



D 6.4– Pilot Report

WP6 – Pilots

09 July 2019

Revision: Final

Authors: Kjetil Rommetveit, Ingrid Foss Ballo, Siddhart Sareen

Submitted to: Jamal Shahin

Keywords: Smart electricity, energy behaviours, behavioural change, societal acceptance, public engagement, Responsible Research and Innovation, focus group



EXECUTIVE SUMMARY

This report recounts the main experiences and results from the Bergen pilot within the PARENT project. Whereas the overall goal of the project was to investigate into a variety of ways for promoting energy savings and more sustainable energy behaviors, the specific goal of the Bergen team within the project was to elucidate aspects relating to social acceptability, public participation and Responsible Research and Innovation (RRI). This orientation, which is grounded in long-standing scholarship on the interrelations of science, technology and society (sometimes referred to as STS), also served to shape the approach taken in the Bergen pilot. Our pilot followed the same milestones as the overall project, focusing on recruitment of salient 'users', the installation of an energy monitoring device (of the brand Smappee), and installation of a data analytical platform on top of that already provided by Smappee. In so doing, our main focus, was qualitative, and took the main form of a focus group approach. Each of our three rounds of focus groups focused on three interrelated themes: 1) technical aspects (device installation, energy management platform roll-out), 2) everyday energy practices, and 3) political economy issues, including privacy and data security. The report recounts some main steps taken in the implementation of the pilot: installation, usage and discussion of the technology in a societal and environmental context. Results from the focus groups are correlated with results from the PARENT platform, and from the participant survey circulated at the end of the pilot. Our results indicate that the chosen technology of energy monitoring holds some promise for future developments in the field of smart energy, energy behaviors and sustainability. Still, it is important to notice that our investigations also revealed considerable technical problems attaching to the technology, and that the field is shaped to considerable degrees by high expectations and promises as to what these technologies can actually deliver. As we describe, this indicates to us that possibilities are quite high that some of the emphasis placed on user involvement and behavioral change, may be partially supplanted by automation and real-time energy pricing (indeed, in several countries this is already happening). This is likely to reproduce some of the initial societal issues that have attached to these technologies from the beginning, although in new ways and in new contexts. Such results are nevertheless always locally dependent, and should not be extrapolated without taking into account the local conditions to which they may be applied. When taken on its own terms, we deem that the Bergen pilot was a modest success: it was able to incorporate a wider set of issues and concerns, and our pilot participants confirmed our approach as interesting and relevant.

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Version Log			
Issue Date	Rev No.	Author	Change
25-05-2019	1.0	KR, SS	First draft
05-07-2019	2.0	IFB	Additions and comments to original draft
09-07-2019	3.0	KR	Acceptance of previous version + updates

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List of Abbreviations

Abbreviation	Description
WP	Work Package
Partner Abb.	Description
VUB-IES	Vrije Universiteit Brussel – Institute for European Studies
BLP	Blue Planet AC
UU	Universiteit Utrecht
RES	Resourcefully
SVT	University of Bergen, Centre for the Study of the Sciences and the Humanities
ENR	Enerbyte

1 Introduction

In this report we go through some main conditioning factors in the making of the Bergen PARENT pilot, the main stages of its execution, and some main results to emerge from it. The experiences and findings are based on quite extensive empirical materials, mainly in the form of qualitative data, but also incorporating energy data (from the PARENT platform) and a participant survey. Details on these sources of data, or the data themselves, can be provided upon request. Some more detail can be found in the attached Annex 1. The main focus of the report is on the execution of the pilot, and not on scientific analysis. This analysis is still in the process of being completed (due to a 6-month delay in the Bergen pilot), and will mainly be found in scientific publications still under elaboration.

2 Pilot considerations

2.1 Ensure observance of Responsible Research and Innovation (RRI)

Taking into account that self-observation and self-assessment has limitations for assessing acceptability and 'responsibility', the following considerations are important in considering the observance of RRI in PARENT's Bergen pilot:

RRI: Process dimension.

First, in accordance with the requirement for social acceptability (cf. D3.2), the PARENT project (as a whole) could be seen as an important contribution to RRI, insofar as it aims to bring a wider set of actors and view-points, to bear of questions of innovation in the smart electricity domain. This has been the case in all three pilots (Brussels, Amsterdam, Bergen), each of which has relied upon different methods of recruitment and engagement. In the case of Bergen, we did not make great efforts to achieve representativeness amongst participants; rather, we extended open invitations on social media, and in our own networks. This issued in a somewhat unequal representation, insofar as a large part of the participants were well-informed, early adapters, from generally well-off households. Geographically, the households are located both within and outside of the Bergen area, and so the geographical spread is fairly good. This nevertheless ensured that a wider set of viewpoints than normally found in smart electricity innovation could be heard, but it did not sufficiently include vulnerable or excluded groups, or people at threat from, or suffering from, energy poverty.

The specific design of our pilot contributed to a widening of the ordinary discussions. The pilot functioned in close collaboration with a Living Lab, which in practice functioned as a steering group, with representatives from societal actors involved in smart electricity

innovation (municipality, energy company, local community networks, NGOs, renewable energy companies, cf. also D7.1). In this way the Bergen pilot achieved, on a modest scale, to carry out an extended discussion of smart electricity in the Bergen area.

Second, as also outlined in D3.2 our discussions (during three rounds of focus groups and a few related public events) focused on the desirability and non-desirability of certain smart energy futures, which is another central theme in RRI (cf. D3.2). Discussions were not limited to energy behaviors or the smart metering device, but related them to sustainability, institutions, international collaborations, and issues of privacy, security, democracy and power. Again, the impacts of such a small-scale contribution are likely to be modest, and are nevertheless hard to assess. On the level of the project's execution, however, the very fact that these themes were consistently promoted (during approximately 1/3 of the focus group time), is in accordance with RRI requirements on both substantial and procedural levels.

Finally, in accordance with the requirements of D2.1, a consent form (standard for PARENT) was translated into Norwegian and extended to the participants ahead of installation of the energy monitors. Whereas some participants reported that more information could have been provided on the use of the Smappee device generally, information was provided on privacy and informed consent, sharing of data with the project, device installation, and usage. Participants received information on what would be required from them throughout the project, as prescribed by D7.1. They received regular updates on the progress of the project through monthly newsletters, and through participation in three rounds of focus groups.

RRI: Product dimension.

Discussions also extended into the viability (technical and ethical) of the product dimension, that is, the technology. In this case this meant mainly the Smappee, which was an explicit theme in three rounds of focus groups. Whereas a number of issues came up during everyday usage, communication with participants, and in the focus groups, it was difficult to communicate findings and problems back to the Smappee company. In this sense, the product dimension was not in full compliance with RRI requirements; it was however difficult to ensure collaboration with a producer that was not a project partner, and furthermore an operator in a commercial market.

Discussions also covered the official smart meters rolled out taking place at the time of the pilot (in Norway, that is). We discovered that it matters not merely what kind of product is being implemented, but also who implements it: a small research-based team seems to have greater trustworthiness than large corporations, grid operators and government(s).

Guarantee representativeness of households

The Bergen Pilot did not aim for representativeness, but extended invitations to people with an interest in smart electricity (cf. also above section). The participants were to some extent ‘early adopters’ (that is: approximately half of the participants) of the technology and some were quite knowledgeable about renewables (some were prosumers). However, some participants also stated that they had not been particularly engaged in energy technologies or environmental issues prior to joining the PARENT project.

