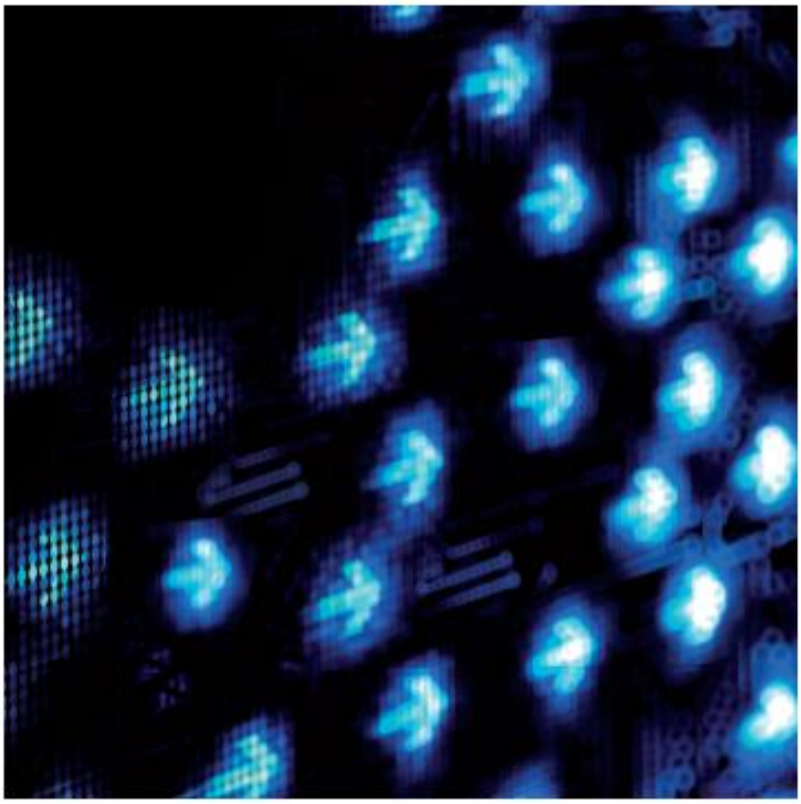
ADVANCED



Active Demand Value ANd
Consumers Experience Discovery

FINAL REPORT

January 2015

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EXECUTIVE SUMMARY

Active Demand (AD) has the potential to contribute to solving some of electricity systems current and future challenges while offering significant benefits to consumers

ADVANCED is a research project co-funded by the EU's Seventh Framework Programme (FP7/2007-2013) that aims to shed light on ways to overcome the barriers hindering the mass deployment of AD in Europe.

Within ADVANCED AD was defined as:

> **"*providing electricity consumers with information on their consumption and the ability to respond to time-based prices (either manually or automatically) as well as with other types of incentives, thus motivating them to actively manage their consumption by altering usage in line with the network conditions, such that modifications in consumer demand become a viable option for addressing challenges of electricity systems*".**

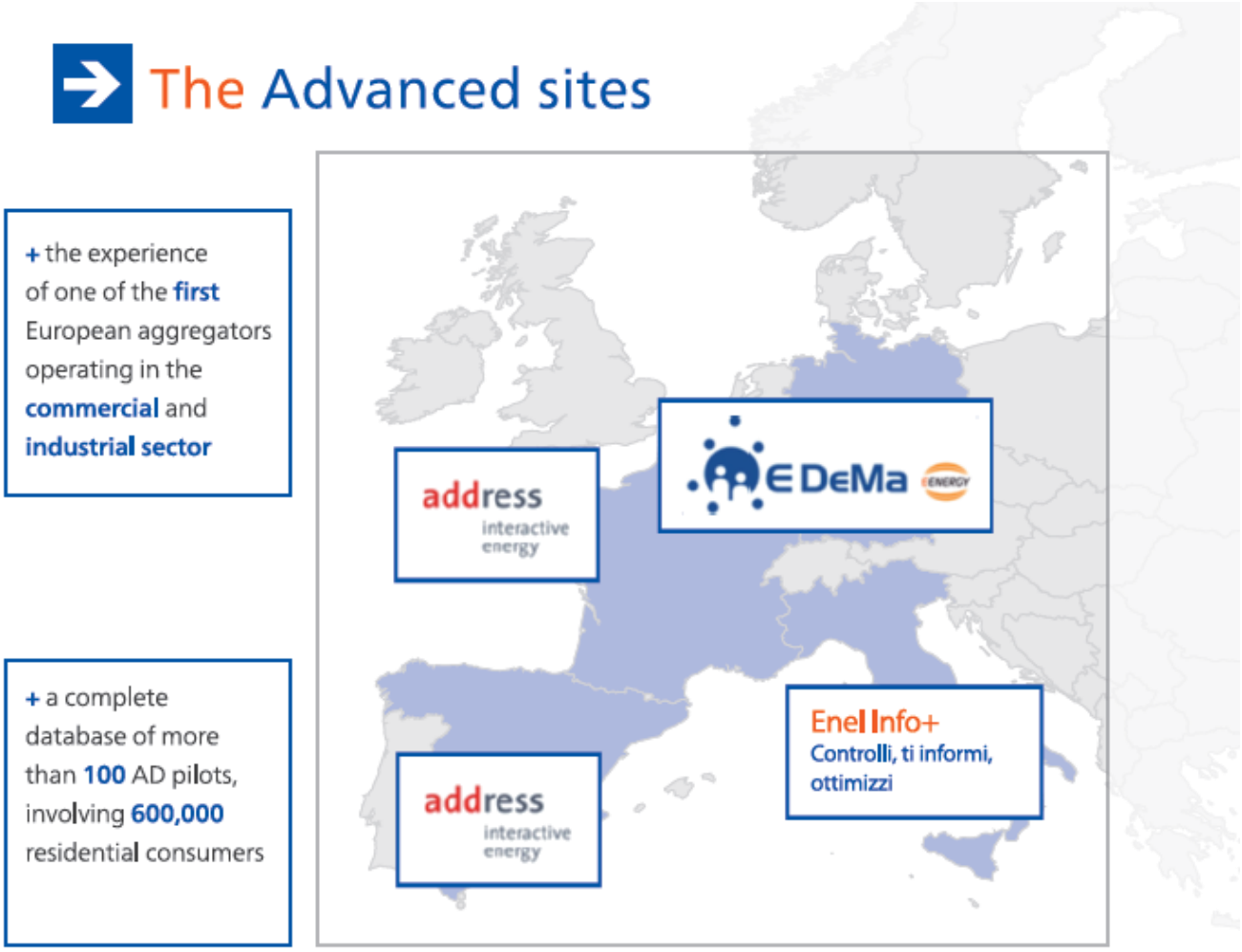
Accordingly, the research within its scope focused on energy efficiency (EE) and demand response (DR) programmes. EE programmes offer consumers more direct, detailed, comparable and comprehensive information about their household's energy consumption patterns in order to influence their behaviour towards a conserving effect. In DR programs consumers are requested to modify their consumption (either decreasing or increasing it) in response to price/volume signals in order to meet the need of the system.

