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Report with detailed case analyses of 'Family of Projects' members who used the guidelines

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Abstract:

In this deliverable, the active partners and respective initiatives based on tools and guidelines from the S3C toolkit in their test sites are presented as case studies. The case studies detail

-   the process of involvement in S3C,
-   the choice of guidelines and tools from the toolkit,
-   the initiatives that were based on them by the active partners,
-   the results that were achieved with these initiatives.

Furthermore, the case studies imply how the experiences in the field and the expert reviews have impacted the content of the S3C toolkit in return and the preface chapters sum up process-related learnings and the methodology behind the work with the active partners and experts that agreed to review, test and validate the S3C guidance.

Keyword list:

- active partners
- case study results
- high-level results

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Executive Summary

Having dealt with a very heterogeneous group of 11 active partners incl. three utilities from nine European countries that launched a total of 14 testing initiatives based on the S3C toolkit and numerous European experts on Smart Grids topics, the S3C consortium can deduce further findings for end-user centric research in Smart Energy/Smart Grids and enhance the already established knowledge from the framing process (D1.1) and the analysis of best practices (D3.4).

The goal for WP5 of the S3C project was to execute at least 10 practical tests covering a majority of the tools and guidelines developed by the consortium. The consortium succeeded in executing a total of 14 practical test initiatives. Together with complementary actions, nearly all developed tools and guidelines have been reviewed and/or tested.

Number of guidelines and tools	Number of R&D projects implementing guidelines and tools	Number of utilities implementing guidelines and tools	Number of overall initiatives launched based on the tools and guidelines	Number of utilities reviewing the tools and guidelines	Number of ADB experts reviewing the tools and guidelines
50	8	3	14	3	16

Table 1 Numbers of practitioners and experts involved in S3C toolkit reviews and active testing based on the toolkit, source: the S3C consortium

After having found key success factors, pitfalls and opportunities in the analysis of concluded pilots and projects (WP3, D3.4), the tools and guidelines developed in WP 4 were tested in WP 5 to be further improved based on the tests and, thus, validated while creating new best practice examples.

Within WP 5, the consortium worked to set up as many initiatives based on the tools and guidelines with as many active partners and utilities seeking new projects as possible. Overall, 14 different initiatives were set up covering different subject areas from feedback to co-creation, gamification and storytelling approaches.

The key findings from the initiatives further point to a previous insight: "*One size does not fit all*". S3C does not deliver an answer to the question "what is the most successful customer engagement strategy", because the most successful engagement strategy differs from utility to utility and project to project due to different contexts and challenges. Instead, the S3C guidance points to methods and processes that help utilities and projects to learn about the people they seek to approach and to keep their customers in the center of attention in their respective tailor-made engagement strategy.

This deliverable details best practice examples in form of case studies from our active partners that have implemented the S3C guidance together with the consortium in their initiatives. These case studies serve as further inspiration to develop deeper and broader insights. The consortium succeeded in connecting the tests to the opportunities and pitfalls that were identified in the analysis in D3.4. Especially the opportunities identified

- Reinforce the end user perspective in the project design,
- Develop viable business models,
- Co-creation,
- Gamification,
- Roll out smart grids towards the general public,
- Develop novel stakeholder coalitions,
- Connect smart grids to smart cities, smart living and sustainable lifestyles and
- Develop an overarching storyline to achieve a sense of urgency about smart grids

could all be addressed together with active partner projects and utilites. Thus, new best practice examples on these promising approaches have become available and can further the development of innovative activation and engagement approaches. The examples created with active partner projects and utilities

have been fed back into the redrafting process of the tools and guidelines. The guidelines, in fact, now include first hand experiences created by applying them.

However, involving projects with fixed time frames and project plans is challenging. Whether it is a utility and commercially-oriented project or nationally or European funded RD&D project - projects are mostly on a very tight (time) budget for very good reasons. Funding has to be approved based on approved time plans and project plans, which can only be changed to little extent or at great costs after approval. The consortium decided to not exclusively work with funded R&D projects, but to engage utilities and initiate bottom-up tests as well. In fact, experiences from working with R & D projects and experiences driven by commercial and development interests of utilities complement each other. However, the issue resulting from time and availability constraints also applied to the utility driven active partner tests.

In fact, during the first stages of active partner involvement, it already became apparent that the inclusion of 15 active partners implementing the S3C tools and guidelines in a strict PDCA-cycle (as was promised in the original S3C "Description of Work") would be difficult to implement. An amendement to the original DoW was therefore needed, as discussed with our Project Officer and Project Reviewers during the 1st periodic review, and formally accepted in the amended version of the DoW (16 February 2015). The idea to find self-funded test-beds remained the same, while the plan to implement strict PDCA-cycles was replaced by individual, flexible and iterative processes tailored to the availability and needs of the projects and utilities that wanted to work with the S3C toolkit and consortium. The original and adopted approaches to involving active partners are described in chapter 2.

While the involvement and interaction with the active partner projects and utilities became more flexible, the consortium ensured that the output from the collaborations remained comparable by setting up a semi-structured interview and a survey template that recorded

- why the tools/guidelines were implemented,
- how they were implemented,
- how they were rated and what impact they created,
- how they could be improved based on the experience gathered in the test.

These interviews and surveys together with the ongoing collaboration served as the basis for the case studies that can be found in chapter 4 in this deliverable.

One of the main practical findings of working with our active partners and utilities has been that the usability of the toolkit increases, the earlier it is introduced in the development of a customer engagement project. The largest initiatives based on the toolkit were developed from the beginning. However, other project phases have proved to be good starting points for the toolkit, too. The evaluation phase offers possibilities to improve learning processes and rollout and test phases can be complemented by extra efforts that ensure that customer needs are respected and taken into accounts at all time. Further high-level lessons learned are summarized in chapter 3.

Since the fourteen active partner initiatives could not ensure a practice test for all 50 tools and guidelines, the consortium launched further actions to ensure that the toolkit would be evaluated and further improved by knowledgeable experts and practitioners that could relate the guidance and its background to their personal expert background or their daily work and, thus, provide fact-checks and usability lessons (see summary of extra activities in chapter 5) .

The actions included focus group sessions with practitioners and experts from the S3C ADB and further evaluations and input from utility representatives.

By combining the work in the active partner initiatives and the further validation activities, the consortium was able to have almost all tools and guidelines reviewed and/or evaluated. Table 2 sums up the key findings and impact created by the active partner initiatives that were based on the S3C toolkit.

Active partner initiatives that tested and validated S3C tools and guidelines	Key learning and impact
ABGnova and mainova – Product Development	It is important for utilities to build new product development processes for innovative, smart product during which the focus on customers' needs – in this case commercial customers - can be maintained. A new product on light management was developed co-based on the S3C product development methodology.
HiT – Supporting the rollout of Smart Home technologies	It is important to involve funded projects as an early point in the project phase to adapt concepts. Furthermore, rollouts of technical equipment are an important first contact for the successful involvement of customers. They can only make the project a success, when they understand the new technologies they work with.
Insero Live Labs – Connecting and engaging people beyond the technical level	A relatable story told by peers can have a greater impact on understanding the new opportunities stemming from smart grid technologies than a lengthy manual. The storytelling guideline serves as the basis for interviews and video stories that brought the reality of Insero Live Labs participants closer and the transformation of their homes closer to their peers.
Kibernet – Including human-centric approaches in an industry-driven technology project	For a successful engagement of SMEs in smart energy projects, it is important that utilities communicate with management and operation representatives synchronously. The predictable concerns about implementation of smart systems may be efficiently resolved by using the prescribed procedure involving both parties.
SPEU – Developing feedback and consumption targets for SMEs	It is important to involve the end user when designing the EMS interface that the end user has to cope with in the implementation phase. While many pilots have been conducted to deduce optimised feedback for residential customers, the SPEU project applied the S3C Feedback and KPI guideline to agree on a consumption target and appropriate feedback system for the employees of engineering and technology firms sharing an office building. The needs of the tech-savvy employees were very different from the needs of residential customers and resulted in an accurate, real time and highly informative feedback channel.
LINEAR – Gaining a deeper understanding of target groups and project results by applying segmentation	It is important to gain a deeper understanding on the energy practices of end users engaged in pilot projects based on qualitative insights (interviews), next to the quantitative insights gathered by using surveys.
Mooi Wildeman (Amsterdam Smart City) – Involving residential customers in co-creation to learn about their energy needs	This co-creation project in the Wildeman neighbourhood – which was part of the Amsterdam Smart City initiative – showed that even without actually deploying technologies, a shift in awareness, attitudes and behaviour concerning energy use can be achieved by applying a co-creation approach. The co-creation guideline is a very good tool for "learning on the job" together fellow citizens or colleagues, and to align different stakeholders, since it can be tailored to local contexts and goals. Furthermore, the outcomes of such a co-creation approach can be used for strategic decision making processes.

Sala-Heby – Supporting utilities and researchers to offer new incentives with products	Households in multi-apartment buildings often have low electricity consumption and therefore also less financial gain in saving energy than large consumers have. Apartment customers may instead be engaged through other incentives, such as infor-mation campaigns, target-setting or social comparisons. A new concept has been developed by Sala-Heby Energi, with input from S3C, to test such alternative approaches. It takes time and effort to develop new incentives - more so for some types of incentives than others. A campaign can be launched relatively soon after concept development, while the legal circumstances related to, for instance, introducing new tariffs are more complex. Such incentives thus take longer to realize.
UppSol 2020 – Helping projects to benchmark themselves and improve their performance	In evaluation and follow-ups, it is beneficial to let an objective part contact respondents. This enables respondents to provide both positive and negative feedback. Feedback on experience from different groups of stakeholders in a project can provide valuable insights to project management, and thereby enhance project development.
InovGrid and InovCity – The Stakeholder Initiative	The results of the stakeholder initiative had a direct impact on the gamification initiative. An in-depth stakeholder analysis was carried out. The methods implied by the guideline were furthermore tested and double-checked in several InovGrid test sites. The results of the Alcochete study were directly related to the next initiative carried out in the test-site – the gamification initiatve. Regarding further results of the stakeholder initiative, it was clear from the beginning that there are two different levels of involvement with the InovGrid project among stakeholders in Alcochete depending on the information stakeholders have about the project and the degree of direct contact with EDP. City hall and stakeholders in more regular and direct contact with EDP refer to a very positive and open relationship while others show a more distanced attitude towards smart grid projects. To inform those stekholders without direct contant and extend pre-existing relation, specific initiatives appealing to different stakeholder groups were set up. The interviewed stakeholders referred to these initiatives implemented as very positive. Especially a smart grid exhibition was being perceived as a way of recognition of the Alcochete community and it is essential to bring the new technologies closer to the population.

InovGrid and InovCity – The Gamification Initiative	Stakeholders in Alcochete pointed to the benefits of engaging younger generations in the Smart Grid trial while sensitising them for responsible energy consumption at the same time. As a result, the first local supporters for the gamification platform to be developed could already be involved – especially in the school district. The gamification platform took several non-monetary incentives to the test by building a web-platform with energy quizzes, persuasive feedback and a goal-setting components mainly targeting school children. While the results of the initiative would have been more stable, if the test timeframe would have been longer, the first results indicate a clear impact. The participants that actively used the platform were able to decrease their energy consumption by more than 28% compared to their consumption during the same time in the preceeding year. The answers in the quiz were mostly answered correctly indicating that people really engaged with the platform and that the incentives chosen by EDP were successful in raising the attention of their target group.
InovGrid and InovCity – The Meter Rollout Initiative	The Meter Installation Initiative served to revisit and improve the entire meter installation process for the new trial sites of the InovGrid project. The EDP team within the S3C consortium was mainly in charge of the drafting of the guideline. In fact, as with the Stakeholder initiative, the utility could put the developed concept to the test, benchmark them to other projects and rollouts and then further develop their processes. In workshops, the EDP staff directly interacted with the installers to increase learning and sensibility of the installers for customer needs. Together, the utility and the contractor identified challenges and ways to overcome them. As a result of the learning that customers need thorough information about the newly installed technology and will ask the installers for help, who can become overburdened in return, EDP has introduced a new and thorough FAQ section on the rollout on their website that the installers can refer to when being asked on-site.
InovGrid and InvoCity – The Home Energy Management Initiative	The Home Energy Management initiative served to double-check EDP's own Home Energy Management offer. The EDP approach was compared with the advice in the guideline and studies on feedback channels, different types of users and potential improvements of the offer now complement the knowledge in the guidelines tested in this initiative.
St. Gallen utility - Involving commercial customers in co-creation to learn about their energy needs	This initiative is the counterpart to the Mooi Wildeman test. Here co-creation was adapted to suit the needs of commercial SME customers as opposed to residential customers in a shorter, more focused process. SME associations and utilities can form a stakeholder network that enables completely new business opportunities complementing the traditional energy value chain.

Table 2 Key learnings and impact created by the individual S3C active partner initiatives, source: the S3C consortium

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Table of Contents

Index of Figures

Index of Tables

Index of abbrevations

ADB   Advisory and Dissemination Board

BRP   Balance Responsible Partner

CHP   Combined Heat and Power

DR   Demand Response

DSM   Demand Side Management

DSO   Distribution System Operator

DTC   Distribution Transformer Controller

EDP   Energias de Portugal

EDPD   Energias de Portugal distribuição

EV   Electric Vehicle

GPRS   General Packet Radio Service

HEM   Home Energy Management

HQL   High-Pressure Mercury-Vapor Lamps

KPI   Key Performance Indicators

LV   Low Voltage

PLC PRIME   PowerLine Communication PoweRline Intelligent Metering Evolution

R & D   Research and Development

RD & D   Research, Development and Demonstration

RF MESH   Radio Frequency Mesh

SCADA   Supervisory Control and Data Acquisition

SCADA   Supervisory Control and Data Acquisition

SME   Small and Medium Enterprises

ToU   Time of Use

VPP   Virtual Power Plant

V2G   Vehicle to Grid

1. Introduction

This report includes the detailed case studies on the active partner projects' and utilities' initiatives launched within the cooperation with S3C. In addition, it renders background information on the approach taken to work with active partners and complementary actions.
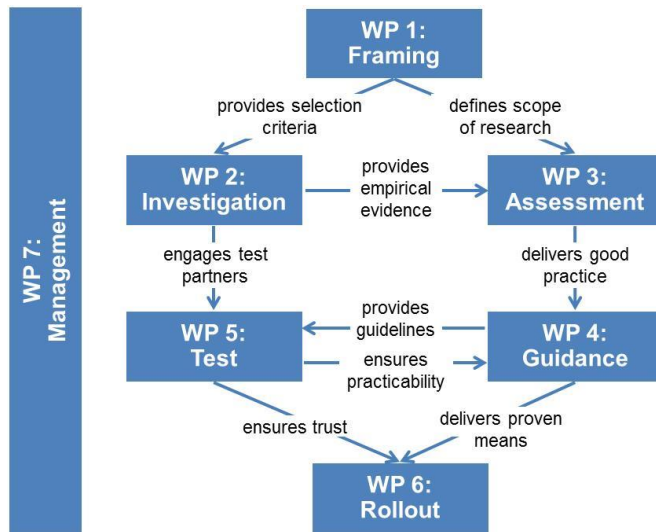
Figure 1: WP 5 in the overall S3C project set-up, source: the S3C consortium

The report constitutes an overview over the activities carried out in S3C's WP 5. The focus of the work package consisted in the test and validation of the tools and guidelines developed under WP 4.

Suitable projects and partners to collaborate with in this work package were already identified under task 2.3 in WP 2. After the analyses of concluded passive partner projects that were willing to share their experiences and results for a cross-project analysis in WP 3 to identify cross-cutting success factors, opportunities and barriers to end-user engagement were identified. Together with the gained insights, especially opportunities – very promising practices that had rarely been tried yet – and pitfalls were addressed with the tools and guidelines that were developed in WP 4. The first version of the tools and guidelines were then shared with the active partners, so that the S3C consortium and the partner projects and utility could base initiatives for improved user engagement on them. Of course, the needs of the partner projects were decisive for the choice of guidelines and tools that were implemented by the active partners in their test sites.

The insights gained from the tests of the guidelines were then included in the second drafting round of the tools and guidelines. The finalised toolkit contains best practice examples from the partner projects and utilities that implemented the S3C guidance and have been improved according to the recommendations from the active partners regarding

a)   the usability/content of the guideline and
b)   the readability/ease of use of the guideline.

This report details the work carried out together with the partner projects and the complementary actions undertaken to ensure a thorough evaluation and testing of the entire toolkit content.

The case studies detail

- the process of involvement in S3C,
- the choice of guidelines and tools from the toolkit,
- the initiatives that were based on them by the active partners,
- the results that were achieved with these initiatives.

Furthermore, the case studies imply how the experiences in the field and the expert reviews have impacted the content of the S3C toolkit in return and the preface chapters sum up process-related learnings and the methodology behind the work with the active partners and experts that agreed to review, test and validate the S3C guidance (see Table 3).The table details, whether the tools and guidelines were "reviewed" by experts and/or practioners or "tested", i.e. whether the advice in the guidelines were translated into actions or the tools were implemented. Furthermore, the table indicates whether the tools and guidelines were adapted based on the experiences collected in the field with them or the expert knowledge and experience that was gained through the review. As the table clarifies, nearly all tools and guidelines could be improved and enhanced by test and review feedback.

Name	Reviewed by active partner	Tested by active partner	Adapted by active partner	Reviewed by utility	Tested by utility	Adapted by utility	Reviewed by ADB
Guideline bonus & malus – changing behaviour with rewards and penalties	KIBERnet INSERO Sala-Heby						
Guideline choosing and combining monetary and non-monetary incentives	KIBERnet Sala Heby		KIBERnet Sala Heby	Wunsiedel Utility		Wunsiedel Utility	
Guideline choosing from different types of monetary incentives	KIBERnet Sala Heby		KIBERnet Sala Heby	Wunsiedel Utility		Wunsiedel Utility	
Guideline choosing from different types of non-monetary incentives	KIBERnet Sala Heby		KIBERnet Sala Heby	Wunsiedel Utility		Wunsiedel Utility	
Guideline co-creation - collaborating to develop smart energy solutions	Mooi Wildeman	Mooi Wildeman	Mooi Wildeman	St. Gallen	St. Gallen	St. Gallen	
Guideline collection of survey questions for smart grid evaluation	INSERO		INSERO				
Guideline designing a dynamic tariff	KIBERnet Sala Heby		KIBERnet Sala Heby				
Guideline develop FAQs to assist the support staff	HiT InovGrid Meter Installation Initiative	InovGrid Meter Installation Initiative	HiT InovGrid Meter Installation Initiative				
Guideline energy audits for households							
Guideline engaging people through telling stories	INSERO	INSERO	INSERO				
Guideline gamification - making energy fun	Sala-Heby InovGrid Gamification Initiative	InovGrid Gamification Initiative	InovGrid Gamification Initiative				
Guideline how personal goals can motivate behavioural change	Sala-Heby InovGrid Gamification Initiative	InovGrid Gamification Initiative	InovGrid Gamification Initiative	Wunsiedel Utility		Wunsiedel Utility	
Guideline how to create a consumption baseline	KIBERnet	KIBERnet	KIBERnet				

Name	Reviewed by active partner	Tested by active partner	Adapted by active partner	Reviewed by utility	Tested by utility	Adapted by utility	Reviewed by ADB
Guideline how to gather community support for your smart grid							
Guideline how to identify regional stakeholders	InovGrid Stakeholder Initiative	InovGrid Stakeholder Initiative	InovGrid Stakeholder Initiative				
Guideline how to improve you smart energy project through check-ups		UppSol 2020					
Guideline how to make energy visible through feedback	SPEU InovGrid Home Energy Management Initiative	SPEU InovGrid Home Energy Management Initiative	SPEU InovGrid Home Energy Management Initiative				
Guideline how to monitor demand response performance	KIBERnet		KIBERnet				
Guideline innovative product development				ABGnova	ABGnova	ABGnova	
Guideline introducing demand side management to SMEs	KIBERnet	KIBERnet	KIBERnet				
Guideline introducing smart appliances	InovGrid Home Energy Management Initiative	InovGrid Home Energy Management Initiative	InovGrid Home Energy Management Initiative				
Guideline KPIs for energy consumption effects	SPEU KIBERnet	SPEU KIBERnet	SPEU KIBERnet				
Guideline learning about target groups	UppSol 2020		Uppsol 2020				
Guideline motivating consumers with social comparison and competition	Sala Heby InovGrid Gamification Initiative	InovGrid Gamification Initiative	InovGrid Gamification Initiative				
Guideline optimizing the meter installation process	InovGrid Meter Installation Initiative	InovGrid Meter Installation Initiative	InovGrid Meter Installation Initiative				
Guideline predicting effects of renewable energy integration							
Guideline privacy and data protection				Alliander		Alliander	
Guideline recruiting participants				EDP Commercial		EDP Commercial	

Name	Reviewed by active partner	Tested by active partner	Adapted by active partner	Reviewed by utility	Tested by utility	Adapted by utility	Reviewed by ADB
Guideline self-assessment to create a reflecting team culture		UppSol 2020					
Guideline smart meter monitoring and controlling functionalities	InovGrid Home Energy Management Initiative	InovGrid Home Energy Management Initiative	InovGrid Home Energy Management Initiative				
Guideline testing tariff schemes in a pilot context	KIBERnet		KIBERnet				
Guideline training installers	InovGrid Meter Installation Initiative	InovGrid Meter Installation Initiative	InovGrid Meter Installation Initiative				
Guideline user-centred KPIs for the evaluation of smart grids	SPEU LINEAR	SPEU	SPEU LINEAR				
Guideline using flexibility manually or automatically	KIBERnet	KIBERnet	KIBERnet				
Guideline using segmentation to better target user groups	LINEAR Sala Heby	LINEAR	LINEAR				
Tool collecting FAQs during the installation process	HiT InovGrid Meter Installation Initiative	InovGrid Meter Installation Initiative	HiT InovGrid Meter Installation Initiative				
Tool enact 2020 – exchanging know-how in a multi-stakeholder workshop							
Tool how to estimate your load shifting potential	KIBERnet	KIBERnet	KIBERnet				
Tool making leaflets to educate the customers	HiT		HiT				
Tool monitoring and evaluation through stories – most significant change							
Tool postcard from the future workshop method							
Tool product development checklist cooperation				ABGnova	ABGnova	ABGnova	
Tool product development checklist marketing strategy				ABGnova	ABGnova	ABGnova	
Tool product development checklist customer				ABGnova	ABGnova	ABGnova	
Tool product development checklist product				ABGnova	ABGnova	ABGnova	

Name	Reviewed by active partner	Tested by active partner	Adapted by active partner	Reviewed by utility	Tested by utility	Adapted by utility	Reviewed by ADB
Tool questionnaire for engaging SMEs	KIBERnet	KIBERnet	KIBERnet				
Tool user group segmentation light	LINEAR	LINEAR	LINEAR				
Tool web based energy quiz				Wunsiedel Utility **			

Table 3 Overview of tool and guideline validation status, source: the S3C consortium

2. Approach to active partner tests

The S3C project consortium developed guidelines and tools based on best practice analyses and tested them in cooperation with other demonstration projects or utilities to further improve them. However, the involvement process for the "active partner", i.e. projects that could test the S3C guidance, had to be adjusted over the course of the project and complemented with further activities to ensure a thorough validation of the guidelines and tools.

While the project was progressing, the consortium had to broaden the approach for testing the toolkit due to several reasons.

The original approach foresaw to test the tools and guidelines only by the "Family of Projects" (FoP), in fact the test beds of other R&D projects. These were to integrate the tools and guidelines into their engagement strategies to improve their programs and introduce new means and methods for the user participation in active demand side management and in energy efficiency of the overall electricity system.

Many active partners with adequate and functional test beds were chosen in the run-up of the project. Many of them signed a Letter Of Intent (LOI) to confirm their willingness to participate. Additional test sites and partners who were willing to cooperate and test the means outlined in the guideline have been selected and engaged in WP 2.

The implementation of the tools and guidelines was supposed to follow a strict PDCA (plan-do-check-act) cycle. The implementation of the PDCA cycle into the project design is illustrated in the following Figure 2.

Steps of the work plan for testing the tools and guidelines with active partners (PDCA cycle):

(1) To assess experiences with or plan for customer involvement and create revision / action plan

(2) To implement revised / improved means (in the first round without assistance from the S3C team, in further turns with coaching)

(3) After 3/6 months pilot team and S3C team to perform an audit to

a. Assess if guideline and tools provided were comprehensive enough and easy to use

b. Check results of the first phase of the field-test

(4) To decide about continuation of the tests

(5) To create a new 3/6-month plan for the implementation of the customer involvement means in the field and go to

Figure 2: Action flow to implement PDCA in WP4 and WP5

The envisaged PDCA cycles in WP5 was to provide feedback for the toolkit after each audit, and the tools and guidelines were to be updated and/or extended to better fit the practice and improve usability:

- Improvement of the interactivity of the toolkit website (e.g. by introducing feedback loops and opportunities for content rating)
- Integration of additional guidelines and tools still under development and/or tailored to the needs of the respective active pilots
- Improvement of individual guidelines and tools according to the PDCA cycles followed in WP5
- Finalization of the interactive toolkit for end user involvement

However, when the S3C consortium started to involve active partners, it soon became apparent that the approach could not be implemented as planned. The biggest challenges countering the implementation of the initial model were

- scarce time and resources in th active partner projects on the one hand side
- and little flexibility and needs for security in project plans on the other hand side.

The initial approach was too time-consuming for the partner projects to accomodate. Whether it is a utility and commercially-oriented project or nationally or European funded RD&D project - innovation projects are mostly on a very tight (time) budget for very good reasons. Funding has to be approved based on approved time plans and project plans, which can only be changed to little extent or great costs after approval. The consortium decided to not exclusively work with funded R&D projects, but to engage utilities and initiate tests of the guidelines and tools as well. In fact, experiences from working with R&D projects and experiences driven by commercial and development interests of utilities complement each other. However, the issue resulting from time and availability constraints also applied to the utility driven active partner tests.

Constant pre-scheduling of workshops including different work package leaders and decision makers proved to be of little success. The needs of the respective partner companies and/or consortia involved differed strongly with regard to their development and test topics, their project phase and resources strongly. Every interaction process with the respective partners had to be tailored to the specific situation to enable a successful involvement.

As a result, the different consortium members took the lead in involving different partners. The consortium members built a steady contact point for individual partners and developed the collaboration with the active partners based on their availability and needs. They were supported by the other consortium members, especially those that drafted the guidelines and tools that were tested in their initiatives, as needed. The different involvement processes are described in the case studies individually in chapter 4.

In fact, the collaboration and the tests were carried out in a constant, flexible and iterative processes tailored to the availability and needs of the projects and utilities that wanted to work with the S3C toolkit and consortium.

While the involvement and interaction with the active partner projects and utilities became more flexible, the consortium ensured that the output from the collaborations remained comparable by setting up a semi-structured interview and a survey template that recorded

- why the tools/guidelines were implemented,
- how they were implemented,
- how they were rated and what impact they created,
- how they could be improved based on the experience gathered in the test.

These interviews and surveys together with the ongoing collaboration served as the basis for the case studies that can be found in chapter 4 in this deliverable.

The feedback of the active partners was collected and utilised to improve the quality and usability of the guidelines and tools on the hand side. The impact that was created in the active partner initiatives was described as well to be included as best practice examples in the tools and guidelines.

The adapted approach ensured that 14 active partner initiatives could be carried out that served to test a majority of the guidelines and tools contained on the toolkit website.

3. High level results of active partner involvement and tests of tools and guidelines

The active part of the S3C Family of Project was constituted by a group of very heterogenous projects.

The investigated projects include a wide variety of smart energy projects in 9 different European countries, stretching from Sweden to Portugal and from the Belgium to Slovenia, with many differences with respect to project goals, project design, target groups, tested interaction schemes, etc.

Member State	Active partner project	Partner/Reviewing Utility
Austria	HiT	
Belgium	LINEAR	
Denmark	Insero Live Labs	
Germany		ABGnova and mainova, Municipal Utiliy Wunsiedel (Stadtwerke Wunsiedel)
Netherlands	Amsterdam Smart City	Alliander
Portugal	InovGrid and InovCity	EDP
Slowenia	SPEU, KIBERNET	
Sweden	UppSol2020	Sala-Heby
Switzerland		Municipal Utility St.Gallen (Sankt Galler Stadtwerke)

Table 4 Geographical distribution of S3C active partners, source: the S3C consortium

The types of customers targeted in the active project initiatives strongly differs. Some initiatives (St.Gallen, SPEU, Kibernet, ABGnova) targeted commercial customers, but most focused on residential customers (HiT, LINEAR, Insero Live Labs, Amsterdam Smart City, the InovGrid initiatives, UppSol 2020, Sala-Heby).

The amount of end-users impactd by the initiatives is also vastly different among the projects dealing with residential customers. From the Mooi Wildeman project within Amsterdam Smart City that focused on just one singular neighbourhood to the Gamification initiative in Alcochete carried out within InovGrid that affected and targeted more than 13.000 customers, different types of test-sample sizes have been included as S3C active partners.

Customer segments represented in the field-tests differed as well.

Mooi Wildeman, carried out within Amsterdam Smart City, as well as Insero Live Labs tested socially challenged neighburhoods and regions that are usually not considered early adopters for smart technolgies. The gamification initiative carried out within InovGrid mostly focused on young, tech-savvy people, while the LINEAR project mostly counted early adopters as its participants. HiT focuses on intergenerational living and applid its smart home technologies in an apartment complex that has become the home to a very heterogenous group of people.

The support for the Sala-Heby project and AGBnova only affected customers indirectly, as the direct support was given to product developers and/ researchers developing a new produc or ervice for the utility customers.The S3C consortium provided the partners with tools and uidelines to facilitate their strategy and benchmark them to best practice examples.

Some projects were designed from a top-down perspective (what services can the increased flexibility of energy end users offer to energy market participants, e.g. lowering peak demand?, e.g. LINEAR, SPEU, HiT), whereas other projects took the perspective of the end user as the starting point (what new products and services can deliver added value to the end user?, e.g. Amsterdam Smart City , St. Gallen, InovGrid Stakeholder and Gamification initiative).

While HiT, LINEAR, Insero Live Labs, InovGrid, UppSol2020, KIBERNET and Sala-Heby were at least partly funded from national or European development, energy, innovation or research funds, the initiatives carried out

with ABGnova, Amsterdam Smart City and the St. Gallen utility are bottom-up projects funded by the involved utilities and other entities. Interestingly, these initiatives focused less on abstract research questions, but had very concrete purposes directly linked to product development and/or to bringing in customers closer to their utilites.

The active partner initiatives also differed in terms of the project phases they were in when they were approached by the S3C consortium and the project phases during which the S3C consortium could eventually collaborate with them (see table Table 5).

Orientation Phase	Design Phase	Rollout Phase	Test Phase	Evaluation Phase
Municipal Utiliy Wunsiedel (Stadtwerke Wunsiedel) Alliander EDP Municipal Utility St.Gallen (Sankt Galler Stadtwerke)	ABGnova and mainova	HiT	Insero Live Labs Kibernet	LINEAR UppSol 2020
	Mooi Wildeman (Amsterdam Smart City)			
	InovGrid and InovCity (all four initiatives)			
	SalaHeby	SPEU		

Table 5 Project Phases during which the active partner initiatives collaborated with S3C, source: the S3C consortium

While utilities that were willing to review S3C guidelines and add their own insights were mostly in a general orientation process before starting out further or completely new initiatives, most of the initiatives on customer engagement launched in collaboration with S3C started in the design phase. However, the examples of HiT, SPEU, Insero Live Labs, Kibernet, LINEAR and UppSol 2020 indicate that projects and utilities can also benefit from the S3C toolkit in later stages of a project to complement already implemented or planned approaches.

The aforementioned characteristics of the active partner initiatives clarify that no definitive, quantitatively significant results can be deduced from the active partner initiatives on the most successful ways to engage customers. No initiative implemented in S3C – even if they were based on the same guideline such as the test in St.Gallen and Mooi Wildeman – equal each other. Each initiative was tailormade for its context.

One issue not touching upon the usability of the toolkit's content, but relating to readability and understandablity is related to the different target groups of the S3C toolkit. The consortium has worked with pratitioners in utilities and researches as well as regional developers alike in the test initiatives.

The expectations of these groups with respect to what a guideline or tool should look like differ strongly.While researchers favoured scientific language, exact and exhaustive descriptions in many cases, practitioners focused on easy to understand step-by-step descriptions. To overcome this challenge, the second version of the tools and guidelines are completely alike in structure and include information targeted to both audiences. While practitioners can easiliy skip the background and further reading section to focus on the instructions in the "What you need to do"- and "Do's and don'ts"-sections, researchers have further reference material and a personal notebook that offers the results from previous work packages on theory and prior best practice in an easy to use fashion. That way, a balance between the different target groups could be achieved.

Regarding the content of the tools and guidelines, the character of the guidelines is instructing. They supported the active partners to make informed decisions and plan processes while taking into account the own context and target groups. The guidelines were often referred to as a introductions of how to set up a process or inspiration on how to improve an existing process. They help to doublecheck ideas and expand ideas or align them with other best practice examples.

The findings further point to a previous insight: "One size does not fit all". S3C does not deliver an answer to the question "what is the most successful customer engagement strategy", because the most successful engagement strategy differs from utility to utility and project to project due to different contexts and challenges. Instead, the S3C guidance points to methods and processes that help utilities and projects to learn about the people they seek to approach and to keep their customers in the center of attention for different challenes and project phases.

This deliverable details best practice examples in form of case studies from the active partners that have implemented the S3C guidance together with the consortium in their initiatives. These case studies serve as further inspiration to develop deeper and broader insights. The consortium succeeded in connecting the tests to

the opportunities and pitfalls that were identified in the analysis in D3.4. Especially the opportunities and pitfalls identified could all be addressed together with active partner projects and utilites. Thus, new best practice examples on these promising approaches have become available and can further the development of innovative activation and engagement approaches. The examples created with active partner projects and utilities have been fed back into the redrafting process of the tools and guidelines. The guidelines, in fact, now include first hand experiences created by applying them.

Reminder from D3.4 : The pitfalls and opportunities of active end user engagement

Pitfalls of active end user engagement

➢ *Non-viable business cases for end users.*
A number of evaluated projects refer to the creation of business models as one of their project objectives, but there are virtually no indications that these business models turned out to be economically attractive. Thus, for the vast majority of projects, the business case for pricing schemes seems not to be very viable. Generally, the price spread between high and low peaks is too small to be a valid (financial) incentive for participants, and for DSOs they don't reflect economic reality. Without the development of solid business models for residential and commercial consumers, full-scale rollout is not likely to be feasible.

➢ *On-going technical problems and unreliable technology.*
Approximately 40% of the investigated case studies reported technical problems that caused delays in the installation phase and/or the execution phase to such an extent that it had negative impacts on the engagement of end users. In several projects, this resulted in a loss of engagement or even a drop out of participants. In these cases, it became evident that it is a tough challenge to repair a damaged reputation. Hence, the importance of adequate expectation management combined with allowing time for a phased roll-out, with thorough testing and troubleshooting among friendly users, should not be underestimated.

➢ *Inadequate expectation management.*
Expectation management is of key importance to keep end users committed and engaged, both regarding the outcome dimension (technology, products and services) and the process dimension. For instance, if the design of the equipment does not meet end user's expectations, e.g. because it is very big or aesthetically unattractive, the end user might refuse it. On the process dimension, a long waiting period until the actual instalment of the equipment, as well as malfunctioning equipment has shown to be a disappointing factor for end user participants.

➢ *Engaging end users without sharing decision power.*
A potential barrier for engagement of end users in active demand projects lies in the actual opportunities for end users to influence the design of specific aspects in the project (e.g. project communication, service concepts, procedures). Generally there should be some leeway for end users to bring up ideas and take initiatives within the project, without putting the project goals, the research design and the time planning at risk. In this respect, a trade-off needs to be made by project managers between active participation and empowerment of end users and staying in control of the project.

Opportunities

➢ *Reinforce the end user perspective in the project design.*
Large scale smart energy innovations are only likely to succeed if they manage to adapt to the everyday social practices of end users. A vital challenge for future smart grid developments is to design projects in such a way that the end user perspective cannot be overlooked. This implies to underscore the sense of place, to achieve a sense of ownership and to provide added value for the end user: what's in it for them?

➢ *Develop viable business models.*
The absence of obvious, viable business cases is one clear barrier for active end user engagement in smart grids. Therefore the challenge to develop economically solid smart grid business models should be high on the agenda of energy companies, because an engaged end user is the key to long-term success of the smart grid.

➢ *Co-creation.*
A promising way in which products or services can be adjusted to fit the wishes of the participants and thus improve its chance of successful use, is by applying co-creation with end users. Although it might be difficult for them to voice what they want, it is possible to gain very valuable feedback from the end users about the proposed product or service when co-creation methods are applied adequately. Products and services rooted in co-creation are more likely to succeed in future roll-out of smart grid infrastructures, as their added value for the end user is more evident.

➢ *Gamification.*

A rather novel and non-intrusive way to engage with end users and simultaneously collect data is to incorporate gamification in products and services or in research and development activities. The experiences with gaming interfaces and competitive elements in the case studies are promising and inspiring, both in terms of engaging end users in the project and in terms of outcomes. However, a challenge regarding gamification is to capture the interest and attention of end users in the long run.

➢ *Roll out smart grids towards the general public.*

In many case studies, the end user base consisted of friendly users and energy insiders. However, the opinions and insights into consumer behaviour detected in these projects can rarely be considered representative and be used as reference when interacting with the general public. Since many business cases will only become viable if there is a large enough customer base, gaining better understanding of the needs, expectations and concerns of the general public is a precondition for future expansion of smart grid infrastructures.

➢ *Develop novel stakeholder coalitions.*

The case studies show that the current generation of smart grid projects is predominantly run by the 'usual suspects' from the energy business. In order to introduce smart grids to the general public, novel stakeholder coalitions with stronger societal involvement are indispensable. A few projects successfully managed to involve civil society stakeholders. To better connect with everyday social practices of end users, it is recommended to establish such coalitions with civil society and other non-energy stakeholders.

➢ *Connect smart grids to smart cities, smart liv*ing and sustainable lifestyles.

The smart grid is a very abstract concept that focuses on the 'low interest topic' electricity. Coupling the topic with other thematic areas that are known to raise more interest and appear less abstract is a promising strategy to overcome obstacles such as false perceptions or no perceptions at all. Therefore, it is vital to explain the interconnectedness between topics such as smart grids, smart cities, smart mobility and sustainable lifestyles to unaware end users.

➢ *Develop an overarching storyline to achieve a sense of urgency about smart grids.*

For the future expansion of smart grid infrastructures, it can be beneficial to create a consciousness about the unsustainability of the contemporary energy system. When the advantages of renewable energies and of smart grids are in the foreground, end users may be more likely to adopt a sense of urgency that increases their motivation to participate actively. An easily understandable, overarching storyline can be helpful to educate end users and to improve their energy awareness, which can lead to a stronger motivation to act accordingly.

Table 6 and Table 7 relate the initiatives carried out in the active partner initiatives to the

	Reinforce the end user perspective in the project design	Develop viable business models	Co-creation	Gamification	Roll out smart grids towards the general public	Develop novel stakeholder coalitions	Connect smart grids to smart cities, smart living and sustainable lifestyles	Develop an overarching storyline to achieve a sense of urgency about smart grids
ABGnova and mainova		x				x		
GL: innovative product development		x				x		
T: Product development checklist customer		x				x		
T: Product development checklist marketing strategy		x				x		
T: Product development checklist product		x				x		
T: Product development checklist cooperation		x				x		
HiT	x		x		x			
GL: Making leaflets to educate the customers	x		x		x			
GL: Develop FAQs to assist the support staff	x		x		x			
T: Collecting FAQs during the installation process	x		x		x			
INSEREO Live Lab	x			x	x		x	x
GL: Engaging people through telling stories	x			x	x		x	x
GL: Collection of survey questions for smart grid evaluation	x							
KIBERNET	x	x						
GL: Introducing demand side management to SMEs	x	x						

	Reinforce the end user perspective in the project design	Develop viable business models	Co-creation	Gamification	Roll out smart grids towards the general public	Develop novel stakeholder coalitions	Connect smart grids to smart cities, smart living and sustainable lifestyles	Develop an overarching storyline to achieve a sense of urgency about smart grids
T: Questionnaire for engaging SMEs	x	x						
T: How to estimate your load shifting potential	x	x						
GL: How to create a consumption baseline		x						
GL: Using flexibility manually or automatically		x						
GL: How to monitor demand response performance		x						
GL: KPIs for energy consumption effects		x						
GL: Designing a dynamic tariff		x						
GL: Bonus & malus – changing behaviour with rewards and penalties	x	x						
GL: Testing tariff schemes in a pilot context		x						
GL: Choosing and combining monetary and non-monetary incentives	x	x						
GL: Choosing from different types of monetary incentives	x	x						
GL: Choosing from different types of non-monetary incentives	x	x						
SPEU	x	x	x					
GL: How to make energy visible through feedback	x	x	x					
GL: User-centred KPIs for the evaluation of smart grids	x	x	x					
GL: KPIs for energy consumption effects	x	x	x					

	Reinforce the end user perspective in the project design	Develop viable business models	Co-creation	Gamification	Roll out smart grids towards the general public	Develop novel stakeholder coalitions	Connect smart grids to smart cities, smart living and sustainable lifestyles	Develop an overarching storyline to achieve a sense of urgency about smart grids
LINEAR	x				x			
GL: User-centred KPIs for the evaluation of smart grids	x				x			
GL and T: Using segmentation to better target user groups	x				x			
Mooi Wildeman	x		x		x		x	x
Co-creation - collaborating to develop smart energy solutions	x		x		x		x	x
Sala Heby				x				
GL: Bonus & malus – changing behaviour with rewards and penalties				x				
GL: Motivating consumers with social comparison and competition				x				
GL: Gamification - making energy fun				x				
GL: How personal goals can motivate behavioural change				x				
GL and T: Using segmentation to better target user groups				x				
GL: Designing a dynamic tariff				x				
GL: Choosing and combining monetary and non-monetary incentives				x				
GL: Choosing from different types of monetary incentives				x				
GL: Choosing from different types of non-monetary incentives				x				

	Reinforce the end user perspective in the project design	Develop viable business models	Co-creation	Gamification	Roll out smart grids towards the general public	Develop novel stakeholder coalitions	Connect smart grids to smart cities, smart living and sustainable lifestyles	Develop an overarching storyline to achieve a sense of urgency about smart grids
UppSol2020	x		x					
GL: Co-creation - collaborating to develop smart energy solutions	x		x					
GL: Learning about target groups	x		x					
GL: How to improve you smart energy project through check-ups	x		x					
GL: Self-assessment to create a reflecting team culture	x		x					
InovGrid Energy management	x	x	x				x	
GL: How to make energy visible through feedback	x	x	x				x	
GL: Smart meter monitoring and controlling functionalities	x	x	x				x	
GL: Introducing smart appliances	x	x	x				x	
	x	x	x				x	
InovGrid Meter installation	x	x			x			
GL: Training installers	x	x			x			
GL: Develop FAQs to assist the support staff	x	x			x			
T: Collecting FAQs during the installation process	x	x			x			
	x	x			x			
InovGrid Stakeholder engagement					x	x		x

	Reinforce the end user perspective in the project design	Develop viable business models	Co-creation	Gamification	Roll out smart grids towards the general public	Develop novel stakeholder coalitions	Connect smart grids to smart cities, smart living and sustainable lifestyles	Develop an overarching storyline to achieve a sense of urgency about smart grids
GL: How to identify regional stakeholders					x	x		x
					x	x		x
InovGrid Gamification	x	x	x	x	x	x	x	
GL: Gamification - making energy fun	x	x	x	x	x	x	x	
GL: How personal goals can motivate behavioural change	x	x	x	x	x	x	x	
GL: Motivating consumers with social comparison and competition	x	x	x	x	x	x	x	
St Gallen utility	x		x		x		x	x
GL: Co-creation - collaborating to develop smart energy solutions	x		x		x		x	x

Table 6 The active partner initiatives and how they relate to the opportunities of active end-user engagement, source: the S3C consortium

	Non-viable business cases for end users	On-going technical problems and unreliable technology	Inadequate expectation management	Engaging end users without room for actual involvement
ABGnova and mainova				
GL: innovative product development	■		■	
T: Product development checklist customer	■		■	
T: Product development checklist marketing strategy	■		■	
T: Product development checklist product	■		■	
T: Product development checklist cooperation	■		■	
HiT				
GL: Making leaflets to educate the customers		■	■	
GL: Develop FAQs to assist the support staff		■	■	
T: Collecting FAQs during the installation process		■	■	
INSEREO Live Lab				
GL: Engaging people through telling stories	■		■	■
GL: Collection of survey questions for smart grid evaluation				■
Kibernet				
GL: Introducing demand side management to SMEs	■	■	■	
T: Questionnaire for engaging SMEs	■		■	
T: How to estimate your load shifting potential	■	■	■	
GL: How to create a consumption baseline	■	■	■	
GL: Using flexibility manually or automatically	■	■	■	
GL: How to monitor demand response performance	■	■	■	
GL: KPIs for energy consumption effects	■	■	■	
GL: Designing a dynamic tariff	■	■		
GL: Bonus & malus – changing behaviour with rewards and penalties	■			
GL: Testing tariff schemes in a pilot context	■	■		
GL: Choosing and combining monetary and non-monetary incentives	■			
GL: Choosing from different types of monetary incentives	■			
GL: Choosing from different types of non-monetary incentives	■			
SPEU				
GL: How to make energy visible through feedback	■		■	
GL: User-centred KPIs for the evaluation of smart grids	■		■	

	Non-viable business cases for end users	On-going technical problems and unreliable technology	Inadequate expectation management	Engaging end users without room for actual involvement
GL: KPIs for energy consumption effects				
LINEAR				
GL: User-centred KPIs for the evaluation of smart grids				
GL and T: Using segmentation to better target user groups				
Mooi Wildeman				
Co-creation - collaborating to develop smart energy solutions				
Sala Heby				
GL: Bonus & malus – changing behaviour with rewards and penalties				
GL: Motivating consumers with social comparison and competition				
GL: Gamification - making energy fun				
GL: How personal goals can motivate behavioural change				
GL and T: Using segmentation to better target user groups				
GL: Designing a dynamic tariff				
GL: Choosing and combining monetary and non-monetary incentives				
GL: Choosing from different types of monetary incentives				
GL: Choosing from different types of non-monetary incentives				
UppSol2020				
GL: Co-creation - collaborating to develop smart energy solutions				
GL: Learning about target groups				
GL: How to improve you smart energy project through check-ups				
GL: Self-assessment to create a reflecting team culture				
InovGrid Energy management				
GL: How to make energy visible through feedback				
GL: Smart meter monitoring and controlling functionalities				
GL: Introducing smart appliances				
InovGrid Meter installation				
GL: Training installers				
GL: Develop FAQs to assist the support staff				

	Non-viable business cases for end users	On-going technical problems and unreliable technology	Inadequate expectation management	Engaging end users without room for actual involvement
T: Collecting FAQs during the installation process				
InovGrid Stakeholder engagement				
GL: How to identify regional stakeholders				
InovGrid Gamification				
GL: Gamification - making energy fun				
GL: How personal goals can motivate behavioural change				
GL: Motivating consumers with social comparison and competition				
St Gallen utility				
GL: Co-creation - collaborating to develop smart energy solutions				

Table 7 The active partner initiatives and how they relate to avoiding the pitfalls of end- user engagement, source: the S3C consortium

4. Case analyses of engaged active pilots

4.1 ABGnova and mainova – supporting smart product development

Full project title	Utility initiative on developing a new product for SME customers
Website	http://www.abgnova.de/ http://www.mainova.de/ https://www.mainova.de/static/de-mainova/downloads/Flyer_Mainova_Lichtaudit_0615.pdf
Funding scheme	Not applicable
Tested guidelines	
- Guideline: innovative product development - Tool: Product development checklist customer - Tool: Product development checklist marketing strategy - Tool: Product development checklist product - Tool: Product development checklist cooperation	
Which barriers and opportunities were addressed?	
Barriers - Non-viable business cases for end users - Inadequate expectation management	
Opportunities - Develop viable business model - Develop novel stakeholder coalitions (within utilities and between utilities and external, especially local stakeholders)	

4.1.1 Introduction to the pilot and impact of S3C

The utility mainova is located in Frankfurt am Main and constitutes one of the largest energy suppliers in Germany delivering electricity, gas, water and heat. Next to the residential sector, this utility emphasizes its commercial customer sector. It offers several innovative and smart solutions and services for SMEs and larger business or industry customers. The ABG Frankfurt Holding, the largest housing society in Frankfurt (nearly 50.000 dwelling units), is another important stakeholder, when it comes to energy (consumption). Together, mainova and ABGnova founded a subsidiary called ABGnova. AGBnova's task is to further mainova's and ABG Frankfurt Holing's knowledge and experience in practice with energy efficiency and climate protection efforts, thus, rendering the city more competitive and a role model for smart energy usage. One of the main tasks carried out by ABGnova is to design new innovative energy products based on their insights that can then be launched by mainova.

