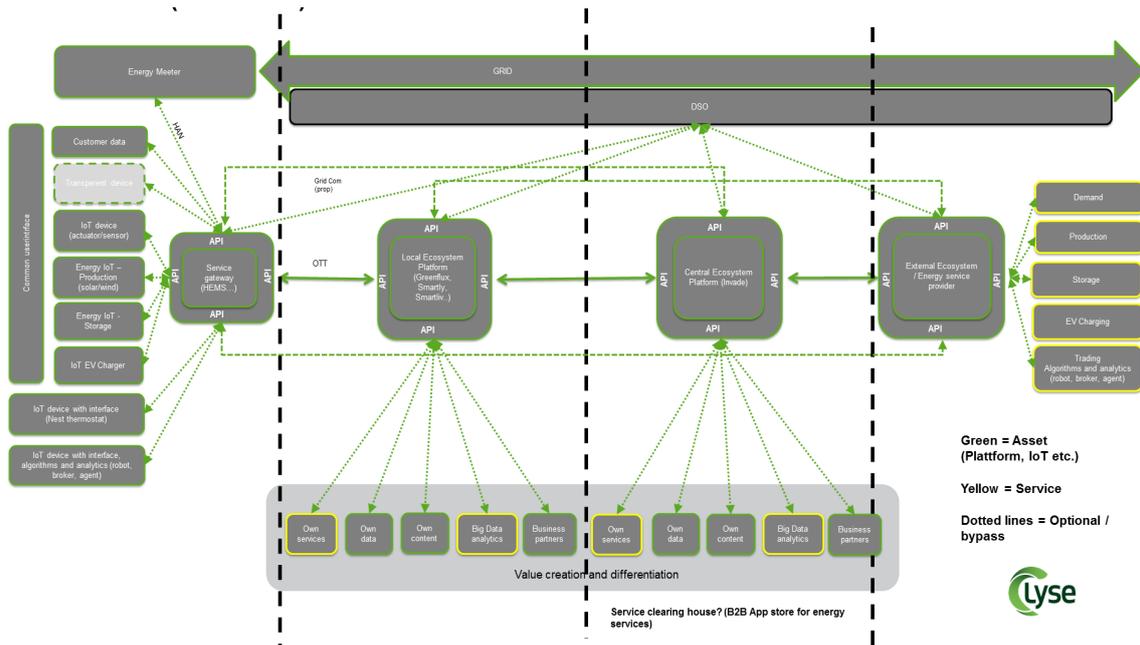


Figure 4 The overall business concept currently proposed for the Flexibility Operator in INVADE. It suggests a bi-sided business platform designed to provide networking based on IoT technologies. The horizontal bar above represents the principal demand side of the concept.

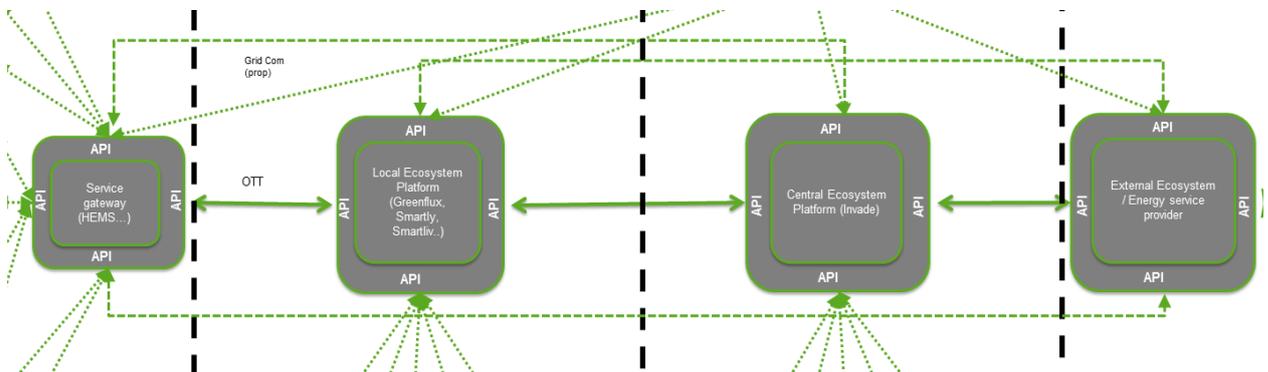


Figure 5 It is anticipated that the INVADE FO ecosystem may connect to individual users as well as to other communities (ecosystems) which are likely to be built in parallel. These communities will have a more specialized or regional scope than in the case of the INVADE FO. However, the INVADE FO can be prepared to also cover this function. Then its presence will be both local and more hands-on as well as global. The API could be replaced by an Autonomous IoT (A-IoT) interface.

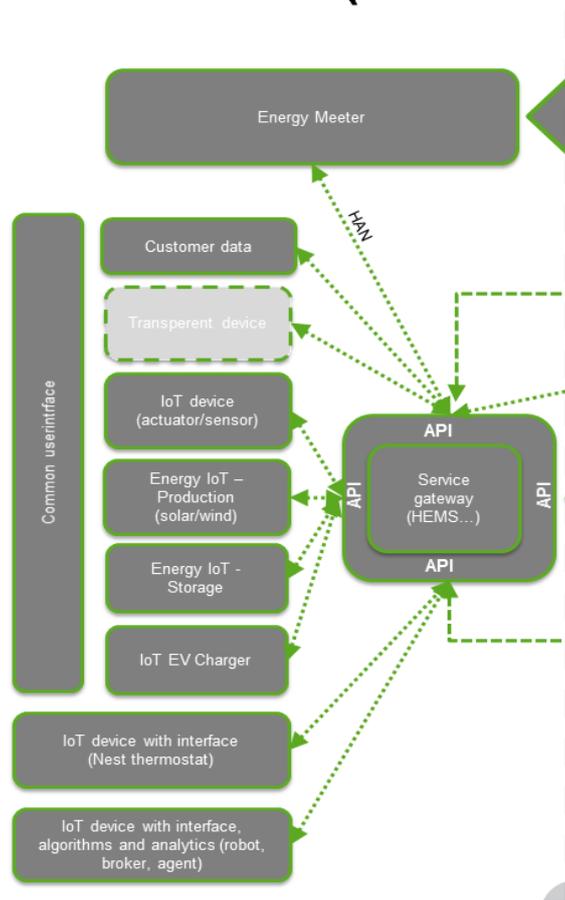


Figure 6 This is a typical prosumer side of the system. However, this side could also demand flexibility services to gain higher load or feed in priority within a local community (or microgrid).