THE PROJECT OBJECTIVES WERE THE FOLLOWING:

- ✓ To assess and compare the case studies to understand how scaling up from pilots to real implementation
- ✓ To reveal the benefits of AD for the key stakeholders
- ✓ To analyse inherent impacts on the electricity system considering its potential contribution to system stability and efficiency
- ✓ To develop actionable frameworks (validated recommendations for an efficient design of AD programmes) enabling residential commercial and industrial consumers to participate in AD thus facilitating mass uptake of AD in Europe

The basis for the investigations within ADVANCED is a unique empirical knowledge base including:

- ✓ data generated within the ADVANCED sites, four different real life AD demonstration projects: two ADDRESS pilots (Spain and France), E-DeMa pilot (Germany) and Enel Info+ pilot (Italy),
- ✓ a database containing a meta-analyses of 138 AD pilots, involving more than 630,000 consumers
- ✓ the expertise of a leading provider of Demand Response solutions for commercial and industrial consumers in Europe;
- ✓ results of a qualitative survey with approximately 20 residential or small commercial consumers per ADVANCED site and with some industrial consumers in Germany who are exploiting AD for their business;
- ✓ results of a quantitative online survey among more than 8000 residential consumers in eight European countries.



The ADVANCED project has provided answers to the following issues that concern the design and management of AD programs and the impacts of AD on the electrical system and its actors:

HOW TO ASSESS AND TUNE AN AD PROGRAM?

- ✓ The “TARGET MATRIX” to know what and how should be measured
- ✓ Validated and operationalised KPIs both at program and household level
- ✓ Determinants behind behaviour change

HOW TO RECRUIT AND ENGAGE CONSUMERS IN AD PROGRAMS?

- ✓ What motivations behind joining AD programs?
- ✓ What are customers fears, what their “likes”?
- ✓ How to engage with programs in the long term?
- ✓ What about readiness to AD and how to select the most promising targets?

WHICH ARE THE ACTIONS AND COMMUNICATION STRATEGIES TO MAKE AD HAPPEN?

- ✓ The actionable framework and the quick wins
- ✓ The communication umbrellas

WHAT IS THE AD POTENTIAL IN TERMS OF ?

- ✓ AD potential in the 4 pilots’ Countries
- ✓ Services and opportunities for the electrical system

Furthermore recommendations to maximize the impact of AD have been provided.

PROJECT CONTEXT AND OBJECTIVES

Active Demand (AD) has the potential to contribute to solving the challenges of electricity systems and offers significant benefits to consumers. It is considered one of the largest untapped energy resources in Europe today. A significant barrier to realising this potential, is insufficient consumer engagement and awareness regarding their own energy consumption, as well as the lack of viable, consumer centric AD offerings made around Europe. Few commercial industrial (C&I) or residential consumers are offered viable choices which could help them participate in the markets through demand response, lower their electricity costs or encourage energy savings. Therefore an understanding of AD program design - best practice, consumer engagement mechanisms and required technology, is urgently needed within the industry.

The ADVANCED (Active Demand Value ANd Consumers Experiences Discovery) project aimed to overcome these barriers through developing actionable frameworks and utilities which would enable residential and C&I consumers to participate in AD, thus contributing to AD's mass deployment in Europe. The project also quantified the benefits of AD for key stakeholders such as DSOs and its potential contribution to system stability and efficiency, according to different scenarios.

The consortium

It was promoted by a consortium of some of the major European energy utilities (Enel Distribuzione, ERDF, Iberdrola Distribución, RWE Deutschland), universities, research centers and consulting firms in the energy sector (Comillas, Universidad Pontificia, Fondazione Eni Enrico Mattei (FEEM), TNO, VaasaETT), one of the European leading agencies specializing in market research (TNS) and a leading provider of Demand Response solutions for commercial and industrial consumers (Entelios). The consortium was supported by a Stakeholder Advisory Board composed of the main AD target groups.