In terms of geographical distribution, participants came from most parts of Bergen and the Bergen area, with only a slight overrepresentation of people from the Bergen city center area. As can be seen from the below table, a large portion of participants were in households of 130 m² or bigger. Norwegian residencies are generally large (as compared to f.i. Amsterdam and Brussels). The table indicates that participants were relatively affluent, but is not sufficient for making strong conclusions about socio-economic background.

Household size / M ²	One or two	Three	Four	Five
Less than 70m ²	2			
Between 71 and 100	3			
Between 101 and 130	2		2	
More than 130	5	3	1	7

Size per household relative to physical size (m²) for 25 participants as of week 2019-06-10

2.2 Adjust pilots to local conditions

Apart from the above-mentioned geographical distribution of participants, the main way in which the Bergen pilot adjusted to local conditions went through the research design, which combined the pilot activities with a Living Lab. The Living Lab was made to consist of representatives from local actors involved in energy and sustainability in the Bergen area: the municipality, the main power company, renewables business, a local community network and an environmental NGO, and more. In addition to our prior mapping of the energy system in the Bergen area, we conducted a meeting with the Living Lab participants prior to kick-starting the pilot. We scoped for issues of specific relevance, such as relations with the hydroelectric energy industry, connection to the Norwegian grid, connections to

mainland Europe and the UK (planned cables), local micro-grid initiatives, and rough sketches of the ‘average consumer’ and energy habits. These issues, as indicated to us by the Living Lab participants, formed part of the topics of exploration in the pilot focus groups.

Of particular interest to the idea of ‘behavioural change’ and changing energy habits, we mention that several of our Living Lab participants argued that the combination of (relatively) low energy prices and access to large amounts of renewable energy would place decisive limits on the extents to which Norwegians would actually be willing and motivated to engage in real energy saving activities and changed behaviours. This was to some extent confirmed in our living labs, and in the data from the PARENT platform. At the same time, our pilot participants articulated a complex set of motivations for changing their energy practices, as well as potential difficulties for such change, such as household compositions, household dynamics, working hours and more. Many reported environmental concerns as their primary motivation for taking part.

2.3 Acquire equipment necessary to run pilots

Research in the early stages of the project revealed that it would not be possible to use smart meters in the city pilots (D1.4). This instigated a process of testing multiple submetering devices to find the solution most suitable for our purposes (D1.3). All three cities have decided to acquire the energy monitor Smappee.

2.4 Set forth conditions for evaluating pilots results via Living Labs

Meetings were held with the Living Lab participants on four occasions: firstly, prior to starting the pilot (June 14 2017), we carried out a meeting to inform about the project, and to establish some common criteria for assessing the activities of the Living Labs. Agreement was made to follow the three topics of: 1) the Smappee energy monitor (installation, usage, functionalities), 2) energy behaviours, and 3) broader political and ecological issues (incl. privacy). Then, meetings were held as follow-ups to each of the three rounds of pilot focus groups (27.10.2017, 19.03.2018, 18.10. 2018).

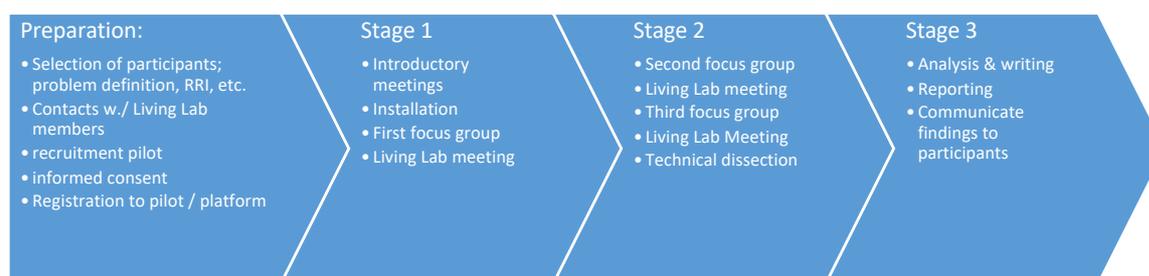
During these meetings we presented preliminary findings from the focus groups and solicited feedbacks from the LL participants. Whereas feedbacks were indeed given, discussions often-times turned into discussions over the actual issues, such as data security, societal or environmental justice, rather than evaluations of the results (one further reason for this may have been that ‘results’ were always preliminary, based on rough interpretations from focus groups normally taking place no more than one week prior to the Living Lab meetings). Furthermore, discussion generally followed the presentations provided by the PARENT team. Hence, the Living Lab participants would observe, and inquire into, the general progress of the pilot, but did not to great extents try to evaluate its

performance or intervene in the running of the pilot. One possible reason for this could be reluctance to intervene with a research project, and the scientific goals and methods adopted by it.

2.5 Develop a template for consent for participation in research

On the basis of D2.1-2.2, a consent form for participation in the pilots has been developed, taking into account ethical, legal and otherwise regulatory requirements in each of the pilot cities. The consent form was translated into Norwegian, and circulated to all participants. No-one were registered as a participant to the pilot or received a Smappee until they had signed the consent form.

3 Pilot timeline - The Bergen Pilot



The Bergen Pilot was largely structured and organised around the (3) focus groups, each of which was followed by a Living Lab meeting, seeking consultation and advice on results, project progress and future direction. Hence, we structure the exposition of our pilot process according to these, and accommodate other main events, such as the Smappee installation and transition to the PARENT platform, according to these meetings.

Preparation stage:

1. Pilot preparation (March 2017 – October 2017)

- Identification and selection of Living Lab participants
- Problem definition and articulation
- Observe compliance with RRI protocol

2. Recruitment of local partners & participants (May 2017 – October 2017)

- Invitations extended to Living Lab partners
- Invitations of Pilot participants
- Distribution (and reception) of informed consent sheet
- Registration to platform

Stage 1 (June 2017 – November 2017)

3. Introductory meeting with Living Lab partners

- Co-defining purpose of project
- Establish understanding of local conditions, needs and circumstances
- Observe and discuss relation with RRI (protocol)

4. Installation of energy monitor

- Circulate energy monitor (Smappee)
- Circulate information on Smappee
- Communication with pilot participants
- Coordination with electrician (where participants were unable to install themselves)
- Share consumption data
- Circulate questionnaire on motivation (reasons for participations)
- Circulate user clustering questionnaire
- Begin circulation of monthly newsletters

5. First focus group (Oct. 2017)

- Translate LL recommendations into focus group protocol
- Organize and carry out focus group
- Write up initial results
- Transcription of results
- Circulation of monthly newsletters

6. First Living Lab meeting

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- Write up initial results from pilot focus group
- Conduct Living Lab
- Write up results for consideration in next focus group
- Circulation of monthly newsletters
- Prepare next stage of project, i.e. update to the PARENT platform
- Prepare registration to platform (communication to participants)

Stage 2 (December 2017 – October 2018)

7. Second focus group (x 2; March 2018)

- Registration to platform
- Translate LL recommendations into focus group protocol
- Organize and carry out focus group (x 2)
- Write up initial results
- Transcription of results
- Circulation of monthly newsletters
- Circulation of reminders to participants to register to PARENT platform

8. Second Living Lab meeting

- Write up initial results from pilot focus group
- Conduct Living Lab
- Write up results for consideration in next focus group
- Circulation of monthly newsletters