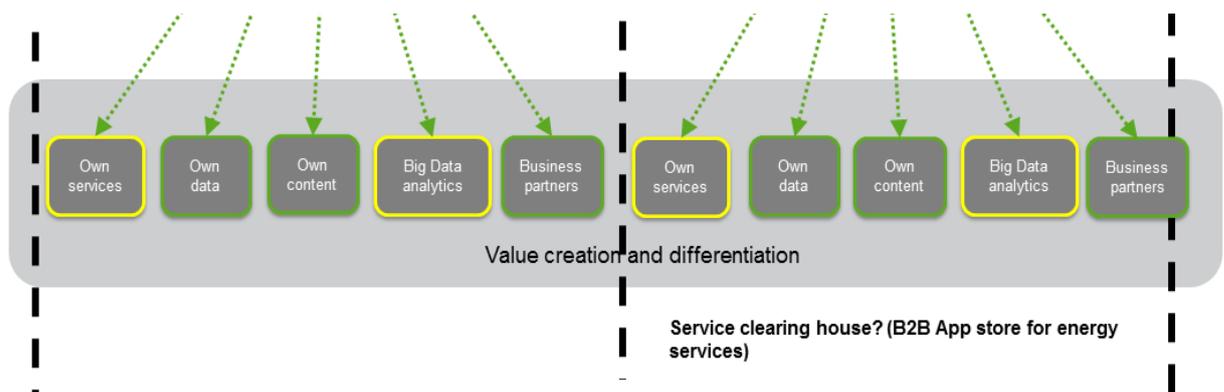
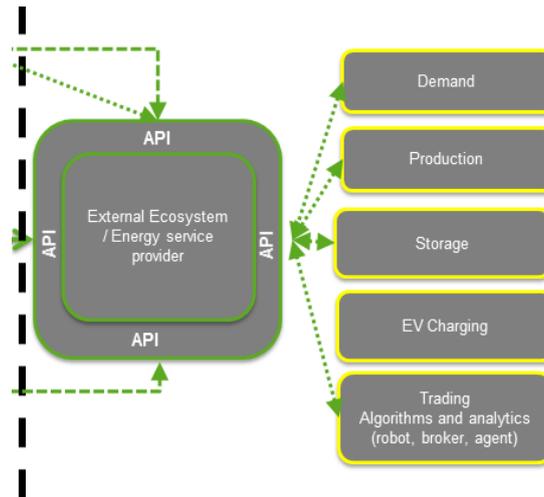


Figure 7 The INVADE FO builds a tool case for information management and effective connectivity to provide leading networking and community services



*Figure 8 This side represents the professional service providers that are another source of flexibility. However, each member here may also negotiate higher priority within the community or local grid and thus request others to reduce their consumption (or increase their discharging capability).*

self-balancing or to ensure high value service that could potentially be threatened if something goes wrong with the central supply. We could foresee that in a weak grid, where a large charging facility (CF) is located, the CF could request priority. In practice this implies that it asks others in the same local area to reduce their consumption in periods where demand for charging is very high and when the general load in that part of the grid is high and historically known to cause trouble in the form of unstable supply or brown-outs.

Figure 7 suggest the core assets controlled by the FO. Local communities organized behind one substation may possess similar capabilities, but the FO would then be able to provide pertinent data of less local character and yield services related to more powerful computing, etc. It may also compare different communities against each other and allow these and individuals to share best practices.

Only the information flow has been depicted in the diagrams shown. The energy flow is a physical aspect that applies to this business model less directly. This is a flexibility-as-a-service model. The revenue streams are also missing. However, the options are plentiful. One alternative is a revenue stream that follows the same path as every transaction, but in the opposite direction. Such transactions include sign-on, time-of-physical-connection, per activation, acquisition of higher priority levels, etc. Indirect revenue models are those that in this case would be generated when other services are placed on top of the basic flexibility service. The flexibility service is basically free if other things are purchased.

### 4.4 An example

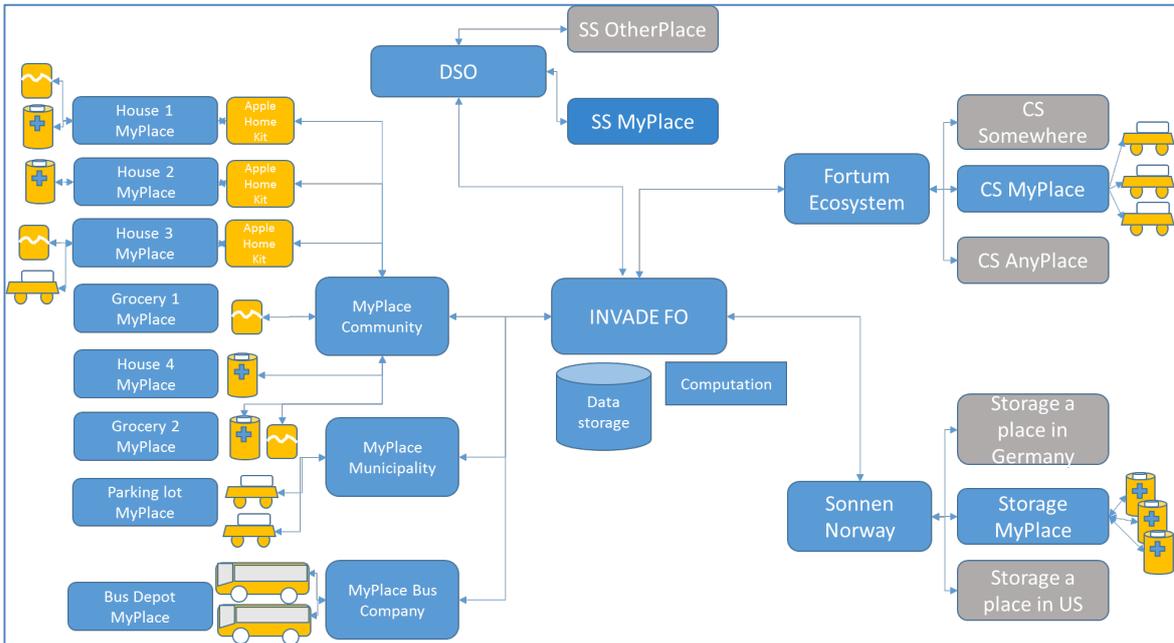


Figure 9 INVADE FO is serving the local DSO with consolidated flexibility to alleviate a temporary capacity problem in MyPlace. This operation is inherently local. The flexibility resources mobilized all need to be located within the part of the grid connected to the sub station at MyPlace.