The members of the ADVANCED consortium defined AD as:
"*providing electricity consumers with information on their consumption and the ability to respond to time-based prices (either manually or automatically) as well as with other types of incentives, thus motivating them to actively manage their consumption by altering usage in line with the network conditions, such that modifications in consumer demand become a viable option for addressing challenges of electricity systems*".

Accordingly, the research within its scope focused on energy efficiency (EE) and demand response (DR) programmes. EE programmes offer consumers more direct, detailed, comparable and comprehensive information about their household's energy consumption patterns in order to influence their behaviour towards a conserving effect. In DR programs consumers are requested to modify their consumption in response to price/volume signals in order to meet the need of the system.

In order to reach the project objectives, real data was made available by the 4 utilities participating in the consortium Enel, ERDF, Iberdrola, and RWE, collected through 4 EE and DR pilot projects in Europe: 2 ADDRESS pilots (Spain, France), E-DeMa pilot (Germany) and Enel Info+ pilot (Italy). Furthermore, data collected in VaasaETT's database, from 138 Active Demand projects with the participation of over 630,000 residential as well as commercial and industrial participants, were exploited. VaasaETT's database has also integrated the pilot sites of ADVANCED project at an aggregated level.

A METHODOLOGY TO ASSESS DIFFERENT AD EXPERIENCES

One of the strength of the ADVANCED project is the access to the aforementioned amounts of pilot data on individual household behaviour in different countries as a response to AD interventions with different characteristics. In order to assess and compare the case studies with the final aim to understand how scaling up from pilots to real implementation a methodology was set up that required a multidisciplinary approach complementing technical data with psycho-social and behavioural knowledge. Achieving this goal was a strong challenge and the use of standardization of data and methods turned out to be of outmost importance.

THE CONCEPTUAL MODEL AND THE TARGET MATRIX

The first step was the definition of a conceptual model of active consumer participation in AD in which all relevant factors influencing the participation of consumers in AD programmes were included and their relationships described in the form of “hypotheses”. These hypotheses were tested in the project by using the data collected in the ADVANCED sites (at household level) to uncover what profiles of household consumers adjust their consumption the most or the least to certain interventions and to what extent.

For this purpose a “TARGET MATRIX” listing the variables that should be measured are made available in order to be able to assess the effectiveness of AD program in terms of recruitment strategies, incentives, communication strategies, functionalities and applied technologies and all the relevant KPIs etc. Moreover, the target matrix reports for each variable their unit and scale in order to allow comparison of different programs.

KEY PERFORMANCE INDICATORS (KPIS):

A set of KPIs was defined test the hypotheses in the conceptual model of active consumer participation in AD as well as to evaluate the impact of AD on the system.

The following main categories of KPIs were identified within the project taking into account the perspectives of the key AD stakeholders: improving energy sustainability, reducing system costs, maintaining electricity system reliability, improving affordability, and improving customer relationship. Within the aforementioned categories, some KPIs have been identified measuring benefits that take place at the grid level while some other benefits take place at the household level.

The “Increased demand flexibility” and “Change in overall electricity consumption” KPIs are extremely common for AD pilots but the success is always measured at an aggregated pilot or group level. ADVANCED is unique in defining, measuring and evaluating these KPIs on a household level. They were chosen for validating the hypotheses included in the conceptual model and a methodology to quantify these KPIs in a univocal manner has been developed. An additional and completely new indicator: “Signal Compliance: difference in consumption pattern” has been defined. This KPI is calculated comparing the consumption trend of each consumer after the DR signal comes into force with its habitual one. Thus it allow analyzing at household level.

THE VOICE OF CONSUMERS

A qualitative research was designed and carried out based on in-depth interviews with consumers who have participated within AD programmes (residential as well as commercial and industrial). These included both those of the ADVANCED sites, and those who are already exploiting AD for their business as the Entelios’ commercial and industrial customers.
This research enriched the study with insights into socio-economic drivers of consumers’ behavior. The interviews were focused on interactions, beliefs, attitudes and their evolution throughout the experiment and with the AD technologies. It was important to discover what the benefits and barriers were and further to understand if any elements of the project impacted their beliefs and/or made them change their behaviour.

Some additional data were gathered through quantitative online surveys within a representative sample of residential consumers in eight European countries with the aim of providing statistically robust indications of awareness, understanding and attitudes towards AD revealing in particular the degree of knowledge and understanding of AD and consumers’ stated flexibility when it comes to their energy consumption.