The ABGnova enables a continuous knowledge transfer on innovative energy topics and helps to spread the innovation within the region. New results on market requirements, changing legal situations and technical developments are being researched, compared, implemented into new product ideas and disseminated.

One of the key challenges faced within ABGnova is to find new products for commercial customers, especially SMEs. Smart or innovative products beyond the traditional energy supply have been gaining importance for utilities especially with regards to their commercial customer. Offering value-added services can increase customer loyalty and even attract new customers. As commercial customers are considered the low hanging fruits for the successful and profitable implementation of smart energy products, they are of specific importance.

SMEs in the context of this product are considered to be smart customers, making the most of their appliances and flexibility.

However, the development of products and services going beyond offering new tariffs for "selling the kWh" the usual spectrum of tariffs is more difficult to implement and requires utilities and their partners to explore new ways of working together. The main challenge for the S3C project in this case thus consisted in helping AGBnova and mainova to develop new products targeted to SMEs by establishing a sound process for product development that maintains a clear focus on this group of end users.

B.A.U.M. Consult, as a representative of the S3C consortium, had been in contact with ABGnova and mainova utility to discuss the potential for collaboration. After introductory meetings, the involved consortium partners and representatives of ABGnova and mainova came to the conclusion to cooperate on the inclusion of SME customers and structured innovative product development processes.

The senior product developer at ABGnova had already worked on a new enticing product idea for SME customers that was further developed during the collaboration.

This innovative product is called "Lichtaudit" (light audit) and was supported in its development and launch with S3C guidance, namely by the guideline and checklist tools on product development. The product idea was based on a new law banning the sales of so-called HQL-lights[1] in Germany starting in May 2015. HQL-lights are mostly used by industrial and commercial energy users in e.g. large production halls and parking lots. The light audits helps SME users to address the new situation and find new, smart and efficient solutions based on an audit service offered by the utility. In return, the utility can increase customer loyalty by offering this new services and generates new revenue. Figure 3 shows the brochure that was developed for the new product and distributed among SMEs in the Rhein-Main area, the supply region of mainova.

Figure 3: Product Flyer for the mainove Light Audit, which was developed on the S3C product development guidance, source: mainova 2015

Product development processes within utilities have been focused on optimizing those products relating to energy deliveries. New services and products going beyond the delivery of different types of energy require new processes within the utilities that are striving to offer them. These processes are in stark contrast to the optimisation of tariff arrangements, as the processes are rarely defined and the competencies and knowledge to clarify what the introduction of an innovative product requires and entails are distributed among different departments in utilities. The S3C consortium's main task was to find a structured process description that could

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[1] High-pressure mercury-vapor lamps (HQL) enable highly efficient lighting systems especially for commercial users.

help to drive the new SME-centred product to its launch and ensuring that the customer perspective in the development and focus on needs of SMEs did not get lost.

The cooperation between S3C, mainova and ABGnova took place in workshops and follow-up processes. After the introduction and decision phase, information on involving and engaging SMEs in a smart energy context were presented to the representatives of ABGnova and mainova based on the results of the S3C deliverables 3.1 and 3.4. The insights underscored the finding that the finding "one size does not fit all" also relates to SMEs, who can deviate very strongly in their experiences and awareness of new energy products. In a second step, the guidance for the organisation of innovative product development within utilities was presented and used by the participants of the workshop representing product developers and sales employees of the utility and the innovation agency. In this workshop, the utility/innovation team was supported in organising the information exchange proposed by the guideline by a senior business consultant from the S3C team. Together, the assembled team could flesh out important questions regarding the new product in terms of questions regarding the customer and the product design as such. The checklist tool on customers was of particular importance, as this stresses the needs of the actual target groups of the new product. Going through the questions in the checklists exposes knowledge gaps about these needs that can be filled during the development process and tailor the design to what SMEs or other targeted customers actually require.

After the first workshop concluded, the senior product developer on the team continued to use the guidance and checklist tools to further organise the bilateral cooperation between different department within ABGnova and mainova up to the launch of the new product in May 2015.

Remaining in contact, the product development guideline and checklist were adapted based on the user feedback of ABGnova.The concept is now available as the guideline "Developing new smart energy services and products in a utility environment" and in form of four corresponding checklist tools.

The main learning in the feedback phase after the test was to include two ways of implementing the guidance with slightly different aims and prospects. The "series of workshops"-option is to raise awareness for complexities and interdependencies within utilities during the product development process, while the bilateral process carried out in a steady exchange between main product developers and the knowledge sharing contacts in the utility is geared towards the actual launch preparation of a product. Both options are described in the guideline. The checklists are found as extra tools, in which the users can make notes and find check-questions that should definitely be answered to prepare the product idea to a point that renders it ready for approval and later launch.

The test and cooperation with ABGnova and mainova indicate that organisational aspects that not just knowledge building or co-creational aspects are key to putting the user in the center of future energy services and products. The organisational structures to create future energy products and services have to be adapt as well. Cross-department and cross-company collaborations will gain importance.

4.1.2 Timeline of collaboration with S3C

Responsible S3C partner	B.A.U.M.	
Date and type of activity	**Contact person**	**Description and outcome**
September 2014 – November 2014 Information and introduction process	innovation manager at mainova and representatives of ABGnova	A continuous conatact was established with innovation managers and other representatives at ABGnova and mainova. Together, a date for a scoping workshop for collaboration possibilities was decided upon. Furthermore, the decision was taken to implement the collaboration via mainova's innovation agency ABGnova.
November 26th, 2014 (scoping workshop for collaboration between S3C and ABGnova/mainova)	innovation manager at mainova and representatives of ABGnova	The scope of the S3C activities and guidance to the contact points at ABGnova and mainova in a workshop. It was decided to involve S3C for innovative product development measures in the field of smart new products and services for SMEs.
December 2014 –	S3C team	The S3C team within B.A.U.M. Consult involved senior

February 2015 Confirmation process and planning phase		experts in product development and sales and clarified a date for a workshop to implement guidance and advice with mainova/ABGnova.
February 4th, 2015 workshop on innovative product development for SMEs	S3C team, innovation managers and sales experts from mainova utility and ABGnova	The workshop was conducted. The utility representatives were advised the present on product development and SMEs behavioural findings based on previous findings of S3C. The first steps of a product development workshop (as delineated in the tools and guidelines) were implemented for the product introduced by the participants from ABGnova and mainova, an intelligent lighting audits for SMEs.
February 2015	innovation manager at mainova and representatives of ABGnova	In the aftermath of the workshop, the guidance on innovative product development as opposed to traditional product development in utilities together with checklists was handed over to the responsible parties at mainova/ABGnova to build the further development and launch process for the new SME product on the guidance.
March – May 2015	innovation manager at mainova and representatives of ABGnova and S3C team	The guidance from the guideline and checklists to further the product development for his light audit product for SMEs were implemented. Continuous contact with the S3C project team.
May 11th, 2015	innovation manager at mainova and representatives of ABGnova and S3C team	A review interview on the implemented guideline and checklists took place toclarfiy their impact and find optimisation potential.
May – July 2015	S3C team	Reworking of tools and guidelines based on recommendations by ABGnova and mainova process. Approval for finalised versions by active partner.

4.1.3 Overview of tools and guidelines provided to ABGnova

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Guideline: innovative product development	Yes	Yes	Yes	February 2015	May 2015	May 2015
Tool: Product development checklist customer	Yes	Yes	Yes	February 2015	May 2015	May 2015
Tool: Product development checklist product	Yes	Yes	Yes	February 2015	May 2015	May 2015
Tool: Product development checklist marketing strategy	Yes	Yes	Yes	February 2015	May 2015	May 2015

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Tool: Product development checklist cooperation	Yes	Yes	Yes	February 2015	May 2015	May 2015

4.1.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: Innovative Product Development + Tools "Product development checklist customer", "Product development list product", "Product development checklist cooperations" and "Product development checklist marketing strategy"

Why was the tool/guideline implemented?

ABGnova develops new products and services for the utility mainova. One of the main challenges for the utility is to maintain their commercial users, especially SMEs, and gain new ones. In fact, one of their most significant information requests was to learn about drivers and obstacles in involving SMEs in smart energy products on the one hand side and to find a structured process for innovative product development on the other hand side that involves different stakeholders in the different departments of the two companies.

In fact, the advice in the guideline and the practical tipps in the checklists were used to further delineate and develop the product light audits.

How were the guideline and the tools implemented?

The guidance from the guideline and the checklists tools were implemented in the workshop in February with support from the S3C experts. Afterwards, the guidance was made available to the senior product developer, who implemented the checklist tools as a constant reminder and a double-check options to further guide the product development process of the "light audit" process to its launch in May 2015.

Suggestions for improvement by Bernd Utesch, ABGnova	Suggestion implemented	Reason for decision
The fact that people with very different roles and responsibilities become involved in product development, the more differentiated and innovative the project is, should be clarified. Depending on the product to be developed, the size of the group that has to be involved can grow.	Yes	In the "What you need to do"-section, the requirement to learn as much about the competencies and knowledge carriers to be involved is clearly explained. The search for allies within the utility is one of the first steps explained.
The point in time at which the advice within the guideline is best implemented should be explained.	Yes	While product development processes can greatly differ and it is thus very difficult to pinpoint the exact point in time, during which the advice of the guideline and checklists should be implemented, the guideline includes the advice to start implementing the advice as soon as possible, i.e. after the first product idea has formed and can be presented to others in a basic form.
The guideline should highlight that the clarification requirements between different departments can delay the overall product development and launch process.	Yes	The guidance not includes advice on including extra time that can be used to accommodate delays due to unanticipated needs for clarification in different departments or the unavailability of certain information necessary to make a decision on the further development or launch of

		the product.
The guidance should include the hint that it cannot be implemented in just one workshop. It should be explained that it is either a series of workshops or a continuous exchanges between multiple knowledge carriers throughout the utility. The two different options should be explained clearly and a best practice example could to illustrate how the processes can be shaped.	Yes	The „What you need to do"-section in the guideline now reflects the two different processes and highlights the need for an extended time frame, during which the process is implemented. The process at ABGnova was included as a best practice section.

4.2 HiT - Buildings as interactive smart grid participants

Full project title	"**H**äuser als **i**nteraktive **T**eilnehmer im Smart Grid" "Buildings as interactive smart grid participants"
Website	http://www.smartgridssalzburg.at/forschungsfelder/kunden-und-gebaeude/hit/ http://www.rosazukunft.at/
Funding scheme	This project is funded by the Austrian climate and energy fund and is executed in the framework of the programme "NEUE ENERGIEN 2020". Funded by the "Smart Grids Modellregion Salzburg" Partners within the project are: Salzburg Wohnbau GmbH Salzburg AG Siemens AG Österreich AIT Austrian Institute of Technology, TU Wien, CURE und Fichtner

Tested guidelines
• Guideline: Making leaflets to educate the customers • Guideline: Develop FAQs to assist the support staff • Tool: Collecting FAQs during the installation process

Which barriers and opportunities were addressed?
Barriers • On-going technical problems and unreliable technology • Inadequate expectation management
Opportunities • Reinforce the end user perspective in the project design • Co-creation • Roll out smart grids towards the general public

4.2.1 Introduction to the pilot and impact of S3C

HiT is a Smart Grid housing project located in the City of Salzburg. The abbreviation HiT stands for "Häuser als interaktive Teilnehmer im Smart Grid" ("Buildings as interactive smart grid participants") and refers to the smart integration of houses into the energy grid.

The project deployed and investigated a broad range of Smart Grid technologies within a newly built housing complex. The project is trying to find the optimal interaction between a smart home and its inhabitants, embedded in a smart housing complex. The main research aspects of the project are user-interaction and energy feedback (persuasive technologies), the integration of home automation technologies, the use of dynamic fake tariffs and the combination of different Smart Grid appliances. Additionally to these aspects, the project integrates social aspects with a cross-generational living concept and a sustainable mobility concept with e-car sharing.

HiT is a flagship project of the "SmartGrids Modellregion Salzburg" and consists of two projects: the "HiT - planning and construction"-project and the "HiT - accompanying research". While the first one builds the housing complex, the latter investigates:

- the potentials of smart housing for Smart Grids,
- the optimization and development of interaction and building technologies,

- the influence of persuasive strategies on behaviour,
- the barriers for behavioural changes,
- the acceptance and usage of new technologies,
- and the optimization of housing technologies and interaction technologies.

The result of the accompanying research will be a guideline for the implementation of Smart Grid ready housing/ estates.

The project differs from other Smart Grid projects, because it does not only pick up one aspect of Smart Grids, but builds a whole new housing area from scratch equipped with Smart Grid technology. HiT includes a Smart Housing system with DER generation facilities. The aim of the project is the evaluation and optimization of this housing complex regarding the building technology, the energy consumers' experience and the energy grid within a one-year trial.

The newly built housing complex in Salzburg, with about 130 flats, produces its own heat and electricity with photovoltaic panels, a collective combined heat-and–power (CHP) plant (fired with biogas) and a heat pump. The building is equipped with a 90m³ heat storage buffer and a charging station for the electric vehicles. To ensure an active integration of the housing complex into the load management of the grid, the whole system is connected to the district heating system and the electricity grid. Furthermore, it is equipped with an energy management unit which coordinates the consumption and production of energy and enables the integration of renewable energy. The heat pump and the e-car charging stations are automated demand-response enabled.

Interaction technologies like the Energy Cockpit (feedback and consumption statistics) and a monthly newsletter (email or mail) with feedback and consumption data were offered to the residents. These technologies were used to enable a permanent feedback and interaction with the residents of the housing complex. Feedback is given on the electricity, water and heat consumption.

35 so called "monitoring flats" are highly energy efficient and offer different technical home automation solutions to gain energy efficiency and demand response. They are equipped with an Eco-Button (that allows to switch off many standby devices by pressing just one button), sensors for the room temperature, humidity and CO_2 concentration. An ambient temperature controller enables a central control for the heating of the separate rooms. These features can be controlled remotely via a web-login or with a tablet app. Furthermore the flats are equipped with a Wattson. This is a commercially marketed in-house display that gives the customer a real-time feedback (Watt and Euro) of their electricity consumption and enables the identification of the electricity consumption of individual devices.

A Smart Center App for tablet PC, which integrates many of the described functionalities into one app was handed out to the participating households in the monitoring flats. The app on the tablet combines different functionalities. It shows the forecast for the upcoming energy prices, and statistical and graphical feedback about the energy consumption in previous periods. Furthermore the application offers access to the home automation features, to the Energy Cockpit and to the car-sharing booking system. With the home automation features the residents can define the desired values for the room ambient temperature of the living room and the bed room. Furthermore the humidity and CO_2 concentration of the rooms can be requested. The tablet PC can also be used as an in-house display ("ambient screen"). With a display holder it can be fixed to a table. This should result in a permanent confrontation of the inhabitants with the topics energy and energy savings.

But instead of just giving all the technologies to the customer, there is a combination with many social techniques. In the beginning of the project not only informational material was handed out to the participants, but there were also energy consultants who came to every household and explained the functionalities of the installed devices. For the social interaction of the inhabitants the local Christian social welfare organization is organizing meet-ups and round tables for the new neighbourhood.

The project is integrated into the regional project "Modellregion Salzburg" which aims to develop and test future energy systems with many Smart Grid components. Hence, the results of former research and technology projects like Consumer2Grid and Persuasive end-user energy management are integrated into the framework of the project. These findings were used to improve the interaction and feedback technologies. HiT, as the flagship project of the "Smart Grid Modellregion Salzburg" started in January 2011 and the housing complex, built by different partners , was finished in autumn 2013. The first residents moved in autumn 2013. The field study – executed by a consortium of different partners – started in April 2014 and was finished in May 2015.

Within a one-year field test and the optimization of the housing complex, there was a one year lasting evaluation of the relation to the energy grids, the housing technology and the residents. The result of this evaluation will be a guideline for further projects in that technology area. The project can hence be seen as a living lab for future Smart Grid projects.

For the evaluation of the project, different kinds of data sources will be used. On the one hand quantitative data – like consumption statistics, etc. – will be used to analyse the impact on the user behaviour. Quantitative methods like standardized surveys are used to gain insights into topics like the subjective behaviour, attitudes and values of the participants. And, of course, socio-demographic characteristics and the data-usage of the Energy Cockpit are collected and analysed. For the qualitative analysis of the project, semi-structured interviews, focus groups and energy diaries are used to learn about the end user. These data are compared for different groups: The participants living in the monitoring flats, equipped with all described technologies, will be compared with those participants who only have access to the Energy Cockpit web interface.

The predecessor project PEEM, dealing with persuasive displays, is a passive partner of the S3C project and did already signed a letter of intent in the run-up to the project. Additionally there have been good contacts the S3C partner B.A.U.M. and the Salzburg AG due to former cooperations.

For the cooperation as an active partner a workshop with representatives of the Salzburg AG and CURE has been organized. At the workshop different opportunities to support the project with tools and guidelines have been presented by the S3C team. The result of the workshop was the acceptance on the usage of some tailored S3C tools in the HiT project. On the other side some of the proposed tools and guidelines have been rejected to avoid influences on the end user behaviour that are not caused by persuasive technologies. The rejected tools and guidelines were tailored to the project setting and dealt with gamification, social comparison elements, social dynamics (regular energy tables, including schools, chalkboards) and the improvement of the support. The guidelines dealing with social dynamics etc. have been rejected by the HiT consortium to avoid additional disturbances for the measurement of the used persuasive technology on the participants of the project.

The HiT-consortium finally agreed on the usage of two tools:

1. Tool: Making leaflets to educate the customers
2. Tool: Collecting FAQs during the installation process

In cooperation with the energy consultant who lead the energy counselling in the monitoring flats the two tools were adapted to the HiT-project. Both tools aim to relieve and help the support staff. The A5 leaflet ist trying to fix common problems without contacting the support team and the tool "Collecting FAQs during the installation process" was designed to ease the collection of questions by the represantatives of the utility who have the first contact with the customer. The goal was to design an easy to use tool for the collection of questions which will arise in this early first of Smart Grid projects.

Additionally a review of the evaluation concepts has been evaluated. But due to the very detailed and elaborated evaluation concepts there was not much room for improvement. After the development of the tool "Collecting FAQs during the installation process" the guideline "Develop FAQs to assist the support staff" has been developed to explain the concept and usage of FAQs which is textual connected to the tool. The guideline "Develop FAQs to assist the support staff" is therefore a direct result of the evaluation fo the tools.

4.2.2 Timeline of collaboration with S3C

Responsible S3C partner	B.A.U.M.	
Supporting S3C partners	INEA	
Date and type of activity	**Contact person**	**Description and outcome**
September 2013 – December 2013 Information and introduction process	Head of accompanying HiT-research and executive at Salzburg DSO	e-mail contacts, phone calls facilitiating the information and learning about the S3C project
December 16th, 2013 Workshop	Head of accompanying HiT-research and executive at Salzburg	The S3C team met with the HiT representatives in the Salzburg AG offices to develop a common understanding of the projects and define key areas for collaborations.

	DSO and S3C team	
December 2013 – March 2014 Confirmation process and planning phase	Head oft he HiT accompanying research, the installation lead and involved research institute and the S3C team	Due to the late stage in the project development and implementation and the overall short duration of the project (March 2014 – March 2015), the collaboration with the S3C project had to be discussed intensely within the HiT consortium, in order to maintain the initial project plan. Continuous conference calls served to set up a plan
April 2014 – January 2015 updates on the progress of the S3C projects	Head oft he HiT accompanying research	E mail contacts, phone calls
February 2015	Head oft he HiT accompanying research	Active Partner description for the website
16.2.15	Head oft he HiT accompanying research	Interview about the evaluation of the tools and guidelines

4.2.3 Overview of tools and guidelines provided to HiT

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
DIN A5 Fridge leaflet (guideline)	Yes	No	Yes	25.3.2015	16.02.2015	-
Develop FAQs to relieve the support staff (guideline)	Yes	No	Yes	25.3.2015	16.02.2015	-
FAQ collector for installers (tool	Yes	No	Yes	25.3.2015	16.02.2015	-

4.2.4 Implementation of S3C guidelines and tools and suggestions for improvement

Tool: FAQ collector for installers & guideline: Develop FAQs to assist the support staff

Why was the tool implemented?

The guideline should have been implemented in a very early phase of the project. As part of the HiT-project energy consultants visited the participants of the study to explain them the main features and possibilities of the installed devices. As the project deals with the impact of persuasive technologies on humans, there were many devices that could lead to problems in handling the devices. On the other side the support staff consisted of only two persons. The collection of customer question was one attempt to prepare the support staff and to get early insights into uprising problems. This was seen as a chance to collect questions and problems that could be integrated in the support process.

Due to changes of the persons who leaded the consultancy process the tool was not used within the project. The tool was therefore not tested within the project, but the project officer reviewed them and was interviewed.

How was the tool implemented?

The tool should have been implemented in the early beginning of the project even before the start of the field test. The inhabitants of the flats were already moved in and the flats were equipped with home automation solutions like an eco-button (to "turn off" the flat, when leaving), sensors for the room temperature, humidity and CO_2 concentration, an ambient temperature controller for the heating of the separate rooms and a Wattson (electricity in-house display for real time feedback). Additionally a so called "Smart Center App" for tablets and a web login were available for the customers in the 35 monitoring flats. The energy consultants had to explain all those devices's functionalities and – at the same time - should collect the most frequently asked customer questions.

Due to changes of the persons who led the consultancy process the tool was not used within the project. As an alternative way of improving the tool an interview with the project officer about the improvement of the tool was made. The revised tool was also reviewed by the project officer. Nevertheless the tool was not directly practically tested the feedback of a practioneer was integrated. This feedback was even more important though the project officer also led the support staff within during the project.

Suggestions for improvement:	Suggestion implemented	Reason for decision
More explanation on how to use the tool and how to integrate it into the process of utilities	Partly	Those information have been integrated into the tool description. An additional sheet that explains the usage of the tool has been integrated and a supporting guideline "Tool: FAQ collector for installers" has been developed to give sufficient support. A description about the integration into the process of the utility has not been integrate because it is impossible to give concrete and detailed instructions on this very specific situation that differs from utility to utility. But the hint to organize this process in an efficient way has been added.
Discuss the ideal point of time for the usage of the collection of FAQs	Yes	Within the tool the advice, that the tool has to be used at the beginning of the project, had to be strengthened. This has also been integrated into the guideline "Tool: FAQ collector for installers".
Discuss how to handle the additional workload for energy consultants	Yes	The handling of the additional workload is not discussed in detail within the tool. Therefore we integrated the hint, to keep in mind the additional workload and to find early a solution for this issue.

Suggestions for improvement:	Suggestion implemented	Reason for decision
		This has also been integrated into the guideline "Tool: FAQ collector for installers".
The collection of FAQs will not be finished after the pilot phase, but has to continue.	Yes	This hint is very important and was integrated into the tool.

Tool: Develop FAQs to relieve the support staff

Why was the tool implemented?

Originally the tool was designed to relieve the support team. Based on experiences in other Smart Grid projects, the importance of a good support is very high. Smart Grid projects often affect routines and habits of the participants. Therefore, questions of understanding will arise. Those questions could deal with the usage and the functionalities of new devices, like smart meters, tablet application, in-house displays as well as questions concerning the new tariff structure.

Within the HiT project, the participants received a free energy consulting session after they moved into their new flats. According to the original project design, this would have been also the moment, when the participants were asked regarding their technical affinity. The basic idea behind this tool was to use the first contact with the end user with a representative of the utility to collect emerging questions. If some people do have the same questions of understanding, it is very likely, that others will have the same questions. In the case of the HiT project this first contact was the one with the energy consultants, but in most smart grid projects the first contact will be the one with the installer of the smart meter or other technical applications.

Unfortunately there was a personal change on the side of the energy consultants, which led to the situation, that the tool was not tested for the energy consulting in the HiT project. As a substitute for the testing interviews with the project leader, who was also the leader of the support team, were organized. The improvement of the tools is therefore based on the feedback given in those interviews.

How was the tool/guideline implemented?

Hence it was originally part of the tool "Collect FAQs to assist the support staff" the guideline has not been implemented and tested due to the named reasons. As an alternative way of improving the tool an interview with the project officer about the improvement of the tool was made. The revised tool was also reviewed by the project officer. The feedback of a practioneer was important for the development of the tool. Even more because the project officer also led the support staff within during the project. The tool was also tested

Suggestions for improvement:	Suggestion implemented	Reason for decision
More explanation on how to use the tool and how to integrate it into the process of utilities	Yes and No	This guideline is the direct result to the need for more explanation on the usage of the tool. A description about the integration into the process of the utility has not been integrate because it is impossible to give concrete and detailed instructions on this very specific situation that differs from utility to utility. But the hint to organize this efficient has been added.
Discuss the ideal point of time for the usage of the collection of FAQs	Yes	The ideal point of time for the usage is the early phase of the project. This information has been integrated into the guideline "Tool: FAQ collector for installers".
Discuss how to handle the additional workload for energy consultants	Yes	The handling of the additional workload is not discussed in detail within the tool. Therefore we integrated the hint, to keep in mind the additional workload and to find early a solution for this issue.
The collection of FAQs will not be finished after the pilot phase, but has to continue.	Yes	This hint is very important and was integrated into the guideline.

Tool: Making leaflets to educate the customers

Why was the tool implemented?

One of the main problems in recent Smart Grid projects is a lack of support. Many customers are not sure about the sense of Smart Grid projects and are overburdened with the new devices and technologies that are now part of their living environment. Therefore many questions arise, that have to be answered by the support staff. To relieve the support team a leaflet was designed, which contains the most common questions and problems the customers do have with the new products and services. In case many of the questions could be answered by those information leaflets, less customers will contact the support team. The leaflet, designed for the HiT project was adapted to the design of the project and concentrated on different aspects of the technical equipment of the flats. The most common questions should be answer directly by the guidelines. The aim was to ease the usage of the persuasive technologies that were used in the monitoring flats.

Unfortunately there was a personal change within the project, so that the tool was not practically tested within the project. Therefore the procedure was changed and the tool was reviewed by the project officer, who was also in charge for the customer support. Additionally to the review of the first version of the guideline the revised version was also reviewed by the project officer.

How was the tool implemented?

The tool should have been implemented in an early phase of the project. It was planned, that either the energy consultants should deliver the leaflet or that they could be send to the customers in the starting phase of the project.

Due to the described reason the guideline was not practically tested as planned. Instead a two-step review process with the project officer was done. In this review process the guideline was evaluated as useful and as a tool that could reduce the workload of the support staff.

Suggestions for improvement:	Suggestion implemented	Reason for decision
The most important task for using this tool is the adaptation to the content of the project. This task needs more guidance and an extra explanation has to be added.	Yes	The adaptation of the content and the style of writing to increase the conce of the content by the customer has been improved to maximise the benefit of the tool.
The partner logos and brand colours (corperate design) have to be adapted for every project for this purpose it is necessary to find an easy way to adapt the design of the FAQ to the companies or projects corporate design	Yes	The adaptation of the design to different corporate designs is very important to increase the use of the tool

4.3 InovGrid and InovCity test sites

Full project title	InovGrid
Website	www.inovgrid.pt
Funding scheme	First Phase National Funding, Second Phase Private DSO Funding

Tested guidelines
- Guideline: Motivating consumers with social comparison and competition   - Guideline: How to make energy visible through feedback   - Guideline: Develop FAQs to assist the support staff   - Tool: Collecting FAQs during the installation process   - Guideline: Gamification - making energy fun   - Guideline: How personal goals can motivate behavioural change   - Guideline: Optimizing the meter installation process   - Guideline: Smart meter monitoring and controlling functionalities   - Guideline: How to identify regional stakeholders   - Guideline: Introducing smart appliances   - Guideline: Training installers

Which barriers and opportunities were addressed?
Barriers   - Non-viable business cases for end users   - On-going technical problems and unreliable technology   - Inadequate expectation management   - Engaging end users without sharing decision power.
Opportunities   - Reinforce the end user perspective in the project design   - Develop viable business model   - Co-creation   - Gamification.   - Roll out smart grids towards the general public   - Develop novel stakeholder coalitions   - Connect smart grids to smart cities, smart living and sustainable lifestyles   - Develop an overarching storyline to achieve a sense of urgency about smart grid

4.3.1 Introduction to the pilot and impact of S3C

The Portuguese distribution operator, EDP Distribuição (EDPD) has been pioneering the deployment of the Smart Grids concept, notably through its InovGrid project and the InovCity initiative, and has been evaluating these projects from a technological, social, and economic perspective.

- InovGrid project: an innovative program designed to address – in an integrated and holistic way – the evolution towards smarter grids, capable of dealing with the rising number of distributed energy resources (DER), the provision of detailed information to the consumer to promote their active involvement in energy efficiency, as well as public lighting control, the integration of the electric vehicle infrastructure and the efficient monitoring of asset condition.
- InovCity initiative (part of InovGrid project): The first pilot of the InovGrid project was launched before the expansion to seven additional municipalities and had a specific brand: InovCity (Évora InovCity). The InovGrid concept was implemented and evaluated in the city

of Évora, representing a 'living lab' with more than 35.000 customers. Business case assessment methodologies covering the entire value chain of the smart grid concept were applied, including the evaluation of the addedvalue to communities and society.
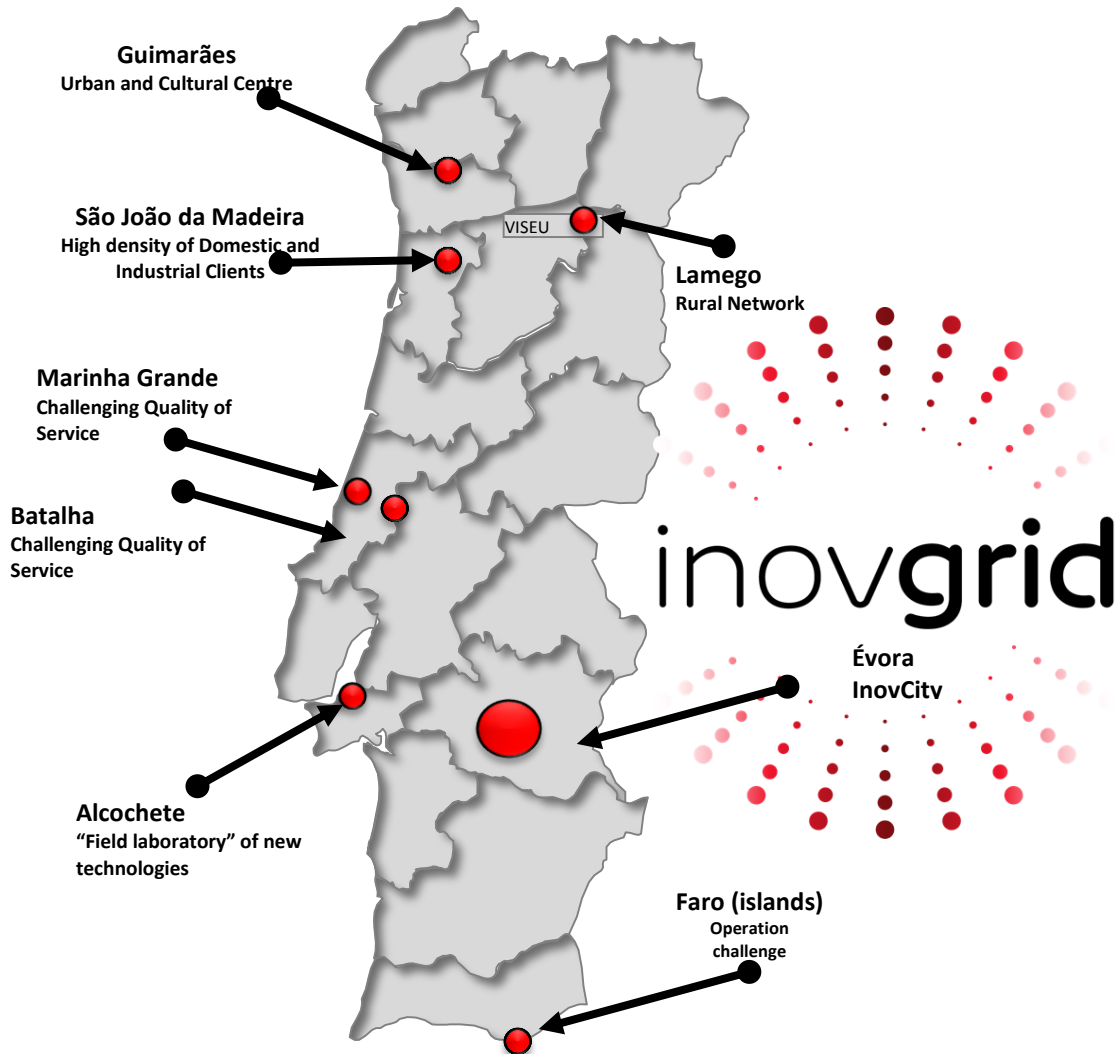
Figure 4: InovGrid demosites, source: EDP

Since 2012, EDP started a large-scale pilot to validate communication technology, escalate operations and ensure integration of multiple suppliers, systems and equipment in different locations with specific social and economic characteristics. After the first phase of smart grid implementation (the Évora InovCity project) which resulted in the deployment of 35.000 smart meters, EDPD installed more than 100.000 EDP Boxes in seven InovGrid demo sites. The demo sites had different network characteristics and different technology focus points on PRIME, GPRS and RF MESH technologies. InovGrid became an active partner of S3C and EDP decided to test 11 tools and guidelines in six of the 10 test sites. The variety of topics covered by the chosen tools and guidelines was strong and not all guidelinesand tools were tested in same locations.

InovGrid is a unique active partner within the S3C active partner landscape due to the variety of guidelines and tools that could be tested. To decide on what tools and guidelines were to be tested InovGrid followed a different path than other active partners. The decisions were taken based on a set of meetings with different departments and different levels of responsibility in the DSO structure to decide

a) what were the main learnings that EDPD wanted to extract from the interaction with end users in the different pilot sites and what activities needed to be designed to provide this learnings;

b) what sets of tools and guidelines from the S3C toolkit would be the most suitable to carry forward different initiatives, project management: planning the initiatives roll out, the different teams and initiative leads, project governance, etc.

The project team and its counselling committee decided to develop a set of four initiatives based on the tools and guidelines (i.e. projects within the active partner project) that would address different issues with respect to the

best engage end users in a smart grid empowered energy ecosystem and help to validate and improve the S3C guidance at the same time:

Meter installation initiative (tools & guidelines: Meter installation (G); Training Installers (T); FAQ during the installation process (G)). The main goal of this initiative was to optimize the meter installation process in a way that it would contribute positively to the engagement of the end-users with the project. This initiative was tested in five InovGrid demo sites: Parque das Nações, Alcochete, Lamego, Évora and S. João da Madeira and involved reciprocal interaction with 43.000 customers.

Stakeholders engagement (tools & guidelines: Stakeholders coalition (G); Potential allies on a regional level (G)). The experience of our project in Évora is an indicator that it is wise and advisable to collaborate with local stakeholders and involve them with the project in order to take advantage of their strengths, communication channels and links with the community. The initiative Stakeholders engagement was tested in the following InovGrid demo sites: S. João da Madeira, Alcochete, Lamego and interaction with more than 42.000 customers.

Specific studies were developed in more detail for Alcochete demo site based on both guidelines "stakeholders coalitions" and "potential allies on a regional level" (that have now been merged into one guideline called "How to identify regional stakeholders" at a later stage) with in depth interviews, targeted to the city hall, school community, local foundation, parish representatives and consumers. The research objectives were to diagnose and to find ways of generating greater engagement of Alcochete stakeholders with a smart grid project and some of the specific goals were:

- To understand how the different stakeholder perceive the energy theme, the project and the initiatives done so far by EDP and S3C in Alcochete;
- To understand stakeholders experience and attitudes towards the project and how they see their role in it;
- To gain access to degree of involvement with the project;
- To find out their perception about the population attitude and perceptions regarding this project, and find ways to engage different target groups / segments of the Alcochete population.

Gamification (tools & guidelines: Gamification (G); Goal Setting as an incentive (G); Competition and social comparison (G)). Can a gaming approach turn a low-engagement topic such as 'energy' in an engaging one? Can a gaming approach help to introduce energy efficiency or smart grid concepts to the population and communities? The gamification initiative was tested in Alcochete and involved more than 100 players, from around 9.200 domestic customers.

Home Energy Management (tools & guidelines: End-user feedback (G); Smart appliances (G); Monitoring functionalities (G)). The new energy ecosystem enables the surge of new products & services. The project decided to study the perceived increased value and the increment in the engagement of the end users of an energy management system. This initiative was tested with around 16 home energy management service (EDP's re:dy)[2] customers (Oporto and Lisbon).

Table 8 sums up the main characteristics of the InovGrid test sites and relates them to the guidelines and tools that were tested within the involvement of S3C. Overall, more than 97.000 customers within the supply area of EDPD were impacted by the implementation of the EDP's four S3C initiatives.

Table 8 The InovGrid test site characteristics and involvement in S3C (the test-sites in bold letters are the test-sites directly involved in S3C)

Municipality	Region	Characteristics	Customers	Tested T&G
São João da Madeira **(S3C test bed)**	Porto	- High density of Domestic and Industrial Clients	10 121	- Meter Installation - Training Installers - FAQ during installation process - Stakeholders Coalition

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[2] re:dy is the EDP Home Energy Management System

Municipality	Region	Characteristics	Customers	Tested T&G
				- Potential allies on a regional level
Lamego (S3C test bed)	Mondego	- Municipality in the interior zone of the country - Rural network	16 946	- Meter Installation - Training Installers - FAQ during installation process - Stakeholders Coalition - Potential allies on a regional level
Alcochete (S3C test bed)	*Lisbon*	- *Field lab for new technologies* - *Close to Lisbon*	*13 427*	- *Meter Installation* - *Training Installers* - *FAQ during installation process* - *Stakeholders Coalition* - *Potential allies on a regional level* - *Gamification* - *Goal setting as an incentive* - *Competition and social comparison*
Parque das Nações (Lisbon) (S3C test bed)	*Lisbon*	- *Field lab for new technologies*	*13 427*	- *Meter Installation* - *Training Installers* - *FAQ during installation process* - *End-user feedback* - *Smart appliances* - *Monitoring Functionalities*
Porto (S3C test bed)	Porto	- High density of Domestic Clients	10 121	- End-user feedback - Smart appliances - Monitoring Functionalities
Évora (S3C test bed)	Évora	- Pilot Évora InovCity (Guadalupe)	35 000	- Meter Installation - Training Installers - FAQ during installation process
Guimarães	*North*	- *Urban centre with strong development* - *European Capital of Culture 2012*	*20 582*	
Faro (ilhas)	*South*	- *Testing for Island operation* - *High operation costs*	*1 214*	
Batalha	*Tejo*	- *Challenging quality of service*	*4 201*	
Marinha Grande	*Tejo*	- *Challenging quality of service*	*21 468*	
Total			**146 507**	

Before summing up the central reults of the four initiatives, it is important to highlight the background of the InovGrid project and the results before the S3C initiatives were implemented.

InovGrid demonstrates Smart Grid concept by means of integrated management tools that:

1. Improve service quality;
2. Promote distribution network remote management;
3. Reduce operating costs;
4. Promote a more active role for customers/producers;
5. Support new commercial services;
6. Increase energy efficiency;
7. Exploit the potential of distributed generation (DG);
8. Enable the integration of electric vehicles charging network;
9. Promote the environmental sustainability through the increase in energy efficiency;
10. Foster the proliferation of micro-generation;
11. Support the renewal of technologies and the improved exploitation of current capabilities.

From historical challenges such as quality of service and operational efficiency, new challenges are emerging leading to a paradigm shift for the DSO role. Those new challenges are

- renewables and distributed generation;
- advanced metering infrastructure;
- network and automation and sensoring;
- electric vehicle
- energy efficiency and new business models
- home energy management system

This change of paradigm required strong intervention on the grid as well as the establishment of a new smart electrical distribution system developed by EDPD. This solution will enable stakeholders in the electricity sector to obtain significant benefits, namely:

- The consumer/producer will benefit from the increase in the ability to produce energy through micro-production, while reducing their energy consumption. They will also have access to new services, new types of pricing and innovative price plans by managing their consumption in near real time;
- Retailers can diversify their supply of services and offer new types of pricing to their customers, reduce the operational costs of metering as well as cut-off and reconnecting;
- The regulator will enable the creation of better conditions for market development, with positive implications on the reduction of electricity rates, through the access to information on market operation and DSO operating conditions;
- The distribution grid operator will increase operating efficiency, the reliability of their grids and can also increase the quality of service in the electricity supply, by optimizing investments while reducing their operational costs and their energy losses. It will also allow for the introduction of improvements in grid operation and in future planning, based on more detailed information regarding operating conditions;
- Aggregators, ESCOs and upcoming players to the energy ecosystem. A smart grid enabled energy ecosystem fosters the urge of new players and grants a new scale to existing ones, such as ESCO companies, since these new actors will be more and more relevant to customer's active participation.

Based on the new paradigm of DSOs, the InovGrid concept is nowadays used as an open platform, based on public standards. On this platform new tools and services supporting customers' involvement have been developed, which allows to empower consumers to make smart decisions about electricity consumption. The InovGrid solution and its platform allows both commercial and technical management through the introduction of accurate billing procedures as well as by using near real-time consumption / production data. The new central system provides an overview of all existing devices, allowing the operation of a truly active network. The bridge between the SCADA components, EDM applications, and other business systems is carried out at all levels, allowing optimization of electricity network management, improving the quality of power supply and the introduction of new features.

One of the most promising benefits is the increase in energy efficiency measures. This can be achieved by encouraging the application of sustainable practices in energy consumption. Naturally when a consumer

becomes a prosumer through DER systems, the demand for information will grow. The Smart Grid is not only the response to that demand but can also be a demand trigger.

The evolution from the traditional role for DSO´s into actual challenges transformed the traditional KPI´s from quality of service and operational efficiency to more complex value drivers such as the following:

Table 9: Value drivers of InovGrid solution

Value drives of InovGrid solutions		
	Value Drives	**KPIs**
Energy efficiency	- Efficiency in consumption - Technical losses - Commercial losses	- Consumption reduction - Peak to non-peak transfer - Technical losses reduction - Commercial losses reduction - Energy recovered - Fraud detection rate
Operations efficiency	- Efficiency in technical operations - Efficiency in commercial operations	- O&M costs recution - Meter reading and work orders cost reduction - Work order average time reduction
Quality of service	- Technical quality of service - Commercial quality of service	- Interruption of supply reduction (duration and frequency) - Quality of supply - Customer satisfaction
Emerging technologies	- Electic vehicle - Micro generation	- EV integration - Increase in micro-generation integration

InovGrid allows a constant involvement of universities and technology companies, boosting research and development of its business. The relationship with the customer improves, becoming more efficient and open through real consumption measurement and increasing the effectiveness of responses to various requests. Improved control over fraudulent and illegal connections is relevant to social equity and the economic and financial sustainability of the electrical system. From the InovCity initiative and its best practices we found evidence that communication and dissemination activities are crucial to obtain the involvement of different stakeholders including the end-users. Some of the initiatives that EDP Distribuição conducted in InovCity include: InovCity showroom, the energy bus, the organization of conferences, events and public addressed sessions as well as the presence in the local press or even the several political and technical visitors from more than 30 nationalities.

Figure 5: InovCity showroom in Évora, source: EDP

Seeing that EDP had already gained experiences in the InovGrid trial sites and InovCity in particular, the engagement with the S3C project and the utilisation of the tools and guidelines, served the following targets:

12. To enable and promote a more active role for customers, consumers and citizens in smart grid projects;
13. To promote customers involvement with all the value chain of a smart project;
14. To test the new DSO roles, mainly the data manager, market facilitator and flexibility service;
15. To foster the development of support platforms for new commercial services, based on greater proximity to the customer.

Figure 6: Gamification web platform developed to promote a more active role for customer in a playful way. This addresses a new challenge for DSOs as data manager: http://www.quiz-s3c.com/; source: EDP

Which role does the end user play in the project?

EDP has been evolving from a concept in which the customer was a user of services defined unilaterally and unidirectionally, to a customer-centric one, focusing not only economical on aspects but also on social and behavioural features. This avant-garde model allows a new approach on many aspects, namely, energy efficiency, CO_2 reduction and smart consumption patterns that represent, above all, an active customer's need for information and satisfaction.