Stage 3 (October 2018 – May 2019)

9. Third focus group (Oct. 2018)

- Translate LL recommendations into focus group protocol
 - Organize and carry out focus group
 - Write up initial results
 - Transcription of results
 - Circulation of monthly newsletters
-

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10. Third Living Lab meeting

- Write up initial results from pilot focus group
- Conduct Living Lab meeting
- Write up results for conclusions & recommendations
- Circulation of monthly newsletters
- Circulation of final survey

11. Organize consortium meeting & participant meeting

- Start analysis of results
- Prepare technical dissection
- Carry out meeting & participant event

4 Pilot implementation

4.1 Pilot scope

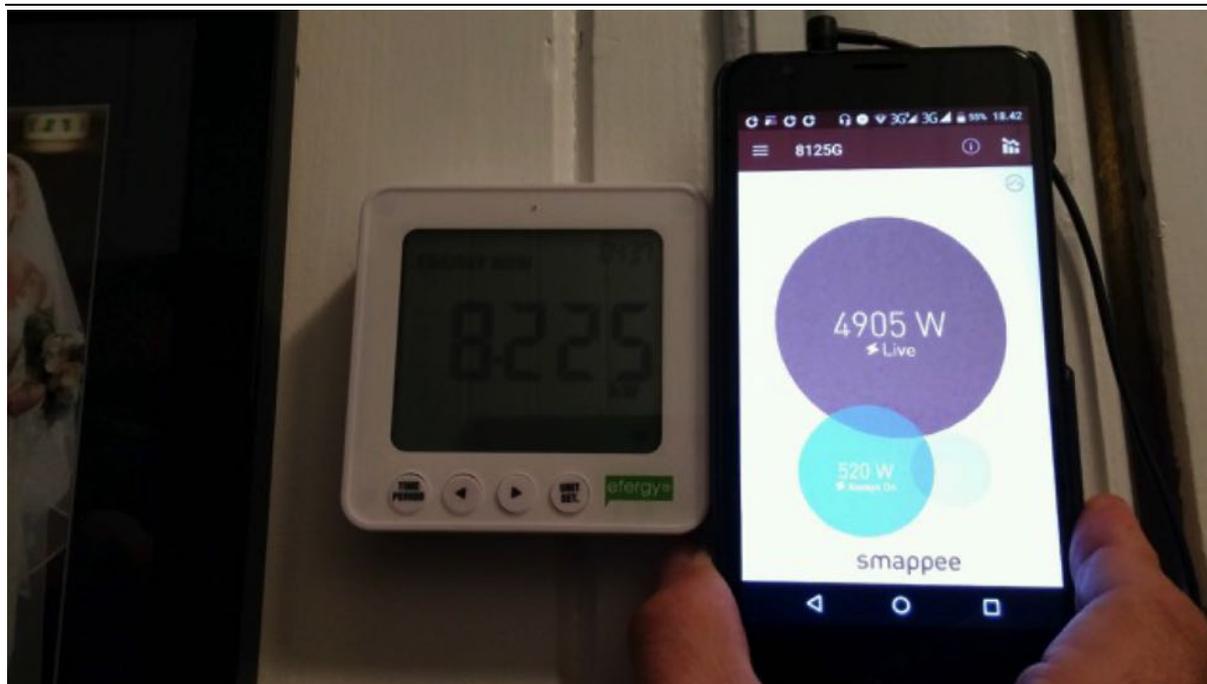
The Bergen Pilot did not set out to recruit a big group of participants, but wanted to focus on limited participation, using appropriate qualitative methods to gain a better understanding of challenges and opportunities relating to energy efficiency and energy behaviours. Hence, an initial goal was to have 25 participants. Upon request from the project coordinator, and also seeing a high level of interest following initial invitations, it was decided to increase the number of participants. At the beginning of the pilot's implementation phase (around June 2017), we had a total of 57 registered participants. However, some of these were lost on the way to the actual installation of the energy monitor, and so the final number of active participants came to 46. By November 2017, all of these had installed a Smappee.

The main phases of implementation are recounted above in terms of focus groups. Yet, the main phases of the pilot can also be divided into 1) the installation of the Smappee, and 2) registration to the PARENT platform. The first phase saw the installation of the Smappees, including the contribution / help of an electrician, and questions (usually by email and to some extent by phone) from participants on practical issues relating to installation. The second phase centred on usage of the platform, getting participants to sign up and use the platform. All participants signed up to the platform, but all were not equally engaged in its

usage. Only 8 participants regularly used the platform (in spite of repeated reminders). Based on feedback from participants, part of the explanation for this was that the PARENT platform was not integrated with the Smappee app. Since the participants familiarized themselves with the Smappee app when the energy monitors were installed, this was their go-to interface for getting information about their energy consumption. Furthermore, some had issues logging into the PARENT platform from their mobile phones, and thus they found it easier to keep track of energy consumption using the Smappee app on their phone, rather than logging into the PARENT platform using a computer.

4.2 The Smappee energy monitor

Main parts of the Bergen Pilot were organized around the installation and use of the Smappee energy monitor. Although a few participants report having no problems with the Smappees, they are exceptions to the rule. Generally, people reported (i.e. during focus groups and in survey results) on quite a few problems: There was a general complaint that the Smappee is not as user-friendly as promoted, and that the 'plug-and-play' imagery was promising too much. Several needed help to install Smappee from an electrician. For instance, people experienced problems with fuse boxes that were isolated from the rest of the house, with identifying the right cables (especially with older fuse boxes), and with the Wi-Fi connection. This problem was confirmed also by LL participants (some of whom were also using Smappee), who experienced similar problems. In use, the Smappee had problems recognizing the household appliances, and participants had trouble 'teaching' it the differences between appliances. Other problems pertained to what appeared to be wrongful readings of energy consumption, when compared to the energy bill or to results from other, similar, energy monitors (i.e. Tibber, efergy).



Comparison of measurements from two different energy monitors: efergy and Smappee.

The LL participants recommended that we document the difficulties, and possibly report them to Smappee. Especially among the technically proficient participants, few believe Smappee, or similar applications will be used in future. Yet, it is possible that they point in relevant directions (i.e. houses becoming smarter with more interactivity and information exchange built in, however, the doubt is about the value of a separate device). The technical problems, therefore, are not settled in our pilot, and the reasons for their occurrence should be further investigated and clarified.

On the more positive side: feedbacks were generally good on the user interface: the visuals seem to be intuitively understandable, and also served their purpose of visualizing energy consumption.



Image of fuse box sent by one participant to explain difficulties of installation.

4.3 The newsletters

The Bergen Pilot circulated all in all 14 monthly newsletters, between October 2017 and January 2019 (no newsletter in July 2018). A typical newsletter would contain updates on recent events, be that regarding installation and usage, or the upgrade of the project to the PARENT platform. It also reported on other, related activities, for instance participation in conferences or public events by the Bergen team. Next, many letters contained tips on energy saving (taken from the general PARENT newsletter). Finally, the newsletter would provide pointers to upcoming events, especially preparing participants for focus groups.

According to the survey (with only 11 replies) participants were generally quite content with the newsletter.