THE ADVANCED KNOWLEDGE BASE

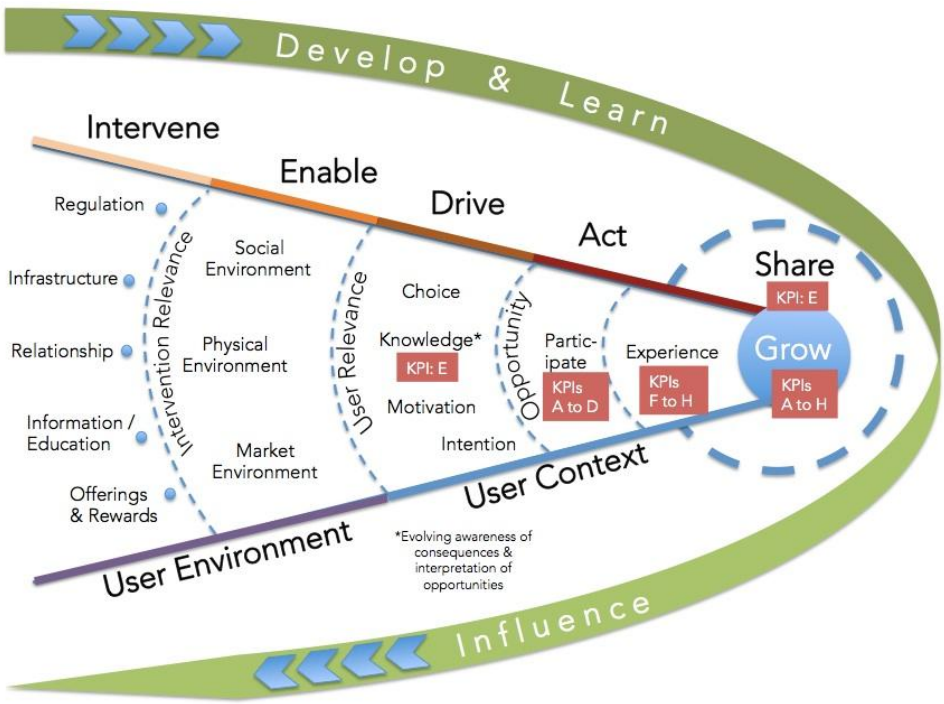
An ADVANCED knowledge base was compiled through gathering data in a uniform manner, in order to enable comparability. This knowledge base includes the ADVANCED sites databases (with both consumption data as social data coming from questionnaires, recoded to the uniform ADVANCED format), the data within the VaasaETT database, the outcomes of the qualitative

and quantitative surveys conducted within the project and some more data coming from the experience of project partners, especially Entelios.

VALIDATED CONCEPTUAL MODEL

As the conceptual model was built around relatively short-term pilots, the second step was to adapt it in order to extend its applicability to a mass market context. Several principles were considered for defining these adjustments like the complexity of the social and physical environment where consumers act, the evolution of consumers behavior, the capacity to choose among different offers, etc.

The conceptual model was validated based on support from the body of evidence collected by ADVANCED through pilot data analysis, the qualitative research and the quanitative interviews. The findings of these reports, when combined provide an additional degree of insight to the conceptual model, specifically clarifying particular aspects of it. In fact the entire model defines the set of drivers that lead to active consumer participation in AD.



ACTIONABLE FRAMEWORK

From the validated conceptual model has been derived an interpretation of consequential key barriers to active user participation in AD for commercial, industrial and residential consumers. For each barrier, there are suggested associated actions to address those barriers. This was

also supported by the practical experience of aggregators, retailers and DSOs, that are active throughout Europe. Hence, the ADVANCED consortium conducted research on the market conditions and regulatory framework for AD in the ADVANCED markets in France, Germany, Italy and Spain. Combining the findings of the interviews with the research in the markets, the ADVANCED consortium elaborated an Actionable Framework for C&I and residential consumers that describes the main barriers and hurdles to Active Demand in general, and Demand Response in particular, and suggests actions and recommendations how to overcome them to support the widespread integration of AD across European electricity markets. The consortium put special emphasis on actionable recommendations with a direct and immediate positive effect which is why focus was put on the most important barriers. The evaluation showed that fixing the three most important barriers are quick wins with a significant impact on creating viable markets for AD services that allow the C&I consumers to participate with their demand-side flexibility. The actions and recommendations are supported by examples of European markets which have successfully removed barriers and hurdles to AD.

COMMUNICATION UMBRELLAS

The Communication Umbrella consists of key messages and motivational drivers tuned to address the two segments residential and C&I consumers. The ADVANCED consortium in addition, suggests some communication guidelines *how* to communicate the concept, mechanisms and benefits of AD. For utilities and DSOs the challenge is to inspire consumers on measures that are economically meaningful but very often complex and abstract.

IMPACT ASSESSMENT OF AD ON ELECTRICITY SYSTEMS

The flexibilities that AD might offer with demand response and energy efficiency in France, Germany, Italy and Spain have been calculated for a baseline, optimistic and technical potential scenario. The results with regard to energy efficiency indicate that even in the baseline scenario a small potential exists. The results for the commercial & industrial sector are quite better. By taking this into account, the aggregation of the AD potential of the residential sector and the C&I sector indicates that a high AD potential is available in all four countries.

A special DSO perspective was taken in order to find a fit between DSO's (expansion) needs and the possibilities of AD. The outcomes of this analysis are four major categories of (future) system services: frequency control, optimization of distribution network planning and

construction, optimization of system operation, management of emergency situations, network or system restoration and islanding.

The benefits in terms of investments for the distribution network reinforcements that a more efficient use of existing and new grid capacity due to AD could defer or avoid have been evaluated. The analysis showed that these benefits are strongly dependent on network expansion drivers, network typology, current level of network constraint, and location of responsive consumers.

PRIVACY AND DATA PROTECTION

A framework was also created for data security and data protection. The analysis was based on a review of relevant EU (policy) documents, technology assessments, of existing guidance and advice and of other selected authoritative sources on topics including smart grids and smart meters. Special attention was paid to available empirical evidence regarding privacy issues in AD systems. The research made use of the unique knowledge and experience available within the project which includes partners involved in deploying AD pilots. The results of some of the ADVANCED pilots as well as the results of the surveys were used. Moreover lessons learnt from relevant international initiatives were taken into account.

REGULATORY ASPECTS

The full potential of AD has still not been achieved in most of European countries. From the revision of the main regulatory aspects that should be reviewed in order to unlock the potential of AD, the most concerns are raised by DSO regulation and network tariff design, but also to retail markets, standardization and consumer protection. The main findings in the regulatory analysis have been listed.