In Évora InovCity , the end users were involved through three different engagement strategies:

Firstly, explaining to all customers smart meter functions and communicating its benefits on the short and long run.

Secondly, testing the use of new products and services that can be provided via the smart meter. This involved around 1,200 domestic customers.

Thirdly, in the later stage, trying out and co-creating new products and services. Since interactions with the utilities have been raised up as an important issue, we tested the new solutions (as long as it was possible) with different interaction schemes/ time periods in 3 small groups of users. This involved around 50 consumers.

The initiatives carried out under the involvement in S3C in the other trial sites were to built on the approach and a) double-check whether the approaches and actions taken were in line with other European initiatives and best practices and b) to further develop the approach for the new test sites.
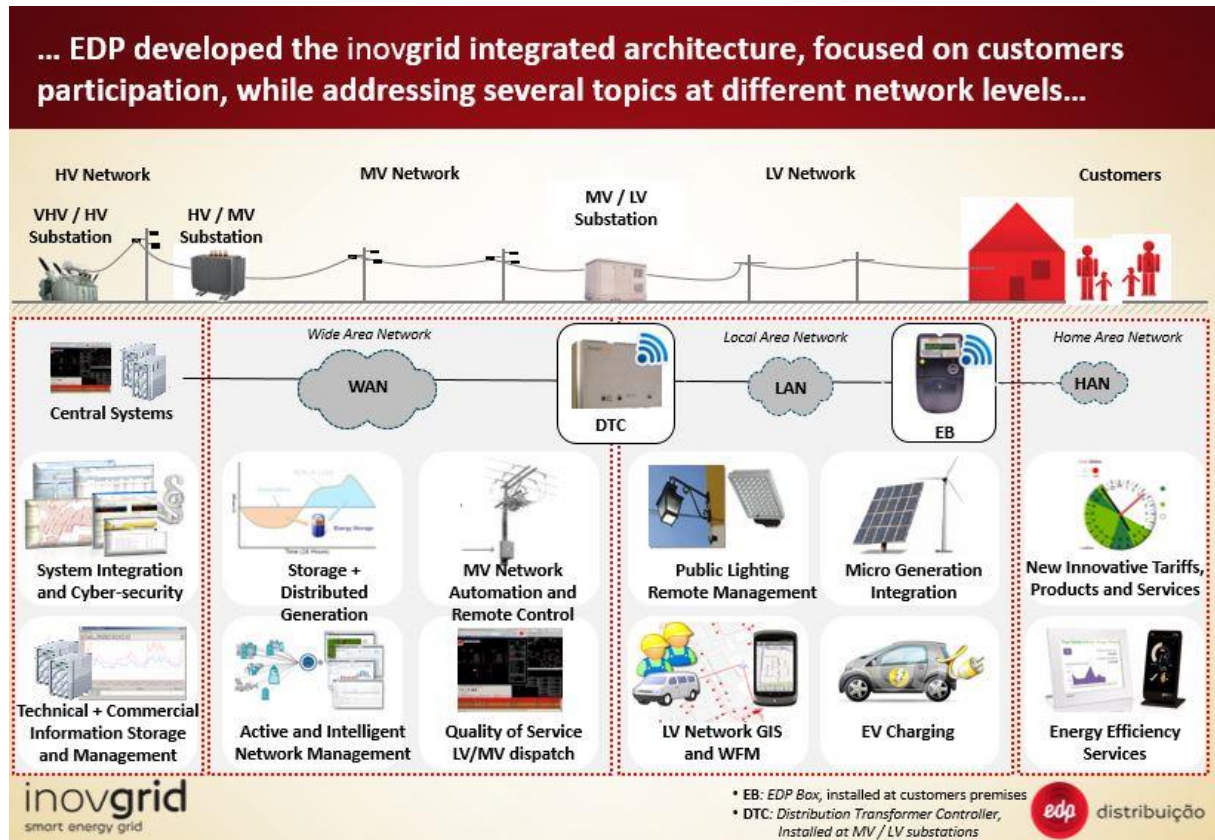
Figure 7: InovGrid innovative platform, source: EDP

The results of the initiatives taken by EDP based on the S3C toolkit worked complementary to each other and created significant impact.

The results of the stakeholder initiative had a direct impact on the gamification initiative. An in depth stakeholder analysis was carried out. The methods implied by the guideline were furthermore tested and double-checked in several InovGrid test sites. The results of the Alcochete study were directly related to the next initiative carried out in the test-site – the gamification initiatve.

Stakeholders in Alcochete pointed to the benefits of engaging younger generations in the Smart Grid trial while sensitising them for responsible energy consumption at the same time. As a result, the first local supporters for the gamification platform to be developed could alreay be involved – especially in the school district.

Regarding further results of the stakeholder initiative, from the beginning it was clear that there are two different levels of involvement with the InovGrid project among stakeholders in Alcochete depending on the information stakeholders have about the project and the degree of direct contact with EDP. City hall and stakeholders in more regular and direct contact with EDP refer to a very positive and open relationship while others show a more distanced attitude towards smart grid projects.

To inform those stekholders without direct contant and extend pre-existing relation, specific initiatives appealing to different stakeholder groups were set up. The interviewed stakeholders referred to these initiatives implemented as very positive. Especially a smart grid exhibition was being perceived as a way of recognition of the Alcochete community and it is essential to bring the new technologies closer to the population.

The gamification platform took several non-monetary incentives to the test by building a web-platform with energy quizzes, persuasive feedback and a goal-setting components mainly targeting school children. While the results of the initiative would have been more stable, if the test timeframe would have been longer, the first

results indicate a clear impact. The participants that actively used the platform were able to decrease their energy consumption by more than 28% compared to their consumption during the same time in the preeceding year. The answers in the quiz were motly answered correctly indicating that people really engged with the platform and that the incentives chosen by EDP were successful in raising the attention of their target group.

The Meter Installation Initiative served to revisit and improve the entire meter installation process for the new trial sites of the InovGrid project. The EDP team within the S3C consortium was mainly in charge of the drafting of the guideline. In fact, as with the Stakeholder initiative, the utility could put their concepts to the tests, benchmarked them to other projects and rollouts and then further developed their processes. In workshops, the EDP staff directly interacted with the installers to increase learning and sensibility of the installers for customer needs. Together, the utility and the contractor identified challenges and ways to overcome them. As a result of the learning that customers need thorough information about the newly installed technology and will ask the installers for help, who can become overburdened in retun, EDP has introduced a new and thorough FAQ section on the rollout on their website that the installers can refer to when being asked on-site.

The Home Energy Management initiative served to doublecheck EDP's own Home Energy Management offer. The EDP approach was compared with the advice in the guideline and studies on feedback channels, different types of users and potential improvements of the offer now complement the knowledge in the guidelines tested in this initiative.

4.3.2 Collaboration with S3C

The S3C team at EDP established a board and continuous contacts to various departments within the utility and especially those departments involved in the InovGrid project. The chosen advisors facilitated the implementation and evaluation over the duration of all four initiatives.

Responsible S3C partner	EDP Distribuição SA
Supporting S3C partners	EDP Distribuição SA
Position of the Contact person	**Description and outcome**
CEO of EDPD	Presentantion of the S3C Project & KPI`s
Board of Directors Adviser & EDP´s Board of Sponsors for S3C	Senior Advisor for the S3C results and implementation
Marketing Head of Department	Advisor for Marketing activities and Qualitative Studies
Director of Commercial Department & EDP´s Board of Sponsors for S3C	Advisor for the End-User Engagement/Gamification Initiative
Director of Planning and Control Department & EDP´s Board of Sponsors for S3C	Advisor for S3C results and implementation
Commercial Department	Advisor for Gamification Initiative
Business Development	Advisor for S3C results and implementation
Operation Departmental Advisor	Advisor for Meter Installation Initiative
Operation Departmental Advisor	Advisor for Stakeholders Engagement Initiative
Innovation & Technology Department	Advisor for Home Energy Management Initiative

4.3.3 Implementation of S3C guidelines and tools and suggestions for improvement

As an active partner, InovGrid tested eleven tools and guidelines, organized in a group of four initiatives addressing different issues on how to best engage end users in a smart grid empowered energy ecosystem.

Table 10: Tools & Guidelines tested in several InovGrid demosites with qualitative studies and different methodologies

Initiatives	S3C tools / guidelines	InovGrid Demo sites	Rationale for decision	Timeplan	Evaluation Studies	Objectives
Stakeholders engagement	Stakeholders coalition (G) Potential allies on a regional level (G)	São João da Madeira Lamego Alcochete	Meter roll-out was planned within the project time frame	1Q15 2 Q15 3 Q15	In depth interviews (8-10 stakeholders); Target: City hall, local energy agencies, client associations, school community	To measure the degree of engagement of the stakeholders with the project Evaluate the satisfaction and the awareness of the initiatives held in their city
Meter installation	Meter installation (G) Training installers (T) FAQ during installation process (G)	Parque das Nações (Lisbon) S.J da Madeira Guadalupe (Évora) Alcochete Lamego	Meter roll-out was planned within the project time frame	4Q14 1Q15 2Q15	Workshop with meter installers and internal teams (#5) Target: smart meter installation teams from outside providers	Identify bottlenecks and improvement opportunities in the smart meter installation process (taking into account the engagement of the end-users with the overall project)
Home Energy Management	End user feedback (G) Smart Appliances (G) Monitoring Functionalities (G)	re:dy (EDP HEM system) clients (Lisbon and Oporto)	Improvement of the HEM system	1Q15 2Q15 3Q15	Client panel for HEM service holders (4 scenarios) Target: clients with EDP's HEM service	Identify what are the end-user preferences when using the service Test new functionalities of the HEM system with the end-users
Gamification	Gamification (G) Goal Setting as an incentive (G) Competition and social comparison (G)	Alcochete	Due to the social, cultural and economic environment of Alcochete Municipality	1Q15 2Q15 3Q15	Gamification platform with online quizzes Target: gamification contest participants (local students and families from Alcochete #100)	Engage participants and the community with a gamification platform Evaluate the participants knowledge on the basics of a smart grid project and energy efficiency

4.3.4 Overview of tools and guidelines provided to InovGrid stakeholder engagement initiative

Tested guidelines
• Guideline: How to identify regional stakeholders (previously two guidelines named "Stakeholder coalitions" and "Potential allies on a regional level")
Which barriers and opportunities were addressed?
Barriers • Engaging end users without sharing decision power.
Opportunities • Roll out smart grids towards the general public • Develop novel stakeholder coalitions • Develop an overarching storyline to achieve a sense of urgency about smart grid

Table 11: Overview of tools and guidelines provided to InovGrid stakeholder engagement initiative

Guidelines/tools received	Reviewed for implementatoin	tested	adapted	Start	First audit	End
Stakeholders Coalition	Yes	Yes	Yes	Feb/15		Jul/15
Potential Allies on a Regiona Level	Yes	Yes	Yes	Feb/15		June/15

Guideline: Stakeholders Coalition (G)

Why was the tool/guideline implemented?

This guideline was implemented to foster stakeholder's involvement and develop a novel stakeholder's coalition. The use of this guideline is directly linked with the" Potential allies on a regional level" guideline and, in some extent, to the Gamification guideline which was instrumental to engage Alcochete's youngsters, families and school community (see Gamification initiative).

In this context, Alcochete - a medium size town, near Lisbon – was the most relevant demo site for testing this guideline,. Alcochete offers a suitable social, educational and economic environment to test how the satisfaction level of service can be improved by using an educational platform and how a proper project communication can contribute to a successful stakeholder engagement. Due to the fact that there are several demo sites running at the same time, the guideline was also tested in São João da Madeira and Lamego in order to compare different areas: both rural and urban with high consumption density (São João da Madeira), urban (Alcochete) and rural (Lamego). EDP initiated the rollout of Smart Meters in all three test sites while the guidelines were tested.

EDP involved governmental stakeholders, local and regional media, civil society organizations and research organizations form the beginning. The guideline did not provide any significantly different methodology from what InovGrid already used within the InovCity initiative in Évora. Nevertheless we have tested it since the involvement of the major players of the municipality are a key driver to any smart grid project´s success.

How was the guideline implemented?

The involvement of the major players of the municipalities was a key driver to the initiative´s success, which was the major reason for having the guideline tested in several demo sites, reinforcing some of the InovCity lessons already learned.

EDP has learned that only a global approach involving all the stakeholders would really impact the engagement of consumers and that this activities must be implemented from the start. These end-users are still reactive players in electricity supply chain and must be transformed into customers with an active role, a fundamental requirement for the success of smart grid project.

Since this guideline provides a theoretical and scientific framework helpful to any smart grid project, EDP applied it. Following the recommendations of the guideline, EDP activities were developed in order to guarantee the involvement of government stakeholders, local and regional media, local non-energy organizations (including civil society), research institutes and commercial partners.

In addition to these activities in all three test sites, 10 in-depth interviews were conducted with different represenetatives of stakeholder groups in Alcochete (city hall, school, parish, consumers) to perform a stakeholder analysis as implied by the guidelines tested in the stakeholder engagement initiative.

By undertatking the analysis, EDP as an active partner tried to
-   understand how the different stakeholder perceive the energy theme, the InovGrid project and the initiatives done so far by EDP Distribuição in Alcochete,
-   understand stakeholders experience and attitudes towards the project and how they see their role in it
-   evaluate the awareness and satisfaction level of the undertaken initiatives ,
-   To understand how they perceive the role of EDP Distribuiçãoin in this project, and what could be done to improve the role and/or image of the utility,
-   find out their perception about the population attitude and perceptions regarding this project, and find ways to engage different target groups / segments of Alcochete population and
-   find out how they picture the role of EDP Distribuição in the future (new products and services).

Figure 8: Info Sessions developed at Alcochete municipality with local government support and info sessions flyer, promoted by the communication department of Alcochete municipality to inform citizens about the functionalities of the InovGrid project. This information was available at the city hall website and Facebook, source: EDP

The main conclusions for testing this guideline were in fact very aligned with EDP's previous idea of how to involve a wide range of stakeholders in any community. In fact, the general key drivers for building stakeholder' coalitions were:

- It is important to increase the information, within the population, by clarifying all the meters functionalities and the advantages for people´s daily life by making sure they understand the advantages, by using clear and simple language and by making them feel safe (as there is also some degree of anxiety towards any change);
- Increasing stakeholders engagement is basically a matter of a more frequent and systematic feedback and a continuous support. Stakeholders expect to be constantly informed and involved in what is happening and in what is planned to happen. They welcome EDP's participation in other planned initiatives and other projects and feel it's important to acknowledge their relevant contribution to this project;
- Increasing the population engagement requires a multidimensional strategy: to be close and clear are the key words. It's important to promote a policy of closeness, by organizing several small information sessions at parish councils, city hall departments with direct contact with the population, local associations and neighbourhoods;
- It is important to have clear messages in order to attract people and inform them in a light and pragmatic way.

Nevertheless, stakeholders less involved with energy topics see energy efficiency more as a way to save money and less associated to intangible gains. They are much more focused on short-term gains and immediacy of the results and saving money argument remains by far the most powerful. Regardless of their own involvement with the topic, all stakeholders agree that it is fundamental to be closer to the population. This can be empowered, in part, by establishing alliances between electric sector incumbents and other stakeholders such as local agencies with whom citizens are more identified and that may foster the awareness on the benefits of these new technologies**.** Globally, the following customer groups are the most resistant to change:

- Elderly population living in the more traditional part of the city;
- Underprivileged population;
- People that receive the minimum income allowance;
- Population with a low education level;
- Rural areas.

Figure 9: InovGrid project presentation at Alcochete local stakeholders placed their doubts, source: EDP

Another conclusion is the importance to involve children when aiming for more behavioural changes. There is an overall agreement that children can be very helpful when it comes to introducing new habits and more energy efficient behaviours in the family. The S3C game - tested with the help of the guideline "gamification" - was seen as useful in terms of educating the population towards a more sustainable behaviour. In fact, the stakeholder analysis and in-depth studies in Alcochete served as a preparation for the Gamification initiative by suggesting the main target group for the game to be developed and serving to win over the first group of allies in the school district and city hall, who were persuaded that such an initiative would be fruitful while agreeing to help implement it.

Suggestions for improvement:	Suggestion implemented	Reason for decision
Stakeholder engagement drives stakeholder satisfaction, so, some best practices detailed examples are mandatory for the guideline. E.g. a link to a website containing best practice information. Addressing the different stakeholders segments and serving all stakeholders with the set of channels favoured by each segment should be considered.	Yes	The guideline was merged with the guideline "How to identify regional stakeholders". Best practice examples and stakeholder analysis are included in the combined guideline.
Specific key drivers for success from all best practice examples from S3C FoP should be presented and detailed &and disruptive activities identified in order to test different approaches from already used	No	

Suggestions for improvement:	Suggestion implemented	Reason for decision
by the Portuguese DSO.		
Since the final objective is the consumer/customer/citizen engagement and it's referred that non-energy entities are key for this purpose, it should be described more in detail what are the tasks that can be delegated to them and that they can perform in a more effective way when compared to electric companies.	Yes	The guideline was merged with the guideline "How to identify regional stakeholders". In the combined guideline the role of none energy stakeholders has been emphasized

Guideline: Potential allies on a regional level (G)

Why was the guideline implemented?

The guideline "Potential allies on a regional level" was chosen because it is a perfect fit with EDPD current approach towards the deployment of smart meters. Testing this guideline provides a theoretical and scientific framework helpful to any smart grid project. The city-by-city approach is one that has proven to be fruitful. Through tests in São João da Madeira, Alcochete and Lamego, three important areas with high density for customers and with different social and economic environment, EDP Distribuição assured that both rural and urban areas will provide more result diversity. Furthermore, these regions (north, center and south of the country) will offer different perspectives from different stakeholders. EDP aimed to connect smart grids project to a smart living and sustainable lifestyle in these three demo sites.

How was the guideline implemented?

EDPD has learned that only a global approach involving all the stakeholders would really impact the engagement of final consumers. These end-users are still reactive players in electricity supply chain and must be transformed into customers with an active role, a fundamental requirement for the success of smart grids.

As previously referred, testing this guideline provides a theoretical and scientific framework helpful to any smart grid project, nevertheless, more case study examples should be listed. The guideline served as a double-check for the pre-existing rollout strategy. It provided some further ideas on methodologies and ensured that the InovGrid approach is aligned with all listed best practice examples from all over Europe. Several specific activities were developed in all demo sites to attract regional stakeholders as explained in the guidelines. Among these activities were info sessions for the community announced by flyers provided by the local government and that reflect their own buy-in. Local media played a very significant role introducing the buzz word InovGrid in their own local communities.

The most helpful aspect of this guideline is the confirmation of a model for different scales of deployment of smart grid projects regarding interacting with potential allies. Addressing the different stakeholders segments and serving all stakeholders with the set of channels favoured by each segment should be considered in this guideline.

Figure 10: Engaged community leaders at São João da Madeira get to know the technologies to be deployed, source: EDP

Figure 11: Regional paper from Lamego demo site with information about the advantages and key drivers of the InovGrid project, source: EDP

Figure 12: Different stakeholders segments including Alcochete mayor attending to the launch of the specific exhibition developed for the Alcochete demo site. EDP developed a specific exhibition with a specific narrative for the evolution of electricity at Alcochete, from the past and until the smart grid project InovGrid, source: EDP
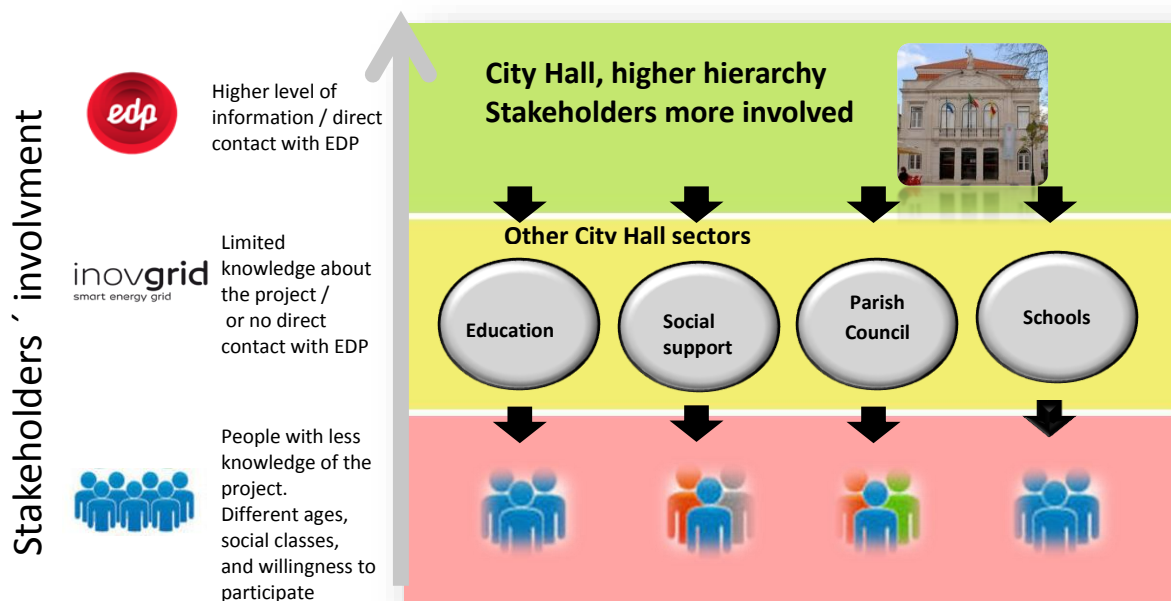
Figure 13 Results of stakeholder involvement analysis: Different role perceptions according to the knowledge stakeholders have of the project and the degree of interaction with EDP, source: EDP

According to the guideline, the stakeholders involvement was analysed. Figure 13 sums up the results of the analysis.

Among stakeholders, there are different degrees of involvement in energy and environment related themes. Especially city hall representatives in environmental related departments of the city hall cooperate closely. These stakeholders point out mainly environmental and political gains. For stakeholders less involved with these themes and focusing more on short-term gains and immediacy of the results, the "saving money" argument remained the most impactful benefit of energy efficiency. Overall, EDP is seen as major partner by Alcochete city hall representatives and the InovGrid project is considered a good example of this partnership. It is recognized as an important project as it can leverage the image of the region, its executive and also the daily life of its people.

To find allies and partners on the regional level EDPD defined the municipality of Alcochete and the school community as key stakeholders. In this case, the stakeholders' attitude towards energy efficiency was fundamental to develop a closer work with the population to increase its environmental and energy-saving consciousness. Alcochete city hall wanted to promote this, by taking several initiatives together with EDPD in order to engage the population, and specifically the children and families who play a major role in bringing home information and changing behaviours. The results of the analysis had a strong impact on the gamification initiative (see chapter 4.3.5) pointing to the fact that the game should be aiming towards the very stakeholders at schools. Particularly pupils were considered to be open to try new energy-related games and to achieve an impact not only with regards to their own behaviour, but by making an impact on their families' overall comsumption.

In fact, achieving a positive word-of-mouth towards this project greatly depends on a well-organized closeness policy. Alcochete is a very traditional and cohesive council, people have the habit of directly approaching their elected representatives and tend to trust them more than other (non-local) institutions. In this extent, EDP concluded that having selected the municipality of Alcochete as the most relevant stakeholder right from the start was a key success factor.

Suggestions for improvement:	Suggestion implemented	Reason for decision
This specific guideline could be improved if considered some practical and real case studies as well as how a global plan that should involve a perfect articulation between different scales stakeholders can be effectively implemented.	Yes	A real stakeholder analysis from Northern Germany and its results was included to visualize and explain a stakeholder analysis.
The information should be more detailed with best practices examples and some social studies results (there are some figures at several EC reports, such as: "Single case-study and reference project for JRC and Eurelectric Reports on Smart Grid assessment and Business Case".	Yes	The guidelines "finding allies on a regional level" and "stakeholder coalitions" were merged after the case analyses in the active partner projects and now include further best practice examples.
Another aspect that should be additionally detailed is how to manage an effective and synchronous interaction between the actors of the different scales.	Yes	The further developed guideline "how to identify regional stakeholders" now includes tipps as to how to manage the communication.

4.3.5 Overview of tools and guidelines provided to InovGrid gamification initiative

Tested guidelines
Guideline: Motivating consumers with social comparison and competition
Guideline: Gamification - making energy fun
Guideline: How personal goals can motivate behavioural change
Which barriers and opportunities were addressed?
Barriers   • Non-viable business cases for end users • Engaging end users without sharing decision power.
Opportunities   • Reinforce the end user perspective in the project design • Develop viable business model • Co-creation • Gamification • Roll out smart grids towards the general public • Develop novel stakeholder coalitions • Connect smart grids to smart cities, smart living and sustainable lifestyles

Table 12: Overview of tools and guidelines provided to InovGrid gamification initiative

Guidelines/tools received	Reviewed for implementatoin	tested	adapted	Start	First audit	End
Gamification	Yes	Yes	Yes	Jan/15		Jul/15
Goal setting as an incentive	Yes	Yes	Yes	Jan/15		Jul/15
Competition and social comparison	Yes	Yes	Yes	Jan/15		Jul/15

Tool: Gamification – Making Energy Fun

Why was the guideline implemented?

EDPD, the EDP group's grid operator, developed a gamification initiative and the gamification guideline was one of the source of information to start the project and build the process. However, the start of the gamification initiative was also supported by the first outcomes of the stakeholder initiative (see chapter 4.3.5). Strong EDP brand value within the community of Alcochete allowed the involvement of the main institutions and local communities to develop a "Living Lab" process of mutual learning with a view to promote more energy efficiency consumption habits through an educational platform. The results of the stakeholder initiative, in which in-depth interviews with different stakeholders in Alcochete were carried out had provided additional knowledge about starting points for the gamification initiative and already yielded access to important collaborating stakeholders that facilitated the gamification platform and advised on the main target audience for the platform: younger generations in school age.

When setting up the Gamification platform, EDP based its approach on the Goal Setting as an incentive and Competition and social comparison guidelines (see evaluation of later guidelines). EDP organized a set of events to launch the game and to ensure a fair level of participation for Alcochete Community. The S3C game, both in Portuguese and English version, was launched in April and the gamers could be ranked and awarded until 30th July 2015.

Launched under the S3C activities, this contest was meant for the inhabitants of the municipality of Alcochete, holders of an electricity supply contract, as long as they have a computer or mobile device that supports the technical specifications of the website. Children can participate, properly supervised by their parents. This quiz related to Smart Grids. EDP launched this game, which counted with more than 100 participations, to try to demonstrate the value of such a platform to engaged energy consumers.

How was the tool/guideline implemented?

The kick-off of the project was in February 2015 and the gamers started to play in April. Using Gamification as an enabler to foster citizens' engagement through a playful manner seemed very interesting and a new approach to the Portuguese DSO.

EDPD used the gamification approach as delineated in the guideline while trying to answer further practice-relevant research questions:

Can Gamification be really a strong instrument to change energy behaviour and incentivise energy efficient behaviour? How easy or how difficult is it to apply this kind of activity in the Portuguese market? Are young people more interested in the initiative since it mirrors education programs? Does gender influence the interest in this issues? Also, questions related to Data Management and Data Privacy, could be also tested due to this initiative.

In the S3C game, the participants must be the holders of the delivery point codes to be registered and to participate in the contest, the participants must visit the website www.quiz-s3c.com and carry out the following instructions:

1. Register, to do so the participant must enter a valid CPE (point of delivery code)[3] in order to track to which household the customer belongs;
2. Accept the game regulation;
3. Go to "Quiz", choose the desired phase and answer the questions;

More than 100 Alcochete inhabitants participated in the Gamification initiative with the following gender and age (by date of birth) distribution:

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[3] CPE is the code that identifies every customer/supply contract
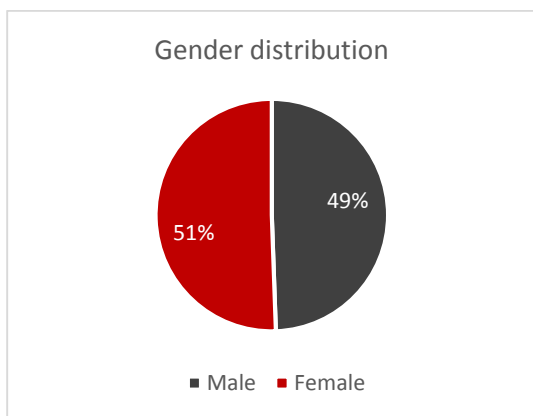
Figure 14 Gender distribution of the participants of the S3C Quiz, source: EDP
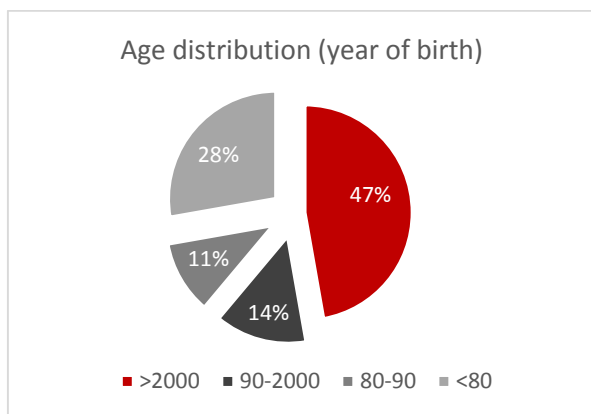
Figure 15 Age distribution in the participants of the S3C Quiz, source: EDP

Interestingly we found no gender bias in the participants. Female participants actually outnumber male participants by 2%. In terms of age groups, the initiative team found that almost 40% of the participants are in the age group of 24 and above and 47% are 15 years or younger.

The contest aimed to promote the knowledge about the benefits and basics of smart grids and responsible, efficient electricity consumption. Two different channels served to find a winner in the contest:

1. Quiz – In this part of the game, specific questions related to energy savings and calls for actions to adopt new behaviours were presented to the gamers and they received points for their successes.
    a. The first Quiz is available from the moment of the website registration and the two succeeding ones will be available at the beginning of each month.
    b. The game has 3 different quizzes and each quiz has 10 questions with 4 choices. Each correct answer is worth a 1000 points.
    c. The Quiz has no time limit, but once a question is answered, it cannot be changed.
2. Consumption reduction – With the smart meter technology already installed in Alcochete, all the gamers were listed with their weekly consumption to analyse whether their participation in the game had an influence on their consumption.
    a. Every week, the participant's weekly consumption is compared to the consumption of the same week but in 2014.
    b. For each percentage point of weekly consumption reduction, they were awarded 50 points.
    c. When metered consumption was maintained or increased in the comparison, it had no impact on the score.
    d. In case of a tie, the winner is the player who obtains the highest reduction in consumption in absolute numbers.

Within the process of implementing the tools and guidelines 'Gamification', 'Competition and social comparison' and 'Goal setting as an incentive' EDP developed the S3C Game, according to the several steps highlighted in the Guideline:

1. Define goals for the game
2. Get an idea of your main target group for your game
3. Look for partners
4. Define the reward system
5. Define prizes
6. Offer further education possibilities
7. Organize milestones / sub-ordinate goal
8. Promote your Game
9. Choose communication channels
10. Design the website or the smartphone app

The game is available at www.quiz-s3c.com[4] in both Portuguese and English. The game's rollout was supported with a specific communication campaign within Alcochete municipality, with several actions in local schools, through local and regional press releases and flyers, as well at the website of the city hall. A video report is available at www.youtube.com/watch?v=f-avZ4XNCyY.
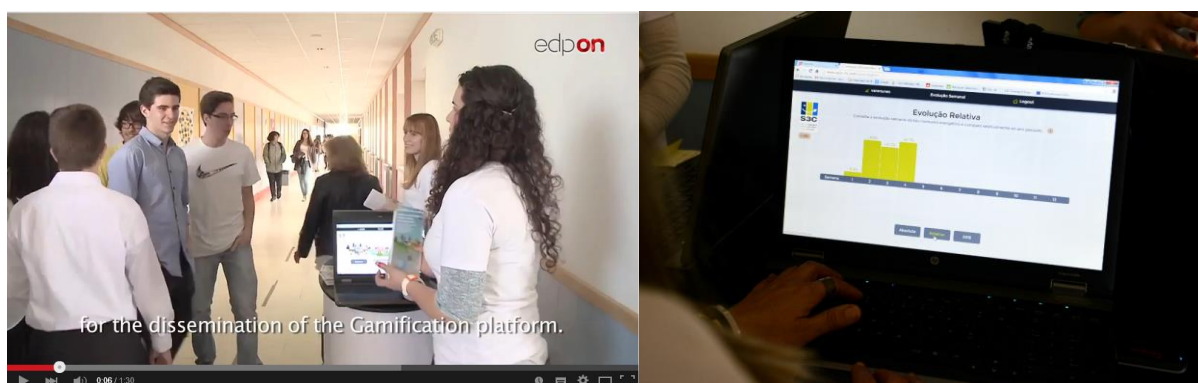
Figure 16 Launching Gamification Platform at Alcochete High School, source: EDP

Furthermore, dissemination material such as flyers and posters were developed in order to engage the local students and families to participate in the contest:

With the correct answer to all questions and with weekly reduction of consumptions, gamers could aim to be awarded with the following prizes:

-    1st Prize - Electrical Bicycle,
-    2nd Prize – Laptop,
-    3rd prize - Tablet.

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[4] You can test the game under the given URL with the following user information: general user and id: user and password33

Figure 17 Poster for the S3C game; engaging high school students for the gaming contest, source: EDP

The following diagram render an overview of the achieved results.
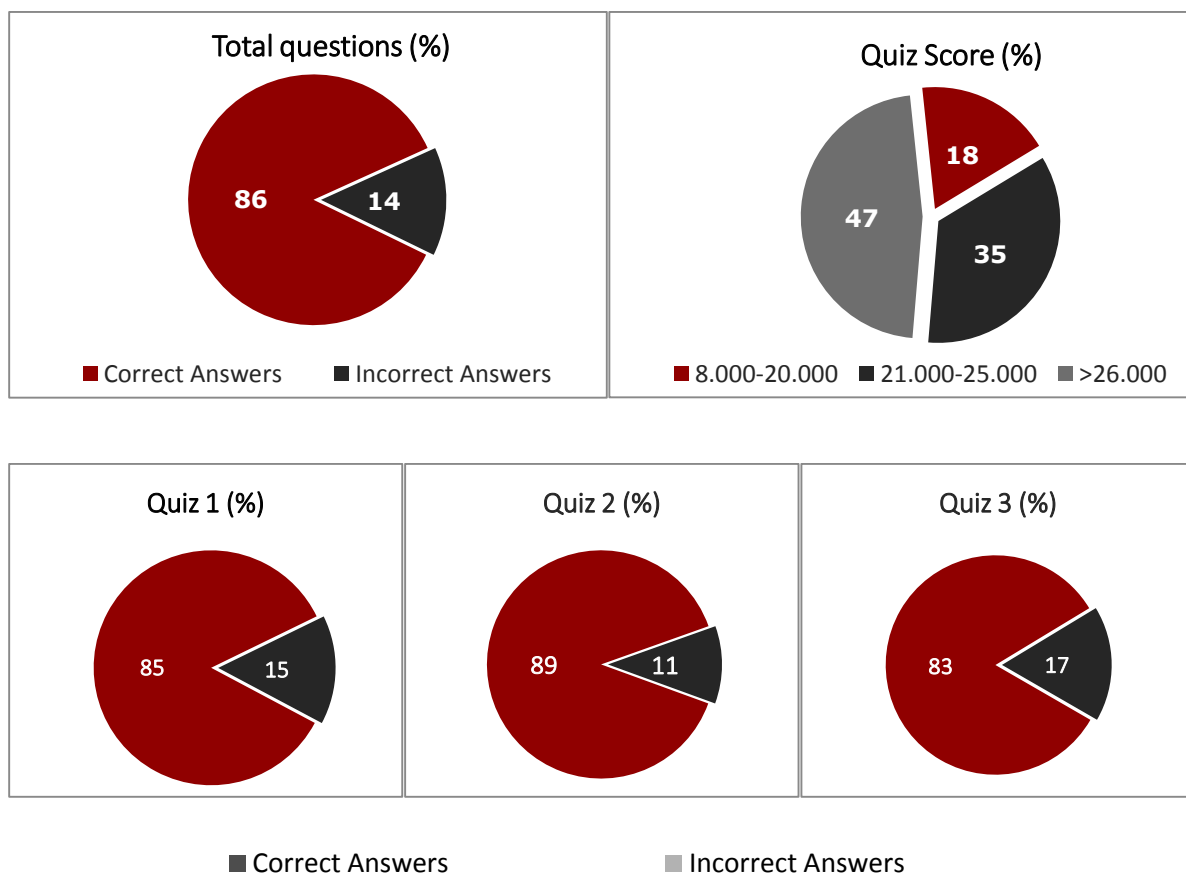
Figure 18 Quiz results in terms of correctly answered questions (differentiated according to the three quizzes) and achieved scores, source: EDP

The project team was surprised by the overall score achieved across the quizzes as well as the score per quiz. There was a total of 86% of correct questions compared to 14% of incorrect ones considering all participants. The results per quiz are also impressive with the highest percentage of incorrect questions of 17% to be found in Quiz 2. This result indicated that participants did indeed engage in the game and really put in effort to achieve the highest score. The project team is sure that the prizes on offer served as a strong incentive as they were carefully chosen to be attractive for a tech savvy target group.

One of the most relevant aspects of the implemented gamification initiative was that it put the gamers into a situation, in which they could see the impact of their participation. By being able to register their consumption reduction and seeing their metered energy consumption compared with the metered consumption of the preceeding year, they became aware of changes and could talk about what probable causes might have occurred to explain the different development. The following inidicate the changes in consumption that occurred in the households of the three best participants that were awarded with prizes.
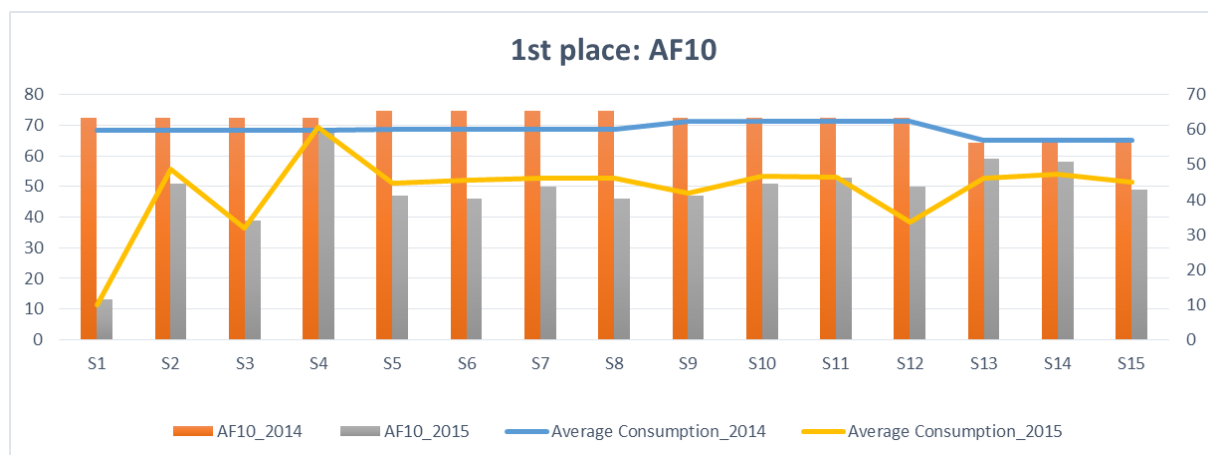
Figure 19 Graph displaying the consumption evolution of the 1st winner in the gamification initiative, source: EDP

The gamer that landed in first place was responsible for the highest consumption reduction and also decreased 2015´s consumption to lower levels than the ones registered in the previous year. It is clear that the consumption readings during the 15 test weeks in 2015 were significantly below the consumption metered for the same time in 2014. The average reduction achieved by this player is about 22,80 kWh (31,9%) per week.
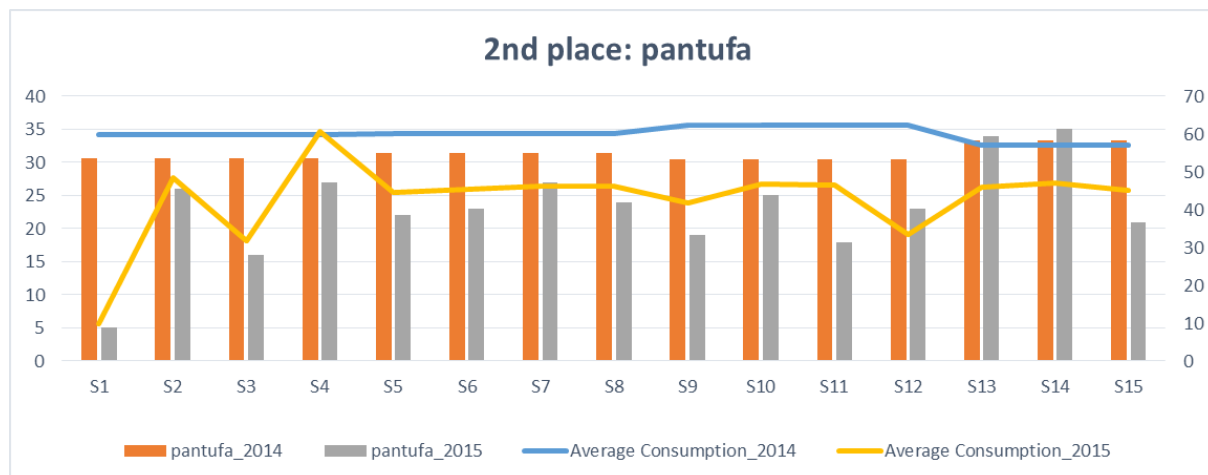
Figure 20 Graph displaying the consumption evolution of the 2nd winner in the gamification initiative, source: EDP

The gamer in second place achieved a 26,6% consumption reduction, meaning an average reduction of 8,37 kWh, while the participant that placed 3rd presented an average consumption reduction of 21,9% corresponding to 6,52 kWh saved.
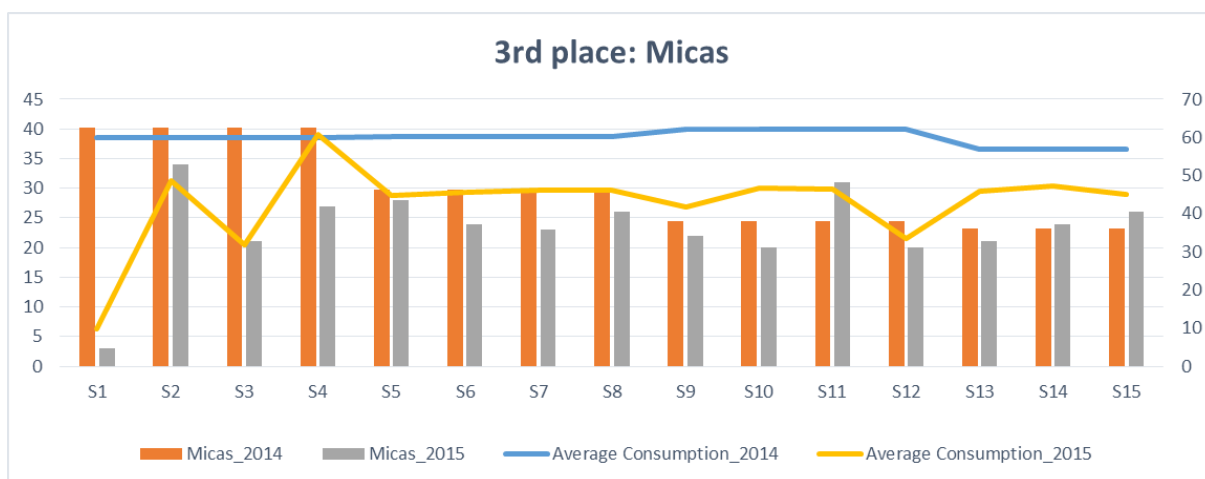
Figure 21 Graph displaying the consumption evolution of the 3rd winner in the gamification initiative, source: EDP

Since experiments demonstrate real value the effect of "smarter" actions were reflected in the Gamification platform and consumers were able to understand that they play the main role. Meaningful information and creating awareness from interacting with customers is one of the most powerful learning stories form developing this game.

There has not been a decision about whether the learning experience will be replicated by the DSO, since the priorities have to be clarified. The clarification relates to the role of the DSO and the question, whether happier customers are an asset for DSOs in general. The question directly relates to the overarching question of digital engagement of customers and whether it can be considered more effective in terms of e.g. the payback period for the investments into such programmes.

The gamification initiative served as a first step to answer these questions and the experiences will be complemented by studies on e.g. the DSO as data manager and new roles within the regulatory framework. Nevertheless, consumers are dramatically reshaping the utility sector and as a result, utilities need to seek for new customer engagement approaches, competing among other industries, traditionally seen as much more appealing for end users and historically more interesting than the energy sector.

The project team has also conducted a quantitative study with a sample of the gamification initiative participants (17 participants) to evaluate the effects of the gamification initiative in terms of awareness raising beyond the platform. The team evaluated the levels of awareness on Energy Efficiency topics, the InovGrid project and their knowledge of Smart Grid benefits.
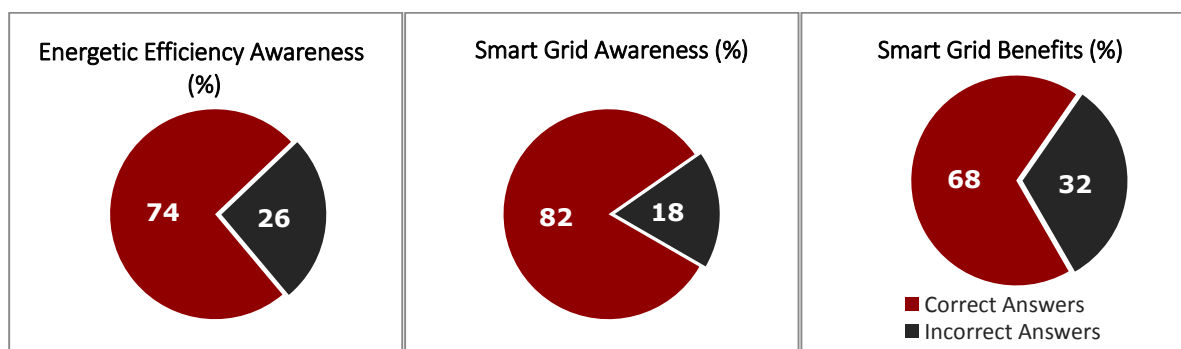
Figure 22 Shares of correctly and incorrectly answered questions on energy efficiency, smart grid awareness and benefits, source: EDP

The selected participants showed a fair amount of knowledge on smart grid projects (82% of correct answers); a fair amount of knowledge on energy efficiency (74% of correct answers) and a modest amount of knowledge on smart grid benefits (68% of correct answers). These results might seem slightly disappointing when being compared with the quiz results from the gamification platform, but it has to be taken into account that the prizes as incentives have been removed for the study and the participants did not have access to any means of

information other than their on knowledge (when playing the game they could navigate the web in search of the correct answers).