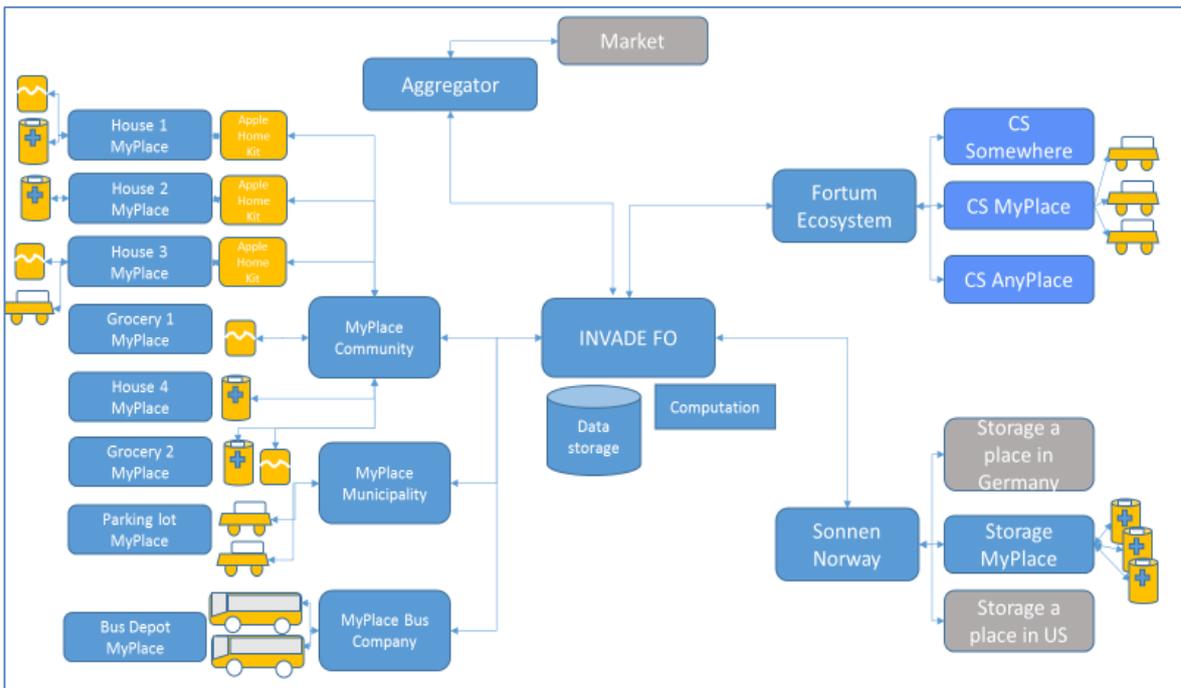


Figure 10 INVADE FO is serving an aggregator which sells flexibility in the central market or has made sell/buy commitments in the central market that it needs to fulfil. Flexibility resources can be consolidated across local boundaries as long as they fall within the regime of the energy exchange (i.e. NORDPOOL) or a specific TSO.

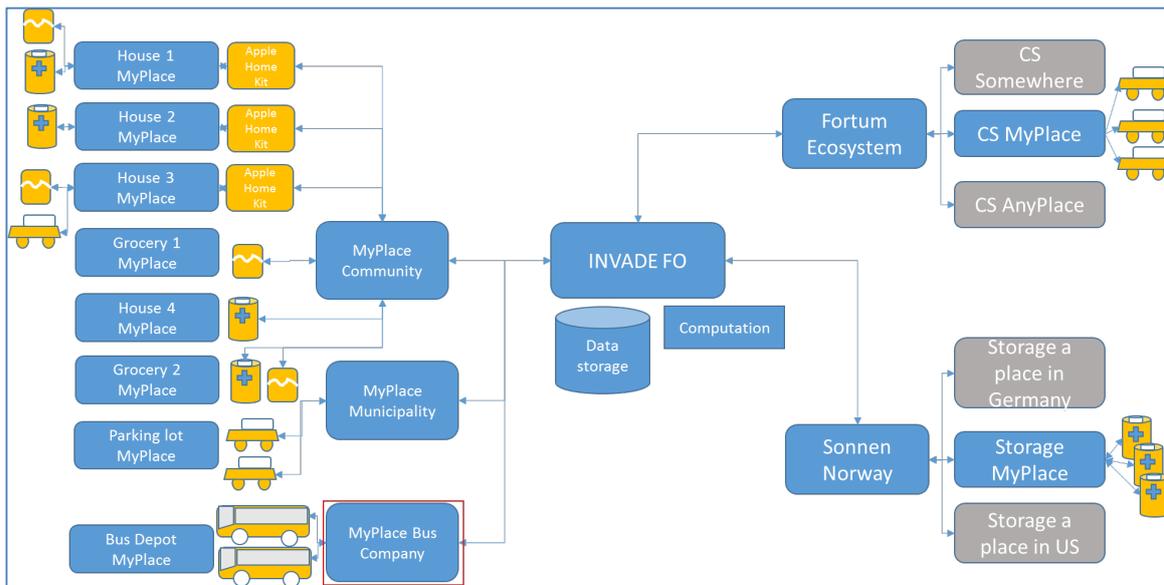


Figure 11 Here the buyer of flexibility is found among those who could also sell flexibility. This situation depicts a situation where there could be a capacity issue on a regular basis both locally and regionally. In this example the local bus company reserves higher priority. This means that if there is a problem with supply during a specific period the charging of the electric buses will have priority. INVADE FO will request load reduction in other parts of its network. Those that comply will be rewarded.

In Figure 9 to Figure 11 an example has been provided that illustrates how the generic business model proposed in WP9 could be applied.

Figure 9 shows the base case where the DSO is the buyer of flexibility. In such a case the DSO experiences a problem in a local substation at MyPlace. As a result, INVADE FO offers to consolidate flexibility resources that it controls in MyPlace. The challenge is inherently local. But as it can be observed, the concept can be replicated for other local areas too. Just like Uber which operates a scalable business model world-wide, cab operations are inherently local. Only local resources are used to meet local demand. In Figure 11 note also how the INVADE FO can interact with individuals and communities alike. There could be a direct link that connects a boiler (depicted as a cylinder with a coil) with the control desk of INVADE FO. However, it may also be a less direct connection. Signals to the operator of the local charging station may be channelled through a central desk operated by that operator. This operator could operate a cloud facility to serve charging spots scattered across one or more countries. That is a de facto community too. A similar arrangement could be true for facilities owned by the local municipality or any of their agencies too.

Requests could be channelled through a common interface controlled by an entity owned by individual prosumers or consumers themselves. Such an entity could be the EMPOWER SESP role and organized by a cooperative (Bremdal 2017). The INVADE

FO could interact directly with a specific boiler, load or PV panel, but more likely in the future is a type of interaction operated via standard HAS (e.g., Apple Home Kit). In this case all could be prearranged with Apple, Google NEST or any other global supplier of a HAS platform. The moment the buyer installs his Apple Home Kit he or she may immediately become member of the INVADE FO ecosystem. It is just a matter of activating the connection by downloading an app or responding to a push request.

In Figure 10 INVADE FO serves a local or a national aggregator that operates in the central market (day-ahead, intraday, tertiary balancing market). This operator may or may not interact with some of the same enterprises and individuals organised in the INVADE FO ecosystem. It does not need to be exclusive. The aggregator may look towards this ecosystem as one supplier in its wide hyper-regional portfolio. However, it may also look upon the INVADE FO as a back-up or security facility and even as a customer. It depends on the business model of the aggregator. If the aggregator has specialized in the future flexibility market, selling flexibility to facilitate the system operator it may see INVADE FO as one source. It could be more attractive for this aggregator to sign up with INVADE FO rather than to create a parallel portfolio, which could be considered confusing for the end users (having to relate to two parties interested in their flexibility) and very costly to acquire. However, if INVADE FO is big enough it might take the position of an aggregator itself. Consequently, they would be adversaries.