MAIN SCIENTIFIC AND TECHNICAL RESULTS

The main results of the ADVANCED project both concern the different aspects behind the design and management of AD programs and the impacts of AD on the electrical system and its actors. The extensive outcomes and the analyses behind them are available to all stakeholders on the "Results" section of the project website http://www.advancedfp7.eu/

DESIGN AND MANAGEMENT OF AD PROGRAMS

HOW TO ASSESS AND TUNE AN AD PROGRAM?

ADVANCED sites, VaasaETT database and Entelios expertise

1) A "target matrix" was defined that is the structure of the ADVANCED knowledge base. It includes about 250 variables organized in such a manner that data from a wide range of pilots and consumer segments can be compared in a logical, comparable manner.
Beyond being a means for carrying out the analyses within the scope of the ADVANCED project, using the target matrix is very important in the design phase of future AD programs as it lists the data that need to be gathered, the units of measurement and the granularities required.

ADVANCED D1.1 – Report describing the conceptual model and the target matrix

2) A set of KPIs was defined to measure the benefits of AD for the key stakeholders and for the whole electrical system. A univocal way to carry out these calculations was described and in fact these indicators where used within various stages of the ADVANCED project. It is worth saying that the KPIs on flexibility and energy conservation have been calculated on a household level being this an important evolution with respect to the traditional calculations carried out within AD programs. An additional indicator: "Signal Compliance: difference in consumption pattern" has been defined. This KPI is calculated comparing the consumption trend of each consumer after the DR signal comes into force with its habitual one. It is a unique KPI that allow the identification of the determinants behind change, once correlated with psyco-social concepts.

ADVANCED D1.2 - Report on the validated KPIs

ADVANCED D2.2 - Cross case analysis

3) A model of active consumer participation in AD was defined where the determinants behind the behavioral change required by the participation in AD programs have been included and their relations described.

ADVANCED D1.1 – Report describing the conceptual model and the target matrix

ADVANCED D2.2 - Cross case analysis

HOW TO RECRUIT AND ENGAGE CONSUMERS IN AD PROGRAMS?

Surveys

1) The motivations behind joining AD programs were explored. Residential consumers showed to be mainly moved by the ideas of becoming more aware of their energy use (and therefore learning how to reduce their energy consumption), of being part of innovative initiatives based on the use of new technologies and of supporting the local community through their participation. Word of mouth turned out to be of outmost importance. Also for C&I consumers saving money opportunities are major drivers for increasing their energy efficiency (that also leads to environmental benefits) and for participating in DR programs, if the security of their production process can be guaranteed. The reduced need for larger contract sizes and for grid expansion and the opportunity to optimize their business are also important drivers. Building trust is essential for involving all the consumers segments.

ADVANCED D3.2 – Report with conclusions from the qualitative surveys

2) Customers fears and “likes” were identified. The increased awareness of their energy consumption was the main “like” of consumers. Moreover residential consumers were satisfied of realizing that saving energy is not so difficult. The main concerns of residential consumers are the installation of the devices composing the technical solution, the effect that using these devices could have on appliances and the impact that reducing energy consumption could have on lifestyles and comfort. Minor concerns are about the privacy of data. C&I customers are concerned about the contractual complexity behind the participation in Demand Response initiatives and the perceived risk of incurring penalties in case peaks exceed the limits as defined in the grid fee.

ADVANCED D3.2 – Report with conclusions from the qualitative surveys

3) The strategies to engage consumers with programs in the long term have been detected. The link between household usage levels and collective usage issues needs to be made so people understand that what they achieve in their own household can impact on wider energy goals. Motivating people requires education. The consumption data provided to consumers should be simple and easy to understand. The technology/devices used to deliver consumption data, and inform people about changes, as well as enable them to interact with appliances needs to be user friendly. In fact to assist/ensure behaviour changes happen people need to clearly understand what to change as well as and how to change their behaviour. A step by step approach where consumers are gradually provided with more advanced features and solutions and a continuous support starting from the installation phase and going on during all the program are of outmost importance for granting a long term engagement.

ADVANCED D3.2 – Report with conclusions from the qualitative surveys

4) The readiness of consumers to AD was scouted. This research produced many important outcomes that can help identify how to promote AD and the most promising targets for its implementation. One of the main findings was consumers are concerned about energy cost and most already pay at least occasional attention to energy use. The majority agree it is important for them to reduce their energy consumption, and many are already taking steps to do this.

ADVANCED D4.2 – Report describing AD perception in EU

5) A high-level overview of potential risks posed to individual privacy and data protection (including security) and other relevant fundamental rights and freedoms relevant for AD have been identified. Corresponding solution and/or mitigation strategies were defined.

ADVANCED D6.4 – Report on privacy and data protection impact assessment

WHICH ARE THE ACTIONS AND COMMUNICATION STRATEGIES TO MAKE AD HAPPEN?

ADVANCED knowledge base

1) An actionable roadmap for consumers participation in AD with outlined hurdles and recommended actions was designed. The starting point was the design of a model presenting a state-of-knowledge view of the way AD is developed beyond pilots, into the real world identifying numerous Drivers of Active Consumer Participation in AD (e.g. Knowledge through education and feedback, Trust and relationship through experience, etc..). Barriers to Active Consumer

Participation in AD were developed and suggested actions proposed to counter those barriers. These barriers were then formulated into a set of practical roadmaps to guide practitioners and policy makers in their efforts to prioritise their activities.