Other interesting results of the study had to do with word of mouth habits of the participants.

How often do you talk about **energy efficiency** with your family or friends? (scale 1 to 5)

6	18	53	24

■ Always ■ Frequently ■ Occasionally ■ Rarely
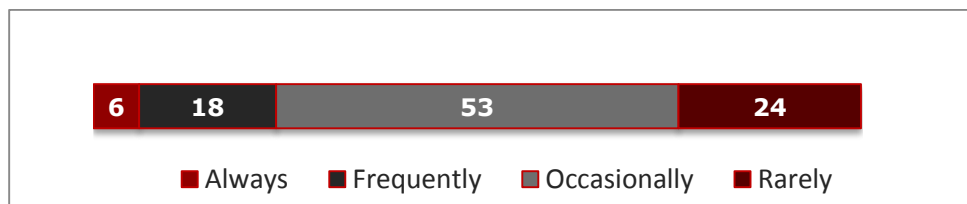
Have you already talked with your family or friends about **InovGrid**?

35	18	47

■ Yes, positively ■ Yes, neither positive nor negatively ■ No
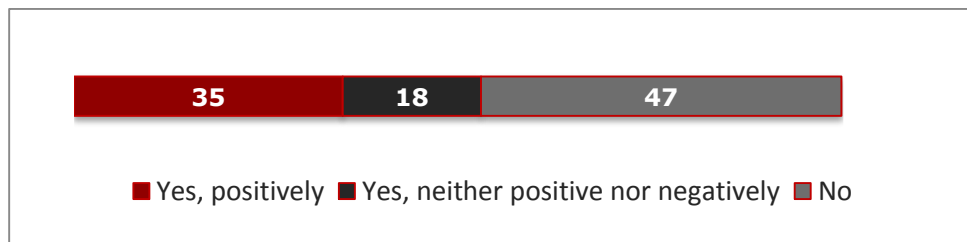
Figure 23 Word of Mouth habits regarding energy efficiency and participating in InovGrid of participants in the quantitiative survey, source: EDP

One of the main findings is that energy efficiency is a topic in the participant's inner circles. More than 75% talk about energy efficiency topics frequently. Another finding relates to the fact that 35% of the respondents affirm that they talk positively about the InovGrid project.

This last finding is reinforced by the recommendation of the smart meter rollout in Portugal by the respondents, (who already have a smart meter installed at their premises) with 82% of the respondents giving a green light to its installation at a national level.

Recommendation (%)

82	18

■ Top 3 ■ Middle ■ Bottom 3
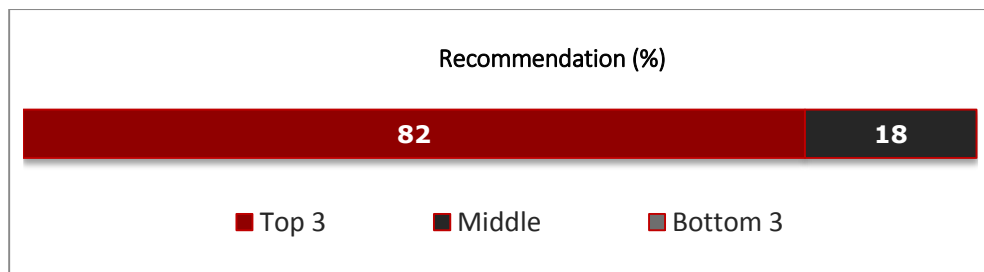
Figure 24 Would you recommend the smart meter installation at a national level? (1 to 10: 1 – would not recommend; 10 – would recommend for sure), source: EDP

Suggestions for improvement

Since EDP had no experience or track record in engagement with gamification platforms, the guidelines represented a good starting point. "Gamification", "competition and social comparison" and "goal setting component as an incentive" (for more detailed evaluations of the latter two guidelines see page 76 ff) represented a new approach. The guidelines might need more future developments to e.g. index the results of saving to the young people´s allowance for example, or explain how to start a Facebook page associated to the game.

Suggestions for improvement:	Suggestion implemented	Reason for decision
Although EDP made a good use of this guideline a way to improve it would be to provide more examples from outside the Energy industry. There are many good examples on how Gamification is used in several fields that might provide interesting insights to companies / projects that want do develop such a platform.	Yes	Further examples have been added in the updated version of the guideline.

Guideline: Competition and Social Comparison

Why was the guideline implemented?

This specific guideline was tested along with the "Gamification" and "Goal Setting as an incentive" guidelines within the initiative as a way to test and identify new tools to involve the consumer in projects related to Smart Grids, especially after the InovCity experience. It extends the options provided by a gamification approach. During the first phase of the InvoGrid project – Évora InovCity – no similar approach to competition and social comparison was developed. Consumers were engaged to reduce their consumption. However, they they were not persuaded to compare their own consumption information with the one of others' or their own individual performance development.

Utilities face big issues today as they search to maximize consumer engagement. Being able to manage the millions of data available, understanding the new and different types of consumer segments, being able to build-in innovations in their operations while focusing on maximizing value for all stakeholders was the trigger to test these tools and guidelines. Moreover, using environmental education and consumption reduction as topics to promote this guideline, was an effectively way to attract, involve, inform and engage end-users.

How was the guideline implemented?

The EDPD experience with competition and social comparison is very recent and highly connected to the implementeation of the Gamification guideline. Through the already described quiz and supported with a specific communication campaign at Alcochete, EDP aimed to promote the knowledge about smart grids and responsible electricity consumption through the knowledge assessment about sustainability for consumption and consumption reduction evaluation. Based on the guideline, EDP decided which type of information would be made available for the gamers. With detailed consumption information to consumers provided by the already installed mart meters, all the gamers were listed in a ranking available on the gamification platform and could compare their behaviour with others and even share their position in social media.
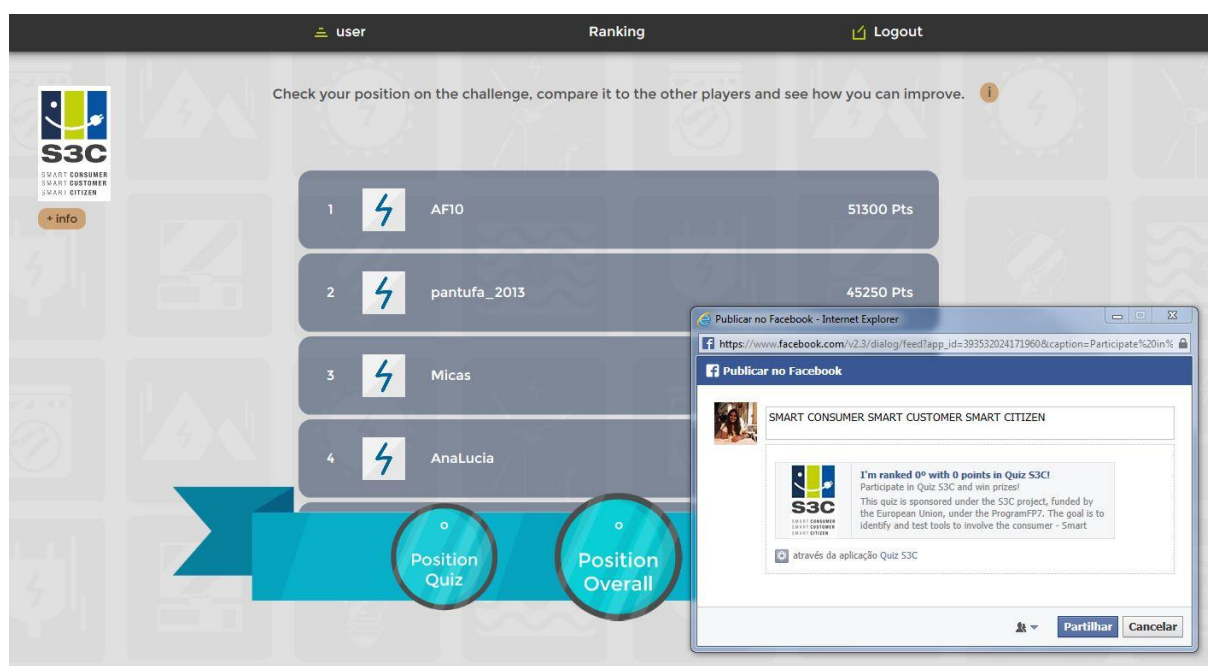
Figure 25 Gamers could check their portion in the challenge, compare it to other players and share their success on social media, source: EDP

Within the Alcochete community, EDP focused on the school community. The advice from the "competition and social comparison" was added to the gamification platform's implementation and implemented on the S3C Gamification platform.
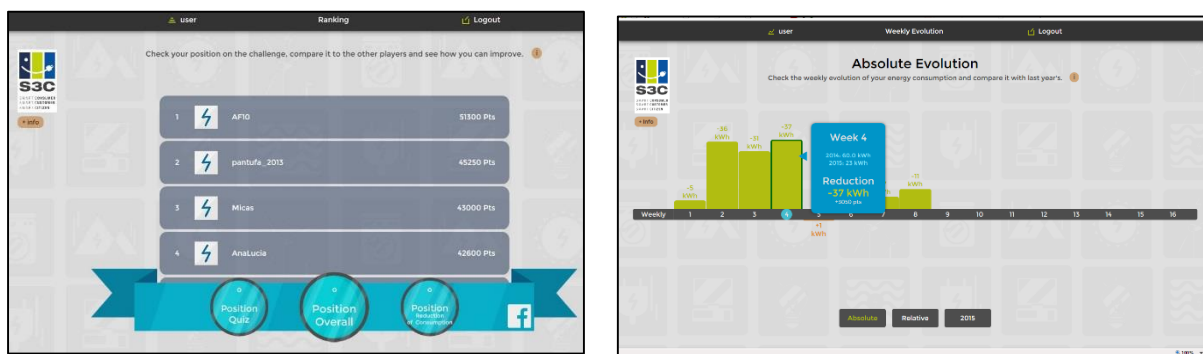
Figure 26 Graphic ranking positions and weekly evolution with appealing design, source: EDP

Social comparison is a strong and motivating tool and regularly used among the youngest, but due to some social characteristics, is not a usual practice among Portuguese people, in general. Reasons can be seen in privacy concerns or in other social behaviour related to monitoring success. Furthermore, a goal setting component that is properly defined can bring people to increase their energy efficiency in a further powerful way (see implementation of the goal setting guideline below). Increased energy efficiency and new business models are being set and tested by the Portuguese DSO. The most relevant lessons learned from this specific initiative were the focus on value creation for the customer, to create partnerships between DSO and cities, empower citizens and ensure the right activities to deploy a successful plan for smart grids roll out. To fully evaluate the results for implementing this guideline, a larger period of time would be necessary, since it would be more meaningful to analyse the results for a complete year, mostly due to changes in consumption over the course of the seasons. In general, and despite consumers are different from each other and value different things, the gamers were very sensitive to the layout of the game and felt secure with the privacy issue, since EDP clearly focused communication activities on specific information related with this mater.

With respect to the methods brought forward by this guideline and the entire initiative, the project team is of the opinion that utilities need to engage consumers by developing new solutions and become increasingly consumer focused: consumer engagement drives consumer satisfaction and social comparison can be a strong beyond-the-grid "service". Consumers are changing – traditionally, they were defined by paying the bill, but addressing the different consumer segments (young people and families in this specific case) and serving them with the proper set of channels favoured by their segment will mostly lead to results. Testing this guideline assisted the promotion for the buzz for S3C Gamification platform. All three guidelines contributed to the EDP behaviour analysis in order to promote consumers more active role, in a playful way, with easy and personal experiences and this way, leading to the desired long-term engagement of end users.

Suggestions for improvement:	Suggestion implemented	Reason for decision
A very interesting guideline. No improvements needed from EDP's point of view	n/a	

Guideline: Goal Setting as an incentive

Why was the guideline implemented?

This specific guideline was tested among the Gamification guideline and social comparison and competition guideline as a way to test and identify new tools to involve the energy end-user. EDP tested this guideline by implementing a platform and challenge (decribed on p.76ff) based on all three guidelines. This guideline was a helpful way to complement the insights from the Social Comparison guideline by promoting changes in the routines and leading to the possibility to be awarded with one of the prizes for the S3C Gamification. Since the awards are immediately at the disposal of the consumers, the gamers were highly motived to adopt new options for consumption. Furthermore, the awards were specifically chosen to appeal to our target group, since technological products are very appealing for young people.

How was the guideline implemented?

The purpose of testing this guideline was to understand how end users would respond to a stimulus, such as the awards offered s the 1st, 2nd and 3rd place prizes, in order to improve performance such as displayed in the guideline.

For this purpose, EDPD used prizes that are perceived as valuable by the gamification target group. Technology products such as a laptop and a tablet for the 2nd and 3rd place and an electric bicycle for the 1st place. This first level of incentive had a very positive impact on the first rounds of the game, with many of the gamers completing the rounds to see how they compared with others and what their chances were to obtain one of the prizes. Unfortunately, some of the users that were further from the first positions did not feel that it was worthwhile to play the last round. We consider this the risk of such an approach, because a fair percentage of the players in a gamification platform are only there for the prizes and not so much for the learning experience. Figure 18 shows the table with the final scores.

Recalling the gaming dynamics, each player had to answer three quizzes made up of 10 questions each; each correct answer was worth 1000 points. Based on the correct answer to all questions and with weekly reduction of consumptions, gamers had their score, which compared with others. This extra incentive to gain extra points by reducing the energy consumption of their home was another form of incentive that had great results among the players. Since their weekly consumption is compared with the consumption in the same week of the year 2014 they ultimately competed with themselves.

There was also another goal setting incentive beyond the final goal - to achieve the highest position possible on the board that has to do with one of the score components – the weekly reduction of electricity consumption.

As a result, during the game, the project team found some impressive consumption reductions by some of the players. The players that finished in the top 10 positions achieved and average consumption reduction of 28,8%.
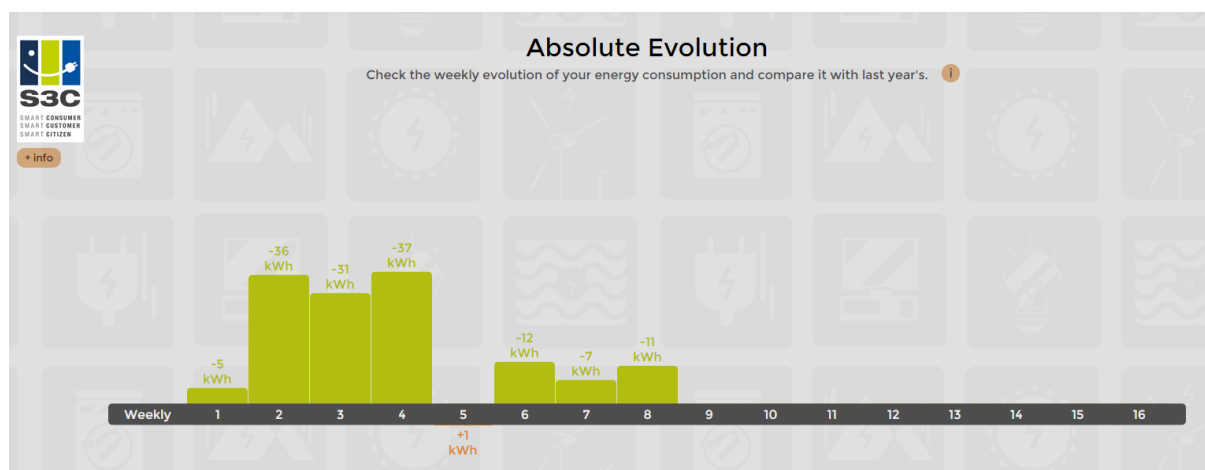
Figure 27 Consumption reduction dvelopment over the course of the test, source: EDP

Suggestions for improvement:	Suggestion implemented	Reason for decision
The EDP approach was more related with the Goal-setting as a commitment. It is very interesting to combine this approach with HEM services or Gamification platform approaches	Yes	The guideline is now linked to other non-monetary incentives such as gamification.

4.3.6 Overview of tools and guidelines provided to InovGrid meter installation initiative

Tested guidelines
• Guideline: Develop FAQs to assist the support staff • Tool: Collecting FAQs during the installation process • Guideline: Training installers • Guideline: Optimizing the meter installation process
Which barriers and opportunities were addressed?
Barriers • On-going technical problems and unreliable technology • Inadequate expectation management
Opportunities • Reinforce the end user perspective in the project design • Develop viable business model • Roll out smart grids towards the general public

Table 13: Overview of tools and guidelines provided to InovGrid meter installation initiative

Guidelines/tools received	Reviewed for implementatoin	tested	adapted	Start	Audit	End
Meter installation	Yes	Yes	Yes	Dec/14	June/15	June/15
Training Installers	Yes	Yes	Yes	Dec/14	June/15	June/15
FAQ during installation process (tool and guideline)	Yes	Yes	Yes	Dec/14	June/15	June/15

Guideline: Optimizing the meter installation process (G)

Why was the guideline implemented?

To comply with European Commission directive about the deployment of 80% of meters by smart meters until 2020, EDP is expected to install 4,8 million smart meters until 2020. The meter installation process is of utmost importance and needs to be mastered. The guideline on optimizing the meter installation process was thus deemed very useful to understand the global objectives of the project and to find the necessary conditions such as infrastructure and devices to plan and install a smart grid network. The most helpful aspect of this guideline are the recommendation points about the simplified meter installation process. The meter installation process is both the setup of the infrastructure that allows the supplier to have a close relationship with customers and an opportunity to create a positive first impression on them.

The main objectives for testing this guidelines as well as the other tools and guidelines associated with the meter installation initiative were on the one hand to explore the interaction between the installers and consumers. On the other hand, the objective was to identify potential challenges during the installation process mainly in terms of interaction and relation with consumers. EDPD listed the following barriers prior to smart meters installation:

1. There are some perceived barriers to the smart meter installation: the way consumers information is provided by DSO and, occasionally, the lack of information from the service providers;
2. One of the main reasons for consumers resistance for meter installation is the lack of knowledge regarding the smart meter installation and also resistance to new technologies adoption;
3. To help overcome initial resistance it's important to reinforce communication. One example was the launch of the EDP Box and InovGrid project mass market advertising campaign, conveying the project main benefits namely more control over energy consumption and the idea of more transparency in the billing process. Furthermore, in specific areas where the smart meters are being installed the use of advertising below the line will allow to engage consumers and raise awareness of the InovGrid project;
4. Contracting smart meters installers with engagement skills may foster a bigger engagement in the installation phase.

During the smart meters installation process, EDPD listed the related main challenges:

*   Main challenges appear when consumers have several questions that are time consuming and are not always easy to answer;
*   To overcome this challenges and make smart meter installation more efficient, several tools can be used, including a script with specific information and FAQ's adjusted to the challenges of specific regions.

In fact, the meter installation inititative carried out as an active partner of the S3C project served to face these challenges and find new methods to improve the process.

As a result of the inititative and based on the workshops carried out based on the guideline, installers have received a flyer with clear, simple yet visually appealing instructions that consumers can rely on when they need to interact with the Smart meter. Furthermore, a FAQ section has been integrated into the EDP website to clarify potential doubts regarding the InovGrid project and the smart meteri.

How was the tool/guideline implemented?

The meter installation guideline was implemented together with the teams that have managed the installation process within the InovGrid project in order to counter the barriers and challenges identified by EDP. Since the meter roll-out was planned within the project time frame, the installation process was revised end-to-end in Lisbon, Alcochete, São João da Madeira, Lamego, Évora, and the installation quality was monitored via an outbound campaign. A workshop was set up with some of the installers in order to identify roadblocks and some solutions to overcome them. The "dos" and "don'ts" are very useful as lessons learned and to be remembered at all times during the process. EDP tested this guideline as well as the associated tools and guidelines in five different demo sites in order to guarantee that lessons learned could be replicated in different sites with different

grid conditions, different installers, different communication technology (RF MESH, PLC PRIME, GPRS) and also with different meter suppliers (JANZ, ZIV, EFACEC SAGEM and LANDIS).
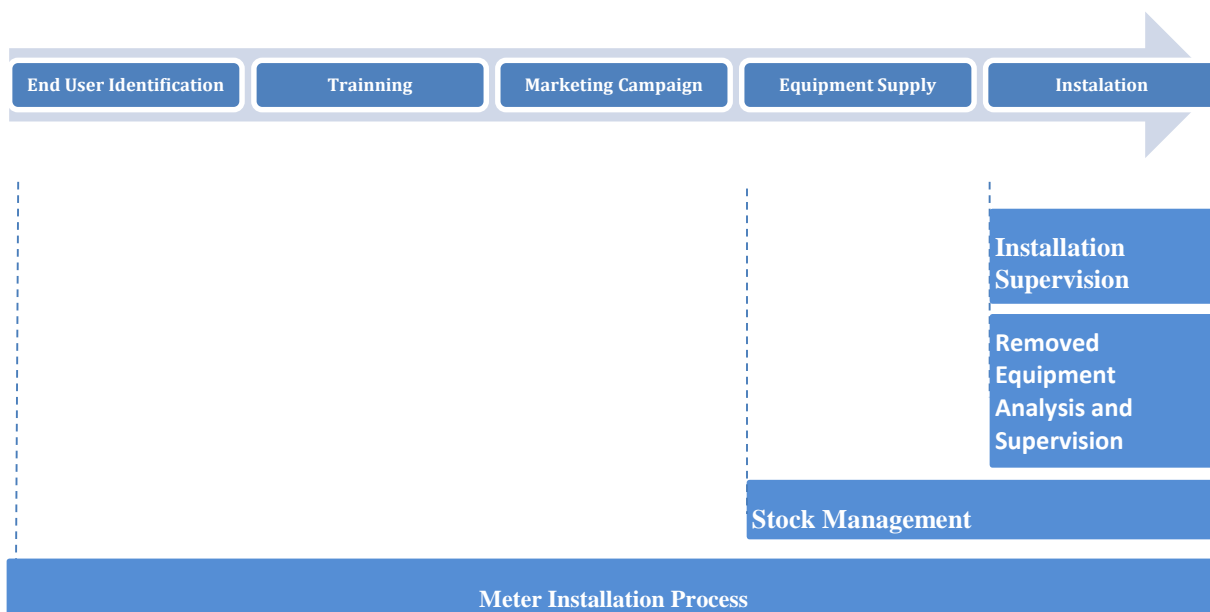
Figure 28: Meter Installation process, Meter Installation Guideline

Suggestions for improvement:	Suggestion implemented	Reason for decision
The section "Do's and Don'ts" could be improved and could detail a little bit more the internal processes of the utility.	Yes	This section needed development and the Do's and Don'ts have been amended according to the new learnings.
The theoretical background could be improved, especially making references to reading material in the customer interaction area.	Yes	The marketing and Communication Campaign is key for a good Community support and examples are useful

Tool: Training Installers

Why was the tool implemented?

The meter installation process is of utmost importance and the installers play a critical role in it. For this reason, training installer´s guidance is crucial for the overall meter installation process as described in the meter installation guideline. Furthermore, some examples of soft skills and brand characteristics needed to be tested in several demo sites, in order to ensure that despite the different regions, the approach towards the customer is the same. This tool is related with the tool and guideline on Collecting FAQs during the installation process and also with the guideline on optimising the meter installation process. These tools and guidelines were tested in five different regions, due the different and specific challenges for each region (see Map InovGrid demo sites, figure1 and table 1): Parque das Nações (Lisbon), S.J da Madeira, Guadalupe (Évora), Alcochete, Lamego.

At the time of conveying the information regarding the EDP Box, obstacles during training, marketing campaign and installation phase as delineated in the meter installation phase were encountered:

- Sometimes the consumer receiving the information on the newly installed smart meter is not the most suitable one (older or younger person in the household, housekeeper etc.) so they might not be very interested or might not have the knowledge to understand what is happening;
- The knowledge/level of information and interest of the interlocutor is relevant. Interested and informed consumers tend to have some previous knowledge, through information they've investigated by themselves. Less informed and/or less interest consumers have problems in understanding some technical terms;
- Managing consumers' expectation regarding the activation of the full service when there is still delays in the software communication between smart meter and data centre.

Furthermore, some consumers are not receptive to the installation of the meters since:

- they are always receptive to change and to implement technological novelties;
- consumers are unaware of the benefits of having the EDP Box namely to increase the level of control over consumption and costs reduction etc.;
- Negative word-of-mouth due to the idea of unfulfilled promises that tend to generate some mistrust.

How was the tool/guideline implemented?

The training installers tool was developed with the teams that have to manage the installation process within the InovGrid project and whom manage the installers directly. The installation quality was monitored via an outbound campaign. A workshop was set up in order to identify roadblocks and some solutions to overcome them (see above the identified obstacles).

The main objective for testing this tool was to identify ways to improve the installation process focusing on the relationship with the consumer and for this purpose specific working sessions were set up. The tool was not only tested, but also drafted by EDP. In fact, EDP had the change to reiterate the entire installation set-up and improve the process together with internal and external partners.

Figure 29: Working sessions with installers, source: EDP

One of the most significant lessons learned from the workshop set up to implement the guideline relates to the training process of installers. It should be reviewed frequently to make sure that the installers understand all updates on the equipment. Additionally, by repeating the training with installers in a regular way, this can provide a safe feeling that the utility high level management is supporting their activities and that they are well recognized for the institution. Providing them with additional social skills and having role-play sessions in order to develop the behavioural training will certainly increase the level of service and decrease the complaints level due to the regular installation process.

Suggestions for improvement:	Suggestion implemented	Reason for decision
The theoretical background could be improved, especially making references to reading material in the customer interaction area.	Yes	
Add to "dos" "The training process should be reviewed frequently to make sure that the installers understand all updates on the equipment".	Yes	The section has been added.

Tool: FAQ during installation process

Why was the tool and guideline implemented?

EDPD tested this tool and the corresponding guideline to review its own InovGrid project FAQ. The Portuguese DSO considers that FAQs during installation process is an important tool to support the meter installation teams and to inform customers about the project. The better relations to the customers and meter installers that were facilitated by implementing the other two guidelines tested within this active partner initiative were further fostered by implementing this tool.

How was the tool/guideline implemented?

This tool should be implemented from the projects' beginning because it goes hand in hand with the installation process. FAQs during the installation process is an important tool to support installation work teams on the one hand side and to inform customers about the project on the other hand side. This tool is highly connected with to the guidelines on Meter Installation and Training Installers .It helped the project staff to anticipate answers of questions likely to be asked.the best answer for each question.

Discussing and further developing the tool in the aforementioned workshop with installers resulted in the decision for a newly improved FAQ section on smart meters on EDPs website and briefing the installers to explain the website's function to the customers they visit at home.

Suggestions for improvement:	Suggestion implemented	Reason for decision
In general this FAQ should address more questions and answers like for example: - What is InovGrid (name smart grid project) Project?... - If EDP Box (smart meter) it's outside my house, how can I inside switch on ICP?... - How can I get my energy consumption?... - Is this information available in the net and it's confidential?... - If this device breakdown, what I have to do?... - If this device breakdown, what are the negative effects for me?...	Yes	Examples for the FAQs are very helpful for the understanding.
The text should be written in a simple format and easily understood terms and should be distributed to work teams with a very good graphical design and resistant paper. Words used for technical issues must be uniform.	Yes	The language was revised during the second draft process.

4.3.7 Overview of tools and guidelines provided to InovGrid energy management initiative

Tested guidelines
- Guideline: How to make energy visible through feedback   - Guideline: Smart meter monitoring and controlling functionalities   - Guideline: Introducing smart appliances
Which barriers and opportunities were addressed?
Barriers   - Non-viable business cases for end users   - On-going technical problems and unreliable technology   - Inadequate expectation management
Opportunities   - Reinforce the end user perspective in the project design   - Develop viable business model   - Co-creation   - Connect smart grids to smart cities, smart living and sustainable lifestyles

Table 14: Overview of tools and guidelines provided to InovGrid energy management initiative

Guidelines/tools received	Reviewed for implementatoin	tested	adapted	Start	First audit	End
End-user feedback	Yes	Yes	Yes	Jan/15		Jul/15
Smart appliances	Yes	Yes	Yes	Jan/15		Jul/15
Monitoring Funcionalities	Yes	Yes	Yes	Jan/15		Jul/15

Guideline: How to make energy visible through feedback

Why was the tool/guideline implemented?

The guideline was tested against EDP Commercial home energy management service procedures. The goal was to improve EDPs HEM system and obtain customer feedback on their perspective of the added value of the feedback functionalities of the system itself.

EDP's HEM system is called re:dy, it allows EDP customers to know and actively manage the energy consumption in their households with local and remote automation of appliances. It also allows the customers to program different consumption alerts. Customers can access and control information from anywhere via the re:dy web portal and the re:dy's smartphone app.

Figure 14: re:dy android app views

Re:dy's value proposal for EDP customers include:

1. **Greater access to information**. Real time consumption information, overall or detailed per equipment or electrical circuit; comparative analysis between the customers consumption and the rest of re:dy's customer community.
2. **To provide a sense of wellbeing and security.** Re:dy provides the possibility to remotely program and control equipment's/circuits. Possibility to create different consumption profiles. Eg.: home/away from home; allows the costumer to simulate their presence at home with the remote control of the house lightning system; allows the customer to identify and correct the source of deviating consumptions.
3. **Energy efficiency.** Re:dy allows the customer to eliminate stand by consumption by appliances and to program when the appliances will be functioning. It also allows the customer to program alerts that help to eliminate waste and unnecessary costs. With a more accurate knowledge of the housing consumption the customer can also optimize their contracted power and choose a tariff that will better suit their needs.

Figure 15: EDP box and smart meter (property of EDPD), one re:dy box (property of EDPC), re:dy plugs and a re:dy meter, source: EDP

The re:dy box is the main component of the re:dy HEM service. It collects the customer's energy consumption (and production) data as a hole and of the identified associated appliances individually. This equipment locally emits all the orders given by the users through the different interfaces (web and smartphone app).

The smart plugs read the energy consumption of the appliance it is connected to and sends this information to the re:dy box. The customer can choose to add as much re:dy plugs as he wants. This equipment reads the consumption of different electrical circuits such as the house lightening or the pool pump and sends this information to the re:dy box.
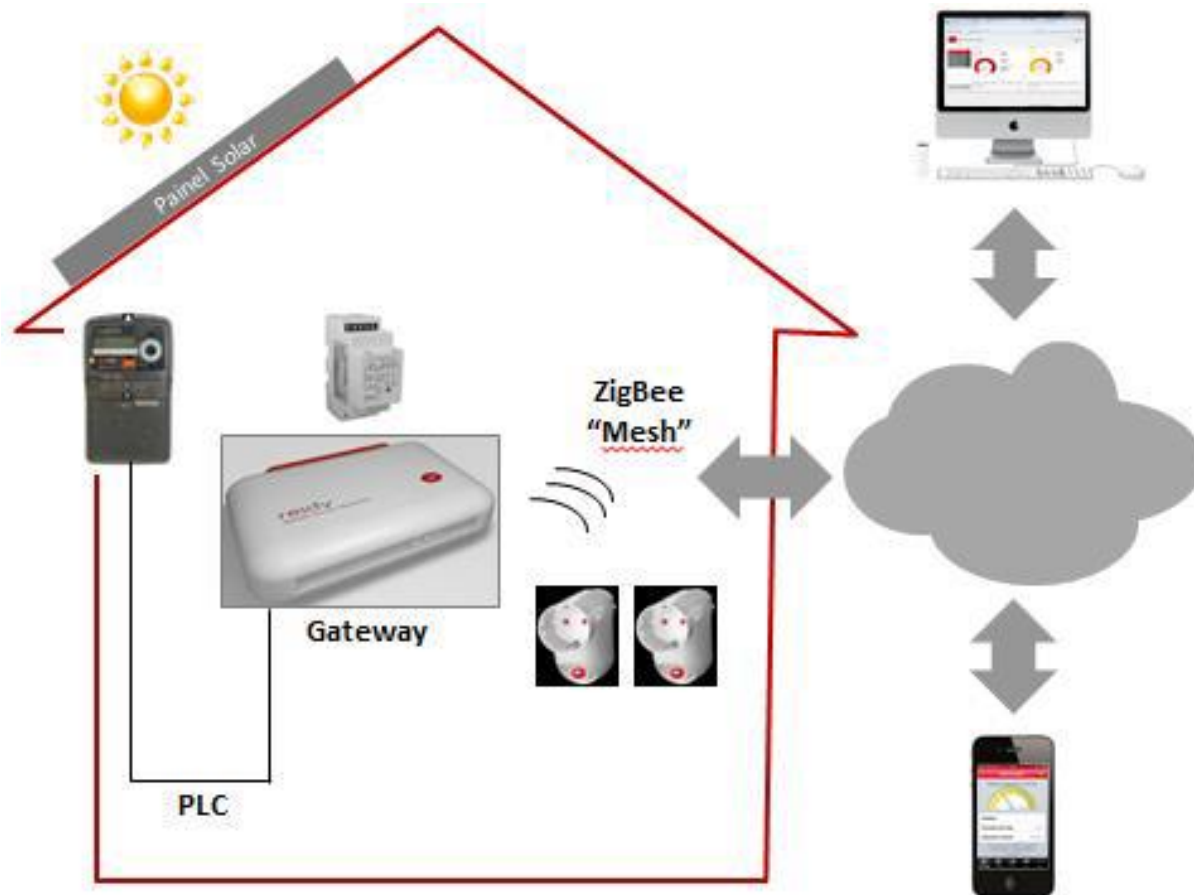
Figure 16: how does re:dy work?; source: EDP

Within the S3C activities, EDP conducted and online community panel with 16 re:dy customers with the objectives of understanding clients experience with the re:dy service and identifying ways to improve re:dy service and generate more interaction with the service. On the other hand side, the results of the interviews serve to doublecheck and/or enhance the guidelines information on different types of usage of feedback, (dis)advantages of different feedback channels etc..

Based on users level of knowledge of the service, equipment owned and used and the number and type of re:dy service functionalities used, five typologies of users where identified. The majority of interviewees were Heavy Users. These interviewees tend to be younger (on their 40s) and more tech savvy that Basic Users (on their 50s).

Re:dy service users by typology:

a)   **Heavy Users** tend to be tech-savvy, have a medium or even a high knowledge of the Re:dy Service, tend to be involved with the service, searching for information, exploring the full potential of the service. For them, the Re:dy service is a way to control and manage their energy consumption in order to optimize and reduce costs. They tend to access the service frequently through a Smartphone app since they value to access real time information at anytime anywhere. They tend to have five to six plugs and a re:dy meter since their main focus is to control as many appliances as possible. Heavy Users tend to use control and energy efficiency functionalities to optimize their household energy consumption. They are globally satisfied with

Re:dy Service as the service meets their expectations, delivering what it promises, generates cost reduction and it's easy to set up and manage.

b)   **Basic Users** tend to have a low knowledge of the Re:dy Service, however, they seem eager to learn more about the service and learn from other users experiences. Their main goal is to implement behaviors for greater energy efficiency. Re:dy service is a way for Basic Users to gather information that allows them to implement energy saving measures, manually. They tend to access the service once a month through their laptop since it is a way to access more detailed information. They tend to use a reduced number of functionalities, mainly control functionalities and simulators. Overall, Basic Users tend to be satisfied with the Re:dy services, since they allow them to lower energy costs. Nevertheless, some interviewees consider that they are not able to use the service's full potential mainly due to their lack of knowledge regarding Re:dy functionalities.

c)   **Producers Basic Users** tend to have some similarities to the Basic Users typology however they are more focused on controlling energy production as well as energy consumption. They tend to access the service weekly or biweekly mainly through their computer. They tend to have one plug or none since they tend to have low knowledge about the service.

d)   **Producers Heavy Users** tend to have some similarities to the Heavy Users typology. However, these interviewees are also focused on controlling energy production as well as optimize energy consumption. This type of user is the one that tends to access the service more frequently, namely several times a day via smartphone app. Producers Heavy Users are globally satisfied with Re:dy Service, however their expectation is to receive more information about the energy consumption per household division/ room.

e)   **Observering Users** tend to have a low knowledge about the Re:dy Service and tend to use the service only to monitor energy consumption. The interaction with the service is almost limited to the monthly analysis of the re:dy report.

When evaluating the access channels to the re:dy service we found that Smartphones are mainly used by interviewees that tend to access the re:dy service frequently and value the possibility of accessing anytime and from anywhere, mainly Heavy Users and Producers Heavy Users. However, the main challenge of this device is that not all functionalities and tools seem to be present in the re:dy service App thus limiting the interaction with the service.

Regarding the smartphone app:

Main advantages:

•   Allow customers to access re:dy service with the most relevant information (ex. consumption and forecast) and functionalities (turn on/off an electric equipment/profile) at anytime from anywhere (they always have their smartphone with them)

Usage barriers /limitations:

•   Not all service functionalities are available on the App

•   However, as smartphone tends to be the main device that some interviewees use to access the re:dy service they consider that all information and functionalities off the service should be available on the app

•   Notices are not available on the app

•   App loses login when the internet connection/signal is weaker

Regarding the **laptop**, it tends to be used mainly by Basic Users and Producers Basic Users Types since all the functionalities and information are accessible in this device. The tablet is very accessible and easy to use and tends to be used by Heavy Users and Producers Heavy Users since it is a good alternative to a smartphone.

Main advantages:

•   All service functionalities and information are accessible in this device (some information and functionalities are only available in this device specially in terms of energy production)

    •   Thus, Heavy Users only tend to access re:dy service through this device when they need to configure or change some service functionalities settings – (e.g. program plugs, create a profile, etc…).

• (For some interviewees) a quicker access and way to interact with re:dy service (vs smartphone and tablet)

Considering the portal assessment itself, the re:dy service portal tends to be very well evaluated since it is perceived as a user friendly and intuitive portal with well structured and detailed information.

a. The Home Screen is perceived as very good starting point as it displays the most relevant information in a direct, appealing and easy to interpret way.

b. The Active Management Menu and My Consumption – Energy menu is mainly used by Heavy Consumers as these interviewees have a higher knowledge of the service and equipment that allows them to take advantage of these functionalities.

c. Globally, for interviewees a Help Section would be valued not only to overcome some difficulties but also to seize the service potential. In fact, previous findings from S3C passive partners pointing to persuasive, guiding feedback in addition to information and control options, apply for the interviewees in this trial as well.

In a focus group with 6 re:dy clients (heavy users) conducted in late 2014, the service feedback challenges were evaluated in addition:

1. SMS / Smartphone notifications are the preferable channels to receive notifications on urgent matters that need immediate action from the user;

2. Newsletter. This channel was stated as suitable to receive general information such as advice to better use the service, with video demos, or general energy efficiency tips;

3. Email / re:dy portal are the channels that are preferred to receive personalized messages. Here, the clients stated that the re:dy portal is especially suited for messages:
   a. regarding the level of energy efficiency of each user in several time frames (1 month, 3 months, 6 months or 1 year), comparing with their past comparable consumptions and with comparable households;
   b. personalized energy efficiency tips.

How was the tool/guideline implemented?

EDP Commercial, the EDP group's retail company, tested this guideline among others in an initiative named "Home Energy Management". The implementation of the guideline consisted in a content check against EDP's experience to identify gaps between what we already do and what is suggested in the guideline. Overall the information in the guideline was interesting to review and it matched EDPs early perception. EDP found it to be a bit general for its needs, as they had their own energy management system developed, which includes user feedback but many other functions. The belief of EDP is that this guideline would be more useful at the moment in which a utility starts to prepare its Home Energy Management offer. With a product and service already on the market, EDP had already considered the advice in the guideline and their efforts actually served to extend the knowledge in the guideline. All together, the use of this guideline depends on where the implementing party stands on the product's stage of development.

Suggestions for improvement:	Suggestion implemented	Reason for decision
There is no best practice section. Needs to be harmonized with the other guidelines.	Yes	To improve the usability of the guideline the best practice has been integrated.
It does not address motivation of the end user to change habits and cost/benefit of the system.	No	This question is answered in the guidelines about incentives which is linked within the guideline.

Guideline: Smart Appliances (G)

Why was the tool/guideline implemented?

The guideline was tested against EDP Commercial home energy management service procedures. The goal was to gain customers perception of the value of smart appliance to further engage them with energy topics, through EDP's HEM system.

At EDP Commercial, there was a misconception that the perceived value of the product was not so much on the smart appliances but on the general consumption information so the team's objective was to gain insights on the value of appliances for the end-users.

How was the tool/guideline implemented?

This guideline was tested from January to August 2015. EDP Commercial, the EDP group's retail company, tested this guideline among others in an initiative named: Home Energy Management. The test consisted on comparing the information of the guideline with EDP's current HEM service functionalities concerning the HEM service. The team found the guideline generic and a good starting point, but somewhat broader in scope than what is necessary for a HEM service and for that reason the information is not so detailed.

EDP's HEM service re:dy is capable of connecting with smart appliances such as smart washing machines, smart thermostats. Because of the comparable cost of acquiring new appliances with connecting capabilities, the re:dy service is delivered with a set of two smart plugs (customers can purchase more) that render the appliances "smart" and it also connects to the housing electrical circuits such as lightning or the pool.

In the S3C funded qualitative study with 16 re:dy clients (more info in the End-user feedback guideline test explanation), the team within the EDP group's retailer concluded that although the equipment prices tend to be a barrier, the smart plugs are highly valued and desired as perceptively only with this equipment interviewees can benefit of the service full potential. The Re:dy Meter tends to be only known by heavy users, perceptively this equipment has the same function as the plugs but for built in electric equipment/ household appliances.

The greater the number of plugs that the interviewees have, the more electric devices they can control and the more benefits they can obtain from the re:dy service. However, some limitations were identified:

- Price per plug is perceived as too high to allow interviewees to purchase extra re:dy plugs;
- Size – re:dy plugs have an excessive size for some locations of the house (ex. home appliances close to the wall);
- Limited signal – re:dy plugs lose signal if in a larger distance from the modem.

For some interviewees the Re:dy Meter is not really necessary in their home, for others it is an essential tool to exercise control over the household energy consumption. However, this device is perceived as very expensive and, in this sense, interviewees hesitate or even reject to purchase it.

Furthermore, some interviewees also have experienced problems, especially the difficulty in pairing the plugs (the manual/info that comes with the plugs is perceived by some interviewees as unclear and too technical).

One of the interesting findings that EDP found from additional insights that derived from a quantitative study in early 2015 (a conjoint analysis with 360 users, re:dy prospective customers), when discussing the value proposition of their HEM service with both clients and prospects was that they valued discriminated information from electrical circuits such as lightning, the pool, or from individual appliances. When interviewing prospective clients, EDP found that among the main barriers to contract their HEM services, the price of an extra smart plug and the insufficient number of plugs that come with the core service, rank second and third right after the HEM service total cost.

In addition, when testing the intention to contract the HEM service, EDP found that by adding two extra plugs the intention to hire the HEM service would almost double, from 25 to 46%.

Suggestions for improvement:	Suggestion implemented	Reason for decision
The motivations of the actors for different types of functions and how benefits can be	No	Value Propositions are include in the incentives guidelines that details how

Suggestions for improvement:	Suggestion implemented	Reason for decision
passed to the user could be more detailed.		different incentives appeal to different groups of customers.

Guideline: Monitoring Functionalities (G)

Why was the tool/guideline implemented?

The guideline was tested against EDP Commercial home energy management service procedures. The goal was to improve EDPs HEM system monitoring capabilities that include our web platform and smartphone app.

EDP knows that monitoring capabilities are the main benefits of a HEM system, and the one that is most valued by the clients that hire the service. Therefore the testing of this guideline was meant to check if anything was missing in the way the data was provided to the end users and in the analytics that were conducted with the data to provide valuable insights to the clients.

How was the tool/guideline implemented?

EDP Commercial tested this guideline among others in an initiative named: Home Energy Management. All together, EDP found the information interesting to review its existing procedures and perceptions, but EDP didn't use it to improve the way they monitor the functionalities that their HEM system provides to their clients.

The test of this guideline consisted on challenging what EDP already did with re:dy and act on the gaps identified. However, the team considered that they needed to incorporate the client's view on the value of monitoring functionalities. The guidelines insights are in line with EDP's findings and served to gain deeper insights based on further studies, focus groups and interviews with EDP re:dy customers in the following months. The results are described in the following.

In the S3C funded study with 16 re:dy users, the retailer been able to break down users by their level of knowledge of the service which impacted the complexity of their interaction with re:dy in terms of monitoring functionalities. The typology that derived from the study is explained in detail on page 88f.

	Analyze information provided by Re:dy Service	Analyze information displayed by Re:dy Service to control energy consumption and production	Manage energy consumption with Re:dy Service	Equipment owned and used
Rarely	Observer			None
Once a month to once a week	Producers Basic Users			
	Basic Users			2 plugs and a re:dy meter
Once a week to once a day	Heavy Users & Producers Heavy Users			5 to 6 plugs and a re:dy meter
More than once a day				
Re:dy Service Level of Knowledge	Low	Medium	High	

Figure 17: re:dy service user typology, source: EDP

Another interesting insight comes from the focus group EDP has carried out with six re:dy clients in late 2014 to understand the customer point of view regarding monitoring functionalities to understand the main benefits of the HEM service monitoring functionalities and rank them according to the customers view. The resulting ranking of benefits indicates that the wish for real-time information is particularly high.

1. Being able to access and monitor the consumption at any moment;
2. Pay a bill based on actual readings and not estimates. All HEM clients have a smart meter installed;
3. Control and monitor the consumption of different circuits and appliances;
4. Achieve energy consumption reductions and bill savings by changing behaviors and implementing easy energy efficiency measures.

In addition, in an extensive study with 360 prospective clients in the beginning of 2015, EDP had found that monitoring and managing the energy consumption was only second to reducing the energy consumption as a

main driver to acquire EDP's HEM system. The third most appreciate functionality was to remotely controlled appliances.

Suggestions for improvement:	Suggestion implemented	Reason for decision
If would benefit from more context in the present home automation trends. For instance, who are the players besides utilities that are working in this field? What kind of innovative solutions are being presented at this point. What are the big technology companies bringing to the table: Google's "work with Nest" or Apple's "Home kit"	Not yet	The timeframe for the adapting the guideline was too short. However, the changes might be implemented at a later stage.