An aggregator/retailer that accumulates surplus to be sold in the central market can use the INVADE FO to reduce risk and to optimize his operation. That depends on the cost that the INVADE FO would charge for its services. Since such an aggregator or retailer will make commitments in the market place ahead of actual delivery he must rely on his own prognosis. Deviations experienced must be covered for, either financially or by means of physical regulations. If INVADE FO can demonstrate potent flexibility capabilities and offer this service at a competitive price, an agreement with the aggregator could be reached. INVADE FO would then respond to requests from the aggregator in a way like that of the DSO. However, not only resources within a local area are likely to be activated. The computational capacity of the INVADE FO would in all cases be able to offer additional services.

Figure 9 suggests a situation where a recurrent capacity problem is foreseen. The DSO issues a red light or stays indifferent to calls for upgrades or alternative resolves. The local bus company plans to expand its operation with electric buses. This is important for them. It anticipates, together with the INVADE FO, that there might not be sufficient

capacity to carry out simultaneous charging of the uses at the depot during hour 22. The value associated with the expansion and operation of the fleet of electric buses now are considered higher than the cost of paying for priority. To wait for the DSO to improve its grid could cause severe delays and impact the passenger transportation service in MyPlace in a negative way. There is bound to be a lot of negative media and significant political concerns. However, through the INVADE FO they negotiate with others to reduce their loads during hour 22. In return these contributors will be credited with a fee paid by the bus company. To the bus company this is a small cost to please the public and meet the demands from the government. However, during hour 6 the bus company estimates that their needs are lower and could be willing to relinquish some of their loads if others need priority during that period. This illustrates the notion that a member of the ecosystem can be both a buyer and seller of flexibility.

We could also foresee that for hour 22 there might be a competitive rush for priority. This could lead to surge pricing or a form of auction. This has been very much discussed in EMPOWER (Bremdal 2017) and would turn the INVADE FO network into a trading floor.

#### **4.5 Implications for the stakeholder engagement strategy and plan**

When relating this model to the 5 forces in Porter's competitive model a set of important stakeholders precipitates. Currently it is not so obvious if the INVADE FO faces a head-on competition, but there are certainly candidates that could move into such a space. The aggregators are such candidates. These include all the communities and ecosystem providers that already have been indicated. A "winner takes all" strategy is important and being the first mover can be essential. Seen from the point of view of WP3, these are, in fact, prime exploitation partners. An expansion strategy from any party that has already consolidated a homogenous or hybrid set of flexibility sources on a local level can easily adopt the business model sketched out here. This would cater for scalability without really having to change their basic model. Communities that operate on a global level such as Tesla will have to diversify. This is what they already do through their PV and battery oriented efforts. However, the question is whether they choose to consolidate such resources for flexibility resources and take the position of the INVADE FO. In this particular case both partnership, as shown in Figure 4, and full adoption of the model shown could be possible. Players such as Apple, NEST, CISCO and lesser ones, such as the Swedish company NEXA, could integrate both vertically and horizontally with their extensive global communities and generic HAS devices. In the context of Porter's model they would represent Intruders. In terms of INVADE they could be prime candidates for

exploitation. However, for the benefit of European industry the project should possibly hedge against dominance from American or Asian juggernaut companies like Apple. What would be the potential Substitutes? In this context there is a growing threat, albeit still small, that consumers and prosumers could turn their back to the central market and the local DSO and become self-sufficient and self-controlled. Batteries, behind the meter and as a shared resource could enable this together with sufficient distributed generation. If the sole focus of the INVADE FO is the local DSO's and the aggregator's needs then such a development would tend to erode its business. However, INVADE FO could step in an offer self-balancing services on a local level. As we have pointed out this still enables a scalable business model that can go global.

Suppliers relate to provisions for different kinds of services that can help to shave peak loads, do load smoothing and self-balancing. In the case specified here the INVADE FO would rely on software suppliers that could offer computational software and resources to meter, predict and classify everything from consumption, traffic to local weather. Network capacity and affordable and accurate devices for monitoring and control would be important. Instruments of this kind need to produce the necessary accuracy, be robust, maintain persistent service and require little support. Suppliers would also include the entities that impose loads and feeds, but according to an uneven demand pattern. Diversity is the key here as peaks often have to be curtailed by those that to a lesser degree contribute to them.

This is the type of analysis that needs to be further elaborated on in Task 3.2. However, it should help to identify the first set of candidates that need to be engaged by the project to refine and enhance the starting point offered here. This will have to be done on a local, regional and national level. The next chapter is meant to capture this.

## 5 Stakeholder plan

### 5.1 Stakeholders and engagement strategies

The following tables specify the type of stakeholders and the engagement strategies applied for each. They also specify preliminary candidates for each stakeholder category discussed. Since the project wish to “export” the INVADE FO role during exploitation we apply the Porter model to solicit what could be considered competitors and intruders. Among these we are likely to find enterprises with a vision and possibly a mission that crosses paths with the notions developed in INVADE. Among these again we might find friendly candidates that are willing to adopt the INVADE FO business model. These candidates are important to find and entertain during the project.

<b>Stakeholder role:</b>	<b>Customers</b>
<b>Stakeholder purpose:</b>	Buyers of flexibility that want to secure operations and reduce OPEX. Reduction of CAPEX or postpone investments in new capacity can also be important. For some INVADE could mean a more rapid growth strategy.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• DSOs</li> <li>• Aggregators</li> <li>• Local energy communities</li> <li>• Farmers <ul style="list-style-type: none"> <li>○ Greenhouse owners</li> <li>○ Chicken hatchers</li> <li>○ Fish farmers</li> <li>○ Dairy producers</li> </ul> </li> <li>• Small scale industry <ul style="list-style-type: none"> <li>○ Saw mills</li> <li>○ Forgeries</li> <li>○ Printing houses</li> <li>○ Etc.</li> </ul> </li> <li>• Property owners</li> <li>• Charging service</li> <li>• Parking operators</li> <li>• Warehouse owners</li> <li>• Transportation companies (electric)</li> </ul>

	<ul style="list-style-type: none"> <li>• Ports</li> <li>• ESCOs</li> <li>• Building societies</li> <li>• Wind and solar farms</li> </ul> <ul style="list-style-type: none"> <li>• Hotel chains</li> </ul>	
<b>Abstract</b>	<p>DSOs are typically the ones operating weak nets and which faces extensive investment costs for upgrades</p> <p>Aggregators and ESCOs are enterprises that run complementary services and could be interested in some kind of back-up or security measures.</p> <p>The others are examples of enterprise types and individuals that are willing to pay for priority if capacity for expansion is low or if critical operations could be jeopardized with a significant cost. We are especially keen on identifying the Innovators and the Early Adopters as they are the most likely to become part of the ecosystem that is established for experimental purposes. They could offer insight in the early phases of the project. However, those that adopt the roles of Connectors, Mavens and “Salesmen” will be essential in the final phase of the project. They can be highly instrumental for future exploitation.</p>	
<b>General engagement strategy:</b>	<p>The idea here is to create awareness of the possible threats any of the above enterprises could be faced with in the near future. It is also important to identify Innovators and early Adopters among the listed candidates and invite them into the project at times for a dialog. Mavens, Connectors and Salesmen are obvious candidates for the TAG.</p>	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	DSOs: Helen Oy, Caruna Networks, Forssan Energia	INT, MON, DRF