ADVANCED D5.1 – The AD Conceptual Model

ADVANCED D5.2, D5.3 – Actionable framework for residential and C&I customers

2) Communication umbrellas were defined. In particular Strategic Principles were identified (e.g. communication needs to change to become personalised and relevant for the individual customer; need for more digital and targeted communication; need for change not only within the minds of the customers but also internally in the organizations of the utility industry, etc). The "AD Communication wheel" was defined as a new methodology for the communication about AD programmes. An extensive segmentation analysis was conducted which enables a much more targeted communication approach, giving the residential segments: "Active", "Moderate", "Indifferent", "Oppositional". A Digital Engagement Engine which provides a methodology to ensure the roll out of AD programs in the future was established.

ADVANCED D5.4 , D5.5 – Communication umbrellas for residential and C&I customers

IMPACTS OF AD ON THE ELECTRICAL SYSTEM AND ITS ACTORS

WHAT IS THE AD POTENTIAL ON THE ELECTRICAL SYSTEM?

ADVANCED sites

1) The potential flexibilities that AD might offer with demand response and energy efficiency in France, Germany, Italy and Spain have been calculated for a baseline, optimistic and technical potential scenario. The results with regard to energy efficiency indicate that even in the baseline scenario a small potential exists. The results for the commercial & industrial sector are quite better. By taking this into account, the aggregation of the AD potential of the residential sector and the C&I sector indicates that a high AD potential is available in all four countries.

ADVANCED D6.1 – Scenario based report on AD potential

2) Services and opportunities for the system

A special DSO perspective was taken in order to find a fit between DSO's (expansion) needs and the possibilities of AD. The outcomes of this analysis are four major categories of (future)

system services: frequency control, optimization of distribution network planning and construction, optimization of system operation, management of emergency situations, network or system restoration and islanding.

The benefits in terms of investments for the distribution network reinforcements that a more efficient use of existing and new grid capacity due to AD could defer or avoid have been evaluated. The analysis showed that these benefits are strongly dependent on network expansion drivers, network typology, current level of network constraint, and location of responsive consumers.

ADVANCED D6.2 – AD based system services

ADVANCED D6.3 – Economic benefits for stakeholders

RECOMMENDATIONS

COLLECTION AND STANDARDISATION OF DATA

Use the ADVANCED target matrix since the set up phase of an AD program to identify which are the variables for its assessment, thus which data need to be collected, the unit of measurement and the granularity.

Use standard measurement instruments so that the comparison of different pilots is easier. This would greatly enhance the understanding of what facilitates Active Demand

Measurement of consumption data should include at least the hourly interval readings, though 15 minute readings would be significantly preferable as they allow for even more detailed and well defined findings. For pilots aiming for flexibility is very important to take into account the duration of the flexibility request.

Capture historical data to generate a baseline (reference load curves) per household before the pilot itself. A control group against which to compare consumption patterns should be established. If possible, this groups should have matched pairs control households to control societal changes over time.

Run pre and post pilot questionnaires to understand the starting point of consumers, their expectations upon joining the program and how the program changed their awareness, attitude etc

ASSESSMENT OF BEHAVIORAL CHANGES

All AD pilots should measure a certain basic set of KPIs consistently across pilots, using a standardized measurement and calculation methodology: energy savings, consumption flexibility, monetary savings and customer satisfaction.

Use the new ADVANCED signal compliance KPI based on household hourly electricity consumption associated with psycho-social concepts to assess compliance with the program and to gain actual insights in the drivers behind active participation of households in AD.

COMMUNICATION CAMPAIGNS TO PROMOTE ACTIVE DEMAND AND TO IMPLEMENT ACTIVE DEMAND.

Communication about AD programmes of the future needs to be a part of the business development and take its starting point in actual business goals.

Work should be done to improve information about energy production and to improve the image of the energy companies. This should increase consumers' willingness to accept sharing control over their energy consumption.

Be careful not to send contradictory or inconsistent messages. The whole body of communication around AD should be as consistent as possible.

Provide consumers with proof and guarantees of the benefits of involvement in AD, otherwise the consumer is being expected to act in blind faith on the advice of an industry they do not necessarily trust very much. This proof must go hand in hand with greater transparency

Become expert at social media, crowd sourcing and other channels of sharing as well as understanding the psychological and sociological dynamics of them to make sure your marketing and communication strategies are appropriate. Marketing and sales need to be timely, targeted and extremely proactive.

Mass market solutions that can be sold across multiple countries and even continents can be cost efficient. Both AD technologies and supporting services need a mass customisation. vendors should create solutions that are broadly appropriate to many, most if not all relevant markets, and made appropriate to a given market primarily through software and the modularisation of add-ons. Just as mobile phones, apps, computers and computer games are largely the same in all markets, so too should AD solutions.

A mass market of customers needs to be touched by AD in order to realise its value and pass on the word to the whole market.

WHEN YOU TRY TO REACH RESIDENTIAL CONSUMERS:

Adopt segmentation so that you can reach the right consumers, with the right message at the right time. Different consumers want and are driven by different motives, want different things and therefore need to offered differentiated offerings and especially need to be communicated to with different messages. Implicit is also the significance of timing. The success of active consumer participation in AD is highly dependent on offering the right service to the right customer at the right time. Refer to these segments: Active, Moderate, Indifferent, Oppositional, that were defined on the basis of the experience in the ADVANCED sites.