PARENT – Bergen – Nyhetsbrev / Mai 2018



1/6

Kjære deltakere i PARENT-prosjektets pilotaktiviteter i Bergen,

Her kommer nyhetsbrev for mai med oppdateringer fra prosjektet og tips til energisparing og bruk av din ~~Smappe~~ energiovervåkningsenhet. Vi håper du vil synes dette er interessant lesning! Hvis du har noen kommentarer eller forslag til nyhetsbrevet, så skriv gjerne til oss på bergen@parent-project.eu.

I dette nyhetsbrevet finner du informasjon om:

1. Oppdateringer fra forskningsaktivitetene
Møte for PARENT-teamene i Brüssel
Ny Facebook-gruppe for PARENT-deltakere
2. Hvordan få mest mulig ut av din ~~Smappe~~
Over 750 berekraftsutfordringer og mål fullført
3. Energisparingstips
4. Hva er neste steg i pilotprosjektet?
Felles allmøte for PARENT-deltakere til høsten
Siste runde med fokusgruppemøter til høsten



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Newsletter May 2018

4.4 The focus groups

The main role for the Bergen team was related to users, social acceptability and responsibility in innovation (see next section). We approached the project with a conscious sense of discomfort with the idea of studying 'users', since this concept typically denotes a highly idealised and abstract notion of an individual energy consumer, modelled on models taken from economics and engineering (sometimes referred to as 'Resource Man'). In the Bergen Pilot we therefore took a quite open-ended approach to discussions in focus groups. This paid off, in the sense that we were able to open up a broader set of questions and issues to discussion. We initially perceived of our participants not merely as users or consumers, but tried to involve them as citizens, and as themselves having valuable knowledge about energy usage and systems, and the directions that energy systems should take for the future.

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Our approach could be seen as validated insofar as it yielded sometimes highly interesting and dynamic discussions, covering a broad range of issues. The contents of these will not be reported here (but are included in some of the above reported results). They will be dealt with to greater extents in scientific publications, of which Sareen and Rommetveit (2019) is the first. We nevertheless acknowledge that we cannot know how our participants perceive of the challenges of smart electricity outside of the framings provided by our pilot and Living Lab approaches. Finally, the previously mentioned drive towards automation and dynamic pricing were not rejected by our participants; hence, the ‘Resource Man’ approach cannot be so easily dismissed (we have learned!). Yet, our discussions into ecology, privacy, political and public participation further confirmed that these policies are themselves likely to generate issues and public questions that cannot be accounted for by economics and engineering alone.



Project participant taking a Smappee energy monitor apart and explaining its inner workings during a project event.

4.5 Platform challenges

Mid-way through the project (April 2018), the PARENT platform was added to the pilot, in the form of an online display / resource center in which participants could read off their consumption patterns in more detailed ways. They were also provided with smileys when consumption went down, or when they engaged in energy-saving behaviours, and they were provided with ‘challenges’ to engage in specifically energy-saving behaviours. Finally, the platform added gameification elements, where participants could compare their response to the challenges, and their energy performance, to other participants.

The responses to the platform were similar to the Smappee itself, although also with distinct advantages and problems. Most participants were positive of gameification and ‘competition’ as means for creating engagement, and one participant highlighted this as the

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best aspect of the project (in the survey). Yet, the platform also had its challenges: several participants did not know how to clearly distinguish between the Smappee app and the PARENT platform. This could be due to poor information in the side of the Bergen team; however, reminders were sent in (at least) four newsletters, and we specifically introduced the theme during focus groups. In the final survey, this was not among the highest rated elements (but neither did it do particularly badly, cf. Annex 1). However, our experience may be taken to illustrate a more general trend: that the technology needs to be extremely user-friendly for users not to lose interest. There is a strong tendency for technologies such as these to be attractive at outset, then to lose attraction. One may question the economy of having a whole team trying to push people into using this kind of solution: reasons such as these may have been strong drivers for participants to propose more automated solutions, where they only have to relate to the ‘challenges’ on rare occasions.

4.6 Living Labs

As explained, the Bergen Pilot was designed to have close relations and interactions between the Pilot and the Living Lab. This was ensured by the following: 1) many LL members also participated in the pilot; 2) following each pilot focus group, we conducted Living Lab meetings to communicate preliminary findings and to receive comments and feedback on the progress of the project. All in all, we carried out 4 such Living Lab meetings (one prior to the pilot kick-off, three following each focus group). The Living Lab had some problems relating to turn-up, with participation falling from the first (9 participants) to the last (2 participants). The primary function of the LL was to gain insights into the local energy situation and system. Because the participants came from a broad background, but all dealing in one way or the other with energy, they contributed a broad contextual understanding to the project. However, many meetings generally played out according to the structure and presentations provided by the Bergen PARENT team. This had the consequence that, whereas generating a lot of discussion and commentary, the LLs were sometimes difficult to distinguish from ordinary pilot workshops, and did not always (though sometimes) play the higher-order, decision making role, that we had planned and hoped for. This is, however, a general problem relating to participation in this kind of project: people participate out of good-will, but do not generally have time nor energy to put into the project.

5 Pilot results

The Bergen pilot’s primary aim was to produce insights on issues relating to energy behaviours and energy transitions, especially focusing on issues relating to social

acceptability (cf. D2.1 and D3.1) and Responsible Research and Innovation (RRI, cf. D2.1 and #3.1). The main role for the Bergen team was related to users, social acceptability and responsibility in innovation. We approached the project with a certain discomfort towards the idea of studying ‘users’, since this concept typically denotes a highly idealised and abstract notion of an individual energy consumer, modelled on models taken from economics and engineering (sometimes referred to as ‘Resource Man’). In the Bergen Pilot we took a quite open-ended approach to discussions in focus groups. This paid off, in the sense that we were able to open up a broader set of questions and issues to discussion. We initially perceived of our participants not merely as users or consumers, but tried to involve them as citizens, and as themselves having valuable knowledge about energy usage and systems, and the directions that energy systems should take for the future. Yet, it is important to notice that the previously mentioned drive towards automation and dynamic pricing were not rejected by our participants; hence, the ‘Resource Man’ approach cannot be easily dismissed. Yet, our discussions into ecology, privacy, political and public participation further confirmed that these policies are themselves likely to generate issues and public questions that cannot be accounted for by economics and engineering alone, and so will generate new issues and controversies in later innovation cycles.

Our approach could be seen as validated insofar as it yielded sometimes highly interesting and dynamic discussions, covering a broad range of issues. Some of the contents of these will be reported below. They will be dealt with to greater extents in scientific publications, of which Sareen and Rommetveit (2019) is the first. We recognize that we cannot know how our participants perceive of the challenges of smart electricity outside of the framings provided by our pilot and Living Lab approaches.

In the following we present the pilot in three interrelated ways: first, we describe (briefly) the focus group methodology; next we (briefly) describe the evolution of the pilot over time, as recorded during our three pilot focus groups; finally, we present some main findings.

5.1 The focus group approach

Focus group (FG) is a qualitative research methodology to collect data from groups and let complex issues to emerge. As compared to individual interviews, focus groups (a kind of ‘collective interview’), enables more ‘natural’ forms of discussion to emerge, since they are dialogical and interactive. The Bergen pilot focus groups were semi-structured, in the sense that they always followed a relatively organized structure according to themes (see below). Thus, the researchers initiated discussions by proposing themes for discussion, and then

pursuing these in an open-ended (frequently non-structured) way. This allowed for spontaneous discussions and for following topics into greater detail, sometimes also straying far beyond the initial framings provided by the facilitator, and to discover new issues. The meetings were recorded, and later transcribed. Prior to each focus group meeting, participants were informed about the recordings, reminded of the data protection practices and priorly collected informed consents. The option to not record was available at each meeting, but not asked for.