	<p>Retailer and Charging Service: Fortum</p> <p>TSO: Finngrid Oy</p> <p>Energy community: Ecovillage Kempele, Ylä-Kivelä Apartment, Kaakonoja Area Residents' Association</p>	
<b>Germany</b>	<p>DSOs (small &amp; medium sized): Stadtwerke Rosenheim, Stadtwerke Münster, Stadtwerke München</p> <p>DSOs (large): E.ON, RWE, Vattenfall and EnBW</p> <p>Energy communities: Die Bürger-Solarkraftwerke Rosengarten eG</p>	<p>PPM, TAG, DRF,</p>
<b>Netherlands</b>	<p>TSO: Tennet</p> <p>DSOs: Enexis, Liander, Stedin</p> <p>Aggregator: Senfal, Jedlix, Cohere</p> <p>Market: Eneco, Grunneger power, VandeBron, Scholt</p> <p>Farmers: Testlocation Liander with multiple Greenhouses in the Bommelerwaard</p> <p>Solar farmers: Lomboboxnet</p> <p>Small scale industry: Allego, Fastned</p> <p>Charging service: Greenflux, Engie, Pitpoint, TheNewMotion, LastMilesSolutions</p> <p>Property owners: Syntrus Achmea</p> <p>Ports: port of Rotterdam</p> <p>Municipalities/ provinces: G4 (Amsterdam, Rotterdam, The Hague,</p>	<p>DEM, WPE, FFC, INT PIE, INR, SUR, GDA, MON</p>

	<p>Utrecht), MRA-E (provinces of Noord-Holland, Utrecht &amp; Flevoland), Noord-Brabant</p> <p>Transportation companies (electric): GVB, Qbuzz</p> <p>Graag hier aanvullen uit living lab partners</p>	
<b>Norway</b>	<p>DSOs: Norgesnett, Skagerak, BKK, NTE, Agder Energi</p> <p>Aggregator: Statnett, ENFO, LOS</p> <p>Market: Smart Energi, Fjordkraft, LOS</p> <p>Farmers: To be identified</p> <p>Small scale industry: To be identified</p> <p>Property owners: Statsbygg, Avantor</p> <p>Warehouse owners (cooling/freezing): ASKO, Lerøy</p> <p>Ports: Borg havn</p> <p>Charging service: Fortum</p> <p>Transportation companies (electric): Troms fylkestrafikk, Triangulum</p>	<p>EPB, PPM, TAG, DRF, DEM, WPE, FFC, INT PIE, INR, SUR, GDA, MON</p>
<b>Spain</b>	<p>Bassols Energia</p> <p>Iberdrola</p> <p>Endesa</p>	<p>MON GDA SUR PIE TAG WPE FFC</p>
<b>Other country 1</b>	None specified	
<b>Other country 2</b>	None specified	

<b>Other country 3</b>	None specified	
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<b>Stakeholder role:</b>	<b>Potential competitors</b>	
<b>Stakeholder purpose:</b>	A European competitor could be a potential candidate for the INVADE FO role and an obvious candidate for future exploitation. But in general the competitor could create barriers for the INVADE FO initiative and should be monitored carefully.	
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Existing energy communities/ecosystems (ECOM)</li> <li>• ESCOs</li> <li>• Aggregators (technical and commercial)</li> </ul>	
<b>Abstract</b>	In this project we consider two types of competitor roles. One is another project or enterprise in Europe that is pursuing the same ends as INVADE, but which eventually could adopt the INVADE approach. The other can be considered a true competitive initiative that could erode the foundation for a successful exploitation. All Non-European (global) initiatives are seen as true competition. They should be monitored carefully and even invited to present their approaches. This could yield information valuable to the project. However, similar European initiatives supported by small or medium sized enterprises could be seen as potential allies, rather than competitors and should be solicited for future exploitation.	
<b>General engagement strategy:</b>	Solicit allies and potential candidates for the INVADE FO role Learn from competitors in general and hedge against competitive initiatives that could erode the basis for future exploitation.	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>

<b>Bulgaria</b>	None specified	
<b>Finland</b>	TSO: Fingrid Oy DSOs: Helen Oy, Caruna Networks, Forssan Energia Retailer: Fortum	MON GDA INR PIE FFC
<b>Germany</b>	DSOs (large): E.ON, RWE, Vattenfall and EnBW Batteries/business: SONNEN, Lichtblick Business: KiwiGrid	MON
<b>Netherlands</b>	ECOM: USEF ECOM: Nuon (Vattenfall)	TAG, MON, FFC
<b>Norway</b>	ECOM: Smart Energi, Otovo, DEFA, Fortum	EPB, PPM, TAG, DRF, WPE, DEM, FFC, PIE, INT, MON
<b>Spain</b>	REstore, Iberdrola, Endesa, Viesgo Solar, inergy,	MON GDA INR PIE FFC
<b>Other country 1 USA</b>	Nest/Google, TESLA	
<b>Other country 2 Sweden</b>	Teldus/NEXA	
<b>Other country 3</b>	None specified	

<b>Stakeholder role:</b>	<b>Suppliers</b>
<b>Stakeholder purpose:</b>	They provide the sourcing for the INVADE Flexibility Operator. The main factors are flexibility and instruments to consolidate and deliver such flexibility on demand.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Households</li> <li>• Owners of buildings</li> <li>• Cooperatives</li> <li>• Local energy communities</li> <li>• Owners of parking spaces for EVs</li> <li>• Building societies</li> <li>• Storage owners</li> <li>• Aggregators</li> <li>• Electric fitting companies</li> <li>• Suppliers of power electronics</li> <li>• Providers of EMS and SD systems</li> <li>• Providers of batteries and BMS systems</li> </ul>
<b>Abstract</b>	There are two main types of suppliers. 1) Those providing flexibility 2) Those offering instruments and devices that can monitor, control and activate flexibility on demand. Both are essential. The first group can also be customers of flexibility or flexibility services. The second group must be able to deliver devices that are accepted by all parties involved. The second group could also potentially become intruders if they claim control over devices and maintain an ecosystem in a cloud.
<b>General engagement strategy:</b>	Solicit suppliers that can readily offer flexibility. Consult them and find out what incentives that motivates them. Monitor the technical developments for controllers and communication systems.