Do far more research into your consumer bases. It is not possible to build AD services around customers that you do not know or have any direct contact with, unless you simply build the service for specific segments of customers and have enough marketing for the right customers to come to you. Build or hire competences to secure data collection and data mining to provide the basis for rule based communication in accordance with targets and goals for the company.

It is utmost important, that each communication addresses only a very few elements, since trying to communicate everything at once will make the communication unclear and less understandable – and in the end the effort will most probably have no effect.

The link between household usage levels and collective usage issues needs to be made so people understand that what they achieve in their own household can impact on wider energy goals.

Do not focus on ‘Costs and benefits’ as it would only be effective in changing the behaviour of the very small proportion of reluctant consumers. Most people are already aware and convinced about the monetary benefits they could obtain by paying attention to their energy consumption. Focus on the degree of the benefit that comes from different types and degrees of action and efforts towards energy efficient behaviours. and ensure that the perceived cost (including financial cost, effort and risk) of AD is not greater than the perceived benefits.

Use ‘Social norms’ by enabling people to talk about it with friends and family and hear their opinion: Social norms provide more discrimination between groups, particularly the attitude of family or friends. However, actions focussed on social norms will need to be carefully targeted to be effective - as there is already a consensus amongst most respondents that paying attention

to home energy consumption is the ‘right thing to do’ to protect the environment, so campaigns emphasising this aspect may have limited impacts.

Enable, promote and support more social discussion about AD, for people to talk about it more with friends, family and others and to hear their opinions.

Work on people’s ‘Beliefs’ and inform them around the seriousness of the environment and the need for change: Actions on beliefs may encourage a positive change in home energy monitoring and consumption.

Leverage on opportunity, need and desire. AD will become increasingly appealing as consumers have more to gain through the use of AD in coordination with the synergies afforded by e.g. roof-top solar, storage and electric vehicles. It will become more common when regulations and markets evolve, facilitating the growth of appealing AD offerings. The development of appealing offerings and effective and consistent communication is essential for this sense of need and desire.

Spreading the word. AD services will need to be developed in ways that encourage the desire to tell others. While energy is often not considered an interesting topic by observers in the energy market, consumers often discuss energy issues with their friends, family and neighbours (word of mouth). If they have something to discuss, they often discuss it. AD can become a more prominent topic of social discussion. Consumers need something to shout about.

Since Active Demand is not known among potential participating customers it is needed to feed in stories of what it is, how it works and that is it actually a benefit. This task is related to “Word of Mouth” as an actual participant rather should tell a success story than by the company offering the service.

Conforming and competing. Consumers are driven by the norms around them, the knowledge of how they compare to other consumers and their own track record. As AD becomes more common, it will also become a more prominent and powerful driver of behavioural energy efficiency. AD therefore, to some extent, drives itself.

WHEN YOU TRY TO REACH C&I CONSUMERS:

Take into account C&I consumers are a very heterogeneous segment. Therefore use personalized and relevant communication on benefits and implications of participation. It is key to a DR program success.

Create clearer connections between businesses, messaging, and behavioural outcomes, as this can lead to a successful communication regarding DR.

The commitment of consumers towards AD often depends on the “energy awareness” of the business. For example, for an industrial customer, energy consumption is is critical to the operation of the business while for commercial customers, depending on size, there can be a low level of energy awareness.

As C&I customers have a core business (e.g. manufacturing goods, serving customers, etc.) they need to understand how signing up for DR services might affect their ability to continue to deliver their core business. It is important to explain that DR is designed to have no knock-on effects on the productivity of a commercial or industrial consumer’s core business.

Give good explanations of the technology that will be installed in communications: what is the technology, what are the security aspects, etc..

Provide customers with regular, consistent feedback and progress reports as it can create positive encouragement on ongoing participation.

HOW TO MANAGE YOUR AD PROGRAM

Educate consumers through well before and during the service as many of them simply do not know enough about their consumption, the impact on the environment or how much they can do themselves to help the environment through their own AD related actions (sense of responsibility and empowerment). Events are one good way of achieving this, though traditional communication such as leaflets and welcome packs are also important.

Provide consumers with a proper choice. In order to engage in AD a consumer needs to be able to select a service that suits their needs, preferences and capabilities and to be able to access a realistic and convenient service. Make sure offerings have sufficient appeal and usability.

Make sure the methods promoted are easy and hassle free. Use simple technical solutions and provide people with a good education prior to use of those technologies to make AD appealing to more consumers. Naturally consumers who like or are confident in the use of new technology - early adopter types - are more likely to get involved in technical oriented AD offerings, but solutions should not only be appealing to early adopters so simplicity and usability of technology needs to be enhanced. Create feedback infrastructure to Provide customers with Consumption feedback (monitoring), it is an essential part of knowledge. Customers need to relate their behaviour to their consumption. Consumption feedback is an extremely effective channel in this respect. Consumers need to feel more in control of the development of AD. Customers will not accept AD unless they feel that what they are doing and the pace of its development is what they have chosen, actively or passively. Consumers often do not want to be pushed too fast into being controlled and automation without behavioural AD taking place first can lead lower consumer knowledge levels.

Build trust and relationship through experience. Positive experiences can lead to a significant improvement in the likelihood of participating in AD and the likelihood of consumers talking to others. If the image of the sector can be improved, satisfaction with individual service providers will improve, and so in turn will trust in the capability of the AD service, and ultimately so will consumers' willingness to accept supplier management (an important pre-cursor to ultimate AD automation). Trust is therefore a reflection of the relationship that the consumer has with the AD supplier and the energy sector. Data privacy is also a pre-requisite of this trust. Few energy companies have what could be called a relationship with their customers and customers often have issue with the way the industry behaves (e.g. price rises, high profits, salaries, sales practices etc.) or at least the way the consumer perceives they behave. Stronger, more trusting relationships are therefore needed to convince consumers that the negative connotations with the energy industry are not associated with AD service offerings.