We informed the participants about the nature of qualitative research, about focus groups generally, and about the role of the facilitator. We highlighted that the purpose is to elicit topics, problems (technical as well as ethical and societal) and controversial issues; not to provide any 'right' or 'wrong' answers. We tried to the best of our abilities to let everyone speak, and also to encourage those who tended to take less part in discussions. We specifically worked to keep discussions on track if it diverged too much from the overall topic, got stuck on a theme of interest only to a few, or. We kept track of time for each topic, and kept discussion time within the given time frames of each meeting (generally lasting from 1,5 to 2,5 hours).

5.2 Pilot evolution over time as recorded in focus groups

As noted the focus was consistently kept on three main themes throughout the focus groups. Yet, each round of focus groups took place at a different stage of the project, and so yielded slightly differing results.

The first focus group took place during installation, and few participants had started to really use the Smappee monitor. Here, a main focus was on reasons and motivations for participation, and also first impressions of the Smappee. At this stage, we see quite some fascination with the 'plug and play' imaginary, with the fact that the monitor was actually capable of identifying household appliances, and with the visuals of the app. Beyond this, discussions were of already existing energy behaviours. Discussions of smart energy 'as such' were largely speculative, with participants recounting a number of real-life experiences with similar or prior technologies. Thus, the first focus group was to large extents marked by the generally promissory discourse surrounding smart technologies, and fascination with technological potential. At the same time, counter-imaginings were also broached, and we discovered that for several, data security and privacy are real concerns. Further, when digging beneath the promissory discourse, we also discovered broader concerns with the general institutional environment within which these technologies emerge (i.e. dis-trust with energy companies and grid operators).

The second focus group was much more concrete, in the sense that participants had gained experience with the workings of the Smappee. At this stage, all participants had installed the monitor, and most had started using it (to greater and lesser degrees). This is where the doubts and uncertainties concerning the technology itself really started to emerge, as several reported about shortcomings relating to both installation and use. The theme of automation was brought up, as was the possibility of real-time pricing and the emergence of third party actors (businesses) as providers of ‘energy services’. It became clear that several were not really interested in spending a lot of time on ‘behavioural change’, unless this was coupled to quite concrete, working technologies and services. Deepening of the broader issues were achieved, especially as the pilot was associated to the on-going roll-out of smart metering in Norway, which took place at exactly this time. Again, concerns with data security and privacy were recurring themes. And, the theme of dis-trust in major institutions and corporations in charge of ‘energy transitions’ were repeated. Whereas participants are quite positive of energy transition, including related behavioural changes, they do not necessarily trust the institutions through which such changes are expected to occur.

The third focus group repeated several of the themes from the second focus group, with some themes tending towards saturation (i.e. technical problems, energy behaviour, automation, dis-trust with certain institutions). An additional theme was with the PARENT platform, with considerable confusion as to the difference between this and Smappee. In spite of repeated reminders through the newsletters, we never really managed to overcome this problem, with the result that the reporting on the platform results could have been more solid.

5.3 Some main findings

The pilot resulted in three kinds of outputs: One is quantitative tracking of real-time consumption from late 2017 to early 2019. This demonstrated a somewhat scattered change, indicated below. The second output, and the most important in the Bergen pilot, comprises qualitative insights from focus group discussions (see Appendix III with 20 pertinent, frequently occurring terms with anonymized contextual quotes). The third output is comprised by responses to the survey circulated towards the end of the pilot.

5.3.1 Real-time consumption

The Bergen Pilot was not focused on tracking the interrelations between real-time consumption and energy habits. Yet, as the below table 1 shows, and as can also be read from the qualitative data and the survey results, such correlations are not likely to be

strong. Among main reasons for this are: 1) the data in Table do not show any overarching trend, but (where change is visible) diverging trends that do not amount to an overall pattern; 2) This is also the finding from the focus groups and the survey. The Bergen Pilot did not aim to ‘nudge’ its participants in any specific direction, but aimed to articulate some of the conditions (mainly local) under which more sustainable energy uses and behaviours could emerge; 3) as became clear during workshops and in the survey, the Smappee energy monitor had several technical problems, and did not provide accurate readings. This was especially so for single applications, and to some extent also the case for overall (monthly, etc.) readings (although here reliability was greater).

Of the 46 households that participated, 43 installed the Smappee and shared data with the project from late 2017 to early 2019. The earliest began in October 2017 while most joined by January 2018. The Bergen living lab formally concluded December 2018 but some households continued to share data till April 2019. Table 1 provides an overview of household electricity consumption figures for 39 households during January and February 2018 and 2019, as these enable comparison during the same months of the year. Table 2 provides data of both electricity consumption and production for four participating households, which produced photovoltaic electricity as well, during the same period. Households for which figures are available for all four months are shown in italics. Overall, changes in electricity consumption are scattered and do not show a single clear trend.

Table 1. Electricity consumption by household (Jan-Feb 2018 & Jan-Feb 2019)

No.	Household size	House type	Area (m ²)	1/2018 (kWh)	2/2018 (kWh)	1/2019 (kWh)	2/2019 (kWh)
1	1-2	Apartment	<70	515	428	848	598
2	1-2	House	<70	-	-	628	607
3	1-2	Apartment	<70	-	1154	-	-
4	1-2	Apartment	<70	1309	1395	-	-
5	1-2	Apartment	<70	-	-	-	906
6	1-2	House	71-100	5517	5716	3674	2792
7	1-2	Apartment	71-100	1042	931	957	698
8	1-2	Apartment	71-100	612	513	1037	794
9	1-2	Apartment	71-	-	1321	844	816

			100				
10	1-2	House	71-100	1468	1341	-	-
11	3	Apartment	71-100	497	401	-	-
12	1-2	Apartment	71-100	1408		-	-
13	4	<i>Apartment</i>	101-130	3696	3342	2121	1612
14	4	<i>House</i>	101-130	2732	2509	2587	2018
15	1-2	House	101-130	-	2646	2818	2045
16	1-2	Apartment	101-130	2039	46	-	-
17	1-2	House	101-130	3172	2965	-	-
18	1-2	House	101-130	-	-	3160	2542
19	4	<i>Apartment</i>	>130	2700	2540	2775	2189
20	1-2	<i>House</i>	>130	4576	3794	4025	3399
21	5	<i>House</i>	>130	4794	4943	5014	3487
22	5	<i>House</i>	> 130	3778	3868	3788	3133
23	1-2	<i>House</i>	>130	3025	3047	3476	2549
24	5	<i>House</i>	>130	2955	2809	3043	2433
25	3	<i>House</i>	>130	1209	1151	1261	972
26	3	<i>House</i>	>130	1742	1644	2218	1847
27	5	<i>House</i>	>130	4391	3886	4514	3418
28	5	<i>House</i>	>130	2013	1758	1729	1392
29	1-2	<i>House</i>	>130	5604	5454	3026	-
30	1-2	<i>House</i>	>130	1557	1366	1372	-
31	3	<i>House</i>	>130	5114	-	2142	1595
32	5	<i>House</i>	>130	3964	3754	-	-
33	>5	<i>Apartment</i>	>130	1113	986	-	-