<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	Valmet Automotive	
<b>Germany</b>	EMS: Kisters Hardware: Siemens, Steca	
<b>Netherlands</b>	Aggregator: Jedlix, Senfal EMS: Cohere	PPM;TAG, WPE
<b>Norway</b>	Households: Hvaler communities Owners of buildings: Statsbygg, Forsvarsbygg Power electronics: Schneider, Siemens, ABB EMS: eSmart Electricity fitting: Storm Elektro	PPM TAG, WPE FFC, INT. PIE, MON
<b>Spain</b>	Households connected to EYPESA's grid Municipalities in EYPESA's grid Nissan Spain <hr/> Power electronics: teknoCEA, Circutor Owners of parking spaces for EVs: B:SM	PPM, INR, PIE, INT, FFC, WPE, PPM <hr/> GDA, FFC, PIE, MON, WPE
<b>Other country 1</b>	Households; Øro communities	MON
<b>Sweden/Switzerland</b>	Hardware: ABB	
<b>Other country 2</b> <b>UK</b>	EA Technology	MON
<b>Other country 3</b>	Loyds, General Electric, Intel IoT	MON

USA/UK		
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<b>Stakeholder role:</b>	<b>Intruders</b>
<b>Stakeholder purpose:</b>	These stakeholders seek opportunities in the energy/flexibility domain based on current assets. INVADE must study their assets and how they have approached their customers.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Suppliers of HAS and HAS communities</li> <li>• Security companies</li> <li>• Telecom companies</li> <li>• Parking lot owners</li> <li>• Auto manufacturers</li> <li>• Property owners with a centralized control and monitoring system</li> <li>• Hotel chains</li> <li>• Home retailers</li> <li>• Electricity fitters</li> <li>• Media companies</li> </ul>
<b>Abstract</b>	Intruders are considered enterprises currently with no or little activity in the energy business. They can be considered potential allies, but may have a competitive attitude. They include enterprises that have access to the type of customers that the INVADE FO wants to engage. They also have different means to engage these customers in ways that the INVADE FO wants to. They have the capability to integrate both vertically and horizontally. Some may also employ a business model that scales up to a global level.
<b>General engagement strategy:</b>	Monitor their activities and involve them in the TAG and Exploitation grope. Possible to piggy-back INVADE specific findings on top of their system OR be proactive and organize them into sub-communities (as shown for FORTUM in Figure 11). Non-European initiatives may not be controllable and different strategies must be developed

<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	New Smart energy companies: <u>Tespack</u>	
<b>Germany</b>	The IoT initiative by Siemens New Smart energy companies: Tado, Changers	MON, INT
<b>Netherlands</b>	Auto: Renault Property owners: Syntus Achmea Ports: port of Rotterdam Transportation companies (electric): GVB, Qbuzz New Smart energy companies: QwikSense	MON, INT
<b>Norway</b>	Security: Verisure      Parking: OSL, Europark Media: Alt-i-Box      Property: Statsbygg Telecom: Telenor      Hotels: Choice Nordic Fitters: Fixel Maked & Management	WPE, FFC, INT, MON
<b>Spain</b>	Auto: NISSAN Dexma BuoHome Wattabit	MON, PIE, FFC, WPE
<b>Other country 1 USA</b>	HAS: Apple, Google, CISCO, Amazon	
<b>Other country 2 Japan</b>	HAS: Sanyo, Sony	MON
<b>Other country 3</b>	Telecom/HAS: Huawei	MON

<b>China</b>		
<b>Other country 4</b> <b>Denmark</b>	Xtel Energy Harvesting	MON
<b>Other country 5</b> <b>Estonia</b>	New Smart energy companies: <u>Prismattery</u>	MON, INT

<b>Stakeholder role:</b>	<b>Substitutes</b>
<b>Stakeholder purpose:</b>	These are stakeholders that seek to eliminate the need for flexibility by using other approaches to alleviate voltage problems, price volatility, congestion problems or excessive power tariffs. Arguments against this must be cultivated through scientific means.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• DSOs</li> <li>• Power plants (i.e. hydro, CHP)</li> <li>• TSOs</li> <li>• Property owners</li> <li>• Hotel chains</li> </ul>
<b>Abstract</b>	These stakeholders may in fact be the very customers that INVADE FO wishes to engage. Hence it is important to gain their trust and to make them aware of the benefits associated with the business concept offered by INVADE FO. The substitutes to look out for are power line upgrades, substation upgrades, placement of batteries and other storage under own control, flexible production to counter irregularities in price and supply quality.
<b>General engagement strategy:</b>	Create awareness, conduct comparative analyses and involve some of them from the start of the project, especially those that are selected to be pilot customers. Assistance with cost-benefit analyses based on experiences from the pilots.

<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	DSO: Fortum	WPE, DEM, FFC, INT, MON
<b>Germany</b>	DSOs: All Energy Cooperatives	MON
<b>Netherlands</b>	TSO: Tennet DSOs: Enexis, Liander, Stedin	WPE, DEM, FFC, INT, MON
<b>Norway</b>	DSO: Hafslund, Troms Kraft, Norgesnett TSO: Statnett Property: Statsbygg Production: Vardar	WPE, DEM, FFC, INT, MON
<b>Spain</b>	TSO: Red Electrica de España DSO: ENDESA	MON, GDA, TAG, PIE, FFC WPE, FFC, INT, MON, TAG
<b>Other country 1</b>	None specified	
<b>Other country 2</b>	None specified	
<b>Other country 3</b>	None specified	

<b>Stakeholder role:</b>	<b>Demand condition – know-how</b>	
<b>Stakeholder purpose:</b>	As pointed out earlier this is a professional entity that monitors the customer side and demand situation. Primary focus is the needs for flexibility. Technology and devices that enable this in different deployments are also important. INVADE must keep on top of developments at all times to be able to define its market position and fine tune both concept and business model.	
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Market analyst</li> <li>• Interest organization for DSOs</li> </ul>	<ul style="list-style-type: none"> <li>• Interest organization for TSOs</li> <li>• Interest organization for property owners</li> </ul>
<b>Abstract</b>	This type of stakeholder is a resource for estimating the demand and to determine incentives for the customers on a general level.	
<b>General engagement strategy:</b>	Subscribe to publications, invite key individuals from this stakeholder group to present their view on flexibility. Interview them.	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>		
<b>Finland</b>	<p>VaasaEtt</p> <p>Energy community: Ecovillage Kempele, Ylä-Kivelä Apartment, Kaakonoja Area Residents' Association</p>	MON, INT
<b>Germany</b>	<p>User engagement: Windpark Druiberg in Dardesheim, Die Bürger-Solarkraftwerke Rosengarten eG</p> <p>Associations: Verband Kommunaler Unternehmen (<a href="#">VKU</a>), BDEW e.V. ,BITKOM</p>	INT

<b>Netherlands</b>	HvA (Hogeschool van Amsterdam) EDSO	MON
<b>Norway</b>	Energi Norge	MON, FFC
<b>Spain</b>	None specified	
<b>Other country 1 Belgium</b>	GEODE, ENTSO-E, SEDC, EUROBAT, CEDEC, EDSO	FFC, MON
<b>Other country 2 UK</b>	Engerati,	MON
<b>Other country 3 Denmark</b>	User engagement: Middelgrundens Wind Farm, Hvide Sande Community	INT