4.4 Insero Live Lab

Full project title	Insero Live Lab (FINESCE trial site)
Website	http://inserolivelab.dk/en/insero-live-lab-a-living-laboratory-of-the-future/
Funding scheme	EU-funded (FP7), project FINESCE

Involved guidelines
- Guideline: User-centred KPIs for the evaluation of smart grids   - Guideline: Bonus & malus – changing behaviour with rewards and penalties   - Guideline: Engaging people through telling stories   - Guideline: Choosing and combining monetary and non-monetary incentives   - Guideline: Choosing from different types of monetary incentives   - Guideline: Choosing from different types of non-monetary incentives   - Guideline: Gamification - making energy fun   - Guideline: Collection of survey questions for smart grid evaluation   - Guideline: Designing a dynamic tariff

Which barriers and opportunities were addressed?
Barriers   - Inadequate expectation management   - Engaging end users without sharing decision power.
Opportunities   - Reinforce the end user perspective in the project design   - Gamification.   - Roll out smart grids towards the general public   - Connect smart grids to smart cities, smart living and sustainable lifestyles   - Develop an overarching storyline to achieve a sense of urgency about smart grid

4.4.1 Introduction to the pilot and impact of S3C

The Insero Live Lab project is one of seven trial sites of the EU-funded project FINESCE (Future INtErnet Smart Utility ServiCEs), which is testing innovative web-applications and services in the energy sector. The trial site is located in Stenderup, a village close to Horsens, Denmark. In this village, the Insero Live Lab project staff has recruited 20 families to have their houses equipped with the newest technology from the energy and ICT sector, including:

- Heat pump connected to a hydronic heating system
- Solar heating system
- Photovoltaic cells
- Complete home automation system for control of indoor climate and comfort
- Charging box for an electric vehicle
- Electric vehicle (leased)
- Broadband internet connection

Figure 30, Key Visual of Smart Village Stenderup exemplifying different technologies tested by the 20 participant families (source: InseroLiveLab.dk)

As an incentive to participate in the project, the equipment was offered at a heavy discount. Still, participating families had to substantially invest into their homes in order to be able to take part in the project. One of the main selection criteria in choosing participants was that their houses had to be situated outside the collective heating area.

During the trial, the participating end users have access to live information about market prices, weather forecasts, production and consumption forecasts. The equipment, combined with useful information, is expected to influence the energy consumption behaviour of the participating families. At the same time, the end users play an important role by providing feedback to develop easy to understand and user-friendly new products and services.

Even before collaborating with the S3C project, the Insero Live Lab project had an extensive plan to collaborate with their end users that included several rounds of interviews and surveys, contextual inquiries, co-creation workshops and interaction schemes via social media channels. Furthermore, the project retained a social scientist, who acted as the main point of contact for the project's participants.

In the initial stage of cooperation, the contact persons at Insero Live Labs and the S3C team decided on guidelines and tools to be prepared for the project based on the plans Insero had for the project phase. In early 2014, when collaboration started, Insero had already rolled out the extensive technology set-up in the homes of the participating families and devised their extensive catalogue of interactions. However, they sought to benchmark their effort to what other Smart Grid trials in Europe had done and were thus very interested, in e.g. comparing their survey approach to the ones for other existing projects. The will to maintain the families' interest in the new technologies was high, so the team was eager to learn about new ways of engaging with end-users beyond sending price signals and installing technologies. The focus of the sociologist working in the project, Munna Hoffmann-Jørgensen, was to create and learn as much as possible about the actual daily routines influenced by the new technologies and how to raise awareness and acceptance for them. Furthermore, in the beginning, the project was interested in simulating a renewable-energy tariff to see how their test customers would react based on tariff and gamification principles.

Thus, during a meeting in Amsterdam, the S3C consortium presented several best practice examples from other projects in the areas of interest to the team from Insero present. It was agreed that the following thematic areas should be supported by S3C with guidelines and tools:

1. Pricing
2. Evaluation
3. Gamification
4. Storytelling

In fact, the following guidelines were made available to the Insero Live Labs team between April and August 2014:

- Guideline: User-centred KPIs for the evaluation of smart grids
- Guideline: Bonus & malus – changing behaviour with rewards and penalties
- Guideline: Engaging people through telling stories
- Guideline: Choosing and combining monetary and non-monetary incentives
- Guideline: Choosing from different types of monetary incentives
- Guideline: Choosing from different types of non-monetary incentives
- Guideline: Gamification - making energy fun
- Guideline: Collection of survey questions for smart grid evaluation
- Guideline: Designing a dynamic tariff

Most of the guidelines centred on support for a test phase with a gamification-based simulated tariff that was discussed in early 2014. However, the project decided not to implement this specific test phase after all, which made the advice unnecessary. Nevertheless, the "Collection of survey questions for smart grid evaluation" guideline and the "Engaging people through telling stories" guideline had a strong impact on the project.

The tool "Collection of survey questions for smart grid evaluation" was used to doublecheck the own survey design and to benchmark it against the work in other European projects. It helped the project staff to see if they were "on the right track", if their approach was comparable to other European projects and served as decision-making basis on questions to drop and add to arrive at a concise yet comprehensive survey design.

The "Engaging people through telling stories" guideline was used as a starting point and inspiration manual for the project's own story telling approaches in form of written interviews and videos. The storytelling structure outlined in the S3C guideline was transferred into the semi-structured interviews used with the families willing to share their experiences publicly. The story telling interviews and videos have been a great success for Insero in three areas:

- For marketing and dissemination
- For educating consumers
- For learning about their participants' experiences in their project (self evaluation)

The FINESCE project will terminate in autumn 2015, however, the Insero Live Lab is expected to host further projects and activities in the future.

4.4.2 Timeline of collaboration with S3C

Responsible S3C partner	B.A.U.M. Consult	
Supporting S3C partners	VITO, ECN	
Date and type of activity	Contact person	Description and outcome
Nov.2013 – Feb. 2014:	Social Science team	Information and introduction process with plans to

e-mail contact and face-to-face meeting	expert at Insero Live Labs and S3C team	conduct a workshop for further collaboration
26.01.2014	Social Science team expert at Insero Live Labs and S3C team	First meeting with the project during the opening of the test site in Stenderup. Introduction of the S3C project and gaining an understanding of what Insero Live Labs is about.
06.03.14: Workshop (Task 5.1)	Social Science team expert and senior innovation expert at Insero Live Labs and S3C team	Workshop to define key areas for collaboration and agree on a procedure. Priority areas for guidelines and tools: - 1. Pricing 2. Evaluation 3. Gamification 4. Storytelling
April 14 – Aug. 14: E-Mail contact	Social Science team expert at Insero Live Labs and S3C team	Provided tools and guidelines: - Guideline: User-centred KPIs for the evaluation of smart grids - Guideline: Bonus & malus – changing behaviour with rewards and penalties - Guideline: Engaging people through telling stories - Guideline: Choosing and combining monetary and non-monetary incentives - Guideline: Gamification - making energy fun - Guideline: Collection of survey questions for smart grid evaluation - Guideline: Designing a dynamic tariff
02.12.14: face-to-face meeting at an Open Day event in Horsens	Social Science team expert at Insero Live Labs and S3C team	Audit: First feedback on the received guidelines and tools; discussion of potential further areas of collaboration
08.01.15: TelCon	Social Science team expert at Insero Live Labs and S3C team	Interview to fill in the questionnaire for the evaluation of the S3C guidelines and tools, for: - Guideline: Engaging people through telling stories - Guideline: Collection of survey questions for smart grid evaluation Requests for further collaboration: - Idea / template for an animation exemplifying Smart Grids - Reference lists of findings on incentives and disincentives for participants in Smart Grid trials
Since April 14: frequent e-mail contact and phone calls	Social Science team expert at Insero Live Labs and S3C team	- Updates regarding guidelines and tools - Invitation to the relevant S3C events - Feedback and clarification dialogue

4.4.3 Overview of tools and guidelines provided to Insero Live Lab

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Guideline: User-centred KPIs for the evaluation of smart grids	No	No	No	-	-	-
Guideline: Bonus & malus – changing behaviour with rewards and penalties	Yes	No	No	-	-	-
Guideline: Engaging people through telling stories	Yes	Yes	Yes	Aug. 2014	Jan. 14	Sept. 15
Guideline: Choosing and combining monetary and non-monetary incentives	No	No	No	-	-	-
Guideline: Gamification - making energy fun	No	No	No	-	-	-
Guideline: Collection of survey questions for smart grid evaluation	Yes	Yes	Yes	Aug. 14	Jan. 15	Jan. 15
Guideline: Designing a dynamic tariff	Yes	No	No	-	-	-

Due to changes in the project outline, the extensive guidelines on pricing and incentives were not of use for the project after all. When the guidelines to be delivered by S3C were done, Insero had effectively decided to not implement a pricing game to simulate an innovative tariff arrangement. In fact, the guidance became irrelevant for the project.

4.4.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: Collection of survey questions for smart grid evaluation

Why was the guideline implemented?

The sociologist in charge of developing and carrying out the surveys within the test site considered it particularly relevant guidance to doublecheck whether the approach taken by them was in line with other projects and to ensure that fields of enquiry were not left out or underrepresented in their surveys. Thus, the battery of questions served as an orientation point. The main motivation to ask for and work with the guideline was to increase the comparability of the results from the questionnaires and survey to other smart grid projects. The Insero representative working as the S3C contact point pointed out that the surveys are of even more relevance for projects starting completely new. By providing a battery of questions for the evaluation within smart grids, future projects gain a good starting point in developing their surveys and questionnaires. Instead of having to do the research all by themselves, they can replicate the approaches of other projects and adapt them to the special applications and challenges to be dealt with by their project. Unfortunately, the timelines of S3C and Insero Live Labs did not coincide in a way, where this would have been possible, as the first rounds of surveys were already concluded, when the collaboration started and the format for surveys was already developed. Nevertheless, the batteries o questions were considered a helpful benchmark for evaluating their Smart Grid Project and the

opportunity to compare the own approach against other European and national survey outline was strongly valued.

How was the guideline implemented?

The S3C guideline "Collection of survey questions for smart grid evaluation" was used to double-check and optimize the questionnaires applied for the ongoing evaluation the Insero Live Lab project esp. to the project's research protocols were in line with other European Projects, if the consortium was on the right track and to make decisions about keeping or dropping certain questions. The project's sociologist developing the interactions with the end-users in the test sites was keen on developing concise surveys that would not overburden or take up too much time for the end-users to work on. In fact, the guideline facilitated decision-making processes in terms of optimizing their survey format.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Add references to the guideline, perhaps in form of a guideline explaining how to use the tool	Partly	Instead of writing an entirely new guideline, the "how to use"-section in the guideline was implemented. A guideline on how to design surveys in general has not been implemented because it is a too generic information.
Add a Do's and Don'ts section regarding the instrument "questionnaire", in which important aspects such as the benefits and limitations of working with surveys are pointed out	Yes	The most pressing Do's and Don'ts were included in the improved and more detailed new version of the how to use the tool section to avoid common mistakes
Add a "before" and "after" section: the "before section" should include a meta-frame for a questionnaire (incl. questions that absolutely should be asked) and a step-by-step guide on how and when to apply the other questions. The "after section" should give an insight on collecting and evaluating the received data.	Yes	Every chapter or block of questions now includes an indication of the project stage and purpose the questions should be used for.
Link the guideline to other valuable methods of gathering data, including qualitative methods, i.e. by establishing a strong connection to the "Learning about target groups" guideline	Yes	The link was established in order to stress the fact that quantitative surveys and qualitative surveys are complementary.

Guideline: Engaging people through telling stories

Why was the guideline implemented?

The guideline was implemented to utilise storytelling to communicate the experience of families participating in the project to the greater public. The social media and web-presence of Insero Live Labs was supposed to become more. The abstract, technical innovations that are being tested by the households in Stenderup were supposed to be made more tangible for people in terms of "what does it mean to live in a smart community" and "what are the challenges for your daily routines resulting from the new equipment in your home".

How was the guideline implemented?

The guideline was mainly used in the preparation and decision making process of implementing a storytelling approach in the project.

The project's sociologist who was in charge of implementing the storytelling approach for Insero Live Labs greatly valued the option to revise the basic methods and ideas of storytelling in the guideline and to be given first examples of what to do. The basic method of how to make a story out of the experiences of families participating in the project in the "What can it look like? What are possible forms of storytelling?" was of particular relevance, as it clearly pointed out a way to carry out semi-structured interviews based on "the challenge" the participants had to face in the project to change their behaviour and "the journey" they had to make in order to become "a hero" in the story. These keywords from the guideline helped to sketch out the semi-structured interview underlying the storytelling interviews and videos of Insero Live Labs. The project's sociologist found this to be a good way of getting deeper and taking a casual conversation on the project on a level where participants would actually reveal their background stories from their daily lives and share the struggles and successes they have faced taking part in the project.

It was decided to implement a video story with participants who were open to publicly sharing their experiences. The narrators are telling the viewer how the new equipment in their house has impacted their daily lives. Their story was structured via loose questions (semi-structured interview) and the outcome was shared on the project's website and facebook account. That way, the project staff was able to gain a deeper understanding of the end-user experience (form of self-evaluation), to share the stories of their participants with others and give a tangible impression of the impact the new technologies have on people's lives (marketing, dissemination) and to share information, build trust and raise understanding for the new technologies in other potentially interested consumers (educational aspect).
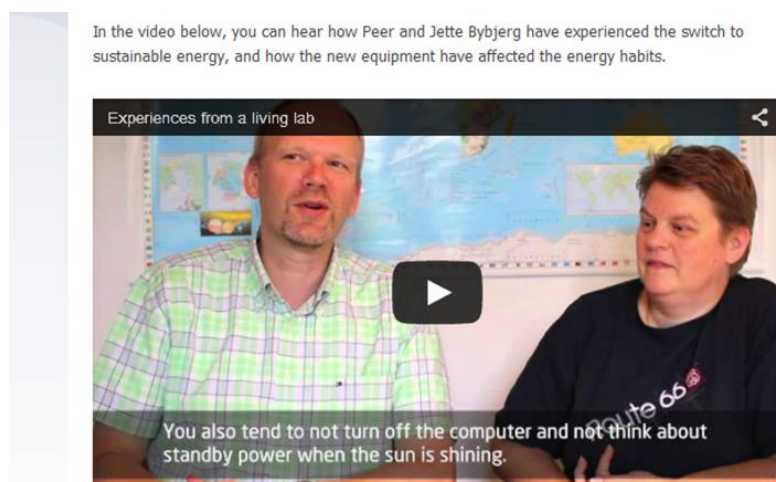
Figure 31: Screenshot of the storytelling video by INSERO (Source: http://inserolivelab.dk/en/2014/08/peer-and-jette-share-experiences-frominsero-live-lab/)

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Highlight the different areas in which storytelling can be used: end user	yes	The guideline now includes a matrix rendering an overview of which story

Suggestions for improvement	Suggestion implemented	Reason for decision
education, evaluation and marketing		formats and narrators are suitable with regard to the two main purposes for telling stories in the context of energy described in this guideline: data & knowledge collection and communication and dissemination. This way, the complex, yet highly relevant information can be conveyed.
Add how storytelling can be applied using different media (Video, text, blogs)	yes	The guideline now includes the section "Decide on the format(s) and communication channels to be used" to account for the differences in media as this useful information for practitioners
Add more details or ideas on story topics, try other combinations than "challenge", "journey", "hero" or collect questions that can be asked in the interviews to receive a deeper insight into people's daily experiences with smart energy technology	partly	To keep the guideline at a reasonable length, this recommendation has been implemented in parts. New reference link to other potential ideas for story topics and storylines that can be utilised.
Add more best practice examples, E.g. from Insero Live Labs	yes	To make the guideline more illustrative and inspiring, best practice examples including the You Tube story clip from Insero have been incorporated.

4.5 KIBERNET

Full project title	KIBERnet (Prototype Development of the System for the Control of Industrial Loads and Distributed Sources on the Distribution Electricity Grid)
Website	http://www.kiber-net.com/
Funding scheme	Slovenian Ministry for Economics and the European Regional Development Fund within the call "Strategic Research Development projects within private companies".

Tested guidelines
- Guideline: Introducing demand side management to SMEs   - Tool: Questionnaire for engaging SMEs   - Tool: How to estimate your load shifting potential   - Guideline: How to create a consumption baseline   - Guideline: Using flexibility manually or automatically   - Guideline: How to monitor demand response performance   - Guideline: KPIs for energy consumption effects   - Guideline: Designing a dynamic tariff   - Guideline: Bonus & malus – changing behaviour with rewards and penalties   - Guideline: Testing tariff schemes in a pilot context   - Guideline: Choosing and combining monetary and non-monetary incentives   - Guideline: Choosing from different types of monetary incentives   - Guideline: Choosing from different types of non-monetary incentives

Which barriers and opportunities were addressed?
Barriers   - Non-viable business cases for end users   - On-going technical problems and unreliable technology   - Inadequate expectation management
Opportunities   - Reinforce the end user perspective in the project design   - Develop viable business model

4.5.1 Introduction to the pilot and impact of S3C

The KIBERnet is a top-down project from Slovenia aiming to develop a prototype system for automatic control of industrial loads and decentralized electrical generation on the power distribution grid. It has received funding from the European Regional Development Fund. The project's objective is the development and demonstration of a novel service that distribution system operators (DSOs) would like to introduce to their industrial consumers and producers of electricity. The main purposes of this service would be:

- create economic benefits for industrial consumers and producers,
- reduce costs of balancing the mismatch between planned and produced electricity (balancing and control energy),
- reduce the need for investments due to reinforcements and enlargements of the power grid,
- increase security and reliability of the power distribution grid operation,

- enable efficient energy consumption,
- enable large scale integration of decentralized electricity production units.

Within the scope of the project, new technological solutions and measures have been implemented:

- innovative algorithms of computer control and regulation,
- optimization algorithms,
- hardware and software for automatic demand response,
- user-friendly design.

This project resulted in the design and implementation of an automated demand response system, which consists of a control centre (designed for KIBERnet service providers) and a communication control hardware installed at the side of the end user and consumer. Using specially developed advanced control algorithms in the central control centre, a service provider connects individual consumers and producers into a virtual group and manages their offered adaptation capacities according to the group's technical and economic best interest.

The automated demand response communication procedure between service centre and consumer (see Figure 32) regularly exchanges the adaptation information data and does not directly involve the end user. The direct end user interaction is provided offline via the technical support and billing – collecting the incentives. The main face-to-face contact was established at the beginning of the project through the end user engagement process. The SMEs preferred the automated solutions since this does not affect their production process and they can focus on their primary business and value chains. Automated solutions demand less additional interactions due to the automated smart grid services and enable easier adaptation of production processes. From the end user perspective it is a "set and forget" service, which should have only positive financial and energy effects.

The KIBERnet system has been installed and tested at the locations of four industrial end users which were also partners on the project. The interaction scheme started with the preparation phase, which consisted of the selection of end users and the investigation of technical characteristics for adaptation. After signing the contract, the interaction scheme passed to the operation phase, which was mainly controlled by the automated solution.
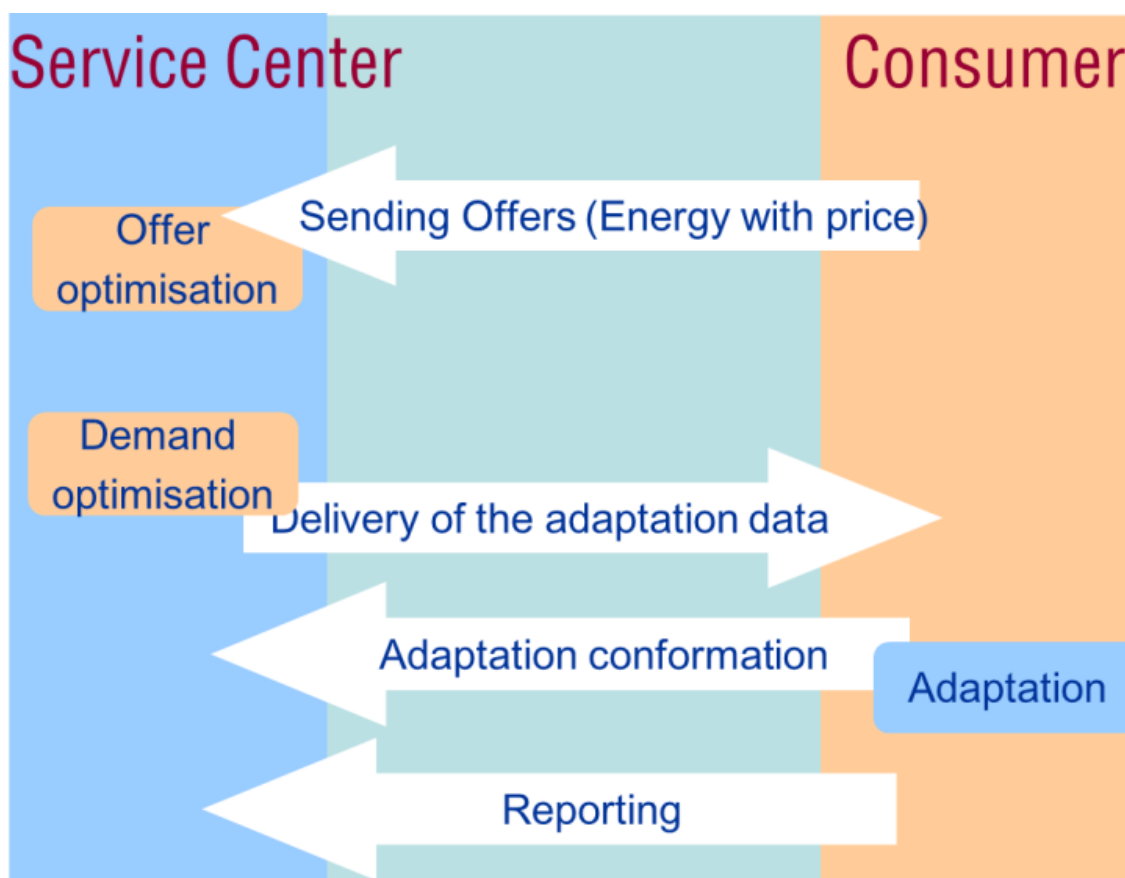
Figure 32: Communication algorithm of the end user device with the control centre, source: KIBERNET

The main impact of the S3C project on KIBERnet was to strengthen the focus on end users, i.e. to not only analyse their needs from a technological point of view, but to take into account the needs of industrial customers that used the new applications. In particular, the recruitment process was consolidated and the allocation of flexible energy was revised. Additionally, certain points of the evaluation, which concentrated on dedicated performance indicators and baseline calculation, were examined.

The series of guidelines on incentives were analysed, but due to the advanced stage of the project they were not implemented. Nevertheless the ideas of nonfinancial and nonmonetary incentives resulted in interesting ideas for the motivation of end users in future engagement processes.

The goal of the KIBERnet project was to set up a system to the pilot stage and set it ready for the commercial use. The end users obligated themselves to participate actively and made their loads accessible for the investigation of the project. In exchange, they received the automated solution of the demand response system free of charge, which will bring profits when the service will pass to a commercial stage.

The end user candidates for participation were selected from the pool of SMEs from various branches according to technical characteristics and personal contacts. Those selected end users were invited to the engagement workshop for the project demonstration. After this step each selected end user went through the detailed technical analyses of the production process, finishing with the installation of the KIBERnet equipment.

During the operation phase the interactions with the end user were provided mainly carried out within the automated algorithm for demand response. The end users had an option to monitor the demand response activities online through a web application (see Figure 32 and Figure 33). This technology is designed to support the contractual relationship between service provider and the commercial/industrial customers. The contract defines the obligated flexibility capacity, adaptation frequency, penalties and optionally also the incentives for demand response.
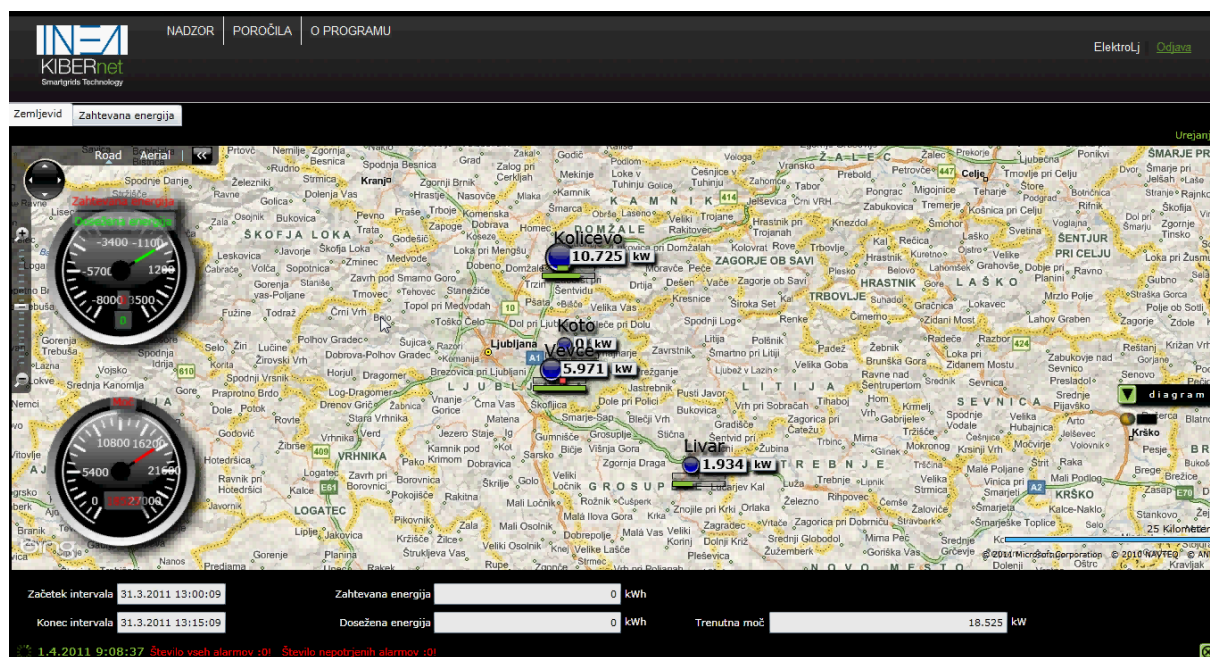
Figure 33: KIBERnet Project, snapshot of the service provider control, source: KIBERNET
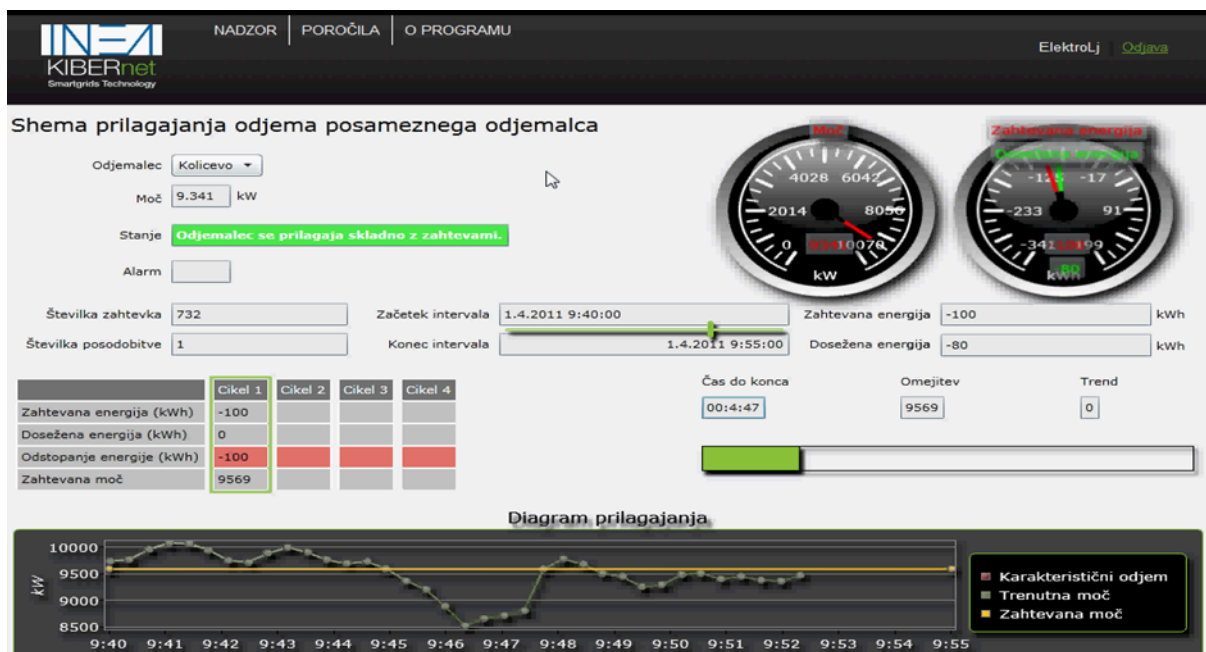
Figure 34: KIBERnet Project, snapshot of the end user adaptation monitoring, source: KIBRNET

In the KIBERnet project, the commercial customers were treated as smart consumers, receiving and realizing the requirements from the service provider. The end user wanted to avoid the risk of failure or losses due to introduction of the demand response changes affecting his core business. Therefore, the automated control solution was adapted to those requirements resulting in limited behavioural change while optimising financial benefits.

Due to the fact that the S3C partner INEA also led the project KIBERnet, a direct contact to the consortium was enabled. The KIBERnet project finished just before the S3C project but the project partners showed interest to participate in the S3C as an active pilot and to contribute with their experiences as end users from the industrial segment.

The first workshop with the consortium was organized to detect common interest of participation. The result was the agreement to focus on guidelines on business relationships and business models. Furthermore, a collaboration on guidelines about the technical characteristic of demand response capabilities (depending on the regular end user production processes and evaluation methods) was agreed upon. A series of workshops resulted in the investigation of the following guidelines:

Guidelines optimizing the recruitment and demand response process

- Guideline: Introducing demand side management to SMEs
- Tool: Questionnaire for engaging SMEs
- Tool: How to estimate your load shifting potential
- Guideline: Using flexibility manually or automatically
- Guideline: How to monitor demand response performance

Guidelines used for evaluation

- Guideline: KPIs for energy consumption effects
- Guideline: How to create a consumption baseline

Financial oriented guidelines

- Guideline: Designing a dynamic tariff
- Guideline: Bonus & malus – changing behaviour with rewards and penalties
- Guideline: Testing tariff schemes in a pilot context

- Guideline: Choosing and combining monetary and non-monetary incentives
- Guideline: Choosing from different types of monetary incentives
- Guideline: Choosing from different types of non-monetary

The financial oriented guidelines were used to elaborate ideas about incentives and on how to build a proper business relationship between end users and service providers (win-win). Those guidelines remained untested for two reasons: 1.) The project has not go into the commercial phase yet and 2.) The guidelines did not payed much attention to automated solutions and SMEs.

The guidelines dealing with the recruitment and demand response processes were used and tested, to revise the existing process and to test new end user candidates. One of the candidates was very interested in those services and further activities were planned.

The guidelines regarding the evaluation were used to define parameters for the demand response efficiency and to improve the calculation for accounting incentives. The project KIBERnet found some performance indicators about the adaptation of energy consumption, which can be compared to the demand response efficiency of particular consumers. The guideline about the calculation of the consumption reference gave important information about the handling of individual specifics, when defining the incentive terms in the contract.

4.5.2 Timeline of collaboration with S3C

Responsible S3C partner	INEA	
Supporting S3C partners	RSE, VITO, EDP, BAUM	
Date and type of activity	**Contact person**	**Description and outcome**
Dec 2008 – May 2011	KIBERNET project manager and S3C team	Setting up a common understanding of end user engagement and setting up a project managemenet Outcome: pilot system setup
Nov 2011	KIBERNET project manager and S3C team	Informational meeting about S3C proposal and agreement to participate on the project
23.9.2015 1st S3C workshop	KIBERNET project manager and S3C team	Description: S3C project description – engagement of end users in demand response - presentation of the idea of tools and guidelines to the participating partners - discussion about the use(ability) of available guidelines and tools for industrial organisations. - Discussion about the suitability of content and structure of guidelines/tools - Discussion about the needs of industrial users with the goal of finding potential applications for implementing or testing of S3C guidelines/tools. Outcome: The following tools and guideline areas have been detected as a subject of interest - Guideline: Introducing demand side management to SMEs - Tool: Questionnaire for engaging SMEs

		- Tool: How to estimate your load shifting potential - Guideline: Using flexibility manually or automatically - Guideline: How to monitor demand response performance - Guideline: How to create a consumption baseline - Guideline: KPIs for energy consumption effects - Guideline: Designing a dynamic tariff - Guideline: Bonus & malus – changing behaviour with rewards and penalties - Guideline: Testing tariff schemes in a pilot context - Guideline: Choosing and combining monetary and non-monetary incentives - Guideline: Choosing from different types of monetary incentives - Guideline: Choosing from different types of non-monetary incentivesThe consortium partners agreed to offer the project measurements for S3C testing. The plan for testing of guidelines and their evaluation was discussed.
13.3.2015 2nd S3C workshop	KIBERNET project manager and S3C team	Description: S3C guidelines and tools - evaluation and testing (technical part): - presentation of draft versions of tools/guidelines - analysis of the content with respect to the reporting template frame (general impressions, readability, content, usability, closing questions) based on input from industrial partners Outcome: - Industrial partners read all the listed guidelines regarding recruitment and evaluation - Industrial partners presented their views and comments on guidelines/tools and related topics. - The testing plan was discussed and started.
14.4.2015 3rd S3C workshop	KIBERNET project manager and S3C team	Description: S3C guidelines and tools evaluation and testing (economical and motivational part) - Presentation of draft versions of tools and guidelines to the industrial partners - Analysis of the content with respect to the reporting template frame (general impressions, readability, content, usability, closing questions). - Preliminary results of the tested guidelines were presented and discussed. Outcome: - Industrial partners read all the listed guidelines regarding incentives and business models - Industrial partners presented their views and comments on guidelines/tools and related topics
Oct. 2014 – Jun. 2015 testing	KIBERNET project manager and S3C team	Testing of the guidelines. Interviews of the consumers in project and candidates were provided. Data analyses for the evaluation purposes were performed.

4.5.3 Overview of tools and guidelines provided to KIBERnet

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Guideline: Introducing demand side management to SMEs	Yes	Yes	Yes	13.3.2015	/	June 2015
Tool: Questionnaire for engaging SMEs	Yes	Yes	Yes	13.3.2015	/	June 2015
Tool: How to estimate your load shifting potential	Yes	Yes	Yes	Oct. 2014	14.4.2015	June 2015
Guideline: How to create a consumption baseline	Yes	Yes	Yes	Oct. 2014	14.4.2015	June 2015
Guideline: Using flexibility manually or automatically	Yes	Yes	Yes	13.3.2015	/	14.4.2015
Guideline: How to monitor demand response performance	Yes	No	Yes	13.3.2015	/	/
Guideline: KPIs for energy consumption effects	Yes	Yes	Yes	Oct. 2014	14.4.2015	June 2015
Guideline: Designing a dynamic tariff	Yes	No	/	14.4.2015	/	/
Guideline: Bonus & malus – changing behaviour with rewards and penalties	Yes	No	/	14.4.2015	/	/
Guideline: Testing tariff schemes in a pilot context	Yes	No	/	14.4.2015	/	/
Guideline: Choosing and combining monetary and non-monetary incentives	Yes	No	/	14.4.2015	/	/
Guideline: Choosing from different types of monetary incentives	Yes	No	/	14.4.2015	/	/
Guideline: Choosing from different types of non-monetary incentives	Yes	No	/	14.4.2015	/	

4.5.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: Introducing demand side management to SMEs

Why was the guideline implemented?

The guideline was implemented to help the project leader finding appropriate SMEs, which could join to the demand response programme for electrical energy.

One of the goals of the KIBERnet project was to demonstrate the possibility for demand response of electrical energy with SMEs from different types of industry. The guideline helped the project leader to find new SMEs and to review existing SMEs. Through the process, which is described in the guideline, the project leader received all information, which was needed to evaluate SMEs as suitable participants for the virtual power plant (VPP).

How was the guideline implemented?

Four SMEs were already connected to the KIBERnet control centre. The project leader used this guideline to review the existing loads for demand response and to find new SMEs, which could participate in the VPP. During the testing of the guideline meetings with consumer representatives were organized. There the standard questionnaire was filled out and the electrical demand response capacity was calculated.

The guideline has proven to be the suitable for finding new SMEs, which could join to the VPP or reviewing the capacities of existing partners.

The guideline helped the project leader in the process of contacting potential SMEs for the demand response programme and it helped to gather the necessary data. Furthermore, it was a useful tool to prepare the communication with SMEs and to recruit appropriate participants.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
The best practice example is not relevant enough	Yes	We did not have any best practice examples. We added one, regarding choosing an additional SME, which could join the KIBERnet (SI) project.
The theoretical background isn't relevant enough.	No	This guideline has been perceived by not very theoretically backed. The changes to the text have not been implemented because the process, which is described in the tool, is made based on experience of experts who were involved in the acquisition of SME for the peak levelling and adaptation of electrical energy.

Tool: Questionnaire for engaging SMEs

Why was the tool implemented?

The tool offers a "standard" questionnaire, which helps service providers in identifying SME candidates for the participation in demand response programmes. The tool enables the service providers to collect relevant information from energy mangers of SMEs, when using the questionnaire in an early stage of the project. The collected answers helped to make a decision about appropriate candidates for a demand response programme.

One of the goals of the KIBERnet project was to demonstrate the possibility of shifting loads of electrical energy within SMEs (from different types of industry) to a demand response programme. The tool helped the service provider and project leader to find new SMEs in a more efficiently manner. After the energy managers of the SMEs filled in the questionnaire the project leader analysed the data. The analysis enabled the project leader to find appropriate SME for further processing and participation in the demand response programme.

How was the tool implemented?

Due to the fact, that the project was already finished, the guideline was implemented in the evaluation phase of the project. There were four SMEs already connected to the KIBERnet control centre. The project leader used this guideline to review the existing loads of those participants. Additionally the tool enabled the project leader to find new SMEs, which could participate in the VPP.

Within the rationality of the SMEs the most important factor for participating in the demand response programme were financial: lower costs or higher benefits for electrical energy, subsidies/grants and the refinancing period of the investment. The meeting with one of the SME's energy manager and filling the questionnaire gave the following results:

> "The SME has a consumption peak of around 6.400kW and a monthly consumption of around 3.000MWh. The monthly amount of working hours is 500. It has 3 appropriate consumption appliances for adaptation. Their average load is 1800 kW for 40% of the whole SME working time. The SME prefer more the electrical adaptation energy trading based on a contract rather than negotiations that have to be renewed every time. For this investment it expects the payback/ investment amortisation period less than 2 years."

Based on the analysed data of the questionnaire, the project leader decided to pass the SME to further processing for the demand response programme.

The standard questionnaire has proven to be a suitable tool for the analysis of the electrical demand response potential of SMEs.

By using the tool the project leader gathered relevant data from the new potential participants (SMEs). The tool helped to structure the work of the project leader and simplified the collection of data. The tool has proved to be successful regarding the gathering of data, which the project leader needed for the analysis of the participants. It simplified the way to find good decision about further negotiates with the new potential SME. Due to the practical application of the tool, the project leader decided also to use it for the re-evaluation of existing SME partners of the KIBERnet project. Summarized the tool has fulfilled the project leader's expectations and goals.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
the best practice examples should be more relevant	Yes	We have recognised the lack of relevance of the presented examples and have added guidance from more example.
the theoretical background should be more not relevant	No	The tool is based on years of experience in the acquisition of SME for peak levelling and adaptation of electrical energy.
data that describes the share of electricity in total costs of the company should be added	Yes	Helps getting better overall impression of the companies' profiles

Tool: How to estimate your load shifting potential

Why was the tool/guideline implemented?

The tool was implemented with the ambition to recheck the existing concept of calculating load shift capacity. Its goal was also to:

- compare calculated results to actual load capacities,
- evaluate the methodology, the calculator and the data model,
- determine the capacity of new end users.

One of the goals of the KIBERnet project is to demonstrate the possibility of a quick and simple estimation of SMEs flexible energy (from different sectors of industry). The tool helps the service provider or the project leader to determine the flexible capacity of SMEs more efficiently on the first meeting even if only limited data is available. As the first step in the process the SMEs energy manager calculates the available capacity. Based on this data the project leader has to analyse the data and to determine if the SME offers potential to participate in the demand response programme.

How was the tool/guideline implemented?

Due to the fact, that the KIBERnet project was already finished, the tool has been implemented in the evaluation phase of the project.

The methodology has been used to re-evaluate actual available flexible energy of two end users. The results of the estimation of load capacity have matched with the actual available capacities. Furthermore, two additional companies were using the standardised questionnaire. The purpose was to determine their potential for demand response and to analyse their potential to participate in the KIBERnet system.

The project leader followed the procedure described in this tool. The results enabled him to effectively acquire the relevant data for evaluation and analysis of new potential end users. Therefore the tool fulfilled the project leader's expectations (goals).

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Enable the import of the end user's actual consumption data into the Excel tool	Yes	The changes make the tool more adaptable for the consumer
Enable copy-paste data input in the Excel tool	Yes	Easy handling for the tool user
Enable adaptable time period of the analysis (1 day, 1 week, 2 weeks, custom…) in the Excel tool	Yes	The tool user gets more detailed overview about the consumer's consumption.

Guideline: How to create a consumption baseline

Why was the guideline implemented?

The guideline was used to recheck existing methods for calculating shifted energy and the billing of shifted energy. The proposed methods in this guideline are useful for conducting specific tasks, which are performed by professionals within the companies (double-check of billings, choosing an appropriate method for individual end users, etc.). Some of the guideline recommendations like transparency and replicability of the baseline calculation are also in line with the project goals, which includes the end users on the personal and confidential basis.

How was the guideline implemented?

Due to the fact, that the KIBERnet project was already finished, the guideline has been implemented in the evaluation phase of the project.

The consortium partners agreed that the measurement data from the KIBERnet project may be used for analyses with the S3C guidelines. The consortium partners, which are consumers, supplied their data. Under the guidance of the S3C-representative the various principles of the baseline calculation were tested. The tests mainly concentrated on the occurrence of stochastic deviation of those consumptions that affect the baseline and harm the consumer.

Various principles were analysed and the conclusion was with minor improvements in line with the general recommendation of the guideline. Recommendations were given in the form of feedback for guideline improvement and also proposed the change of the baseline algorithm.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Clarify whom these methods (guideline) are intended to.	Yes	It improves the readability
Possible (unpredicted) production downtimes have to be taken into account. The guideline calculates the baseline merely based on historical data.	Yes	In SME and industry the occurrence of stochastic interruption is not uncommon.

Guideline: Using flexibility manually or automatically

Why was the guideline implemented?

The guideline has been used for the implementation of DR systems at industrial partners of the KIBERnet project. The guideline has been used to inform end users about possible modes (automatic, manual, mixed) of flexible load operations. The guideline provided an overview and enabled a better understanding of the role of an automated flexibility operation that KIBERnet addresses.

How was the guideline implemented?

The KIBERnet project is already finished. Therefore the guideline has been used at the evaluation stage of the project. The existing design of automated demand response systems of KIBERnet's industrial partners was analysed and re-evaluated. Furthermore potentials of additional capacities have been to upgrade already existing systems. Project partners were able to re-evaluate their automated demand response system designs and analysed further unexploited potentials within their organisations.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
The scope of the guideline could be more detailed	Yes	The content of this guideline is very common and well known in the industrial sector. It does not present many new information to the reader. Although this guideline is written as a general overview on manual and automatic operation of flexible loads, we have recognised that the guideline is lacking some detailed information. We have left unchanged the rather general design (from the perspective of industrial users) of the guideline, although the 'Dos and Don'ts' section has been improved with additional information that active partners have contributed during the interview (the description of mixed automated manual regime).
The theoretical background of the guideline could be extended	No	This guideline has been perceived to be not very theoretical. The changes to the text have not been implemented since the implementation is very case sensitive. Additionally, the intention of the guideline is to introduce automatic and manual flexibility operation to readers and raise awareness on the subject, rather than providing a step by step tool.
The presented best practice examples could be more relevant	Yes	We have recognised the lack of relevance of the presented examples and have added guidance from one more example, which is elaborated in this guideline (Ecogrid).
The guideline could be adaptable to more situations.	No	The guideline has been evaluated as applicable in the early stages of projects. Since the KIBERnet is already ongoing and has even reached its final stage, the guideline has been evaluated as poorly

Suggestions for improvement	Suggestion implemented	Reason for decision
		adaptable for this particular project. We have not implemented any changes to the guideline in this respect since it is intended to be used at the beginning of projects.

Guideline: How to monitor demand response performance

Why was the tool/guideline implemented?

The guideline has been evaluated as applicable in the early stages of projects. Since the KIBERnet is already ongoing and has even reached its final stage, the guideline has not been used.

How was the tool/guideline implemented?

The guideline has been sent (via email) to the active partner for a review. One week later, a meeting with four of KIBERnet's industrial partners was organized. General impressions, readability, content, scope and usability of the document have been discussed. The online questionnaire and the evaluation report was filled in.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
The scope of the guideline could be more detailed	No	Industrial partners are already advanced users of monitoring technology, thus they represent the extreme of the population of readers. It does not present many new information to them but for the general public the scope the scope of the guideline is detailed enough.
The theoretical background could be more relevant.	No	The guideline has been reviewed by industrial energy managers/specialists. They felt that the document holds little theoretical value. The changes to the text have not been implemented since the intention of the guideline is to introduce the general approach (monitoring) to readers, while industrial users are already well informed with the elaborated topics. Moreover this guideline provides an overview by citing several other guidelines, which describe specific (theoretical) aspects of monitoring demand response.
The presented best practice examples could be more relevant.	Yes	We have recognized the lack of relevance of the presented examples and have added two more examples of projects, which have applied monitoring approaches elaborated in this guideline.
The guideline could be more adaptable	No	The guideline has been evaluated as applicable in the early stages of projects. Since KIBERnet is already ongoing and has even reached its final stage, the guideline has been evaluated as poorly adaptable for this particular project. We have not implemented any changes to the guideline in this respect since it is intended to be used at the beginning of projects.

Guideline: KPIs for energy consumption effects

Why was the tool/guideline implemented?

The guideline is used for estimating the consumption and the demand response efficiency in the form of performance indicators. At the demand response service the performance indicators enables a comparison between the end users' activity on their common denominators. Using the performance indicators analyses, the service provider evaluates and compares the activity and efficiency in the demand response programme.

The performance indicators also help the project leader to analyse and optimize the processes inside the virtual power plant. Such processes like collecting flexible energy and the optimisation of the demand requests are provided more efficiently on the basis of the corresponding performance indicators. Additionally, performance indicators describing the economic categories regarding demand response are also important to design the incentives for bonus and malus events.

How was the tool/guideline implemented?