34	1-2	House	>130	3446	2941	-	-
35	4	House	>130	5229	4807	-	-
36	1-2	House	>130	2728	2437	-	-
37	1-2	House	>130	3908	3210	-	-
38	5	House	>130	-	-	3338	2322
39	3	House	>130	-	-	2515	2236

Table 2. Electricity consumption and production by household (Jan-Feb 2018 & 2019)*

No.	House hold size	House type	Area (m ²)	1/18 con kWh	1/18 pro kWh	2/18 con kWh	2/18 pro kWh	1/19 con kWh	1/19 pro kWh	2/19 con kWh	2/19 pro kWh
40	1-2	House	>130	3203	23	2674	80	2015	1	1834	1
41	4	House	>130	2004	2	1899	-	2333	-	1527	-
42	1-2	House	>130	5862	63	5819	115	3807	26	2866	73
43	5	House	>130	-	-	6093	108	3026	13	2481	50

*con = Consumption, pro = Production

5.3.2 Focus Groups: Some main findings

Our discussions and meetings followed a consistent format: each began with technical aspects (device installation, energy management platform roll-out), proceeded to everyday energy practices, and then took up broader political economy issues (including privacy). In the following, our focus is on these aspects, in line with the general approach and focus taken by the Bergen pilot. The following is taken from an early version of (Sareen and Rommetveit 2019), for a more complete description, please refer to the full article.. At least two more articles are under development that will describe the focus group materials in greater detail.

At *the technical* level we first note, as have others as well, that a technical device such as a sub-meter works well for triggering participants' curiosity and fascination. The latter pertains especially to the promise of 'plug and play', where the device will presumably reveal hitherto hidden patterns in the consumption of the household. Whereas this interest to some extent persisted throughout the project, a majority of participants reported troubles with the device: first, installation (into the household's fuse box) was more difficult than expected, and several needed assistance from an electrician. This settled, the device

had problems recognising the household applications, and people had trouble ‘teaching’ it the differences between them. These problems were reported as ‘demotivating’, and so worked to turn people away from participation. Among the technically proficient participants, few believed that this kind of free-standing device will be used in the future, but found it possible that it nevertheless points in relevant directions: several mentioned how houses and buildings are becoming smarter with more interactivity and information exchange built in, hence ‘hidden in the walls’.

As concerns *energy behaviour*, several of the focus group participants reported that they already took an interest in energy consumption before joining the project, and that this may have been part of their reason for signing up in the first place. This complicates the possibility for assessing (or ‘measuring’) the impact of the sub-meter device or the platform. Some participants reported that they could ‘have done the same’ without any technical measures. Yet, one BLL participant argued for the need to monitor behaviour over time, and here the device can be of some help. A problem, however, was that many seemed to lose interest or motivation after some time. An interesting topic brought up by this BLL participant was whether people really want to change behaviour in this way (*i.e.*, by having their consumption patterns continuously monitored and communicated to them), or whether this is a good example of tasks that should rather be automated. This prompts us to ask: why indeed has it been decided that ‘smart electricity’ technologies shall target energy behaviour, and not energy consumption directly? In other countries with which it is relevant to compare, such as Finland, Sweden, the UK and Portugal, we see similar developments: away from ‘awareness raising’ and towards automation, frequently in tandem with mechanisms of dynamic pricing (Silvast et al. 2018). A quite general perception among our participants was that this is ‘almost certain to come’.

The question of what motivates people came up in several contexts. The main interest (among Norwegians) for changing energy behaviour was generally reported as stemming from environmental concerns, the perception being that Norwegians are spoiled with cheap (and relatively clean) energy. Economic concerns may have some bearing on the issues but were not all that important. Norwegians were described as a bit pampered, and not really concerned much about their consumption. Some of the more highly motivated participants reported that they were not able to reduce their energy consumption more than they had done already, and that this would require further technical fixes or technological measures (*e.g.*, improved energy efficiency). Some also reported decisive limits in terms of everyday routines that are not easy to change (picking up the children after school, going home to cook dinner, etc.).

Some participants responded positively to gamification: especially highlighted here was the possibility to compare with other (similar) households in one's area. Relatedly, the visual impacts of the sub-meter device were pointed out as having some potential, since things are perceived to be more convincing when one can point to a screen displaying a graph and numbers. These visual aspects were also pointed to by people debating the social dimensions of the device: showing it to friends, colleagues and visitors, and the screen and the graphs, data and numbers.

Coming finally to the *political economy* issues, discussions turned quite lively. A number of topics and issues were touched upon: in terms of motivation and participation, we saw strong interest in questions of where energy comes from, in terms of country of origin and energy source (*i.e.*, through green certificates). In Norway, strong controversies persist over whether Norway should integrate its energy system, which is often portrayed as clean and green, with Europe or other neighbouring countries, since this seems to introduce a number of 'impure' energy sources, such as coal and nuclear, to the Norwegian system. Whereas some argue that Norway should retain its 'clean' energy for its own purposes, others argue that climate and energy issues are global, and that we should integrate and collaborate, with Europe and beyond. To quite an extent, the BLL participants questioned many of these assumptions, arguing that energy production, distribution and consumption have long been integrated with other countries, and that a main driving force has been Norway's desire to sell surplus energy abroad. Questions were also posed about the idea that Norwegian energy provisions, mainly based on hydroelectric power, are by default 'green'. Sweden abandoned this idea 15 years ago; in Sweden, it is mainly solar and wind that count as green and renewable. Hydroelectric power destroys rivers and water systems.

There seemed to be general agreement upon the Norwegian energy system thus being predicated on industrial and political interests ("it is Norwegian industry and policy makers pushing for these developments, *i.e.* the spot market Nord Pool; not 'Europe'", to quote one participant), a sentiment that does not necessarily penetrate public or political discussions. Whereas there was general agreement that the debate is therefore to some (or even a great) extent predicated on false moralism, this did not translate into agreement on action at political levels. An important issue here also pertains to trust in institutions: it may seem reasonable to have this kind of collaboration across borders, but trust in institutions was an overarching and oft-repeated problem: from the local energy company, to the grid operator, to multi-scalar institutions (regional, national and European). Here, it seems that the broader conditions for effective collaboration were lacking. Yet, it is exactly such trust, and such institutions, that are required if smart energy production, consumption and distribution are to be scaled up.

Trust also becomes a topic at another level, namely due to privacy issues. A smart meter, or a sub-meter device, generates huge amounts of person sensitive data (EDPS 2012). If the tendency towards automation noted above persists, the potential inclusion of new technologies such as Internet of Things and blockchain, or the inclusion of third party services to monitor and manage energy consumption, could drastically exacerbate such concerns. Our living lab did not generate such concerns but was seen as trustworthy in this regard, since it was small-scale, not connected to commercial interests, and not connected to the public smart metering project. People were more concerned about the general, state mandated roll-out of smart meters, and their interactions with other devices or policies, such as in-house alarms and insurance schemes. Similar to the previous section, the main problem seems to reside with a generally low trust in power companies and grid operators, but also national and European institutions.

For further data on some main contents and concepts that emerged during focus groups, please contact the authors.