<b>Stakeholder role:</b>	<b>Related and supporting industries: Partners and know-how</b>
<b>Stakeholder purpose:</b>	These are enterprises, projects and individuals that target the same customers as INVADE FO, but with a complementary strategy and offers.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Internet of things (IoT) suppliers</li> <li>• HAS suppliers</li> <li>• Electricity fitters</li> <li>• Media</li> <li>• ESCOs</li> <li>• Home retailers</li> <li>• Auto makers (EVs)</li> <li>• Telecom</li> <li>• IT</li> </ul>
<b>Abstract</b>	These stakeholders could serve as bridge heads towards important stakeholder groups. They could open gates and offer a proven platform for engagement of customers and other stakeholders. This stakeholder group consists of allies. Intruders

	could turn such allies if they see that there are greater benefits and less costs of combining efforts rather than go all the way alone.	
<b>General engagement strategy:</b>	Solicit synergies and common market channels	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	Energy cooperative: Lumituuli Oy	
<b>Germany</b>	Associations: Verband Kommunalen Unternehmen ( <a href="#">VKU</a> ), BDEW e.V. BITKOM	
<b>Netherlands</b>	HAS: Toon (Eneco)	MON
<b>Norway</b>	IoT: VITIR, Serinus, Tiny Mesh, DEFA Media: Get, Canal Digital, Alt-i-Box Telecom: Telenor, One Call IT: Microsoft, Oracle Home retailers: IKEA	TAG, WPE, INT, PIE, MON
<b>Spain</b>	HAS: NearBySensor	MON. FFC
<b>Other country 1 USA</b>	HAS. Apple, Google/NEST, Amazon	MON. PIE, FFC
<b>Other country 2 UK</b>	KiWi Power Ltd	
<b>Other country 3</b>	None specified	

<b>Stakeholder role:</b>	<b>Factor conditions – know-how</b>	
<b>Stakeholder purpose:</b>	To provide insight on factors that INVADE needs to consider and to enable its business model	
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Universities</li> <li>• Research institutes</li> <li>• Market analysts</li> <li>• ESCOs</li> </ul>	<ul style="list-style-type: none"> <li>• Technology analysts</li> <li>• Psychologists</li> <li>• Sociologists</li> <li>• Finance/bank</li> </ul>
<b>Abstract</b>	<p>This group of stakeholders will address all aspects of storage and flexibility and how to control them. The array of know-how needed includes psycho-sociological aspects related to energy flexibility for individuals, households and companies. It requires references and empirical data related to technologies to capitalize on such flexibility, present and in the making. This includes different types of batteries and control systems for utilizing V2G and V2B and similar things. It relates to insight on available knowledge on this type of business and the technologies involved. The group also includes business angels, banks, venture companies or expertise that know how to get capital to finance the creation of the INVADE FO operation.</p>	
<b>General engagement strategy:</b>	Subscribe to publications focused on market analysis and technology reviews. Interview stakeholders and invite them to present opportunities and caveats.	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	None specified	

<b>Germany</b>	Associations: Verband Kommunalen Unternehmen ( <a href="#">VKU</a> ), BDEW e.V. ,BITKOM	MON. INT
<b>Netherlands</b>	See demand conditions... ElaadNL is positioned towards the universities as the 'valorisation organisation' to apply scientific research.	TAG
<b>Norway</b>	University: NMBU, UiO, NTNU Finance: Innovasjon Norge, ENOVA	MON, SUR, INR
<b>Spain</b>	University: UPC, UdG, UPV-EGU Magnus Commodities	MON, WPE, PIE, PPM, TAG
<b>Other country 1</b>	None specified	
<b>Other country 2</b>	None specified	
<b>Other country 3</b>	None specified	

<b>Stakeholder role:</b>	<b>Authorities (Government, agencies, regulators, standardization)</b>
<b>Stakeholder purpose:</b>	These stakeholders determine the laws, regulations and policies to abide with for the benefit of climate, economy and society.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Regulators</li> <li>• EU commission</li> <li>• Central governments</li> <li>• Local governments</li> <li>• Standardization bodies</li> <li>• Politicians</li> <li>• Directorates</li> <li>• International agencies</li> </ul>

<b>Abstract</b>	This stakeholder group determines the operational space for INVADE FO, their customers and their suppliers. They also define some overarching societal objectives. These are the stakeholders that govern the use of storage in the grid and buildings, requirements for indoor climate in buildings, the use of fossil fuel for heating and regulations related to demand-response, metering and DER. They also influence tariffs, taxation and commissions that could impact consumption and production levels and patterns. Furthermore, these stakeholders may determine what devices and communication systems can be permitted.	
<b>General engagement strategy:</b>	The purpose here is to extract relevant rules, policies and regulations during the planning phase of the project. Then we need to create awareness of the environmental, economic and societal benefits that the INVADE concept can offer. It is an objective to educate and inform this group and demonstrate the viability of the solution for the benefit of European businesses and citizens. It is important to show alignment between global climate initiatives and the INVADE objectives.	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	None specified	
<b>Germany</b>	Federal Ministry for Economic Affairs and Energy (BMWi)	
<b>Netherlands</b>	Regulator: ACM (challenge here is the development of 'legalistic freedom' for the DSO to apply incentives / smart contract dealing with flexibility)  Government: ministry of economic affairs	INR

	Politicians: multiple politicians promote open standards (and open ecosystems), both on municipal, provincial and national level	
<b>Norway</b>	Regulator: NVE Directorate: The Norwegian Directorate for Civil Protection (DSB) Government: Ministry of Oil and Energy, Ministry of the Environment Politicians: The “Østfold Bench”	TAG. WPE, DEM, FFC, INT, PIE, INR
<b>Spain</b>	Ganollers Municipality <hr/> Local governments: ICAEN, AEB	INR, INT, DEM, FFC <hr/> TAG. WPE, DEM, FFC, PIE, INR
<b>Other country 1 Belgium</b>	EU Commission	MON
<b>Other country 2</b>	None specified	
<b>Other country 3</b>	None specified	

<b>Stakeholder role:</b>	<b>Chance mitigating support</b>
<b>Stakeholder purpose:</b>	This stakeholder group can offer insurance and mitigation of risk. It can also help leverage opportunities.
<b>Types of businesses/</b>	<ul style="list-style-type: none"> <li>• Insurance companies</li> <li>• Incubators</li> <li>• Facility management</li> <li>• Call centers/support desks</li> <li>• Information/PR bureaus</li> <li>• Consultants</li> </ul>