The KIBERnet project leader prepared the list of performance indicators covering the peak levelling and demand response for the virtual plant. The list was send to the KIBERnet consumers. At the workshop the performance indicators were discussed. Performance indicators, which describe the ratios of the cost per unit of output are most important for SMEs. Their opinion was that the performance indicators, which describe the economic categories, must be added, because on the basis of these indicators the supervisors will decide about further participation in the demand response programme. Based on the discussion the list of the KPI's, which are relevant for the project from end user and service provider point of view, was created.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
The guideline should be easy to read	Yes	The performance indicators have been described, but not clearly listed. We have, therefore, included a table, which clearly lists all the discussed performance indicators.
Regarding the scope, the guideline could be more detailed	Yes	This guideline has been perceived as not having enough details about its target group. A description of potential users of KPIs was added and several segments by which KPIs could be groped have been outlined. The Segment of KPIs that this guideline focuses on and its relation/link to other segments (specifically to S3C guideline Evaluation through end user centred KPIs) have been specified. Economic parameters have not been included since specific guidelines thoroughly address economic motivations for engaging end users (guidelines Bonus/Malus, Monetary incentives, Setting up a fake tariff, Setting up a price use mechanism).

Guideline: Designing a dynamic tariff

Why was the tool/guideline implemented?

This guideline has been chosen with the ambition to present suitable pricing mechanisms and test their relevance (specific to project partners).

The guideline contributes to the search for suitable pricing mechanisms, which reflects in the project's main objectives. These include designing a novel service distribution system that operators would introduce to their industrial consumers and producers of electricity, with the purpose to:

- induce economic benefits to industrial consumers/producers,
- reduce costs of balancing the mismatch between planed and produced electricity.

The content has not been directly implemented since the project has passed the integration phase. The designing and testing of suitable pricing mechanisms should rather be performed at the beginning of the commercial stage.

How was the tool/guideline implemented?

The guideline has been used at the evaluation part of the project. The text was sent to project partners for evaluation. Shortly after INEA has organised a workshop where all partners were:

- presented with basic DR pricing mechanisms,
- asked to define suitable pricing mechanisms for their case,
- asked to comment on the suitability of existing pricing mechanisms within the project.

The business cases of demand response remain one of the most challenging tasks awaiting (future) project leaders. The discussion on the needs and motivations of industrial end users has been beneficial in creating a clearer image on the subject. Although concrete conclusions on choosing the single best pricing mechanism can't be drawn based on the discussion and theoretical guidelines, the partners agreed that the solution should be thoroughly analysed, case specific and economically most efficient.

The plenary discussion has helped actual users of demand response technology to share information, views and experiences between them. The meeting has also contributed to the search of and towards raising awareness of suitable pricing mechanisms in general.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Regarding the structure it is recommended that maybe Dos and Don'ts should be moved after the tariff types	No	The Do's and Don't represent guidance that is relevant for all different tariff types and even has an impact on what tariff type might be chosen. In fact, it was decided to leave the structure as it is.
Some concrete best practice example would improve the guideline	Yes	A best practice example was added.
Add explanation that relates Table 1 to the Figure 1	Yes	More information was added

Guideline: Bonus & malus – changing behaviour with rewards and penalties

Why was the tool/guideline implemented?

This guideline has been chosen with the ambition to present bonus/malus incentive approach to the members of KIBERnet's consortium. Furthermore, the active partner wanted to test the relevance of bonus/malus pricing mechanism (specific to project partners). Lastly we have intended to evaluate and compare the existing monetary incentives in the KIBERnet project against a bonus/malus mechanism.

It contributes to the search for suitable pricing mechanisms, which reflects in the project's main objectives. These include designing a novel service distribution system that operators would introduce to their industrial consumers and producers of electricity, with the purpose to:

- induce economic benefits to industrial consumers/producers,
- reduce costs of balancing the mismatch between planed and produced electricity.

The content has not been directly implemented since the project has already entered into the evaluation phase. Rather the designing and testing of suitable pricing mechanisms should be performed at the beginning and in the implementation/execution phases.

How was the tool/guideline implemented? The guideline has been used at the evaluation part of the project. The text was sent to project partners for evaluation. Shortly after INEA has organised a workshop where all partners were:

- presented with a bonus/malus pricing mechanism,
- asked to define suitable bonus/malus pricing mechanism for their case,
- asked to comment on the suitability of existing monetary incentives versus a bonus/malus mechanism within the project.

The business cases of demand response remain one of the most challenging tasks awaiting (future) project leaders. The discussion on the needs and motivations of industrial end users has been beneficial in creating a clearer image on the subject. Although concrete conclusions on choosing the single best bonus/malus mechanism can't be drawn based on the discussion and theoretical guidelines, the partners agreed that the solution should be thoroughly analysed, case specific and economically the most efficient.

The plenary discussion has helped actual users of demand response technology to share information, views and experiences between them. The meeting has also contributed to the search of and towards raising awareness of suitable bonus/malus mechanisms in general.

Suggestions for improvement	Suggestion implemented	Reason for decision
Add Dos and Don'ts section.	Yes	The drafting partners have received similar feedback from the ADB already and included a Do's and Don'ts section based on practitioners' experiences for the final version.
Add some graphical elements.	No	The guidelines information content is very dense. The information reflected in a structured manner in two large graphics already. It is difficult to add "easier" pictures as the topic is very analytic.
It is recommended to put the table (or other graphical element) and its explanation more to the beginning of the guideline to draw the reader's attention	Yes	The graphical element on pricing scheme attributes is now on the first page of the guideline.
The instructions in the guidelines are a	Yes	The guideline now includes a Do's and

Suggestions for improvement	Suggestion implemented	Reason for decision
little bit to general and some more concrete directions are missed.		Don'ts section and more best practice to give more concrete actions. However, the decision making process for choosing a tariff and/or a fitting is so complex that it is very difficult to put all relevant information "on paper". In fact, the S3C consortium decided to implement a structured online tool that guides the interested party through the decision making process
The reader is directed to the reading of numerous further guidelines what is a little bit unpractical.	No	The topic of tariffs and/or incentives is one of the most complex options. The consortium decided to interlink the guideline to keep the individual guidelines at a manageable length. On the other hand side, the hyperlinks at least raise awareness for the complexity and indicate, where to find the information. Furthermore, to counteract the problem arising from the guideline approach, the S3C consortium implemented an online tool on the toolkit website that helps to reader to navigate through this complex topic area in a more convenient way.

Guideline: Testing tariff schemes in a pilot context

Why was the tool/guideline implemented?

This guideline has been chosen with the ambition to present a method of setting up fake tariff to the members of KIBERnet's consortium. Furthermore, the active partner wanted to test the relevance of a fake tariff (specific to project partners). Lastly we have intended to evaluate and compare the existing monetary incentives versus a fake tariff mechanism.

It contributes to the search for suitable pricing mechanisms, which reflects in the project's main objectives. These include designing a novel service distribution system that operators would introduce to their industrial consumers and producers of electricity, with the purpose to:

- induce economic benefits to industrial consumers/producers,
- reduce costs of balancing the mismatch between planed and produced electricity.

The content has not been directly implemented since the project has already entered into the evaluation phase. Rather the designing and testing of suitable fake tariffs should be performed at the beginning and in the implementation/execution phases.

How was the tool/guideline implemented?

The guideline has been used at the evaluation part of the project. The text was sent to project partners for evaluation. Shortly after INEA has organised a workshop where all partners were:

- presented with a fake tariff mechanism,
- asked to define suitable fake tariff mechanism for their case,
- asked to comment on the suitability of existing monetary incentives versus a fake tariff mechanism within the project.

The business cases of demand response remain one of the most challenging tasks awaiting (future) project leaders. The discussion on the needs and motivations of industrial end users has been beneficial in creating a clearer image on the subject. Although concrete conclusions on choosing the single best fake tariff (or pricing) mechanism can't be drawn based on the discussion and theoretical guidelines, the partners agreed that the solution should be thoroughly analysed, case specific and economically most efficient.

The plenary discussion has helped actual users of demand response technology to share information, views and experiences between them. The meeting has also contributed to the search of and towards raising awareness of suitable fake tariff (or pricing) mechanisms in general.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Restructure the content and add descriptive linkage to other financial guidelines – namely "Setting up price use mechanism", since Setting up fake tariff also contains some financial incentives.	Yes	The guidelines on Price Use Mechanisms, Setting up a Fake Tariff and the Incentive Guidelines are now interlinked. Furthermore, the content has been prepared as an online tool to make the navigation easier.
Some graphical elements would also be welcome do draw the reader attention	No	This is difficult, since the topic is highly analytic and not easy to illustrate.
The chapter "What do you need to do" mixes the financial elements (influence of the current energy contract, revenue neutrality, financial risks, …) with the organization elements (reference profile, duration of field trial, …). It would be recommended to render some logical	No	

Suggestions for improvement	Suggestion implemented	Reason for decision
grouping with short explanations.		
The guideline actually describes setting up testing environment of the end users for (new) demand respond service. It consists of recommendations on - Setting up the financial incentives - Organisation of the testing environment for evaluation What is not directly reflected in the title. The active partner initially has not found it relevant at the beginning.	Yes	The guideline's title has been changed to changed to "Testing a Tariff Scheme in a Pilot Context"

Guideline: Choosing and combining monetary and non-monetary incentives & Guideline: Choosing from different types of monetary incentives

Why was the tool/guideline implemented?

This guideline has been chosen with the ambition to present available monetary incentives to the members of KIBERnet's consortium. Furthermore, the active partner wanted to test the relevance of monetary incentives (specific to project partners). Lastly we have intended to evaluate and compare the existing monetary incentives versus guideline recommendations.

It contributes to the search for suitable pricing mechanisms, which reflects in the project's main objectives. These include designing a novel service distribution system that operators would introduce to their industrial consumers and producers of electricity, with the purpose to:

- induce economic benefits to industrial consumers/producers,
- reduce costs of balancing the mismatch between planned and produced electricity.

The content has not been directly implemented since the project has already entered into the evaluation phase. Rather the designing and testing of suitable monetary incentives should be performed at the beginning and in the implementation/execution phases.

How was the tool/guideline implemented?

The guideline has been used at the evaluation part of the project. The text was sent to project partners for evaluation. Shortly after INEA has organised a workshop where all partners were:

- presented with monetary incentives,
- asked to define suitable monetary incentives for their case,
- asked to comment on the suitability of existing monetary incentives versus guideline recommendations.

The business cases of demand response remain one of the most challenging tasks awaiting (future) project leaders. The discussion on the needs and motivations of industrial end users has been beneficial in creating a clearer image on the subject. Although concrete conclusions on choosing the single best monetary incentive can't be drawn based on the discussion and theoretical guidelines, the partners agreed that the solution should be thoroughly analysed, case specific and economically most efficient.

The plenary discussion has helped actual users of demand response technology to share information, views and experiences between them. The meeting has also contributed to the search of and towards raising awareness of suitable monetary incentives in general.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Merge it with Non-monetary incentive. The merged guideline should provide a qualitative and quantitative overview of the incentives guidelines included in the toolkit with corresponding linkages (Guideline: Designing a dynamic tariff, Guideline: Testing tariff schemes in a pilot context, Guideline: Choosing and combining monetary and non-monetary incentives, Guideline: Gamification - making energy fun …).	Yes	The guidelines monetary and non-monetary incentives were merged one big guideline on Incentives in general including theoretical background and two sub-guidelines giving information on specific forms of non-monetary and monetary incentives.
The structure could be improved: the chapter "Electricity bill" describes much more than just billing. It is recommended to reorganize the first part or at least	Yes	The sub-guideline dealing with monetary incentives in specific forms now contains this information.

Suggestions for improvement	Suggestion implemented	Reason for decision
rename the subchapter into the "Financial incentives".		
Add "When to use" section and "Dos and Don'ts"	Yes	The main guideline on incentives now includes a Do's and Don'ts section to make the advice more practical.
Add "Best practice example" section	Yes	The main guidelines as well as the two sub guidelines now include best practice sections to make the information more illustrative and less abstract.

Guideline: Choosing and combining monetary and non-monetary incentives & Guideline: Choosing from different types of non-monetary incentives

Why was the tool/guideline implemented?

This guideline has been chosen with the ambition to present available non-monetary incentives to the members of KIBERnet's consortium. The target was to compare the existing monetary incentives versus non-monetary incentives.

The guideline contributes to the search for alternative incentives to those reflected in the project's main objectives. These include designing a novel service distribution system that operators would introduce to their industrial consumers and producers of electricity, with the purpose to:

- induce economic benefits to industrial consumers/producers,
- reduce costs of balancing the mismatch between planed and produced electricity.

The content has not been directly implemented since the project has already entered into the evaluation phase. Rather the designing and testing of suitable non-monetary incentives should be performed at the beginning and in the implementation/execution phases.

How was the tool/guideline implemented?

The guideline has been used at the evaluation part of the project. The text was sent to project partners for evaluation. Shortly after INEA has organised a workshop where all partners were:

- presented with non-monetary incentives,
- asked to define suitable non-monetary incentives for their case,
- asked to comment on the suitability of existing monetary incentives versus non-monetary incentives.

The business cases of demand response remain one of the most challenging tasks awaiting (future) project leaders. The discussion on the needs and motivations of industrial end users has been beneficial in creating a clearer image on the subject. Although concrete conclusions on choosing the single best non-monetary incentive can't be drawn based on the discussion and theoretical guidelines, the partners agreed that non-monetary incentives are less interesting for industrial users. Some potential for their usage has been found for companies with a problematic reputation (such as heavy pollution…) or companies that are dealing directly with end customers.

The plenary discussion has helped actual users of demand response technology to share information, views and experiences between them. The meeting has also contributed to the search of and towards raising awareness of suitable incentives in general.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
It is recommended that the guideline is written in more general form and merged with the guideline "Monetary incentives". The merged guideline should provide a qualitative and quantitative overview of the incentives guidelines included in the toolkit with corresponding linkages (Guideline: Designing a dynamic tariff, Guideline: Testing tariff schemes in a pilot context, Guideline: Choosing and combining monetary and non-monetary incentives, Guideline: Gamification - making energy fun …).	Yes	The guidelines monetary and non-monetary incentives were merged into one big guideline on Incentives in general including theoretical background and two sub-guidelines giving information on specific forms of non-monetary and monetary incentives.

Suggestions for improvement	Suggestion implemented	Reason for decision
The structure could be improved. The subchapter titles does not reflect exactly their content. It is recommended to re-structure the content and put more descriptive chapter titles.	Yes	The entire guideline was restructured to more intuitive and easier to understand.
Add When to use section and Do's and Don'ts	Yes	The main guideline on incentives now includes a Do's and Don'ts section to make the advice more practical.
Add Best practice example section	Yes	The main guidelines as well as the two sub guidelines now include best practice sections to make the information more illustrative and less abstract.

4.6 LINEAR

Full project title	Local Intelligent Network and Energy Active Regions
Website	www.linear-smartgrid.be
Funding scheme	Funding by Flemish government for research partners; in-kind funding (staff + infrastructure) by industrial partners

Tested guidelines
• Guideline: User-centred KPIs for the evaluation of smart grids   • Guideline and tool: Using segmentation to better target user groups

Which barriers and opportunities were addressed?
Barriers   • Engaging end users without sharing decision power.
Opportunities   • Reinforce the end user perspective in the project design   • Roll out smart grids towards the general public

4.6.1 Introduction to the pilot and impact of S3C

The Linear ('Local Intelligent Network and Energy Active Regions') project is a large-scale research and demonstration project on innovative smart grid technologies in Flanders. It is a top-down project aiming to activate domestic demand response to facilitate the integration of distributed (renewable) energy resources in the low-voltage network. Within Linear, Demand Response (DR) stands for the participation of residential end users in the provision of services to different power system participants in the form of an injection/off take decrease/increase.

The objective of the Linear project is twofold:

- Linear aims at developing the required technical solutions (e.g. communication between appliances and home energy management system, technology for the remote control of smart appliances, data management, etc.) to realise a technological breakthrough of domestic DR. Linear also tests the developed concepts in real residential settings. The project involves different types of flexible energy resources installed at consumers' premises: electrical appliances, distributed generation and thermal and electric energy storage systems.
- Linear also looks at possible future energy market structures and potential business cases to validate the flexibility available at the end users' premises. Four business cases for domestic DR are explored during the project. Two of these cases are tailored to the interest of the retailer / balance responsible partner (BRP), i.e.
- "portfolio management" (optimization of electricity purchases and sales on the day ahead market by means of DR) and
- "wind balancing" (reducing the intraday deviations between predicted and measured wind power generation by means of DR).

The DSO is the party concerned in the other two cases, i.e.

- "LV transformer load" (avoiding peak loads on low voltage transformers by means of DR) and

- "LV feeder voltage profile" (managing the voltage profile of low voltage feeders by means of DR).
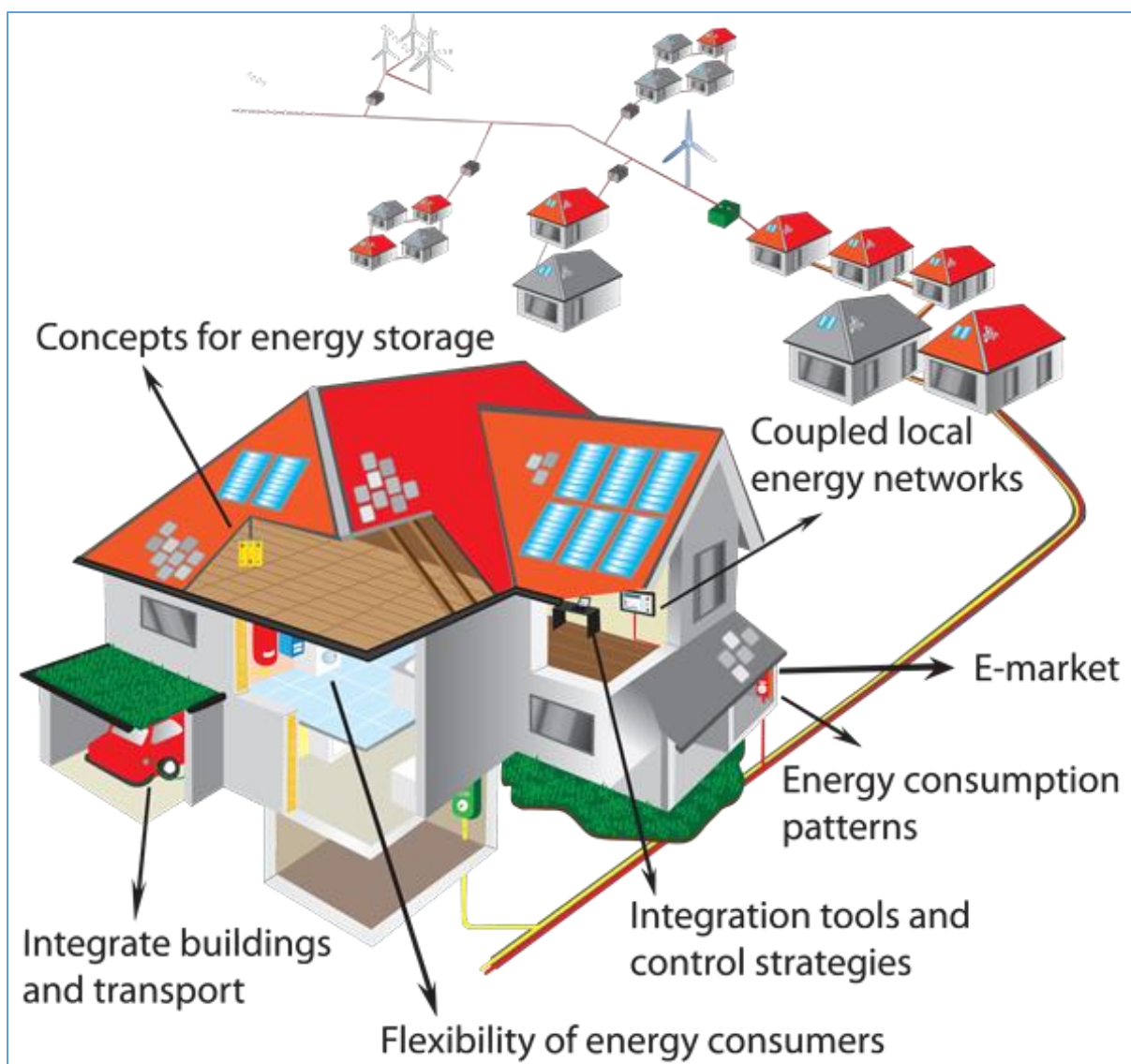
Figure 35: Schematic picture exemplifying different technologies tested in the Linear participant families (Source: www.linear-smartgrid.be)

Linear aimed at generating an implementation breakthrough that would be valuable for the commercial roll-out of smart grid technologies in Flanders. This is evident from a number of the project's features:

- Linear did include some new technology development (and an extensive phase of technology validation before the start of the actual field test), but the project worked with commercially available systems to a maximum extent possible (an energy management system developed by Fifthplay, the Miele@Home communication system, and the smart meters rolled out by the DSOs Eandis and Infrax). These partners implemented additional features in their systems in order to support the business cases that are tested in Linear;
- Linear aimed at the participation of a sufficiently large and statistically representative sample of households in order to draw relevant conclusions on e.g. end user acceptance and amount of flexibility that could be supplied by DR;
- Through the investigation of business cases, Linear aimed at providing information on the technological and economic value of flexibility for the different actors participating in the electricity system (e.g. retailers, BRPs and DSOs).

Both the technical solutions as well as the business cases were implemented in a pilot engaging about 240 Flemish families. The participants of the field trial were split in two groups. For each group a different reward system was tested during a period of 12 months: 'Time of Use' (ToU) tariffs (in 6 time blocks, tested by about 25% of the participating families) and 'Flexibility' (Flex) (remote start of smart appliances within user-defined constraints – tested by about 75% of participating families). Following equipment is integrated as part of the Linear demand response system: smart meter, Home Energy Management System, sub-metering plugs, display/web service, PV installation (only if already installed – this was the case in about 40% of houses) and for the participants offering automated active demand, smart appliances (dish washer, washing machine, tumble dryer, domestic hot water buffer, electric vehicles). The field trial started in spring 2013 and concluded in October 2014.

When the collaboration between S3C and Linear started (early 2014), all of the Linear technology had already been rolled out and the DR experiments with household participants were up and running. Therefore, the Linear project manager suggested two areas where support from S3C could be welcome:

- Linear still had a budget available for giving additional incentives to end users to offer more flexibility. This money could be used in the final project phase to try out new means to get people motivated to offer more flexibility. S3C could give ideas on possible incentives to increase engagement in the final project stage. A possible collaboration on this point was however not implemented. It was decided that changing the incentives towards the participants would make the analysis of the results more complex. For this reason no change in the remuneration models was implemented.
- Another request was to help Linear with establishing contact with households that lost their interest in the project along the way. It was interesting for Linear to know the 'story behind' their loss of interest. Linear was interested in further qualitative analysis about how end-user engagement was perceived by the end users themselves. In order to get to the 'storyline' behind this (lack of) engagement of certain end-users, qualitative research going beyond the use of a questionnaire would be needed.

The second suggestion was taken up and further worked out using the "Evaluation through end-user centred KPIs guideline as an inspiration to develop an interview protocol for probing end-user experiences.

In addition, the "Using segmentation to better target user groups" guideline and tool were used by S3C researchers to get a better overview of the profiles of the participant families. In the current application, we aimed to test to what extent the understanding of Linear participants in terms of the 6 segments identified by the segmentation tool can contribute to explaining and understanding observed end-user response, both in terms of their stated attitudes towards smart grid products and services and in terms of actual flexibility offered.

4.6.2 Timeline of collaboration with S3C

Responsible S3C partner	VITO	
Supporting S3C partners	ECN	
Date and type of activity	Contact person	Description and outcome
Jan. 9, 2014: face-to-face meeting with Linear project coordinator	Project Coordinator of LINEAR and S3C team	The S3C team met with LINEAR's project coordinator to introduce S3C and to have a first discussion on potential areas for collaboration.
Feb. 24, 2014: joint S3C-Linear workshop	LINEAR consortium members and S3C team	The S3C team met with the Linear consortium in the VITO offices in Berchem to develop a common understanding of the project and define key areas for

		collaboration.
March-June, 2014: further discussion with Linear project coordinator to establish key areas for collaboration	Project Coordinator of LINEAR and S3C team	Two areas of collaboration between S3C and Linear were established: - Evaluating end-user experiences through telephone interviews - Testing the segmentation guideline and tool
Sept. 25 – Oct. 14, 2014	Linear field test participants and S3C	The S3C team carried out the implementation of the following guidelines by surveying and conducting phone inquiries of the LIEAR participants together with the LINEAR team. - Testing of guideline: User-centred KPIs for the evaluation of smart grids - Testing of guideline and tool: Using segmentation to better target user groupstool
March 24, 2015: face-to-face meeting with Linear coordinator	Project Coordinator of LINEAR and S3C team	- Erik Laes and Pieter Valkering met with the Linear project coordinator to perform the final audit of the tested and implemented guidelines and tools.

4.6.3 Overview of tools and guidelines provided: Linear

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Evaluation through end-user centred KPIs (guideline)	Yes	No	Yes	Sept. 2014	March 24, 2015	March 24, 2015
Segmentation (guideline + tool)	No	Yes	Yes	Sept. 2014	March 24, 2015	March 24, 2015

4.6.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: User-centred KPIs for the evaluation of smart grids

Why was the tool/guideline implemented?

The Linear consortium was interested in further qualitative analysis about how end-user engagement in the field test was perceived by the end users themselves after the end of the project. In order to get to the 'storyline' behind this (lack of) engagement of certain end-users, qualitative research going beyond the use of a questionnaire was needed. It was expected that a limited set of interviews with Linear participants could add additional insights on the factors contributing to offering flexibility.

In agreement with the Linear project coordinator, we looked specifically for the following 'profiles' among the Linear end users, as we expected that a lot could be learned from these 'extreme' cases:

- end users who despite a positive attitude towards smart appliances (as is evident from questionnaire results) did not offer a great amount of flexibility;
- end users who, despite a self-proclaimed 'doubtful' attitude towards smart appliances, did offer a large amount of flexibility;
- 'champions' (offering a lot of flexibility or earning a lot of bonus) and 'laggards' (offering a limited amount of flexibility and not earning a lot of bonus).

How was the tool/guideline implemented?

Based on the ideas contained in the guideline on "User-centred KPIs for the evaluation of smart grids" a questionnaire protocol for telephone interviews was developed by S3C researchers in consultation with the Linear partners. The Linear team made a list of end users falling in one of the above-mentioned categories; these end users were then approached by S3C researchers for a telephone interview. End users who experienced a lot of technical problems (as witnessed by the number of 'tickets' sent to the helpdesk) were filtered out. 20 invitations were sent out, equally split over 'Flex' and 'TOU' participants. In the end, 10 end users (8 taking part in the 'Flex' test; 2 taking part in the 'TOU' test) accepted the invitation for a telephone interview. The interviews took place between 25 September and 17 October 2014 (after the end of the field test in the summer of 2014) at a date and time chosen by the end-users themselves, and lasted between 30-60 minutes.

Some of the most important findings included:

- The fact that people were participating in a research project led by research institute (and e.g. not a commercial rollout led by commercial firms) contributed to their willingness and motivation to participate. Some participants explicitly stated their distrust of energy companies;
- It is striking that for the majority of interviewees the possibility to realise a 'bonus' (when using the TOU tariff) or a reward per hour of flexibility offered (when using the smart appliances) did not play a role at all in the motivation to enter the field test. Either they did not mention it, or they explicitly rejected it;
- Contrary to the rather divergent and diffuse set of motivations for entering the Linear field test, the large majority of interviewees were convinced that Linear was doing important research with a clear benefit for society. The importance of 'steering' energy consumption by experimenting with new energy tariffs to better reflect the time-dependent nature of renewable energy supply was well understood and contributed to the motivation to enter the field test as a participant;
- The degree to which energy practices were changed in interaction with the smart appliances depended on the interplay between a number of relevant factors: the type of tariff in use, the presence/absence of PV panels and the type of energy practice (doing the laundry, washing dishes or drying clothes);
- In general, the majority of interviewees agreed that it was most easy to offer flexibility with the dishwasher. Offering flexibility with the washing machine and the tumble dryer was sometimes seen as more difficult because of an expressed preference not to leave wet clothes for too long in the washing machine or tumble dryer;
- The majority of interviewees would like to see a major improvement in the way feedback on energy consumption would be given in a commercial rollout. Generally, this feedback should be
  - **Easily accessible** (e.g. not requiring the end user to log into a system, look for the right information, etc. – as this takes way too much time);
  - **Understandeable** – even though this criterion will be (very) different for different types of end users. Some interviewees reported that having information on the monthly energy consumption would be sufficient, while at the other end of the spectrum, one interviewee (an ICT professional) had very specific requirements concerning the analytic capacity of the feedback;
  - **Practicable** – some interviewees stated that they would like to receive clear advice on 'how to do better' (i.e. offer more flexibility, consume less energy, move energy consumption to cheaper tariff periods, etc.).

The theoretical background of the interview protocol (based on the 'social practices' approach) was appreciated by the Linear project coordinator because the interviews were able to show that understanding the social practices of households (with regard to doing the laundry, washing dishes and drying clothes) is crucial to understand why and how much flexibility households are able to offer to the market. The Linear coordinator was therefore of the opinion that the guideline could indeed be used to develop and carry out an evaluation of end-

user experiences in a smart grid pilot or programme, in combination with other tools such as quantitative surveys. In his opinion however, the guideline could not be used without the required background but required an application by a social sciences researcher.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
No	N/A	N/A

Guideline and tool: Using segmentation to better target user groups

Why was the tool/guideline implemented?

Segmentation can be used for many different purposes. E.g. in the case of Linear, a segmentation method derived from the 'technology acceptance model' (Davis 1989; Davis et al. 1989) was applied in the recruitment stages of the project to 'classify' participants into 4 categories:

- '**Adherents**': having a very positive attitude towards smart appliances (w.r.t. their perceived ease of use, impact on comfort, safety, possibilities to control appliances, etc.) – representing about 35% of the Flemish population;
- '**Proponents**': also in general having a positive attitude towards smart appliances, but being a bit more sceptical w.r.t. safety and possibility to control smart appliances – representing about 27% of the Flemish population;
- '**Doubters**': have not yet formed a firm opinion on the use of smart appliances; their scores on perceived ease of use, impact on comfort, safety, possibilities to control appliances, etc. are mostly rather neutral – representing 25% of the Flemish population;
- '**Recusants**': having negative attitudes towards smart appliances – representing about 12% of the Flemish population.

This model was used because it related directly to the interests of the industrial partners in the Linear project, who were interested in the market potential of new devices such as smart dishwashers, smart tumble dryers, smart meters, etc. That form of segmentation is easy to understand for those industrial players (end users are divided into intuitive and easily understandable categories) and gives them information that directly relates to their interests (e.g. x% of the Flemish population are 'technology enthusiasts' when it comes to smart appliances).

However, as it turned out, the large majority of the Linear field test participants belonged to either the 'adherent' or 'proponent' category. It was therefore difficult to extrapolate the findings from the Linear project to the whole of Flanders. Therefore, it was also interesting to test whether a segmentation based on other variables besides technology acceptance could perhaps offer a better view on which 'type' of end user would offer most flexibility using smart technologies. The segmentation tool developed in S3C is directly based on the segmentation model developed by Sütterlin et al. (2011), aiming at identifying the energy saving potential of target groups. The special feature of the model is that it is comprehensive, including both energy-related beliefs and attitudes, and energy-related behavioural characteristics. Concretely, it is based on the following segmentation variables:

- energy-saving actions based on curtailment in the housing, mobility, and food domain;
- energy-saving actions based on energy efficiency;
- financial motive;
- energy consciousness motive;
- acceptance of policy measures;
- beliefs concerning response efficacy, self-efficacy, personal efficacy, awareness of consequences, ascription of responsibility, and personal norms;
- basic convictions about energy conservation; and perceived loss of comfort.

The main goal of using the S3C segmentation was to find out whether the amount of flexibility offered in the Linear field test could be related to belonging to a type of end user identified by Sütterlin et al. (2011).

How was the tool/guideline implemented?

The questionnaire included in the S3C segmentation tool was put online and invitations were sent out to all Linear participants to fill it out. The response rate for the questionnaire was 167 out of 243 (or 69%). After removing incomplete entries, 146 valid questionnaires remained.

Some of the most important findings included:

Correlating the attitudes towards smart grids (situation at the start of the Linear project) to the segments reveals lowest attitudes for the problem aware and convenience-oriented groups, and highest attitudes with the idealistic and materialistic groups (Figure 2). It thus appears that:

- people who are not in favor of saving energy in the first place hold also a lower attitude for smart grid products (which makes sense),
- people who are driven by idealistic motives or by financial gains hold positive attitudes for smart grid products (which also makes sense).

Note however that the differences among average attitudes are relatively small, i.e. comparable or smaller than the spread of attitudes among segments (see error bars representing standard deviation), and that the number of entries notably in the convenience–oriented segment is low (8) offering only limited representativeness, indicating low statistical significance.
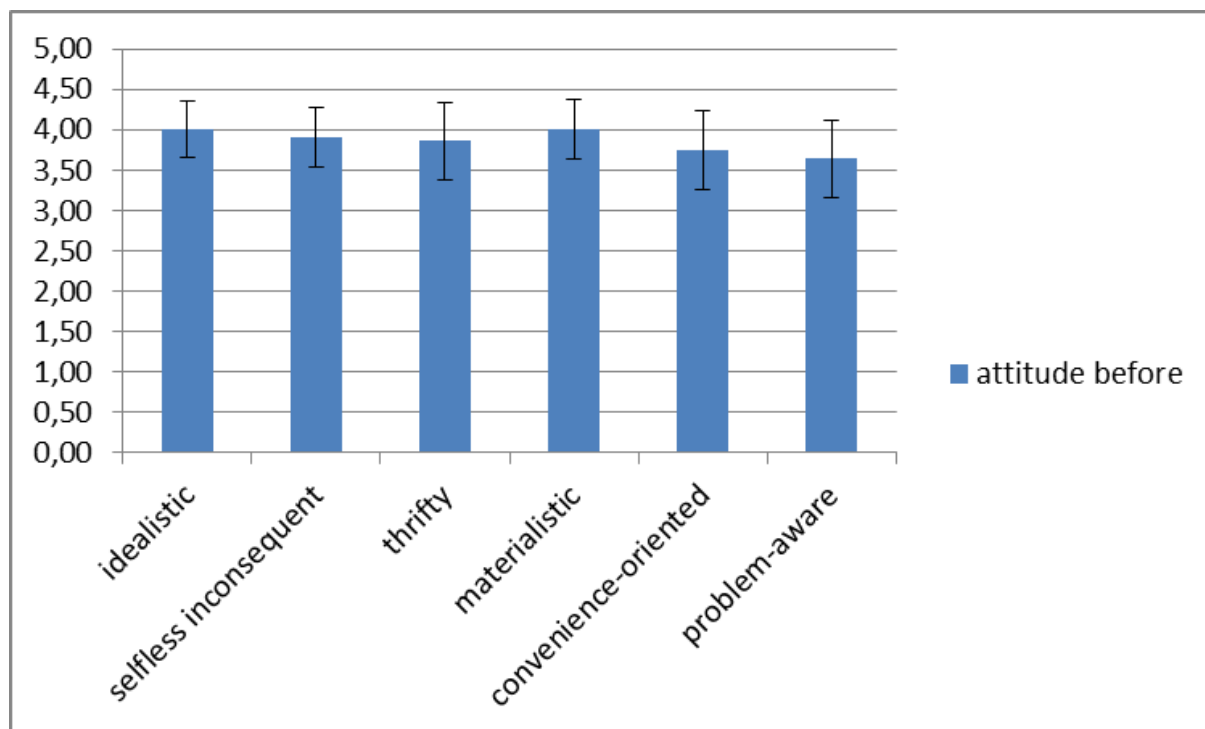
Figure 36: Attitudes towards smart grid products and services among Linear participants at the start of the project. Error bars represent standard deviations, source: LINEAR project

Correlating the actually achieved bonus to the segments (both in absolute terms and per person in the household) reveals that the idealistic energy users scored highest, while the convenience oriented and problem aware energy users appear on the lower end (Figure 3). This suggests some amount of consistency between attitudes and actual flexibility offered, although in particular the materialistic segment scores lower than one would expect. More importantly, however, note that the spread of bonus within segments is very high, with values ranging between zero and typically twice the average bonus value (see also Figure 4). Thus, allocation to segment is **very likely not the main determining parameter** for delivering flexibility.
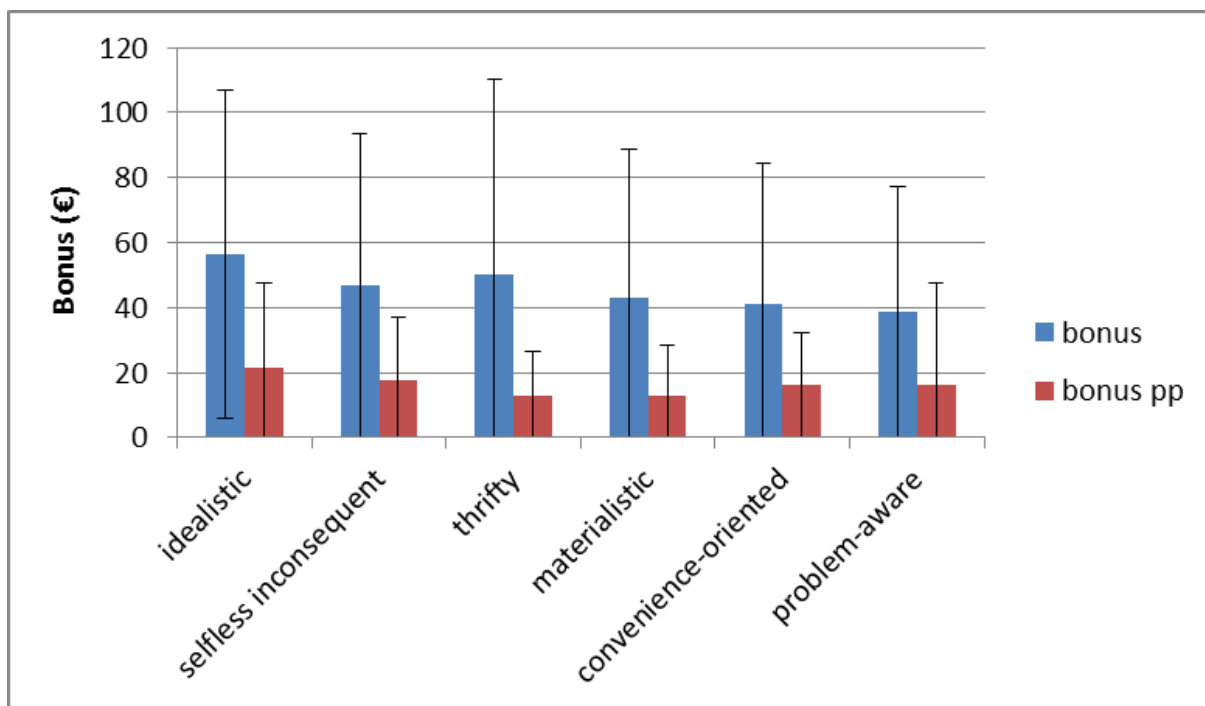
Figure 37: Bonus obtained among the different segments of Linear participants, both in absolute terms and per person (pp) in the household. Error bars represent standard deviations, source: LINEAR project
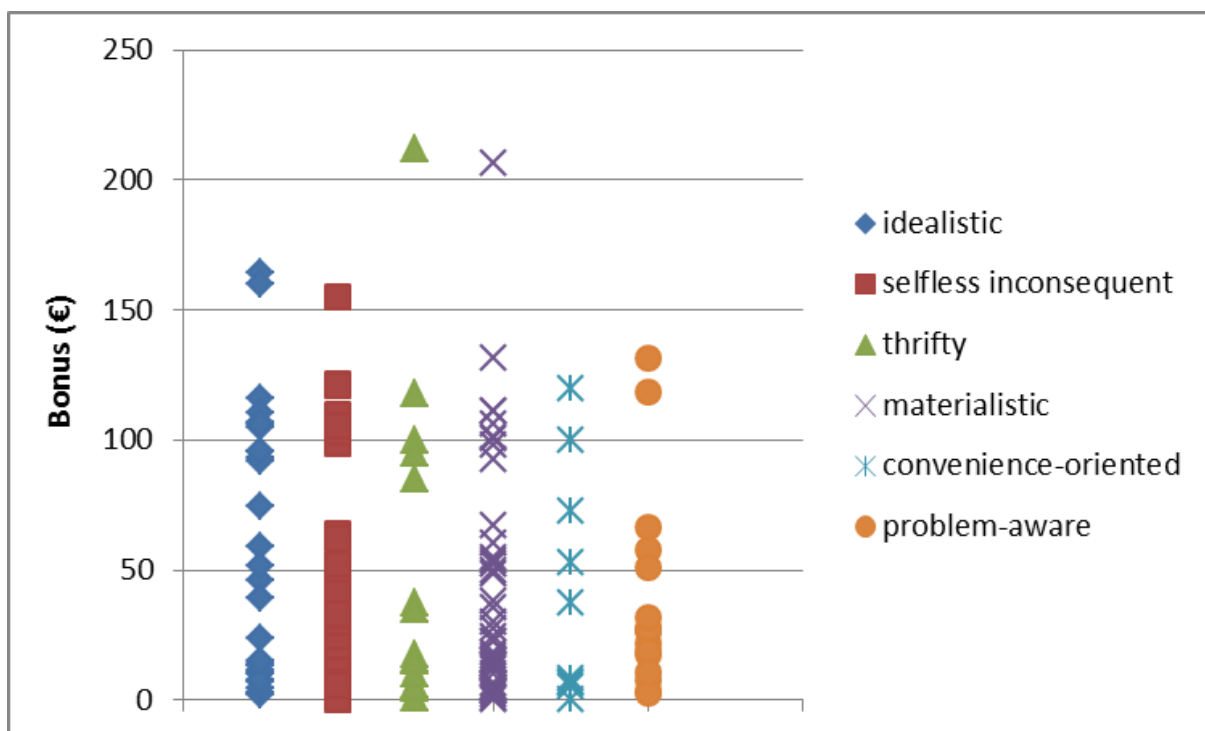
Figure 38: Spread of the bonus obtained among the different segments of Linear participants, source: LINEAR project

Regarding the overall evaluation of the segmentation tool test, the Linear coordinator pointed out that the categories used in this tool were not easy to understand intuitively – i.e. it is not easy to form an idea of the 'typical' end user belonging to a certain category. The categories should be explained with easy catchphrases or typical behaviour. To him, it is also not very clear how the information derived from the segmentation can be used in a smart grid pilot or roll-out. The Linear coordinator's impression was that - since the tool addresses underlying motivations of end-users to participate - the tool could perhaps be used for communication purposes

during the recruitment phase of a smart grid pilot. E.g. different types of messages could be used for the different types of end user to 'speak directly' to their interests (e.g. emphasizing environmental benefits, energy savings, financial gains, etc.). This idea could be tested further and elaborated.

Suggestions for improvement

Suggestions for improvement:	Suggestion implemented	Reason for decision
Explain segmentation categories with easy-to-understand examples or catchphrases	Yes	The guideline now features best practice examples with easy to understand attributes for the different segmentation categories
Link segmentation categories to communication during recruitment	Yes	The guideline now includes a reference to its beneficial use during recruitment processes

4.7 Mooi Wildeman (Amsterdam Smart City)

Full project title	Mooi Wildeman
Website	http://www.nieuwwestexpress.nl/14771/nl/positieve-energie
Funding scheme	Not available

Tested guidelines
• Co-creation - collaborating to develop smart energy solutions

Which barriers and opportunities were addressed?
Barriers • Engaging end users without sharing decision power.
Opportunities • Reinforce the end user perspective in the project design • Co-creation • Roll out smart grids towards the general public • Connect smart grids to smart cities, smart living and sustainable lifestyles • Develop an overarching storyline to achieve a sense of urgency about smart grid

4.7.1 Introduction to the pilot and impact of S3C

'Mooi Wildeman' is a community project to foster energy awareness and smart energy behaviour in the Wildemanbuurt, a multi-ethnic low-income neighbourhood in Amsterdam. A series of workshops with residents was arranged, aiming to investigate public awareness of sustainability in the neighbourhood. The purpose of the workshops was to start a co-creation process with residents to make the Wildeman Neighbourhood prettier, smarter and more sustainable. The workshops were facilitated by consultants from DSO Alliander and The Beach Sustainist Design. A neighbourhood approach to foster energy awareness and smart energy behaviour was investigated in the theme of sustainability; which resulted in S3C support on how to set up a co-creation process with residents and the provision of expert knowledge regarding end user feedback and neighbourhood based opportunities to raise energy awareness.

The motivation for this project came from a community workshop in the neighbourhood of Amsterdam West in the summer of 2014. A discussion with some residents of the Wildeman neighbourhood exposed a neighbourhood wide question of energy use and potential savings. From this question it was decided to set up a co-creation process with the residents the Wildeman neighbourhood. The workshop process was facilitated by Amsterdam Smart City and The Beach, in collaboration with S3C. Two consultants from DSO Alliander were involved in the process on behalf of Amsterdam Smart City.

With the project title 'Saving money with smart energy: the positive energy project' this project consisted of a series of eight workshops with residents. This process resulted in insights in energy use for residents, more energy awareness, potential energy savings and an exploration of the opportunities for local renewable energy. Alliander facilitated these workshops together with The Beach. For S3C, ECN followed this co-creation process in order to test the S3C guideline for Co-creation. After each workshop, a short meeting was held to discuss how to proceed. In addition ECN presented inspirational best practice examples concerning energy saving in neighbourhoods in one of the workshops. According to the project partners who applied the co-creation guideline, it reflected what is important in practice when working on these processes, and that it is written in a way colleagues can be convinced that co-creation is a good way to engage with consumers at an early stage.

Detailed description of the integration of end users and the design of the interaction scheme in this project

The core idea of this project was to achieve a shift in awareness, attitude and behaviour concerning energy use. It is a clear example of a user centred approach, that relates both to the Smart Customer, and to end user role as a Smart Citizen. The project focused on fostering energy awareness and capacity building of citizens. The exploration for sustainable technologies and saving options for individuals and the community are leading and determines the outcomes of the workshops, and therefore the outcomes of the project. There were no actual technologies tested in the project.