Take consumers on an AD Journey, one step at a time to keep them engaged in and make them accept ever more increasing levels of AD. Consumers are cautious and like to move at their own speed, a step at a time. They are easily bored. They must, through their journey increase their trust in the AD supplier and in their energy consumption being increasingly controlled by that supplier. In the meantime, they will also need new reasons to remain active. This will be a big

challenge for AD providers, especially if there is an absence of compelling business models. The customer journey is essentially the growing relationship between the consumer and AD, the AD supplier and the energy sector.

Give support when it is needed. It is often forgotten that AD requires support in many forms, in the form of pre-education (mentioned above), technical support, advice and suggestions. Consumers who do not receive sufficient support (e.g. in the form of a hotline) are likely to not become active, give up, or simply not benefit from the full potential of AD afforded to them and thereby be less successful and satisfied.

Evaluate case by case whether using an opt-in or opt-out approach. Opt-in is usually considered the best option. This is not always the case though. The fact is that the wrong option is often chosen and or wrongly applied, leading to missed engagement potentials or public relations issues. The key is to get them to opt out of or opt into something very simple and appealing at first and grow it from there

PRIVACY AND DATA PROTECTION

Choose a proper type, amount, granularity and retention period of the data collected within the scope of the AD program. The customer consent for the types of data collected and the uses of those data has to be explicit also in case of secondary uses of data/exchanges of data with third parties.

Adopt proper measures that grant the security and confidentiality of data (also in case of data shared with third parties) and ensure that customers are provided with notifications in case of security breaches

Ensure that customers can have a full access to their own data

REGULATION

It is possible to improve the current regulatory practices for the application of Active Demand in the European context and consequently contribute to the achievement of the EU targets of energy efficiency improvement and consumer engagement and protection.

DSOs

DSO regulation could be revised in order to incentivize DSO to make long-term efficient investments and reward innovation more than focus on short-term optimization
DSO could be entitled the choice to count on certain forms of AD to alleviate congestions, which remain to be defined and delimited but a direct commercial relationship with customers may not be advisable in order to boost competition and new business models.
Regulation should make the introduction of AD itself and its support technologies financially viable for DSOs
Regulation should enable DSOs economically and technically to procure AD from customers connected to their grids in a non-discriminatory fashion
A clear guidance on how to connect DRES and other intermittent generation and under which circumstances and at which costs these installations might be curtailed is needed
Regulatory intervention/support is needed in order to instigate a process in which technical connections conditions and technical minimum requirements are overhauled in order to make them AD ready

COORDINATION AMONG STAKEHOLDERS

Cooperation between TSOs, DSOs and AD operators (mainly aggregators or suppliers) should be regulated as it is key to assess and prevent undesirable side effects of AD on distribution networks
The operative process and compensation among BRP/suppliers and aggregators after a DR-dispatch should be standardised and a neutral entity between them should have a role in the central administration of these processes
The flow of information between players handling Smart Grid data should be regulated. The aim is to develop procedures (e.g. frequency of access and what information to make available) and format that allow the access to the information contained in these data bases to achieve an appropriate equilibrium between integrity of the information, privacy of the information, clarity and transparency of the information facilitated to the end consumers

SMART METERING

Regulatory intervention is needed in order to make the roll-out of smart meters financially viable.

MARKET DESIGN

A competitive market without entry barriers should be ensured for retailers, aggregators and other commercial agents to provide smart AD services. it should be the general aim to allow as much competition for DR-services as possible, in order to unlock as much potential as possible, and to allow consumers to choose among a broad range of DR service providers

Regulation should improve market liquidity and ensure that market prices reveal the different resources available at the time of the gate closure. Ideally this should be done in 15 minute intervals in order to reflect the full benefits of low cost renewable generation..

Network fees should be aligned with flexibility requirements, while today network fees tend to incentivize a flat consumption pattern.

Regulation should ensure that end users receive cost-reflective tariffs to make the most efficient decisions as a whole (considering as well simplicity concerns).

An absolute prerequisite for DR participation in the market is aggregation as the vast majority of consumers are far too small to offer their flexibility to the electricity market on their own. independent aggregation in the market should be granted through the definition of clear roles, responsibilities of the consumer's DR service provider, the consumer's retailer and the BRP, as well as regularisation of the arrangements needed between the parties

DR should be allowed to be prequalified as pool and generation bias should be removed in product design.

SMART SURROUNDING INFRASTRUCTURE

The existing public telecommunication networks and the frequency allocation behind those should be developed in a manner that takes the AD / smart grid demand into account and even develops products that are tailored to those needs.

Regulatory intervention needed in both the product and the finance side. On the product side, a speed up in the financing process might come from standardized financial packages, valuation metrics and contract templates. On the financial side, a stable regulatory framework, with clear rules, limited bureaucratic procedures and low market entry barriers are critical enablers.

The existing building codes should be set up in a way that not only fosters energy efficiency (i.e. primary energy usage and primary energy factors per technology) but also includes AD as a source of efficiency

DATA PRIVACY

Consumer protection should be guaranteed beyond the security of the data to the rights of consumers to be informed and be provided the tools to understand the new smart tariffs and complex contracts to which they can be exposed.