<b>individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Legal counsel</li> <li>• Classification bodies</li> </ul>																											
<b>Abstract</b>	This stakeholder group can help to hedge against risk and help ramp-up activities if an opportunity happens unexpectedly. It can alleviate and contain problems associated with testing. This group is important if failures should occur. In the context of INVADE they can help to define design criteria and to extract arguments, principles and maxims to gain trust with other stakeholders.																											
<b>General engagement strategy:</b>	It is important to extract information from this group during the initial phases of the project, involve some of them and then design a system for support for those who will pursue exploitation of the INVADE results later in the project.																											
<b>Candidates:</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;"></th> <th style="width: 60%;">Candidate names</th> <th style="width: 20%;">Engagement type</th> </tr> </thead> <tbody> <tr> <td><b>Bulgaria</b></td> <td>None specified</td> <td></td> </tr> <tr> <td><b>Finland</b></td> <td>None specified</td> <td></td> </tr> <tr> <td><b>Germany</b></td> <td>None specified</td> <td></td> </tr> <tr> <td><b>Netherlands</b></td> <td>None specified</td> <td></td> </tr> <tr> <td><b>Norway</b></td> <td>           Insurance: Gjensidige            Classification: DnV-GL            Facility management: ISS            Legal counsel: Ola Hox            Information bureau: Geelmuyden &amp; Kiese         </td> <td>INT, PIE,</td> </tr> <tr> <td><b>Spain</b></td> <td>None specified</td> <td></td> </tr> <tr> <td><b>Other country 1</b></td> <td></td> <td></td> </tr> <tr> <td><b>Other country 2</b></td> <td></td> <td></td> </tr> </tbody> </table>		Candidate names	Engagement type	<b>Bulgaria</b>	None specified		<b>Finland</b>	None specified		<b>Germany</b>	None specified		<b>Netherlands</b>	None specified		<b>Norway</b>	Insurance: Gjensidige Classification: DnV-GL Facility management: ISS Legal counsel: Ola Hox Information bureau: Geelmuyden & Kiese	INT, PIE,	<b>Spain</b>	None specified		<b>Other country 1</b>			<b>Other country 2</b>		
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<b>Other country 3</b>		
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<b>Stakeholder role:</b>	<b>Culture know-how</b>	
<b>Stakeholder purpose:</b>	Culture know-how seeks to understand both the context for a business and cultural aspects that influence commerce both on an organizational and individual level. The influence of culture on energy use and people's engagement is important. The INVADE Flexibility Operator needs this as it will have a global focus with a local business objective.	
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Universities</li> <li>• Market analysts</li> <li>• Market psychologists</li> </ul>	<ul style="list-style-type: none"> <li>• Research institutions</li> <li>• Social anthropologists</li> </ul>
<b>Abstract</b>	This stakeholder group is useful for INVADE to understand how concept design, user interfaces, payment systems and other things should be designed. It is important to understand people and their cultural background before deploying any equipment. Fear of AMS and smart meters with respect to privacy is one kind of issue that seems culturally based. It is important for drafting legal documents that involve customers and suppliers. It is important to understand this.	
<b>General engagement strategy:</b>	Extract principles and know-how about target areas and people at the locations where the system is first going to be deployed. Use similar principles to define incentives for persistent participation. Invite them to project meetings, TAG meetings and other events to share their knowledge.	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>

<b>Bulgaria</b>	None specified	
<b>Finland</b>	None specified	
<b>Germany</b>	None specified	
<b>Netherlands</b>	University: HvA	INT
<b>Norway</b>	University: BI, NTNU, UiO Research institutions: SINTEF, FAFO	INT, FFC, WPE
<b>Spain</b>	UPC, UdG	INT, FFC, WPE
<b>Other country 1</b>	None specified	
<b>Other country 2</b>	None specified	
<b>Other country 3</b>	None specified	

<b>Stakeholder role:</b>	<b>Opinion makers</b>
<b>Stakeholder purpose:</b>	Opinion makers can help INVADE to ramp up dissemination and create awareness of the project, its concept and future possibilities. It must show that INVADE is one instrument to reach climate goals. They must also be an instrument to tone down “fear of the new” among regular people and leverage the position of the project among other stakeholders.
<b>Types of businesses/ individuals/ institutions:</b>	<ul style="list-style-type: none"> <li>• Technical magazines</li> <li>• Information/PR bureaus</li> <li>• Newspapers</li> <li>• TV</li> <li>• Radio</li> <li>• Social media</li> <li>• Environmental associations</li> <li>• Smart grid associations</li> </ul>

	<ul style="list-style-type: none"> <li>• Conferences</li> </ul>	
<b>Abstract</b>	Journalists, bloggers, PR experts, social networks on LinkedIn, Facebook, Twitter and Youtube can make big difference. Alliance with environmental/climate lobby can be very important. Showing what is possible through smart grid channels and conferences is also important.	
<b>General engagement strategy:</b>	Attempt to feed this stakeholder with news through our dissemination activities and invite influential representatives to major events and demonstrations	
<b>Candidates:</b>	<b>Candidate names</b>	<b>Engagement type</b>
<b>Bulgaria</b>	None specified	
<b>Finland</b>	None specified	
<b>Germany</b>	Media: Clean Energy Wire , Associations: Verband Kommunaler Unternehmen ( <a href="#">VKU</a> ), BDEW e.V. ,BITKOM	TAG, INR, MON
<b>Netherlands</b>	Newspaper: Energieia	INR
<b>Norway</b>	Technical Magazines: TU, Energiteknikk Information bureaus: Geelmuyden & Kiese, Odin Media TV: NRK, TV2 Radio: NRK, Radio Norge Conferences: CIRED, Norwegian Smart Grid Conference Environmental associations: Zero, Bellona Bloggers: Norsk Kilmaforening	MON, GDA, INR, PIE
<b>Spain</b>	Technical magazines: infoPLC++	MON, GDA,

	Smart grid association: Industrial Engineers Association of Catalonia, Spanish Royal Academy of Engineering	INR, PIE, TAG
<b>Other country 1 Belgium</b>	Associations: GEODE, ENTSO-E, SEDC, EUROBAT, CEDEC, EDSO	INT, PIE, TAG, GDA
<b>Other country 2 USA</b>	Green Tech Media	MON, GDA.
<b>Other country 3</b>	None specified	

## 5.2 Engagement matrix and schedule

The strategies defined in the previous paragraph can be extracted to create an initial engagement matrix. This is shown in Figure 12. The various stakeholder activities depicted are then consolidated and scheduled as shown in Figure 13. This schedule is built on top of the existing project plan to ensure harmony as well as maximum favorable impact from stakeholders on the project.

Stakeholder group	MON	GDA	SUR	INR	PIE	INT	FFC	DEM	WPE	DRF	TAG	PPM	EPB
Potential buyers/customers													
INVADE FO (candidates)*													
Potential competitors													
Suppliers													
Intruders													
Substitutes													
Demand: Know-how													
Related and supporting industries													
Factors: Know-how													
Auhtorities													
Chance mitigation													
Culture: Know-how													
Opinion makers													

Figure 12 Engagement matrix shows how the different groups of stakeholders specified will be associated with the project. The acronyms were defined in Paragraph 3.4. \*These are typical candidates that would have been considered competitors, according to the Porter model



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