Figure 39 Impression of workshop #1 (source: the S3C consortium)

In the co-creation project 'Saving money with smart energy: the positive energy project' the steps 1 to 8 (depicted below) were designed to map how to engage residents and how to involve them in the project. The approach was based on a co-design methodology developed by The Beach Sustainist Design, and tailored to the subject of smart energy. The methodology consisted of four steps – Explore, Investigate, Design and Present – which were addressed in eight consecutive workshops between mid-September and mid-November 2014. All workshops took place on Wednesday afternoon from 15.00 to 17.00.
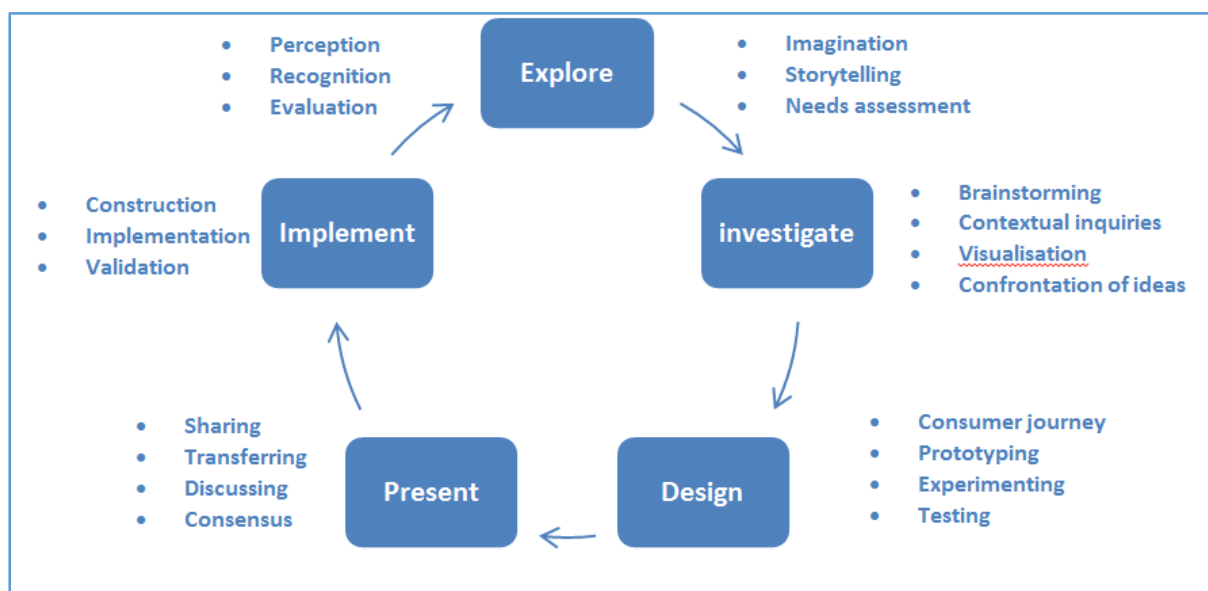
Figure 40 the co-creation cycle, source: the S3C consortium based on works of InovGrid, Alliander and the The Beach

The workshops were facilitated by consultants from Alliander (on behalf of Amsterdam Smart City) with support from The Beach. The actual implementation of the different workshops was adjusted and determined along the way, depending on choices and the progress made. After each workshop, the results, lessons learned and the next steps were discussed by the facilitator from Alliander and ECN (on behalf of S3C).

- **Explore #1:** 'Energy expedition' – Exploring the neighbourhood by using maps that show energy use per housing block together with making walks to map the energy use of the neighbourhood.
- **Explore #2: '**Mapping energy use and energy behaviour' – Depicting daily practices of domestic energy through photos and personal diaries.
- **Investigate #1:** How can the neighbourhood Wildeman save energy? – Residents investigating ideas on how to collectively save energy in their own neighbourhood.
- **Investigate #2:** Ideas for energy saving and local energy production –Brainstorming about ideas on how to individually and/or collectively save energy in their own neighbourhood and explore opportunities to generate renewable energy.
- **Investigate #3:** Ideas for energy saving and local energy production – sequel to the previous workshop.
- **Design #1:** From design to creating a prototype (first session) – Developing concepts and prototypes and mapping relevant stakeholders for implementation.
- **Design #2:** From design to creating a prototype – sequel to the previous workshop.
- **Present:** Public event with neighbourhood residents, local policy makers and other stakeholders in which the ideas and prototypes that emerged from the co-creation process were presented and discussed.

Figure 41 impression of workshop #3 including residential users from the Mooi Wildemans quarter (source: the S3C consortium)

The first two workshops exposed a widely shared question about energy literacy among residents in the multi-ethnic Wildemanbuurt neighbourhood: how can we lower energy use and reduce our energy bills? Several residents kept an energy diary and stakeholders were invited to provide insight in the resident's energy use and potential savings. During the next workshops, focus shifted towards opportunities for local renewable energy generation through solar PV. This led to exploring scenarios to organize PV-generation on the roofs of social housing blocks. Although no actual technologies were tested or implemented in the project, the objective to realize a shift in awareness, attitudes and behaviour concerning energy use in the Wildemanbuurt was achieved. Two partners are currently looking at possibilities for follow up projects (e.g. a feasibility study, stakeholder alignment).
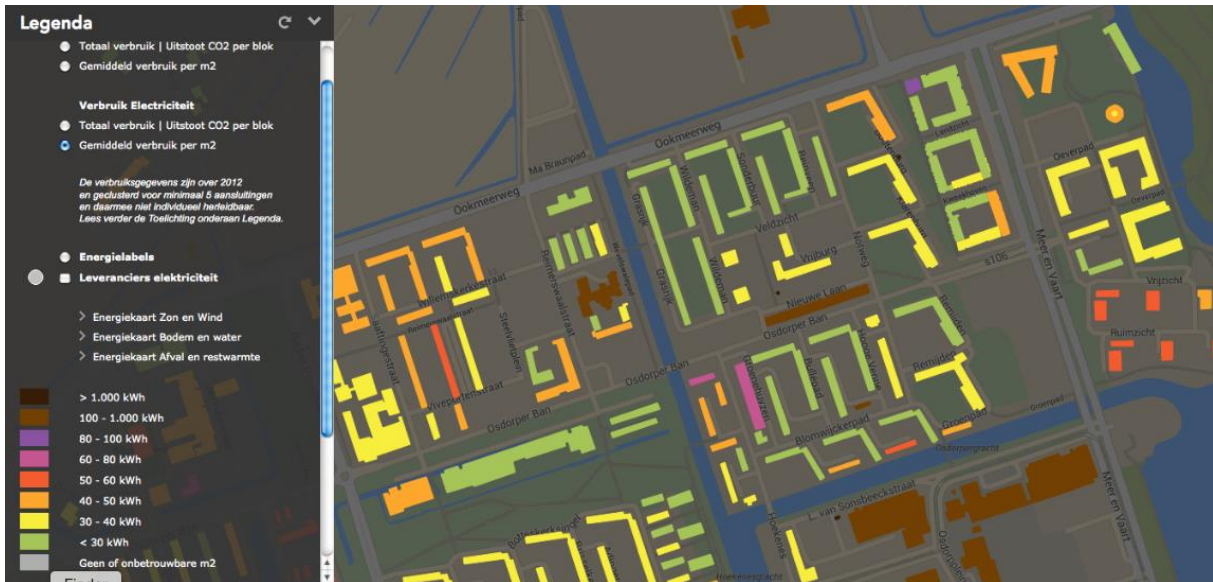
Figure 42 Example output from workshop #1: Energy heat maps showing electricity consumption per building block (source: Alliander)
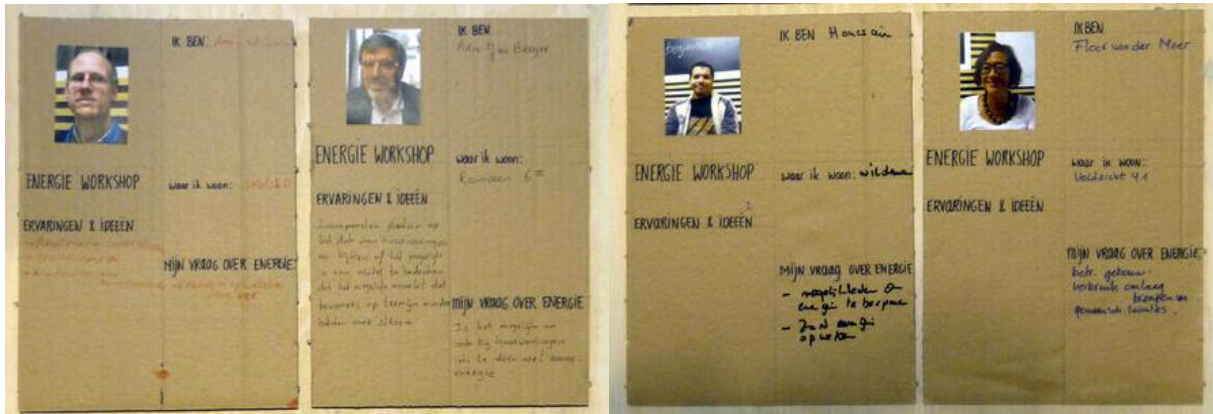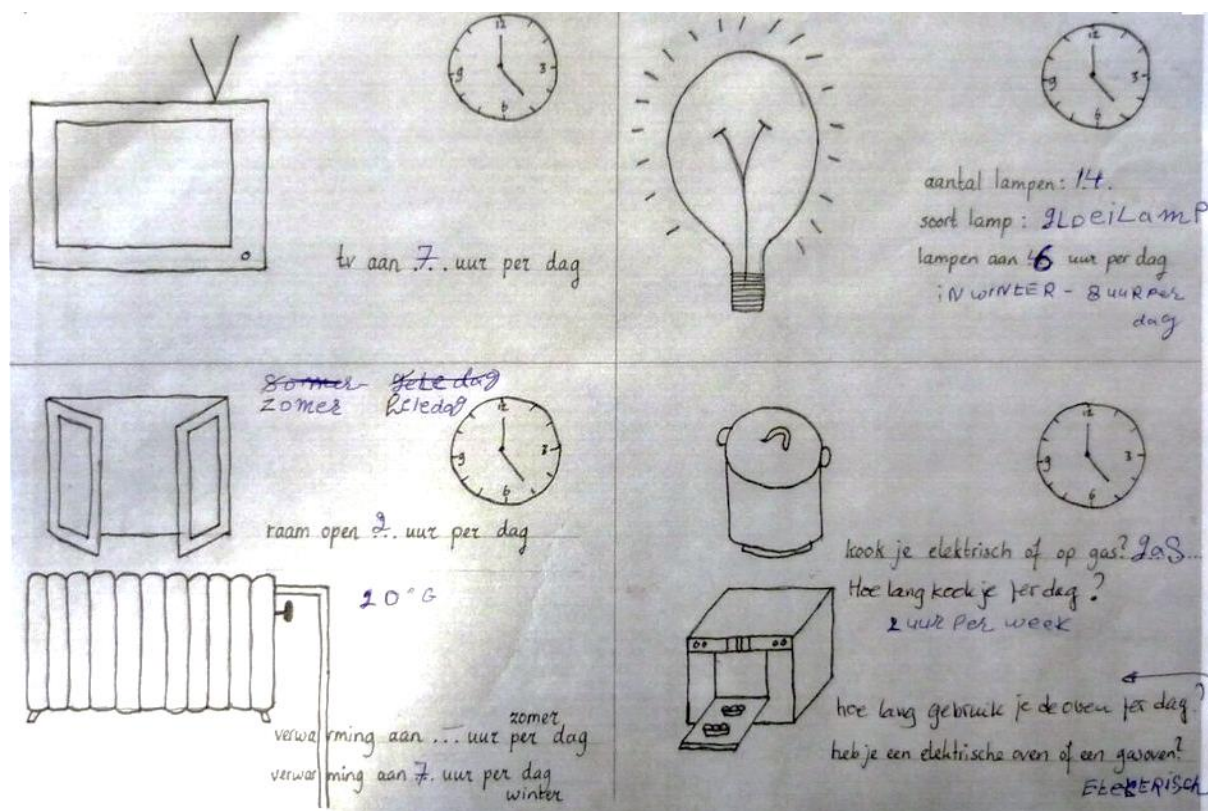
Figure 43 Impression of workshop session #2: energy diaries of the residents of the neighbourhood.

Collaboration with the partners

Point of contact for the project was Fleur Teitink from Alliander/Amsterdam Smart City.

Collaborating partners:

- *The Beach Sustainist Design:* facilitates the workshops and supports the designs and creation of the ideas and concepts of the participants.
- *Alliander:* coordinates and moderates the workshops; provides data concerning local energy use and explores the possibilities of energy savings for the participating households. In addition they do a quick scan on the possibilities of the local business case on locally produced renewable energy.
- *S3C (ECN):* Monitors the co-creation process to collect knowledge for the co-creation guideline for the S3C toolkit. ECN was present on several workshops and provided expert knowledge on how to reduce energy consumption and neighbourhood based citizen initiatives.
- *Participating Wildemanbuurt residents:* actively participating the workshops and are the ambassadors of the project.
- *Wijksteunpunt Wonen (Nieuw West):* Municipal support organisation for social housing residents, providing knowledge and information on domestic energy consumption.
- *Stadgenoot:* Housing association owning a large part of the housing stock in the Wildemanbuurt, involved in the preparation phase to recruit participants and open to discuss plans and ideas.
- *Lucas community*: Local SME-association in the Wildemanbuurt, approached to discuss plans and ideas for energy saving and renewable energy generation.

A short description on the usage of the guideline within this project

The involvement of S3C workshop took off with an informal workshop meeting in which ECN presented the goals and set-up of the S3C project, followed by the activities of WP5 and the related output. The consultants from The Beach and Alliander/Amsterdam Smart City presented their working program for the Wildemanbuurt.

This was followed by a general discussion on where S3C could meet the need of the goals of the consultants and their project. Their needs were inventoried by looking at their program and knowledge gaps. S3C could accommodate them by presenting to participating residents information about feedback on energy use and about community approaches on saving energy. For S3C, the project was an interesting opportunity to develop and test a guideline on co-creation. To this end, it was decided that ECN would contact Alliander after every workshop to discuss progress, lessons learned so far and next to take in following workshops.

Based on the input from the S3C workshop (April 2014) and the conformation meeting on process and planning (June 2016) the S3C co-creation guideline was drafted. The guideline content was also based on lessons learned in S3C passive pilots, as reported in S3C Deliverable 3.4. Together with practice experience from The Beach in the Wildemanbuurt, the guideline served as a basis for the design of the workshop process. Halfway the process, audit interviews were held with consultants of Alliander to collect their feedback on the process and lessons learned so far. In January 2015, an evaluation meeting was held to gather additional feedback. For a detailed description of S3C's involvement in the process, please refer to table in chapter 4.7.2.

Summary of feedback on the guideline by Fleur Teitink (FT) and Marijke van Elk (MvE):

- MvE: "It is a generic co creation model that explains well in general what you need to think of and what a co creation process is. The specific steps, and concrete examples of what to do should be described in a tool, but the guideline definitely fits its purpose. " The guideline is already recognized in practice by one of the partners: "In another project (in Arnhem) where Alliander works with co-*creation* workshops, they use the same steps as described in the section 'what do you need to do', although they learned that these steps are the natural, logic order of how to organize this process."
- FT: The guideline entailed helpful aspects for the project, like the steps in chronological order of what you need to do. The generic model was helpful because it created additional structure in the workshops. However, if one would start without any pre-existing knowledge on the topic, the introduction should perhaps be longer/more extended.'
- MvE: 'The guideline is related to 'learning on the job', and can help with convincing colleagues of it use. It explains the use of co creation workshops very well, and can therefore be used to show why you want to do this as an organization. So it also can help with decision making processes. The outcomes can also be very well used for more strategic decision making processes. It is not something that is only once used and then discarded, the steps and outcomes can be too valuable for that. The text is written in a way our asset department and its management would appreciate, because they understand what can be achieved by doing this. They would be able to comprehend it, and it is something they could add to their portfolio.'
- FT: 'The usability of the guideline is very high, and well appreciated. The model and the steps described in the guidelines are 'unconsciously' exactly the steps you take when co creating. Users of the guideline experienced this in another other project. So the guideline reflects this process very well.'
- FT: 'It is very important to always keep the connection between the needs of the end users, and what you offer in the workshops: one misfit is killing for the enthusiasm of the end users. To prevent this, you need a person who monitors what is happening at the workshops, also as to not let someone take over the process. That person has to see what is happening and if what is happening keeps on track of the desired goals/outcomes of the co creation workshops. So using just a guideline does not suffice: a tool that helps with this is important, but a person that specifically has this role is necessary. A suggestion is to add to the guideline a 'things you need' in which this person/role is described.'
- MvE: 'It contains helpful aspects: it is informative and constructive. It clearly has a scientific approach, but I would also need the accompanied tool. I really liked the steps of what you need to do. Provides me with structure, my company likes that.'

Between mid-September and mid-November there were 6 to 8 workshops organized on Wednesday afternoon from 3 p.m. to 5 p.m. There was a possibility of extending the project focussing on e.g. realizing ideas of citizens on renewable energy projects. Two partners are currently looking at the possibility of this follow up project.

4.7.2 Timeline of collaboration with S3C

S3C leading partner	ECN	
date of activity	**contact person**	**description**
23-01-2014	Program manager of Amsterdam Smart City and S3C team	Meeting, introduction and information process - The S3C team met the program manager of ASC to inform her about S3C, hear about their activities and define key areas for collaborations.
25-02-2014	Responsible Alliander representatives in the Mooi Wildeman test within ASC and S3C team	Information and planning phase - The S3C team introduced S3C and explained the possibilities in WP5. On March 10th ECN sent a proposal for the Mooi Wildeman project, resulting in a positive response from Amsterdam Smart City and their partner organization involved in this project. This meeting resulted in scheduling a workshop about S3C.
15-04-2014	Representatives of the Mooi Wildeman project from the Beach and ASC and S3C team	Workshop meeting (T5.1) - Workshop meeting Mooi Wildeman. S3C team met with project members of 'Mooi Wildeman' to define key areas for collaboration.
01-06-2014	Representatives of the Mooi Wildeman project from the Beach and ASC and S3C team	Confirmation meeting on process and planning phase - Project plan, and description of process plan for co-creation process.
19-08-2014	Representatives of all Mooi Wildeman partners including S3C team	Kick-off meeting with all project partners - All goals, motivations, activities and roles of the project partners are discussed. Appointments were made on who is available for which workshop and what should be the product of the first 2 workshop sessions.
24-09-2014		First co-creation workshop - S3C/ECN was there to introduce themselves as project partners and to gain insights on the process of the workshop.
08-10-2014		Third co-creation workshop - Presentation by ECN about community energy saving opportunities.
From 25-09-2014 until 15-12-2015		Reflection on co-creation workshop process - Weekly contact with Fleur Teitink (Alliander) to discuss results, lessons learned and steps an activities for the next workshop.
04-11-2015 and 05-11-2015	Responsible Alliander representatives in the Mooi Wildeman test within ASC and S3C	Audit interviews - Audit interviews with Fleur Teitink and Marijke van Elk (Alliander) to collect intermediate results/experiences from working with the co-

	team	creation guideline.
12-01-2015	Responsible Alliander representatives in the Mooi Wildeman test within ASC and S3C team	Evaluation interview - Meeting to evaluate the workshop process in the Wildemanbuurt and to collect feedback on the Co-creation guideline

4.7.3 Overview of tools and guidelines provided to Mooi Wileman

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Guideline: Co-creation - collaborating to develop smart energy solutions	Yes	Yes	Yes	24-09-2014	04-11-2015	15-11-2014

4.7.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: Co-creation – developing smart energy solutions in collaboration with users

How and why was the guideline implemented?

Considering the iterative nature of the co-creation process and the generic approach described in the guideline, it was not possible to literally implement the guideline. The guideline was, in fact, implemented as a checklist and guidance for the practitioners to e.g. double-check whether the upcoming workshop sessions were prepared adequately. Furthermore, during the collaboration and implementation process, the guideline was not only used, but also updated to convey the practical experience of the project team. The ideas, steps and advice within the guideline were thus partly inspired by the design of the pilot project in the Wildemanbuurt. ECN maintained weekly contact during the workshop phase to gather feedback on the process and think ahead with the project partners on the workshops that would follow. In these meetings the draft agenda for the next workshops was discussed and several times ECN consultants advised to keep the agenda short and simple, in order to allow for more interaction and discussion with workshop participants. Also, the draft version of a survey about domestic energy consumption was sent to ECN for review; based on ECN's comments the survey was substantially restructured and shortened to make it easier to understand for social housing residents.

Suggestions for improvement from Fleur Teitink and Marijke van Elk (Alliander):	Suggestion implemented	Reason for decision
Introduction - Introduce the makings of the guideline (sell it to the reader) - Another additional introduction can be the trend in society that relates to the co creation and contributes to the relevance of the guideline - For whom is the document intended? Why is it there and what is the job to be done? - Just reading the guideline without looking at the site does not give	Yes	When redrafting the guideline, special attention was paid to the introduction of the topic – to sell it to the reader. This was also put forward by the ADB-members who reviewed the draft guideline.

Suggestions for improvement from Fleur Teitink and Marijke van Elk (Alliander):	Suggestion implemented	Reason for decision
enough introduction to make all these questions clear.		
Guideline structure and use of best practices - Very interesting to read, but they should not be placed in a table as they are now - 'Because of this lay out, I've only read the approach section'. The description part is 'cramped' into a small section and does not invite to read. - The titles from the projects itself are also not very attractive, nor informative. It would be better to place all examples in normal format as the other sections, and use a shorter version of the approach section as heading. This would make the examples much more attractive and it probably does not add a lot in length to the guideline itself	Yes	The best practice examples are now placed throughout the guidelines, and directly relating to the content described in the guideline text.
Practical relevance for utilities - Of the steps under 'what you need to do', step 1 can be made more clear what the goal is.	Yes	In the final version, more emphasis was put on the necessity and/or practical relevance for utilities. To this end, the text under each step was revised.
Internal decision-making process - For step 1 add 'what's the job to be done' seeing it is very important to get confirmation within the company and getting this step very clear helps a lot.	Yes	This relates to the internal process within a company – something that is not a key focus for S3C but quite important for our target group.
Language and style - In the 'when to use' don't use the term 'fruitful'. It is not fitting in the rest of the document, and 'my company dislikes these kind of 'woolly' terms. - The language is scientific. When I think of co-creation, I expect a stimulating and creative piece. This is extremely informative, but for instance, it only has one picture. It should be inspiring for me to work with it.	Yes	A language check was done to avoid any normative or pejorative terminology. To make it more inspiring, the best practice examples ar now displayed throughout the guideline and more graphics were added. It was decided to stick to the rather scientific tone of voice, since it is important that the guidelines provide clear and objective information.

4.8 Sala-Heby: Electricity supply contract for households in multi-apartment buildings

Full project title	Market-based policy instruments in the residential sector. This is a research project conducted by Uppsala University in collaboration with Sala-Heby Energi AB.
Website	http://www.sheab.se/ (Sala-Heby Energi AB) http://katalog.uu.se/empinfo/?id=N12-1155 (Uppsala University, Cajsa Bartusch)
Funding scheme	Research project funded by the Swedish Energy Agency and co-funded by a number of Swedish energy companies.

Tested guidelines
- Guideline: Bonus & malus – changing behaviour with rewards and penalties   - Guideline: Motivating consumers with social comparison and competition   - Guideline: Gamification - making energy fun   - Guideline: How personal goals can motivate behavioural change   - Guideline and tool: Using segmentation to better target user groups   - Guideline: Designing a dynamic tariff   - Guideline: Choosing and combining monetary and non-monetary incentives   - Guideline: Choosing from different types of monetary incentives   - Guideline: Choosing from different types of non-monetary incentives

Which barriers and opportunities were addressed?
Opportunities   Gamification

4.8.1 Introduction to the pilot and impact of S3C

Sala-Heby Energi is a small local distribution system operator in the county of Västmanland in Sweden. Since 2003, the company has carried out a phased installation of smart meters and as part of its effort to explore the added values, the utility has collaborated with Mälardalen University and later Uppsala University to investigate the possibility of reducing system peak loads by means of a demand charge in the residential sector.

In 2003, Sala-Heby Energi introduced a demand-based time-of-use distribution tariff to households in their distribution area. After a stepwise implementation process, the demand-based tariff had been introduced to all households above apartment size in the distribution area in 2009. A research team led by Cajsa Bartusch, Uppsala University, has been following the project since the introduction of the tariff, and has published articles on the effects of its introduction. In early 2014, the research team received funding to start a new research project related to Sala-Heby Energi, named "Market-based policy instruments in the residential sector". The project will for instance include testing of new offers for apartment customers and visualization of energy use. The project is funded by the Swedish Energy Agency, three local DSOs and two companies dealing with energy data and energy feedback, respectively.

The new project aims at developing an electricity supply contract with a target component for apartment households with district heating, as well as quantifying the impact on the electricity use. Furthermore, a real-time energy visualization interface will be developed in co-creation with customers and later tested by about 200 of Sala-Heby Energi's customers. The interface will be implemented both as a web based service and in-home displays. A first pilot will be initiated in autumn 2015, and Sala-Heby Energi and the research team plan intensive interaction with the pilot households. For example, focus groups have been used to map customers'

preferences for the energy feedback interface and will also be used in the planning of the intervention, and meetings will be arranged to support the introduction of the new contract.

S3C has fed into the project by providing a theoretical background, inspiration and good examples on for instance competitions, games, incentives and target components in electricity supply contracts. The research team used compiled knowledge from S3C as a starting point in the design process of the new intervention. S3C researchers have also been part of the research project's reference group.

Figure 44: Local energy company building relations with customers

The users involved in the research project conducted by Uppsala University are all customers of Sala-Heby Energi. The organisational vision and business concept are to work locally with sustainable energy issues, creating large and local change through customer understanding and establishing relations to customers. To Sala-Heby Energi, the long-term relation to customers is crucial and the company has many activities aiming to interact with its customers, such as clubs for people interested in locally produced electricity, social events and information meetings. They also arrange theme days for their customers where they are invited to visit other households with innovative energy solutions.

Ten years ago, Sala-Heby Energi introduced a demand-based time-of-use distribution tariff for households in single-family houses. As this tariff only applies to some of the company's customers, a logical next step was to develop an offer for households in multi-apartment buildings. Sala-Heby Energi in collaboration with Uppsala University has therefore initiated a research project aiming to support the development and evaluate the offer.

Research project on market-based policy instruments

The research collaboration with Uppsala University includes many areas, for instance development of in-house displays/web portals for individual energy use feedback and studies of the load shift potential from different incentives. The collaboration with S3C has only focused on the new offer and therefore doesn't include any specific technology used to interact with the customers. As the contract has not yet been launched, there are no information on how the offer to customers will be designed in detail, how many users that will be involved or what means for communication (such as letters, websites etc.) that will be used.

The user has a central role in the project, both being a customer to an energy company with a strong focus on customer relations and also being the receiver of a new offer to be studied through a research project. To capture ideas and experiences of the customers, focus group meetings will be arranged.

Collaboration with S3C

The relation between S3C and the research project was initiated in early 2013, when SP staff contacted the leader of the research team at Uppsala University, Cajsa Bartusch. Her research on the demand-based time-of-use distribution tariff of Sala-Heby Energi was highly relevant to S3C in terms of representing a successful Smart Energy project. Contacts with the energy company itself resulted in Sala-Heby Energi being included as a passive partner to the S3C project. Thus, the initial contact between the research team, Sala-Heby Energi and S3C focused on collecting information through interviews.

Further, the constellation of Sala-Heby Energi and Uppsala University became an active partner through the framework of their joint future task of creating and studying a new contract to households in multi-apartment buildings. The new offer would be introduced to customers of Sala-Heby Energi, and the final design of the concept would therefore be determined by the energy company. A background study and recommendations on the design of the contract were to be conducted by Uppsala University.

In the early stages of the collaboration process with S3C, it was established that support and information from S3C would be most useful in the initial background studies on incentives and contracts, supporting the research team from Uppsala University. Since then, there has been continuous contact between SP staff and the research team at Uppsala University to pinpoint which specific aspects the S3C project could contribute with. These discussions would eventually result in the identification of a number of guidelines that could be useful as background information to the research team in the contract design process.

As households in multi-apartment buildings often have relatively low electricity use, economic incentives would probably not be sufficient to motivate energy savings and the idea of introducing other/additional incentives was therefore considered by the energy company. To this end, the energy company showed an interest in good examples of different incentives, the possibility to include an element of competition or game in the offer, and setting an energy use target. Further, the research team was interested in information on end-user segmentation as part of another sub-project within the ongoing larger research project. These themes came to be the basis for collaboration between S3C and the research team. Thus, the following guidelines were submitted to Uppsala University:

- Guideline: Bonus & malus – changing behaviour with rewards and penalties
- Guideline: Motivating consumers with social comparison and competition
- Guideline: Gamification - making energy fun
- Guideline: How personal goals can motivate behavioural change
- Guideline and tool: Using segmentation to better target user groups
- Guideline: Designing a dynamic tariff
- Guideline: Choosing and combining monetary and non-monetary incentives
- Guideline: Choosing from different types of monetary incentives
- Guideline: Choosing from different types of non-monetary incentives

The guidelines have been used as input to an initial background study on incentives by the research team, and as inspiration for the development of a new offer to Sala-Heby Energi's customers. The guidelines have primarily contributed to the project by providing information on the status of research in relevant topics, as well as good examples from other countries. A few guidelines remained unused, mainly due to timing.

4.8.2 Timeline of collaboration with S3C

Responsible S3C partner	SP Technical Research Institute of Sweden	
Date and type of activity	**Contact person**	**Description and outcome**
March-June 2013	Senoir research at Uppsala University facilitating Sala-Heby product development and S3C team	E-mail and phone contact with researcher connected to Sala-Heby Energi AB.

June 2013	CEO of Sala-Heby Energi and S3C team	First meeting with group CEO to introduce scope of S3C
September 2013	Representatitves of Sala-Heby Energi and Uppsala university	Interview for D2.2 (as a passive partner) and initial discussions on potential for becoming an active partner.
September 2013 to July 2014	Representatives at Uppsala university	Continuous contact and discussions on the proceedings of S3C and the research part of the Sala-Heby project on new tariffs. Several phone calls and meetings to discuss in depth our future collaboration and details on what support S3C can provide to the research part of the Sala-Heby project. A few points of interest were identified.
April 2014	Representatitves of Sala-Heby Energi and Uppsala university and the S3C team	Kick-off meeting for the research project in Sala-Heby, to which the S3C team was invited.
July 2014	Representatives at Uppsala university	Guidelines related to the identified points of interest were sent to the research team of Uppsala University for testing.
August 2014	Representatives at Uppsala university	Reference group meeting related to the research project of Uppsala University. Some of the S3C guidelines were summarized and presented by a team member to the reference group.
September 2014	Representatives at Uppsala university	Reference group meeting related to the research project of Uppsala University. Again, some of the S3C guidelines were summarized and presented by a team member to the reference group.
October 2014	Representatives at Uppsala university	Audit on tested guidelines with Uppsala University.
December 2014	Representatives at Uppsala university	Reference group meeting related to the research project in Uppsala. The design of the offer to the apartment end-users of Sala-Heby Energi was discussed.
2015	Representatives at Uppsala university	Continuous contact throughout the year between members of the S3C team and the research team.

4.8.3 Overview of tools and guidelines provided to the research team at Uppsala University

Guidelines/tools received	Reviewed for implementation	Tested	Adapted	Start	First audit	End
Guideline: Choosing and combining monetary and non-monetary incentives	Yes	No	No	July 2014	Oct 2014	Oct 2014

Guidelines/tools received	Reviewed for implement ation	Tested	Adapted	Start	First audit	End
Guideline: Choosing and combining monetary and non-monetary incentives	Yes	No	No	July 2014	Oct 2014	Oct 2014
Guideline: Choosing from different types of monetary incentives	Yes	No	No	July 2014	Oct 2014	Oct 2014
Guideline: Choosing from different types of non-monetary incentives	Yes	No	No	July 2014	Oct 2014	Oct 2014
Guideline and tool: Using segmentation to better target user groups	Yes	No	No	July 2014	Oct 2014	Oct 2014
Gamification – making energy fun	Yes	No	No	July 2014	Oct 2014	Oct 2014
Designing a dynamic tariff	No	No	No			
Motivating consumers with social comparison and competition	Yes	No	No	July 2014	Oct 2014	Oct 2014
How personal goals can motivate behavioural change	No	No	No			
Bonus & malus	Yes	No	No	July 2014	Oct 2014	Oct 2014

4.8.4 Implementation of S3C guidelines and tools and suggestions for improvement

As described in the table above, none of the guidelines were implemented or tested by active partner. Instead, they were reviewed for implementation. During the audit with the S3C project team, the reviewed guidelines were clustered in three groups.

The guidelines "Setting up price use mechanisms" and "Target component as an incentive" were originally planned to be reviewed for implementation by the active partner. However, the research project was in its initial phase when the collaboration with S3C occurred, and not all of the planned guidelines were relevant during this stage but would rather be of use in later phases of the project. Thus, these two guidelines were never reviewed, tested or implemented.

Guidelines "Bonus & malus – changing behaviour with rewards and penalties", "Motivating consumers with social comparison and competition" and "Gamification - making energy fun"

As described earlier, the guidelines were used as inspiration and input to an initial background study on incentives by the research team from Uppsala University. The topics of the guidelines are well aligned with some of the goals and aims of the research project, for instance the goal of "developing a goal-based electricity contract for households in multi-apartment buildings with district heating".

The research project had merely started when the guidelines were sent to the research group. The guidelines were thoroughly reviewed by one of the research team members, and the contents of the guidelines were used as input to the background study on incentives. For instance, the contents of the guidelines were presented to all project participants, including several small energy companies, in a reference group meeting.

As the project will be on-going until 2017, it's too early to tell if the goals will be reached. The guidelines were useful as theoretical input and inspiration to the background study and development of incentives.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Add more references in a "read more" section, both general sources and references to specific facts.	Yes	
Add interconnecting links to the other guidelines.	Yes	

Guidelines "Choosing and combining monetary and non-monetary incentives", "Choosing from different types of monetary incentives" and "Choosing from different types of non-monetary incentives"

As described earlier, the guidelines were used as inspiration and input to an initial background study on incentives by the research team from Uppsala University. The topics of the guidelines are well aligned with some of the goals and aims of the research project, for instance the goal of "developing a goal-based electricity contract for households in multi-apartment buildings with district heating".

The research project had merely started when the guidelines were sent to the research group. The guidelines were thoroughly reviewed by one of the research team members, and the contents of the guidelines were used as input to the background study on incentives. For instance, the contents of the guidelines were presented to all project participants, including several small energy companies, in a reference group meeting.

As the project will be on-going until 2017, it's too early to tell if the goals will be reached. The guidelines were useful as theoretical input and inspiration to the background study and development of incentives. Regarding the project's work with users, there was already a good and well-established relationship with Sala-Heby Energi's customers, and the guidelines didn't contribute in this aspect.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Make a clear distinction between monetary and non-monetary incentives guidelines, or a joint guideline.	Yes	The previous version has been extended. There is a common guideline explaining the general impact of incentives and two separate guidelines going into more detail regarding specific monetary and non-monetary incentives.
Apply the same structure as in other guidelines.	Yes	The structure has been thoroughly adjusted and now mirrors the general structure.
Add a theoretical background	Yes	A thorough theoretical background section was added to the overall guideline on incentives.
Add references for further reading.	Yes	This section was included.
Add examples and a text "when does it work". This also helps the reader to understand possible contexts for application.	Yes	See above
Add that the national context must be taken into account, for instance legislation, subsidies etc.	Yes	See above

Guideline and tool: Using segmentation to better target user groups

This guideline was reviewed for implementation and used as background material in a specific subproject, where the research team conducted a segmentation of electricity users based on a survey. According to the responsible team member, a large part of the work on segmentation was based on the guideline in question and the guideline suited the aim and purpose of this subproject very well. Relevant examples as well as a broad theoretical background provided the research team member with sufficient information.

The research team member responsible for the subproject on segmentation reviewed the guideline when the work had just started. The guideline was used as inspiration for the practical work related to segmentation.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
No suggestions		

4.9 SPEU

Full project title	SPEU (Service portal for Monitoring of Energy efficiency)
Website	n.a.
Funding scheme	Slovenian Ministry for Science and Education and the European Regional Development Fund

Tested guidelines
• Guideline: How to make energy visible through feedback • Guideline: User-centred KPIs for the evaluation of smart grids • Guideline: KPIs for energy consumption effects

Which barriers and opportunities were addressed?
Barriers • Non-viable business cases for end users • On-going technical problems and unreliable technology
Opportunities • Reinforce the end user perspective in the project design • Develop viable business model • Co-creation

4.9.1 Introduction to the pilot and impact of S3C

The aim of the project SPEU was the development and test of a cloud computing service for energy efficiency monitoring implemented in the form of the web portal.

The main target of the project was to address the limitations by designing energy monitoring applications on a cloud computing platform. The idea of the application is to bring the monitoring information from several end users, in this case SME's and other commercial customers, to the common workspace enabling the inter-company comparison of energy efficiency processes based on the common efficiency indicators.

The project received cofounding from the Slovenian Ministry of Economy and European regional funds within the Slovenian national development programme "e-storitve 2012".

The energy management process consists of four steps. Two of these were addressed by the project application (see Figure 45):

- Measuring of production or consumption: The measuring is provided on the aggregated level of the consumer as well on the particular appliance.
- Calculation of energy (consumption) efficiency. The service defines the energy efficiency indicators, which are calculated automatically and presented to the consumer in the form of reports.
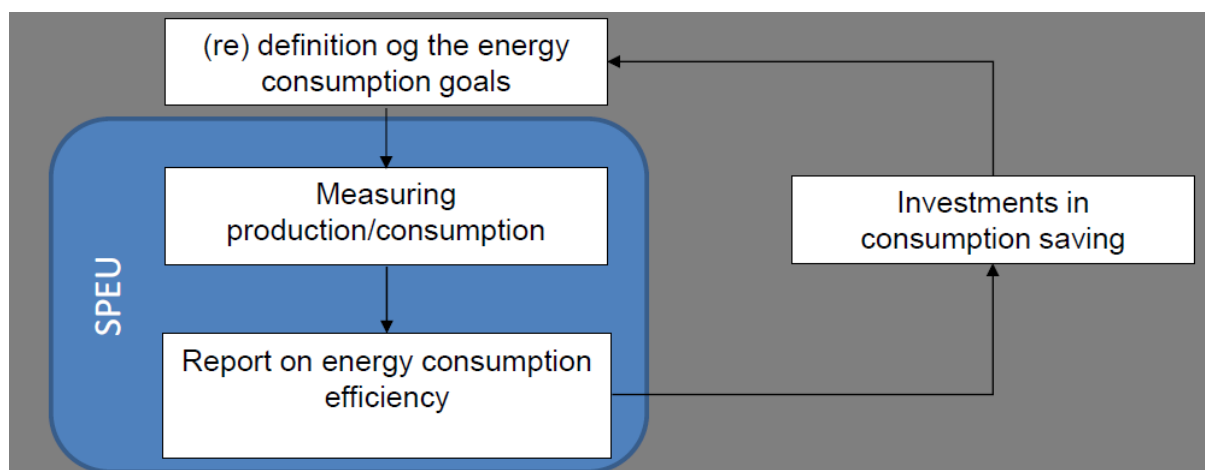
Figure 45: Energy management steps, source: project SPEU, presentation on CLASS Conference 2014, 25.9.2014, Bled

The project background was developed from the hypothesis that energy monitoring systems in the industrial sector are not exploited as much they could be. The main limitations noticed were 1) information collected by the system remained within the technical sector and out of the business domain, 2) the evaluation of the energy consumption was limited to single consumers, not rendering external and/or global comparisons and 3) relatively large installation and maintenance cost prevent small end users to invest in applications and equipment.

The goal of the project was to build the end-user oriented application. Therefore, a close cooperation with the consumers during development was foreseen. It was decided to include two representatives of large-scale consumers as consortium member into the project and to intensively cooperate with them during the development. One consumer was a representative of the motor industry with several locations, while another was representing an office building. The plan was to address other candidates later – after finishing the pilot stage - for testing.

The project had two integration stages. The end users were directly involved into the development and design of the application in a technical process on the one hand side. On the other hand side they were involved in the design of the specific feedback information and end user experience.

The cooperation with the S3C project provided a benefit for both projects, especially with regards to the design of the feedback and the end user experience. Based on S3C guidance, the SPEU project staff readjusted the feedback systems and consumption targets for their trial in an office building.

The project tested the following guidelines:

- Guideline: How to make energy visible through feedback
- Guideline: User-centred KPIs for the evaluation of smart grids
- Guideline: KPIs for energy consumption effects

One of the testing results was a design of additional performance indicator, which included the economic component and gave concrete information to the user responsible for energy consumption.

Another result of S3C impact is the enhancement of the end-user interaction. The SPEU project designed an additional communication channel (web form displayed on screens) of the actual consumption. The presentation was intended for the employees of SME's in the tech and engineering sector sharing an office building to increase their energy awareness and is accessible via a display at the entrance hall (see figure 46).
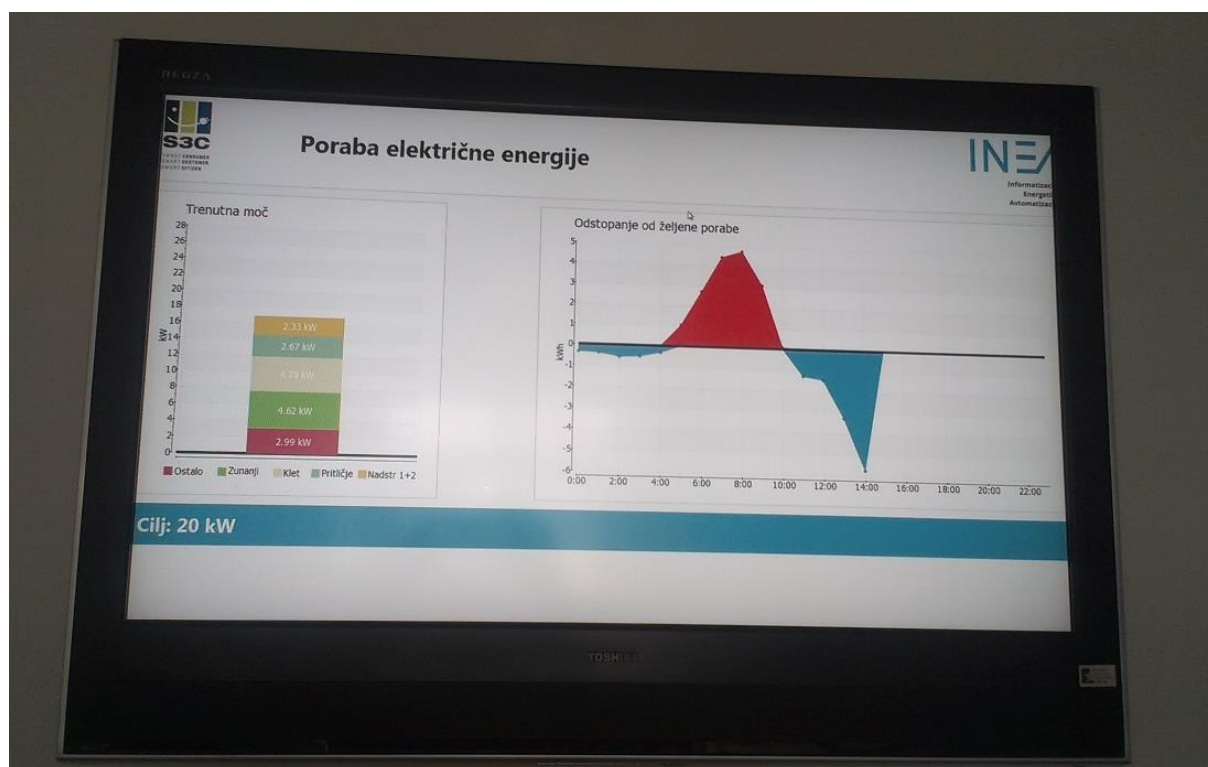
Figure 46: Energy feedback as implemented in the SPEU project, source: the S3C consortium

The cooperation with the S3C also included the interaction with the KIBERnet active partner. The SME representatives from KIBERnet partner also agreed to participate in a short evaluation test of the SPEU project and helped to define some additional performance indicators. The project SPEU was set up to the pilot stage for a proof of concept and to prepare it for the commercial use. The consumer representative from the industrial branch was selected according to the personal contact and included into the project as a consortium partner. Later during the project another consortium partner with smart metering installations in its office building, also participated in the role of consumer in the project.

The end user interaction is provided through the advanced web portal, where they were faced with their consumption and values of efficiency indicators and historical comparison. The application also supports the configurable notification system, which informs the consumers about e.g. unexpected deviations of consumptions via e-mails.

The consumers played active role in the project. They were directly involved in the development of the application as well in its testing and generation of feedback. The company INEA was the project leader of SPEU. It was one-year project, which has started in June 2013. Collaboration with the S3C project started in the summer 2014 when the SPEU started to look for testing and evaluation options on one side and the S3C project provided some interesting and relevant guidelines.

The first workshop served to create an overview of the existing guidelines. It has been identified that the guidelines regarding evaluation were the most interesting and relevant for the project. The SPEU project may also provide important material for the guidelines regarding the performance indicators.

The second workshop was organized together with the KIBERnet partners. The intention was present the options of the web portal and invite the partners for participation. The outcome was that the four industrial consumer representatives agreed to offer their data for testing.

The following guidelines were evaluated:

- Guideline: How to make energy visible through feedback
- Guideline: User-centred KPIs for the evaluation of smart grids
- Guideline: KPIs for energy consumption effects

The guidelines regarding the performance indicators were used to elaborate ideas about definition of the KPIs and corresponding data processing (in the case of the project, they were used to decide on the desirable target for energy consumption in real time within the office building).

The end user feedback guideline was used for active inclusion of the employees of the office building in the project. Based on the different available types of feedback information presented in the guideline, the consumers were enabled to make a decision on which information was of particular relevance to them. Based on the information, a feedback display app was devised and presented at a prominent place in the entrance hall of the building that is divided into different offices for mostly tech-companies and engineering firms. It is important to note here, that industrial/technical/engineering focus of the companies in the office building led to a preference for more technically-oriented feedback than it was the case in the active and passive partners activating residential customers. The employees of the firms have sufficient "energy proficiency" to understand the histograms and block diagrams presented in the feedback app and did not have to be supported of the relevance of energy (costs) for their companies.

Figure 46 is a photograph of the feedback instrument implemented. The feedback instrument's purpose is to be informative as possible and targets the technology-oriented engineers and scientists working in the office buildings and to help bring about the target the companies working in the office building have set for themselves. Based on the advice in the feedback guideline the companies have decided to implement the concept of energy consumption targeting by means of feedback. The consumption targeting information needed to be sourced from the performance indicator, which should provide reliable information about the consumption efficiency. The finding that the evaluation guidelines need to be used synchronously with the end user feedback guideline was one of the main results of testing. In fact, the blue line in Figure 46 at the bottom of the screen indicates the target power in real time (in this case 20kW). The optimum power is dynamically recalculated according to how many employees are present at the time.