5.3.3 Survey results

The survey was circulated to participants at the end of the pilot. It was not specifically developed for the Bergen pilot, but for all the PARENT pilots. This means that the survey could possibly have been more specific as to the nature of the Bergen project, and also that it yields somewhat contradictory results. For instance, in the overall evaluation of the project, the Smappee monitor is rated quite highly, as is the PARENT platform. Yet, in other parts of the survey, these are strongly criticised (question 2a). Further, under section 1, the monitor and platform are seemingly rated higher than the focus groups. Yet, when asked to internally rate the various parts of the project (question 1b), the focus groups come out as the most highly rated by far. This is probably not a great coincidence, as the focus groups were indeed the main focus of attention for the Bergen team. Further, the survey did not enjoy great participation (n = 12), and the extents to which findings can be generalised are subject to some doubt.

This stated, we think the survey results can be used to validate (i.e. triangulate) some general findings and trends, as recounted in the previous two sections:

Overall, the participants that responded to the survey were positive to the project, although with caveats. In general, they are positive about the idea of the energy monitor and the PARENT platform, but experience significant problems in practice (question 2a). For the Smappee, this related to both installation and use, especially location in the fuse box and recognition of specific household appliances. It was not very user friendly, and although the

participants see such technologies (esp. visualisation, automation) as part of the energy system of the future, these particular devices and applications did not work particularly well. This is indicated by the following replies from one participant, to two consecutive survey questions:

2e) 'I think the overall concept is well thought out, the app design is good and the theory is there: that you are able to better control your energy usage'

2f) 'It was not user-friendly and I don't know whether I trusted the numbers it gave me concerning overall energy usage. Several times I was shut out from the app and it took time to get back in again. Then another Smappee app was introduced without the old one being deleted, and now I'm left with 2 apps on my phone...one should be able to trust the numbers and that the app one uses is the right one'

Several participants reported a relatively strong initial interest, but that this waned as the project progressed, and that they stopped looking at the app and platform (question 2 c). This is quite consistent with findings from similar projects, as already described in D 3.1.

Participants are overall positive about communications (esp. newsletters) and focus groups. During focus groups quite a few told us that only by taking part in these, were they really able to see the point of the project. This can also be read off in the survey data (esp. 1 a and 1b).

As concerns energy behaviours, we have already described that no strong discernable pattern emerged (questions 4 a – f). This could be for a number of reasons: 1) we have already described a certain scepticism towards the 'energy man' imagination, according to which energy users main interest lies in optimizing consumption patterns, making savings, etc. In the focus group data, we saw how Norwegians were described (by pilot participants) as 'spoiled' with cheap access to renewable energy. It is thus quite likely that quite strong pressures would need to be applied in order for them to leave their 'comfort zone', as described by one participant; 2) several participants (approximately half of the total) described themselves as already quite concerned with making energy savings. For these participants, the main attraction was not to make further changes, but to engage with emerging trends in energy usage and distribution; 3) the already described technical problems would de-motivate them into realising the potential of the technology, hence the quite frequent reference to automation and real-time pricing.

The survey results can be seen, in a simplified form, in **Annex 1**.

6 Conclusion

The general approach of the Bergen pilot was shaped by the task of studying social acceptance and acceptability. It was also shaped by prior scholarly commitments by the Bergen team. For the Bergen team, it was important to flag that acceptability of a given technology is always also a function of the agendas and technologies being promoted. This implies that we also regarded efforts towards behavioral change with a grain of skepticism. Both from a point of view of public engagements with science and technology (PES), and from the emphasis on public engagements in RRI, such skepticism is a (simultaneously) methodological and normative requirement. It is normative, because commitments to broad public participation presuppose an openness towards a number of worlds and values; not merely those promoted by technologists or policy makers, but those held by the citizens and users encountered during a project. It is also methodological because one wants to capture (to the best of one's capacity) the full spectrum of insights and values, and not prescribe primacy to technical innovation agendas only.

Hence, the goal of the Bergen pilot was to provide broad elucidation and discussion of the technology itself, but also taking into account the behaviors of users, including the broader cultural, political, economic and environmental conditions within which such behaviors with technology emerge, and that inform energy behaviors. As such, the main findings from the Bergen pilot are those explained under section 3.4 on the focus groups (but taking into account quantitative energy data and the survey results). We are explaining this, because these are the main premises on which the Bergen pilot should be evaluated. In saying this, we also hasten to add that in a related report, on RRI, we shall also incorporate the goals of the project as a whole, and the approaches taken in Amsterdam and Brussels. We also add that, academically, we have already published two articles based in the focus group results, and (at least) two more are in preparation, for special issues in good academic journals.

Seen from the perspective outlined above it may come as little surprise that the main positives of the participant survey were ascribed to the focus groups and the participatory elements, in a broad sense, of the project. We think that our approach has been validated, insofar as the general approach to the focus groups, and broader engagements of participants, yielded interesting insights and discussions. These emerged locally, but are also relevant to other places and project framings. As has been experienced by us, including in previous projects, there is a lack of arenas in which to promote wider discussion of the goals and means of technological and economic innovation. This approach

was frequently (not always, and not equally!) recognized and expressed, thus validated, by participants in the Bergen pilot.

7 References

EDPS (2012) Opinion of the European Data Protection Supervisor on the Commission Recommendation on preparations for the roll-out of smart metering systems.

Sareen, S. and Rommetveit, K. (2019) Smart Gridlock? Challenging hegemonic framings of mitigation solutions and scalability. Environ. Res. Lett. 14 . Online July 5 2019.

Silvast, A., Williams, R. A., Hyysalo, S., Rommetveit, K. and Raab, C. (2018) Who 'Uses' Smart Grids? The Evolving Nature of User Representations in Layered Infrastructures. Sustainability 10(10) :3738.

7.1 Annex 1: Extraction of main findings from survey.

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle
(Smappee monitor and application)

Somewhat positive: 7; Neutral: 5

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle.
(The Di.o smart plug that came with the monitor)

Very positive: 1; Somewhat positive: 1; Don't know/ not relevant: 4; neutral: 6;

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Direct communication in person/via email or phone with project team)

Very positive: 1; Somewhat positive: 5; Neutral: 4; Don't know / not relevant: 2

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Newsletters)

Very positive: 1; Somewhat positive: 9; Neutral: 2

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(PARENT online platform 1: comparison graphs and smileys by clusters)

Somewhat positive: 7; Neutral: 3; Don't know / not relevant: 2

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(PARENT online platform 2: challenges for sustainability)

Somewhat positive: 4; Neutral: 3; Don't know / not relevant: 5

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Focus group 1 (autumn 2017))

Very positive: 2; Somewhat positive: 4; Don't know / not relevant: 6

1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Focus group 2 (spring 2018))

Very positive: 3; Somewhat positive: 5; Don't know / not relevant: 4

**1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Focus group 3 (autumn 2018))**

Very positive: 1; Somewhat positive: 5; Don't know / not relevant: 6

**1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(PARENT-workshop w. "Smappee-dissection" (høsten 2018))**

Very positive: 1; Somewhat positive: 2; Neutral: 2; Don't know / not relevant: 7

**1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Facebook-group)**

Somewhat positive: 3; Don't know / not relevant: 5; Neutral: 3; Negative: 1

**1a) Please rate the importance of each PARENT measure in adopting a sustainable lifestyle...
(Involvement of the municipality / local actors (Bergen kommune, BKK, Bærekraftige liv Landås, Høgskolen i Bergen, Naturvernforbundet))**

Very positive: 2; Somewhat positive: 6; Neutral: 2; Don't know / not relevant: 2

1b) Please tell us what measure/event/initiative in the project you liked most or found most informative or useful.

Focus group: 7; Did not show up: 1; sharing / comparison of consumption: 1; Newsletter: 1; Installation of Smappee: 1; Technical dissection: 1.

1c) What other measures did you think were missing that you would have liked to see?

1d) Do you feel like you learned something during this project or that your awareness of energy and other environmental/sustainability related issues increased?

Quite a lot: 1; Yes, somewhat: 7; Maybe: 4;

1e) Please rate your satisfaction with the project communication (Overall communication by project organisers)

Very content: 7; Quite content: 4; Neutral: 1

1e) Please rate your satisfaction with the project communication (Information provided at the start of the project on what the project offered and was expected from you as a participant)

Very content: 3; Quite content: 7; Neutral: 2

1e) Please rate your satisfaction with the project communication (Information provided on data protection and privacy)

Very content: 6; Quite content: 4; Neutral: 2

1e) Please rate your satisfaction with the project communication (Technical support by the project team (excluding Smappee helpdesk))

Very content: 5; Quite content: 3; Neutral: 3; Quite discontent: 1

1e) Please rate your satisfaction with the project communication (**Imøtekommenhet og respons fra PARENT-teamet på dine spørsmål og tilbakemeldinger**)

Very content: 7; Quite content: 4; Neutral: 1

2a) Smappee monitor and application - use and satisfaction

(General satisfaction of Smappee)

Somewhat content: 6; Neutral: 3; Discontent: 3

2a) Smappee monitor and application - use and satisfaction (Installation process and support)

Very content: 5; Somewhat content: 2; Neutral: 1; Discontent: 1

2a) Smappee monitor and application - use and satisfaction (Graphs on overall energy consumption)

Somewhat content: 7; Neutral: 5

2a) Smappee monitor and application - use and satisfaction (Consumption information on household appliances)

Neutral: 3; Discontent: 9

2b) How often did you look at your Smappee application on your phone or computer on average?

Several times a week: 4; Once a week: 4; Once a month: 1; Less than once a month: 3

2c) Did your interest in the Smappee application change over time?

Initially active, then diminishing: 10; Relatively constant over time: 2

3a) Please rank your satisfaction with the PARENT online platform. (General satisfaction of online platform)

Very content: 1; Somewhat content: 3; Neutral: 6; Not relevant: 2

3a) Please rank your satisfaction with the PARENT online platform (Ease of use and clarity of information displayed)

Very content: 1; Somewhat content: 3; Neutral: 6; Not relevant: 2

3a) Please rank your satisfaction with the PARENT online platform. (Comparison graphs with other participants)

Very content: 1; Somewhat content: 2; Neutral: 7; Not relevant: 2

3a) Please rank your satisfaction with the PARENT online platform (Smileys)

Very content: 1; Somewhat content: 3; Neutral: 4; Not relevant: 3; Discontent: 1

3a) Please rank your satisfaction with the PARENT online platform? (Challenges and leader board)

Somewhat content: 2; Neutral: 7; Not relevant: 3

3b) How often did you look at the online platform on your phone or computer on average?

Once a month: 1; Less frequent than once a month: 9; Never: 2

3c) Did your interest in the online platform change over time?

No, it was relatively constant: 6; Yes, initially active then decreasing: 6

Energy actions: During the project, did you implement any changes in your household and in your behaviour to reduce your energy consumption?

4a) Did you make concrete changes to your home? (insulation)

No, I made no changes: 10; Yes, I made some changes: 1; No, I had already optimized my energy behaviours: 1

4a) Did you make concrete changes to your home? (Energy efficient electronic appliances)

No; I made no changes: 7; Yes, I made some changes: 3; No, I had already optimized my energy behaviours: 1

4a) Did you make concrete changes to your home?? (Energy efficient bulbs)

No; I made no changes: 3; Yes, I made some changes: 5; No, I had already optimized my energy behaviours: 4

4a) Did you make concrete changes to your home? (Solar panels)

No; I made no changes: 11; Yes, I made some changes: 1

4a) Did you make concrete changes to your home?? (Switch to greener energy provider)

No; I made no changes: 10; No, I had already optimized my energy behaviours: 2

4a) Did you make concrete changes to your home? (Annet (vennligst spesifiser her under))

No; I made no changes: 10; No, I had already optimized my energy behaviours: 2

4b) Did you make behavioural changes to your lifestyle? (Turning off lights)

No; I made no changes: 1; Yes, I made some changes: 5; No, I had already optimized my energy behaviours: 6

4b) Did you make behavioural changes to your lifestyle? (Turning off standby electronics and other devices)

No; I made no changes: 1; Yes, I made some changes: 4; No, I had already optimized my energy behaviours: 7

4b) Did you make behavioural changes to your lifestyle? (Energy efficient cooking)

No; I made no changes: 9; Yes, I made some changes: 2; No, I had already optimized my energy behaviours: 1

**4b) Did you make behavioural changes to your lifestyle? (Energy efficient heating/cooling)
No; I made no changes: 5; Yes, I made some changes: 5; No, I had already optimized my energy behaviours: 2**

**4b) Did you make behavioural changes to your lifestyle? (Less use of hot water)
No; I made no changes: 4; Yes, I made some changes: 4; No, I had already optimized my energy behaviours: 4**

**4b) Did you make behavioural changes to your lifestyle? (Eco programmes on my dishwasher/washing machine/clothes dryer)
No; I made no changes: 4; No, I had already optimized my energy behaviours: 8**

**4b) Did you make behavioural changes to your lifestyle? (Other (please specify):
No; I made no changes: 10; No, I had already optimized my energy behaviours: 2**

**4 f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Eating more local/organic/vegetarian/non-processed food)
No; I made no changes: 10; No, I had already optimized my energy behaviours: 2**

**4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Growing my own food)
No; I made no changes: 10; Yes, I made some changes: 1; No, I had already optimized my energy behaviours: 1**

**4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Travelling more by foot/bike/public transport)
No; I made no changes: 3; Yes, I made some changes: 3; No, I had already optimized my energy behaviours: 6**

**4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Using less packaging)
No; I made no changes: 5; Yes, I made some changes: 6; No, I had already optimized my energy behaviours: 1**

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Making purchases more consciously (buying less, more sustainable, second hand))

No; I made no changes: 5; Yes, I made some changes: 4; No, I had already optimized my energy behaviours: 3

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Repairing broken things, upcycling items, donating items to others)

No; I made no changes: 5; Yes, I made some changes: 4; No, I had already optimized my energy behaviours: 3

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Using less water)

No; I made no changes: 11; Yes, I made some changes: 1;

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Sorting and recycling more)

No; I made no changes: 3; Yes, I made some changes: 5; No, I had already optimized my energy behaviours: 4

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Wasting less)

No; I made no changes: 5; Yes, I made some changes: 3; No, I had already optimized my energy behaviours: 4

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? (Using fewer toxic products)

No; I made no changes: 7; Yes, I made some changes: 1; No, I had already optimized my energy behaviours: 4

4f) Other sustainable changes: During the project, did you implement any changes other environmentally-conscious changes? Other (please specify):

No; I made no changes: 7; No, I had already optimized my energy behaviours: 1

4h) Participation in other activities: During the project, did you become engaged in any other new local initiative (such as meetings, workshops, signing petitions for improvement locally, political activities, neighbourhood events, shared gardens, etc.)

No, I am already involved in as many activities as I can manage: 5; No, I was not interested in more activities: 6; I am not part of any activities but am more conscious of certain things: 1