The chart diagram on the right side shows the total deviation form the target in kWh on the daily level. Blue indicates that consumption was lower than the target and red over the target. The consumption is very much dependant on occupancy of the building, therefore also presency is measured in real time.

The block diagram on the left side of the screen indicates the power consumed in the building in real time. The different colours refer to the different floors of the office buildings (cellar, ground floor, upper floors, lodgers etc.) to render the individual consumption of the different companies in the office building transparent.

Overall, the S3C guidance helped the commercial customers represented in the office buidling and the SPEU project to devise a new feedback channel that is tailored to information requirements technology oriented SMEs have. Furthermore, the process led a commitment and goal setting process within these SMEs that agreed to using less energy, i.e. making the most efficient use of energy.

4.9.2   Timeline of collaboration with S3C

Responsible S3C partner	INEA	
Supporting S3C partners	SP, VITO	
Date and type of activity	**Contact person**	**Description and outcome**
Jul 2014	Representative of SPEU consortium	Release of the SPEU product pilot stage.
Aug 2014	Representative of SPEU consortium	Overview of the guidelines and selection for their usage and testing.
Nov 2014	Representative of SPEU consortium	Presentation of the SPEU testing & evaluation on the S3C consortium meeting

Mar 2015	Representative of SPEU consortium	Start of testing the performance indicators and end user feedback guidelines
Apr 2015	Representatives of SPEU and KIBERNET consortium	Presentation of the SPEU project to the KIBERnet Consortium.
Jun 2015	Representative of SPEU consortium	First draft results of the testing

4.9.3 Overview of tools and guidelines provided SPEU

Guidelines/tools received	Reviewed for implementation	Tested	Adapted	Start	First audit	End
Guideline: How to make energy visible through feedback	Yes	Yes	Yes	Jun 2015		June 2015
Guideline: User-centred KPIs for the evaluation of smart grids	Yes	Yes	Yes	Mar 2015	June 2015	Dec 2015
Guideline: KPIs for energy consumption effects	Yes	Yes	Yes	Apr 2015	June 2015	Dec 2015

4.9.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: How to make energy visible through feedback

Why was the guideline implemented?

The project SPEU main point was dealing with energy efficiency in SMEs and buildings. The hint from S3C was that SME employees in office buildings may contribute to it. Therefore, the guideline "How to make energy visible through feedback" was used to improve the overall company energy awareness. The section on the different communication channels for feedback in the guideline was of specific importance for the project as they based their decision on their feedback strategy on it.

How was the guideline implemented?

The guideline was used after the project was completed with setting up the application in the pilot stage. The testing included only the consumer with the office building since the industrial representative has not been recognized as relevant.

The main issue of the guideline evaluation was providing the suitable communication channel for the employees. It was decided to use mixed feedback systems, which would combine

- In house display – the existing large display in the entrance hall is use to present the actual consumption (total consumption, consumption per floor and time history compared to average)
- Text messages/emails, sent on the occasions when consumption was extremely high and extremely low.

For the time of writing the report only the first option is in force, while the second is planned to be implemented later in autumn 2015.

The main goal of the guideline – consumer awareness about energy consumption - was reached. There was a lot of feedback from employees about the design and information that should be presented as also investigation, what loads actually cause particular consumption. The test gave some useful information, how to form performance indicators for end user feedback, however the testing period is too short to detect the change in consumption.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Rename chapter title "Feedback systems", which would be better renamed into "Feedback methods" or "Feedback channels".	Yes	A term "system" more describe the facility or a group of facilities, while in the guideline there is more talk about the different options of feedback. The section has been renamed to feedback channels.
The guideline is missing best practice example. In this case one would be very helpful.	Yes	Best practice example makes the guideline more attractive and the active partners at EDP provided great examples of feedback particularly for commercial users.
The use/testing of the guideline needed the description of the feedback information. It was noticed that the guideline was a little bit short on concrete suggestions about this information. It is suggested to add some sample or at least the link to the guideline "Measuring the effects of smart grid projects or rollouts".	No	Using the guideline required also inclusion of other guidelines.

Guideline: User-centred KPIs for the evaluation of smart grids

Why was the guideline implemented?

Dealing with the energy efficiency in SMEs and buildings the project SPEU used various types of performance indicators for its measurements and presentation. With a clear description of end user centred energy performance indicators the guideline was very useful for the project to get an overview of the suitable KPIs with respect to the needs of the end users.

How was the guideline implemented?

The guideline was used after the project was completed with the setting up the application in the pilot stage. The guideline has been found useful for defining suitable KPI's for energy monitoring of a business building. The most relevant part for the active partner is KPIs for Smart consumer. The existing KPI's have been checked. In addition the active partner is going to design and implement also the financially-oriented KPIs. Other parts of the guideline were not found relevant for inclusion into the testing since the project mainly stayed on the level of "smart consumer".

The intention of financial KPIs is to give the users of the application (building owners) the consumption costs and economical effect of different (investment or organisational) measures. With their help the energy manager specifies energy costs and potentials on savings.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
One would appreciate some graphical element to draw the reader's attention.	Yes	Graphical elements have been added to make the guideline more attractive (also in line with general recommendations for all the guidelines).
Best practice examples should be further and thoroughly described.	No	Best practice examples could not be integrated because the S3C project established a clear lack of systematic approaches to evaluating end-user experiences in smart grid projects or rollouts.
The missing information could be, that there is no direction how to approach the evaluation KPI's for the business oriented buildings where the end users are not directly affected by the costs, but one would like to stimulate the employees to behave economically.	No	The guideline is not specifically addressed at employees in commercial buildings. It addresses households in their 3 possible roles as consumers, customers or citizens.
The guideline does not propose the KPIs in explicit form/way. Maybe it would be good to add some good practice example and make a linkage to the guideline "Measuring the effects of smart grid projects or rollouts".	Partly	A link to the guideline "Measuring the effects of smart grid projects or rollouts" has been included. Good practices in the field are lacking (cf. *supra*).

Guideline: KPIs for energy consumption effects

Why was the guideline implemented?

The processing of KPIs and examples presented in the guideline were found relevant for the needs of the project for its evaluation. The guideline has been found useful for defining suitable KPI's for energy monitoring of a business building and SMEs. In the project several of the proposed KPI's (energy per employee, energy savings, energy per m2) have been implemented.

The test that is being performed is actually combining the two guidelines – beside "KPIs for energy consumption effects" it also involved "How to make energy visible through feedback". From that point of view it was established that one needed to implement some motivation goals for end users. Since the goal was energy preserving it was necessary to define the consumption targets based on past consumption and to present it in some understandable form of KPI.

How was the guideline implemented?

The guideline was used after the project was completed with the setting up the application in the pilot stage. The existing KPI's have been checked and adapted according to the directions in the guideline. The main goal was to form the relevant performance indicator, which could be used to attract the employees for consumption awareness and smarter behaviour. The goal was reached by definition of the specific electricity energy consumption, which takes also the amount of residents present in the building, and was used in the definition of the (yearly) target consumption.

Suggestions for improvement	Suggestion implemented	Reason for decision
The structure of the chapter »What do you need to do« could be improved (the title "Use for evaluation" does not tell much").	Yes	Readability improvement.
The table of listed KPIs would improve the readability.	Yes	Readability improvement.
More detailed information on best practice examples would improve the quality.	Yes	Concrete examples variegates the reading
Adding the description of which KPIs are most appropriate for different types of users would benefit to the "width" of the content and scope.	Yes	Segmentation in description is very important at addressing a particular type of end user.
Posting a link to the guideline Evaluation through end user centred KPIs would provide readers the possibility to explore more detailed information on the topic.	Yes	Since the testing used several guidelines synchronously this should be reflected in their description.
The addition of economic parameters should be considered.	Yes	This is important for facing the values of KPIs to the investment decision makers at SMEs
Since the goal was energy preserving it was necessary to define the consumption targets based on past consumption and represent it in some understandable form. It is recommended to enhance the guideline with energy targeting description and its relation to the KPIs.	Yes	One way of triggering the end user feedback is facing him with the energy targeting, which is based on corresponding KPI.

4.10 UppSol 2020

Full project title	UppSol 2020
Website	http://www.stunsenergi.se/projekt/uppsol-2020.aspx
Funding scheme	The Swedish Energy Agency

Tested guidelines
• Guideline: Co-creation - collaborating to develop smart energy solutions • Guideline: Learning about target groups • Guideline: How to improve you smart energy project through check-ups • Guideline: Self-assessment to create a reflecting team culture

Which barriers and opportunities were addressed?

Opportunities
 	
  • Reinforce the end user perspective in the project design
  • Co-creation

4.10.1 Introduction to the pilot and impact of S3C

STUNS – the Foundation for Collaboration between the Universities in Uppsala, Business, and the Public Sector – serves, as their name indicates, to be a connection between academia and industry and facilitate the establishment of spin-off businesses from the universities. The project UppSol 2020 is carried out in collaboration between STUNS, Uppsala county administrative board and other regional organisations in the Uppsala region. UppSol 2020 is one of several projects where STUNS have applied the same method to achieve end user engagement and installation of energy efficient technology. The project ended in the beginning of 2015.

The main aim of UppSol 2020 was to increase the rate of photovoltaic (PV) installations in the region by disseminating experiences from one representative stakeholder (a so-called forerunner) to a group of followers by organizing a number of PV test beds. Each test bed involved a series of three workshops; one each for the planning phase, execution phase and follow-up. The idea was that a number of followers – the same type of stakeholder as the forerunner – would follow the entire installation process from procurement to deployment and monitoring to secure systematic dissemination of experiences. The process aims to give a true picture of the real situation, providing actual insights to the installation of PV, both the positive and negative sides of it. The stakeholder groups involved in UppSol 2020 were housing associations, municipalities and property owners. There have also been test beds presenting PV solutions with battery storage and PV installations on flat roofs.

A group of approximately 15-20 followers were invited to each workshop series to follow the installation of PV at the forerunner's premises. The workshops both contained knowledge-raising activities and activities where the forerunner would present experiences and results, as well as provide answers to questions. The workshops were organized by STUNS in collaboration with the forerunner. At the workshops, STUNS contributed with know-how as independent experts on solar electricity. Every occasion included time slots for social interaction between participants, to provide an opportunity to discuss the topic and ask questions face-to-face. The goal of the forerunner/follower method is to raise the consciousness of the users, to show that if a forerunner within the same target group can do the installation, it should be manageable for others as well. The use of a forerunner from the target group in question is meant to instil security and informal authority.

A user-centric project approach

The project UppSol 2020 was not an explicit smart grid project, but was associated with a methodology to raise users' confidence and procurement skills, and thereby increase the actual installation rate of new energy technologies. Moreover, it dealt with engaging and strengthening the user in a very concrete manner, which may

be useful as input to the implementation process of other technological solutions associated with smart grids. At the core of STUNS business is a true customer focus, which is reflected in their projects. Thus, the users were the centrepiece of UppSol 2020, taking its starting point in the needs and conditions associated with the stakeholders involved. The whole idea of the project is to facilitate customer and user initiatives and provide them with information, experience and support, transferred from one customer to others within the same group of stakeholders. As STUNS works very close to users, they wanted to create forms for dissemination based on the users' questions and conditions, and thereby disseminating experiences rather than only information within Uppsol 2020.

The project is a continuous learning process for all actors involved, including STUNS. It is experimental work based on close contact with users and the project team emphasizes the importance of understanding the true drivers and motivations of the users. Within the project team, there is a common understanding of the importance of humbleness towards the users, to let the discussion be on non-technical issues and issues experienced as trivial or non-factual by an expert. The basic idea is that, since the users are the ones investing their money in the technical systems, their needs and thoughts must be the starting point of the project activities.

Some apparent success factors of this project is its ability to work in the true context of users, getting very close to their situation and understanding the target groups. The project is based on the knowledge and experiences from the customers and users themselves. To succeed with such an approach, close and personal relations are crucial, which is not only enabled by the personal networks of contact but also from the open and intimate setting of the process, involving a relatively small group of people. The local context is also an important success factor, especially when it comes to reaching users/stakeholders in smaller towns or villages. The project team makes sure to structure meetings from the participants' point of view, which means that meetings are organized in the users' context and the team travels to them, not the other way around. The local context is also affecting the forerunner - follower approach, as the followers are more likely to follow someone who resembles themselves and who acts in the same context.

Collaboration with S3C

The initial contact with the project was taken by the S3C team in autumn 2013. Due to vast experience with customer and user collaborations and customer focus, the UppSol 2020 project was engaged as a passive partner of the S3C project and provided information about their work and experience during the first meetings. Further, UppSol 2020 agreed to become an active partner following discussions on potential support from S3C to the project. The team was very interested in getting to know if their project was on track, if project goals would be met and the experience of project participants. In addition, capturing the development and learnings within the project team itself was perceived as interesting. Thus, two guidelines were created to support UppSol 2020 in these aspects, while a third guideline would bring structure to a workshop with the project reference group at the end of the project. Finally, the vast experience in STUNS regarding customer focus was considered a valuable asset, and the team was thereby asked to review an additional guideline from their perspective.

The following guidelines were used in the collaboration with UppSol 2020:

- Guideline: Co-creation - collaborating to develop smart energy solutions
- Guideline: Learning about target groups
- Guideline: How to improve you smart energy project through check-ups
- Guideline: Self-assessment to create a reflecting team culture

Two of the guidelines ("How to improve your smart energy project through check-ups" and "Self-assessment to create a learning team culture") were created by the S3C team to fit the needs of UppSol 2020. These guidelines were tested as part of an evaluation of the project. The activities from the guidelines supported the project by supplying information on user experience, that wouldn't have been captured through other activities. The guideline "Learning about target groups" was reviewed by STUNS due to their knowledge on customer engagement and relations. The guideline on "Co-creation - collaborating to develop smart energy solutions" was planned for testing with UppSol 2020, to be used as a format for the final meeting with the project reference group. However, the character of this meeting changed during the course of the collaboration between UppSol 2020 and S3C, so the guideline was never reviewed, tested or implemented.

4.10.2 Timeline of collaboration with S3C

Responsible S3C partner	SP Technical Research Institute of Sweden	
Date and type of activity	**Contact person**	**Description and outcome**
September 2013	Representative of STUNS	E-mail, phone calls for continuous information and exchange process
4th of October 2013	Representative of STUNS	Meeting to introduce S3C thoroughly and learn about the approaches at UppSol 2020
20th of November 2013	Representative of STUNS	Interview for D2.2 and discussions on becoming an active partner.
14th of March 2014	UppSol 2020 project team	Workshop to define the support S3C can provide the project.
23rd of April 2014	UppSol 2020 project team	Meeting with STUNS to elaborate the details on the guidelines to be tested.
May – September 2014	UppSol 2020 project team	Support of the evaluation of UppSol 2020 through implementation of two guidelines; - Interviews with forerunners - Survey to followers - Self-assessment of the project group
26th of November 2014	UppSol 2020 reference group	Results from the evaluation presented to the reference group of UppSol 2020
24th of April 2015	Representative of STUNS	Audit on tested/reviewed guidelines.

4.10.3 Overview of tools and guidelines provided to Uppsol 2020

Guidelines/tools received	Reviewed for implementation	tested	Adapted	Start	First audit	End
Guideline: How to improve you smart energy project through check-ups	No	Yes	No	May 2014	2015-04-24	December 2014
Guideline: Self-assessment to create a reflecting team culture	No	Yes	No	May 2014	2015-04-24	December 2014
Guideline: Learning about target groups	Yes	No	Yes	2015-04-24	2015-04-24	2015-04-24

Guidelines/tools received	Reviewed for implementation	tested	Adapted	Start	First audit	End
Guideline: Co-creation - collaborating to develop smart energy solutions	No	No	No			

4.10.4 Implementation of S3C guidelines and tools and suggestions for improvement

Guideline: How to improve you smart energy project through check-ups

The guideline was implemented to investigate how the project UppSol 2020 has evolved, if it's on the right track towards achieving its goals, how it's perceived by different project participants and to identify possible improvements.

UppSol 2020 had goals on several different levels. For instance, it should contribute to the county administration's regional work on energy and climate and to the regional innovation strategy set by STUNS. This guideline especially fits and supports the goals related to the effects of the project, such as the number of PV installations and increased knowledge and awareness among users.

The guideline was used in the execution phase of the project. The S3C team supported UppSol 2020 in conducting an evaluation of the project, based on the content of the guideline. To this end, a survey and interviews were conducted with project participants. The support provided through the implementation of the guideline was useful to the UppSol 2020 team, as it helped them to extract results and some of the effects (such as user experience and number of PV installations) from the project. It also helped them to point at different perspectives within the project/stakeholders.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Try to make the guideline less theoretical, complex and detailed; it now focuses on specific aspects - mainly from a research or utility perspective.	Yes	

Guideline: Self-assessment to create a reflecting team culture

The guideline was implemented since STUNS wanted the individual team members to reflect on their own learning process and development, as they are usually a small and homogenous group of only three team members. The use of this guideline gave a possibility to put words to specific individual insights related to the work in UppSol 2020. The S3C team supported the team in conducting a self-assessment, based on the content of the guideline. To this end, an email-based quick survey and focus group interviews were conducted with participants from the project.

The guideline was used when the UppSol2020 project reached a milestone. The project had just finished one of the workshop series and were about to slightly modify the orientation of the coming workshops. The S3C team supported UppSol 2020 in implementing a structured self-assessment process based on the guideline; individual short questionnaires were distributed, collected and handled by the S3C team (being a third party) and focus group interviews with the UppSol 2020 team were implemented and compiled.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Try to make the guideline less theoretical, complex and detailed; it now focuses on specific aspects - mainly from a research or utility perspective. Also try to shorten the guideline by extracting the most important parts.	Yes	
The guideline should stress the importance of explaining for a third party to help formulate what you do without internal expressions.	Yes	
Add that within a project group, having internal principles to guide your work can support reflection.	Yes	

Guideline: Learning about target groups

The review of this guideline was a request from the S3C team to STUNS since the group could contribute to the topic through their experience on customer and user engagement. The guideline was never implemented in practice.

Suggestions for improvement

| Suggestions for improvement	Suggestion implemented	Reason for decision
Try to make the guideline less technical and theoretical. The starting point should be the needs and wishes of users, and not the needs of project management.	Yes	
The guideline is too long and should be shortened.	Yes	
The structure of the guideline could be changed by revising the order in the section "What you need to do": start from the most creative/freethinking/qualitative investigation (open-ended meetings with customers) instead of learning from others through desktop research. If a project really wants to get to know their target group, they must start with an open mind, try to get to know the customers in many different aspects – not just the energy-related - and understand how they really think. The project group must make an effort to really listen to their customers.	Yes	
Emphasize that getting to know your target group is not a quick fix, but rather continuous work.	Yes	

4.11 St. Gallen Utility

Full project title	St. Gallen Utility and Stromnetzte SGS cooperation
Website	http://www.energienetz-gsg.ch/; http://www.sgsw.ch/
Funding scheme	Not applicable

Tested guidelines
• Guideline: Co-creation - collaborating to develop smart energy solutions

Which barriers and opportunities were addressed?
Barriers • Engaging end users without sharing decision power • Non-viable business cases for end users • Inadequate expectation management
Opportunities • Reinforce the end user perspective in the project design • Co-creation • Roll out smart grids towards the general public • Connect smart grids to smart cities, smart living and sustainable lifestyles • Develop an overarching storyline to achieve a sense of urgency about smart grid

4.11.1 Introduction to the pilot and impact of S3C

St. Gallen utility is one of Switzerland's most innovative utilities. The utility has invested in multiple renewable energy resources (especially photovoltaics and water power), mobility initiatives and a full fiber optic cable network for the entire city. The utility strives to make St. Gallen a Smart City and to create Smart Grids related products and services that facilitate and improve business for the enterprises in the region and the utility itself. In addition, energy development in St. Gallen is sharpened by the so called Energienetze GSG, an energy related network of companies in the area's business districts, that was founded in 2011. Together, the companies developed a cross-company energy concept that they can adapt to changing environments and technologies and together advocate reliable, competitive and green energy for commercial energy users. Together, the companies have created energy clusters for e.g. CHP initiatives and share know-how on energy management in business, trade and industrial processes. In fact, Energienetze GSG has become a vital partner for St.Gallen's utility to learn about the energy-related needs and challenges of commercial customers in their supply area and the S3C consortium was asked by the utility to facilitate a co-creation process targeting this exact issue. In the end, a co-creation workshop helped to delineate large business cases and projects that are of interest to the companies and the utilities (see Figure 47: key cooperation areas and business cases to be developed as identified by St. Gallen utility and local SMEs, source: the S3C consortium and the participants shared the impression that they understood each other's perspective.
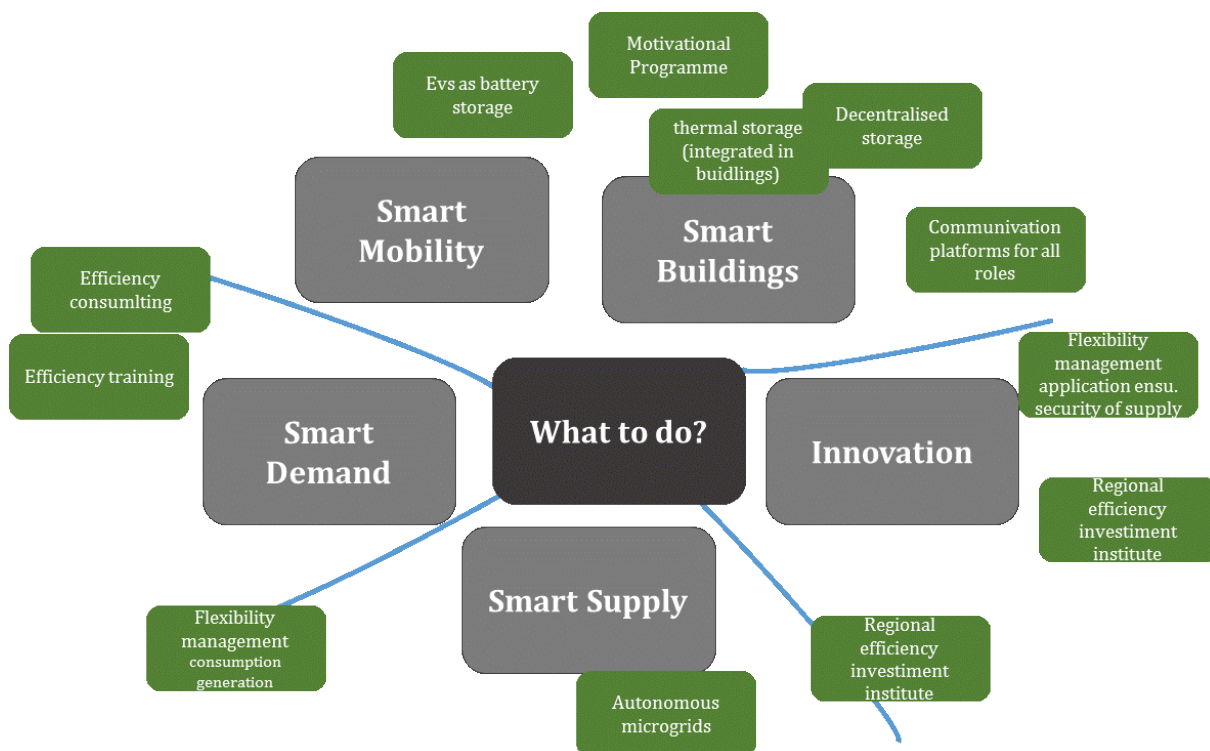
Figure 47: key cooperation areas and business cases to be developed as identified by St. Gallen utility and local SMEs, source: the S3C consortium

By co-creating the potential areas of cooperation together with the local SMEs, the utility hoped to find out, what moves and shakes the regional business decision makers in terms of energy. Instead of losing the commercial customers, the utility wants to include their needs and demands into their business portfolio. The half-day cooperation workshop based on the co-creation guideline was the first step into this direction. It was advertised under the title "what you always wanted from your energy supplier". Bearing in mind high expectations and limited time resources of the participants, a professional facilitator and business consultant prepared and led the workshop. The intention was to cover the phases "explore" and "investigate" as delineated by the co-creation guideline in a 4 hour workshop, in order to provide the utility with a sound basis to prepare the "design" phase.

Figure 48: On site impressions from the co-creation workshop in St. Gallen, source: the S3C consortium

The contact responsible people were satisfied with the outcome of the workshop and particularly liked the fact that co-creation as delineated by the S3C guideline can serve multiple purposes – from dealing with technical functionalities to social expectations – while being close to the customer at all time. They consider it a highly useful guidance to develop customer friendly products.

The contact between the utility and the S3C consortium was established following a speech of Ludwig Karg given at the VGOZT Tagung Marktunterstützung (annual meeting of marketiers in gas supply of Switzerland) in June 2014 (covering S3C and other relevant ongoing research), the executive board of St. Gallen's utility approached Ludwig Karg to present S3C in a face-to-face meeting with the goal to test S3C guidelines and tools in order to discuss possibilities for cooperation between the project and the utility. A meeting could be scheduled in early 2015 during which an entire set of interesting guidelines has been identified. However, since the time was limited, the focus for the collaboration between the St. Gallen utility and S3C was set on co-creation. One strong motivation voiced by the St. Gallen utility was to learn about commercial customers in its regions, especially SMEs and their potential wishes or perceived threats when it comes to energy supply. In fact, the choice to collaborate on co-creation and further sharpen the guideline developed with the active partner Amsterdam Smart City (see chapter 4.7) reflects the wish to get a greater understanding of commercial customers and their future wants with regards to smart energy products. The utility was presented with the current version of the co-creation guideline and the S3C partners in form of B.A.U.M. consult helped to implement the guidance into a workshop. To include many SMEs from the region, the utility contacted 4.7 enterprises in the GSG (Gossau, St. Gallen, Gaiserwald) business district that seemed to be most promising. Companies there are cooperating in the Energienetze GSG and had indicated a will to get in better contact with the St. Gallen utility (plus those of Gossau and Gaiserwald). A decision was made to implement a co-creation workshop in July or August 2015 to co-create common interests, projects and products.

During the time leading up to the workshop, the S3C team and the responsible partners at the St. Gallen utility devised a workshop concept based on the generic steps of the co-creation guideline to adapt it for a process including commercial entities instead of residential energy consumers. This concept including the moderation concept were implemented in the aforementioned half-day workshop and led to the formulation of the common project and business models. After the workshop, the utility and energy association representatives were sure to be able to carry the process on further and to have learnt more about the different perspectives of energy suppliers and commercial users of energy.

The main learning for the S3C consortium relates to the different expectations towards co-creation processes. Depending on the types of products and services to be developed and the customers segment – commercial or residential – to be addressed, the expectations and time frames for the co-creation processes were very different. While the co-creation process in Mooi Wildeman (see chapter 4.7) was implemented over a course of weeks and the design of the individual steps of co-creation were designed flexibly, the requirements for the co-creation workshop with commercial representatives were to be as concise and time-efficient as possible. The additional experience could be included in the guideline to delineate both situations – implementing a co-creation process geared towards residential and commercial users.

4.11.2 Timeline of collaboration with S3C

Responsible S3C partner	B.A.U.M. Consult	
Supporting S3C partners	ECN	
Date and type of activity	**Contact person**	**Description and outcome**
September 2014: continuous e-mail exchange and telephone conference	Representative of executive board of St. Gallener Stadtwerke (SGSW) and S3C team	contact after presentation of S3C at conference in Pfäffikon; information process leading to decision to cooperate
January, 2015, face-to-face meeting	Representative of board and director of innovations at SGSW	cooperation meeting, decision to participate in S3C and prepare a concrete test on co-creation
March - June 2015, continuous contact for planning phase	Representative of board and director of innovations at SGSW	Concrete activity plans and choice of target group, fixing date for co-creation workshop in August
June 2015, Email Approchaing SMEs in the St. Gallen region	Coordinator of Energienetz GSG	A proposal for invitation, decision to send it to all GSG enterprises and related utilities and advertise the co-creation under the title "what you always wanted from your utility"
Aug. 20, 2015	Representatives of SGSW, Energienetz GSG and SME representatives form the region	co-creation workshop with ca. 20 participants from the utility and the local business to identify cooperation and project potential
Aug. 21, 2015	Representatives of SGSW, Energienetz GSG	Feedback and recommendation for adapting the co-creation guideline

4.11.3 Overview of tools and guidelines implemented

Guidelines/tools received	Reviewed for implementation	tested	adapted	Start	First audit	End
Guideline: Co-creation - collaborating to develop smart energy solutions	Yes	Yes	Yes	check	check	25-08-2015

4.11.4 Implementation of S3C guidelines and tools and suggestions for improvements

Guideline: Co-creation - collaborating to develop smart energy solutions

Why was the guideline implemented?

The St.Gallen utility decided to learn about their commercial customers, in order to be able to develop new products and services tailored to the needs of local businesses in the future. The guideline was implemented to enable a co-creation workshop that was advertised under the title "what you always wanted from your energy supplier". Thus, it initiated a learning process between St. Gallen's utility and the business association energienetze GSG that represents and coordinates companies' energy interests.

How was the guideline implemented?

After the initial version of the guideline was provided to the active partners and reviewed, the S3C partners involved and the utility further developed the concepts to reflect the needs of commercial end-users engaged in a co-creation process as opposed to residential end-users. One of the main differentiators consists in the fact that representatives of business have scarce time reserves to participate in co-creation processes. In fact, the process had to be considerably shortened while still maintaining the potential to deliver results. In fact, the steps of the guideline were adapted to fit the needs.

The workshop plan comprised 4 well prepared steps and adopted elements of the "canvas method" business modelling as mentioned in Dijk, D. van, Kresin, F. et al. (2013):

1. Impetus: In a 20 minute speech the moderator presented potential areas of cooperation, showing future trends and innovative means to prepare for a changing energy world. Best practices presented comprised joint implementation of a big Combined Heat and Power (CHP) system – which could guarantee supply for critical processes in emergency cases – and big battery systems using 2nd life batteries from electric vehicles. Examples were given on intelligent financing institutions for energy efficiency (jointly operated by municipalities, enterprises, banks and citizens) and new mobility patterns in a business district.

2. Introduction: All participants presented their roles and expectations to the workshop displaying the "pains" that they are confronted with and the "gains" they would expect from a closer cooperation with the utility. Typical pains of enterprises were anxiety of non-supply and increasing energy prices. Typical expected gains were in the fields of remuneration of flexibility and potential to reduce energy cost by increased self-supply – while not taking full responsibility for operating the technical devices.

3. Brainstorming: A vivid discussion unveiled a lot of potential cooperation opportunities together with expectations for new services to be provided by the utility. The moderator depicted and clustered the inputs online to create the following picture:

4. Elaboration: For each of the cooperation clusters circled in red in the above picture, a small group of participants created a profile for the future cooperation project or expected product. Elements of the profile are:

   o description of the activity or product

   o relation to the "pains and gains" identified in step 2 (for enterprises as well as utilities)

   o elements of cooperation of enterprises and utilities and with other partners

   o key activities of enterprises and of utilities

   o relevant framework conditions or need for legal or regulatory support.

These steps represent the steps "explore" and "investigate" from the actual co-creation guideline and were implemented in a four hour workshop led by an experiences business consultant, in order to ensure a productive workflow and corresponding results.

In the end, the workshop participants could successfully identify areas of common interest and particular relevance for common project and potentially business models (see Figure 47). The representatives at the utility and the energy association of the regional SMEs and business stakeholders now feel enabled to carry the process further by themselves.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
The role and qualifications of the moderator in charge of a workshop, especially with business and utility representatives, have to be clarified. Partial interests of individual representatives have to be accepted by the moderator, but also integrated into the overall discussion. Whether this can be achieved, strongly depends on the qualifications and capabilities of the moderator.	Yes	The guideline now includes the advice to work with experienced and qualified moderators to facilitate the process.
It is important to highlight the different types of participants that might join a workshop and to inform about the distribution of different types of business representatives that enables an optimal result of the co-creation process.	No	Since co-creation processes can be implemented in various different ways, it is difficult to advice on the exact distribution of participant representatives. The optimum is depending on the goal and also regional context of the co-creation process.
Include clearer instructions for the moderator. For commercial participants, time is a scarce resource. The guideline should include advice on how to make the most of little time resources in terms of co-creation.	Yes	The guideline now includes an example for the organisation and implementation of co-creation processes based on the experiences with the utility and the SMEs in the St.Gallen region. It includes a moderation concept that is oriented towards the business model canvas method and helped to obtain results quickly and in a business-oriented way.

5. Expert and Utility Feedback

In order for the tools and guidelines to receive extra validation through renowned experts and practitioners beyond the testing in the active partner projects, several extra activities were carried out. This chapter reflects the cooperation within the S3C Advisory and Dissemination Board (ADB) supplying expertise and utilities and DSOs supplying practitioner's knowledge to improve the guidelines and tools.

By involving external experts with a broad scope of knowledge and practice beyond S3C, the consortium managed to content-check and expand the guidance supplied in all tools and guidelines of the S3C toolkit.

5.1 ADB Meeting and ongoing ADB Support

The S3C consortium has established its Advisory and Dissemination Board (ADB) over the first years of the project. Experts and practitioners from all over Europe agreed to share their knowledge and insights with the consortium. In fact, in order to improve the first version of the guidelines beyond the first feedback from the active partners, the S3C consortium decided in an early stage of the project to utilise the 2nd ADB meeting to implement focus groups on the guidelines and tools available at that point.

In fact, in December 2014, 14 ADB members and two external experts convened with the S3C consortium for a first evaluation of the S3C tools and guidelines and the toolkit website.

The outcome of the meeting is described in detail in S3C Deliverable 6.3. This sub-chapter will summarize the overall impact the expert feedback has had on the improvement and validation of the S3C toolkit.

23 S3C tools and guidelines were discussed and evaluated in two rounds of one-hour focus groups. The participants (for an overview of the involved experts and their backgrounds see Table 15 ADB members participating in the 2nd meeting in focus groupsTable 15 and Table 16) were asked to fill in a questionnaire for each guideline/tool containing 10 questions on general impression, readability, relevance of content and usability that could be rated on a scale from one to five. The questionnaire was based on the active partner questionnaire to ensure comparability in the inputs the consortium received. The feedback was then discussed in groups made up of up to four ADB experts and two members of the consortium. Later the first outputs collected were discussed in the plenum. The ADB members were selected for different groups based on their backgrounds and expertise.

Next to their overall impressions of the toolkit and the guidelines' structure, they could thus also contribute valuable content by linking best practice examples, rendering theoretical insights to complement the existing

Overall, the S3C tools and guidelines received very positive feedback. The most frequently given rating for the first question (for which "one" was the best possible rating, "five" the worst) "overall rating of the tool/guidelines" was "two" (35%), followed by "three" (31%) and "one" (16%).

1. Overall rating for this guideline/tool (1= very good; 5= not good at all)

1	12	16 %
2	26	35 %
3	23	31 %
4	10	14 %
5	1	1 %

Figure 49 Overall Rating for tools and guidelines evaluated by ADB experts during the 2nd ADB meeting

The experts gave detailed input regarding the content that anticipated many comments and requests for changes by the active partners. However, the feedback received had a vast impact of the structure of the tools and guidelines and its language as well.

Main suggestions for improvement included standardising the structure of the guidelines/tools as well as adding a graphic language to which indicates topics the guideline belongs to and how it is connected to the other guidelines of this topic. Together with the inputs received from the first audits of experiences in the active partner projects, this feedback was translated into a completely new template for the guidelines and tools that made a recognizable structure mandatory for all guidelines and included hints on how to use more graphic language and elements throughout the text.

The rating of the guidelines and tools was mixed regarding the practicability of the tool and guidelines and the adaptability for activities and decision-making processes of utilities. Several of the guidelines were, at this point, still written to address pilot projects rather than utilities. Furthermore, it was criticised that while some of the tools and guidelines offered a lot of practical advice, others constitute a theoretical topical introduction rather

than a practical guideline instead. The new structure for guidelines and tools that was developed based on the ADB feedback.

The following components have become mandatory for all guidelines and should be implemented in the instructions complementing the tools, too:

- An abstract summarizing the most important points and clearly indicating the target group for tool or guideline
- A "What is it?"-section describing the overall concept described in the guideline
- A "When to use?"-section describing the purposes for which the advice can be implemented, the circumstances or project phases during which it can be beneficial
- At least one "Best Practice" example rendering the abstract concepts and advice tangible
- A "What do you need to do?" to provide a step-by-step information on implementation
- A "Do's and Don'ts section" highlighting the challenges and chances regarding the topic
- A "Further reading" section for those stakeholders that want more thorough and especially research driven information

This new structure increased the practicability and accounts for the differences in the perception of the guidelines between researchers or research project managers on the one hand side and practice- and efficiency oriented representatives of utilities and companies on the other hand side. Deliverable 4.3 details concrete actions that were taken by the consortium to ensure that the expertise of the ADB members was translated into the finalised ersion of thes S3C toolkit.

Furthermore, the idea to introduce a learning section and a personalized notebook function in on the toolkit website as a ready-to-use tool was developed during the meeting and later implemented by S3C consortium partners ECN, B.A.U.M. and VITO.

Table 15 ADB members participating in the 2nd meeting in focus groups

Name	Organisation	Role/Background
Prof. Americo Mateus	UNIDCOM (IADE) at Lisbon University	Creativity and innovation consultant for several business companies in Portugal and Belgium, specialises in territorial branding and innovation ecosystems
Dr. Carlos Rosa	UNIDCOM (IADE) at Lisbon University	Lectures about the psycho-sociology of consumption, interested in marketing research, economy and societal issues around consumption
Prof. Cecilia Katzeff	Swedish Interactive Institute	Doctor of psychology, her work experience covers research as well as practical work within the design of IT from the perspective of users. Her research focuses on design and development of digital artefacts and services in behavioural change related to the use of energy in various contexts.
Gernot Hagemann	hannoverimpuls GmbH	Regional innovation management; special focus on regional energy management
Jürgen Stetter	E.ON Innovation Center Energy Intelligence	Head of E.ON Innovation Center, Energy Department, responsible for developing new economic activities and business areas at E.ON

Name	Organisation	Role/Background
Michael Hübner	Austrian Ministry for Transport, Innovation and Technology	Ministry representative, responsible for planning and coordination of Smart Grid programmes, coordinator of the ERA-net Plus programme, Austrian ISGAN representative
Dr. Miguel Águas	Lisboa E-Nova	Technical director and financial manager in energy-related projects
Paolo Landi	Fondazione Consumo Sostenibile	President of Adiconsum and coordinator of many EU projects on energy; member of the working group of DG Sanco on "consumers energy transparency"; member of the working group of DG Energy on "energy and vulnerable consumers"
Prof. Ruth Rettie	Kingston University	Smart Grid and Energy Efficiency trials, expert in community initiatives and raising awareness and motivation
Saskia Müller	Amsterdam Smart City	Project manager of Amsterdam Smart City initiative bringing together industry and citizen-driven energy projects in Amsterdam
Sonja Schouten	Alliander	Strategy consultant, Sherpa at European Innovation Partnership at Smart Cities & Communities
Stella di Carlo – substituting for Marina Lombardi	Enel	Project manager, managed S3C sister project ADVANCED, involved in several other Enel Energy Efficiency and Smart Grid Initiatives
Toni Goeller	MINcom Smart Solutions GmbH	Business executive and telecommunication consultant for security, next generation services, billing, charging, payment and operations issues
Wolfgang Teubner	ICLEI – Local Governments for sustainability	Managing director of ICLEI association, development of a number of international urban development projects

Table 16 External experts participating in the 2ⁿᵈ ADB meeting and focus groups

Name	Organisation	Role/ Background
Josef Baur	eueco	Co-CEO eueco, an IT-platform enabling citizen engagement and citizen financing of community energy projects
Dr. Tobias Graml	BEN Energy	Co-founder and CTO of BEN Energy, offering a business model for utilities using social norms to make energy efficiency fun

5.2 Utility Feedback

Due to some of the previously described reasons, it has been difficult and sometimes impossible to actually test all the advice offered in the guidelines.

However, the consortium has been assured of the relevance of these guidelines by ADB members. In fact, as already explained b

5.2.1 Alliander on Privacy and Security Issues

Guidelines reviewed	Privacy and data protection	
Responsible S3C partner	INEA	
Supporting S3C partners	ECN	
Date and type of activity	Contact person	Description and outcome
May 2015	Privacy & Security advisor at Alliander	First contact and sending of the guidelines to Alliander by ECN and INEA
June 2015	Privacy & Security advisor at Alliander	Sending back the comments and suggestions for improvement to INEA

The consortium partner ECN tested a guideline in close cooperation with the active partner project "Mooi Wildeman" in which Alliander consultant were also involved. Henc,e the contact to the DSO Alliander was already established and Alliander agreed to review an additional guideline on privacy and data security to match it to their status of knowledge and concerns as a DSO. The S3C consortium partner INEA who was the lead partner for drafting this guideline got in contact with the privacy and security advisor of the utility. The aim of the cooperation was to get a review by a practioneer with great experience on privacy and data security issues.

Suggestions for improvement	Suggestion implemented	Reason for decision
Improvement of the definition of "data protection" and better differentiation between "data protection" and "privacy".	Yes	The differentiation of both terms and their definitions are important for the understanding of this topic. Hence the definitions have been enhanced
The scope for the protection of personal data should be broadened. smart metering is only one piece in the puzzle next to smart homes, smart cities & societies etc.	Yes	The protection of personal data is crucial for many IT-based services. Smart metering is only one source of data.
Update the content of the guideline based on the content of the new GDPR (General Data Protection Regulation) which will replace the old directive. Within the new GDPR there are strong requirements about data anonymization which should be included.	Yes	The update of the regulatory framework is important to keep the guideline up-to-date. The new GDPR has strong requirements on anonymization that have to be reflected by the guideline.
The European Network for Cyber Security (ENCS) did a pilot together with Alliander	Yes	The project is a good example for the integration of privacy issues into smart

Suggestions for improvement	Suggestion implemented	Reason for decision
on Privacy Enhancing Technologies (PET) which could be integrated as a best practice example.		grid projects.

5.2.2 Regional Utility Wunsiedel (DE) on Incentives, particularly non-monetary incentives

Guidelines reviewed	Choosing and combining monetary and non-monetary incentives Sub-guideline: Choosing from different types of non-monetary incentives Sub-guideline: Choosing from different types of monetary incentives How personal goals can motivate behavioural change	
Responsible S3C partner	B.A.U.M. Consult	
Supporting S3C partners	ECN	
Date and type of activity	**Contact person**	**Description and outcome**
July 2015, E-Mail	senior research fellow and coordinator at Wunsiedel utility	First contact and sending of the guidelines SWW Wunsiedel by B.A.U.M. Consult
Jul 27, 2015, Telephone call	senior research fellow and coordinator at Wunsiedel utility	Semi-structured interview for guideline evaluation
Aug 05, 2015, E-Mails	senior research fellow and coordinator at Wunsiedel utility	Sending back the comments and suggestions for improvement to B.A.U.M. Consult

SWW Wunsiedel is a regional utility in Germany that focuses strongly on innovative projects and products. One of their showcase projects is the "Wohnlabor Energie" (living lab energy) in which on old apartment in need of rehabilitation is transformed into an attractive and energy efficient apartment.

The main contact person for the S3C collaboration was Dr. Gerhard Kleineidam, senior research fellow and in charge of research projects. He voiced an overall very positive impression of the S3C tools and guidelines and confirmed that he would consult several of the S3C tools and guidelines for future projects. He also proclaimed interest in test one of the S3C tools, the "Web based quiz" in the future.

Guideline Choosing and combining monetary and non-monetary incentives & Sub-guidelines Choosing from different types of monetary/non-monetary incentives

Dr. Kleineidam was particularly interested in the guidelines on the topic of end user incentivation as input for the roll-out of new products and services, e.g. the planned roll-out of a SmartEco-Home Automation System in private households to gain load shifting capacity. The guideline choosing and combinig monetary and non-monetary incentives will be consulted in setting up an incentivation model for pilot users.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Main guideline: Increase user-friendlyness by including an index in the guideline better navigation through the guideline	Yes	As the guideline exceeds ten pages, it was decided that an index would increase the user-friendliness of the guideline. An index including hyperlinks to the different chapters of the guideline was included on page one.
Main guideline: For an SME with no internal marketing department, it would be important to include typical application scenarios, e.g. during a smart meter roll-out or offers to connect to a communal heating power station. Which incentive model would be the most suitable? how is it planned, prepared, implemented and evaluated?	No	As application scenarios for incentives are too numerous the suggestion was judged to be outside the scope of the guideline. Furthermore, incentivation models depend on a variety of factors, so that a standardisation for typical application scenarios is hard to realise.
Sub-guideline monetary incentives: Concrete forms of the three types of monetary incentives would be helpful, e.g. participation models for investing in solar plants, wind turbines, etc -> return of equity. Interest on loans, coupons, natural produce from own production (matches, wood pellets to free WIFI and free usage of smart home components <- possibilities for a regional utility)	Partly	Concrete examples for the three types of monetary incentives are included in the best practice examples of the sub-guideline Choosing from different types of monetary incentives.
Main & Sub-guidelines: To facilitate the implementation of these guideline, it would make sense to include numerous practice examples – possibly even an expandable list for all currently known practice examples from utilties	Partly	Several practice examples have been added both in the guidelines themselves as well as the further reading sections. Also, especially for non-monetary incentives additional practice examples are included in guidelines describing some types of non-monetary incentivation in detail, such as: How personal goals can motivate behavioural change, Motivating consumers with social comparison and competitions and Gamification – making energy fun.

Guideline How personal goals can motivate behavioural change

The guideline How personal goals can motivate behvioural change received an overall very positive feedback. Dr. Kleineidam found the topic of using personal goals in a motivation/incentivation strategy to be very relevant and the guideance and practice examples were easily understandable.

After reviewing the guideline, Dr. Kleineidam delivered first ideas for a further developing the guideline into more practical tools, e.g. by including a matrix relating goals of the utility to different possible incentives/ goals of the consumer. For the specific implementation of the guideline, it is important to take the specific product and service portfolio as well as the size and organization structure of the utility into account. This, however, would require the mapping and characterization of different goals for utilities across Europe, which could not be realised within the S3C project due to time constraints.

Suggestions for improvement

Suggestions for improvement	Suggestion implemented	Reason for decision
Insert a mapping table with relation between goals of the utiliy and possible incentives/goals fort he customer	No	This suggestion was judged to be beyond the scope of the guideline.
To increase user-friendliness, the theoretical background should be transferred to an appendix to use to open space for more practice examples.	No	As the guideline addresses a rather large target group of project manager and researchers and the guideline should also be understandable for users with no previous knowledge of the topic, it was decided that the theoretical background on why personal goals can motivate behavioural change was important to understand the how.