SmartGrids SRA 2035

Priorities for

SmartGrids Research Topics

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Foreword

In 2012 the European Technology Platform (ETP) for the Electricity Networks of the Future has presented its updated Strategic Research Agenda 2035[1] (SRA 2035) on SmartGrids. With the SRA 2035 the SG ETP gives detailed descriptions of longer term research and innovation activities, necessary for electricity networks and intelligent electric systems by 2035 and contributing to the EU's envisioned CO2 reduction of minimally 80% by 2050.

In the SRA 2035, many research topics have been defined in various research areas. No priorities have been defined yet. This document "Priorities among SRA 2035 research topics" gives focus on those SmartGrids research topics which are considered as key priorities among a group of SmartGrids experts.

This document serves as input to the EU Framework Programme for research and innovation "Horizon 2020" – starting in 2014 – as well as other SmartGrids RD&D initiatives both on national and European level.

Table of Contents

[1] http://www.smartgrids.eu/documents/sra2035.pdf

Executive Summary: Priorities for SRA 2035 Research Topics

With this document the SG ETP wants to move forward and support the many stakeholders in reaching their goals even more. The SG ETP aims to identify those SRA 2035 SmartGrids research topics that are long term. The goal is the establishment of a common understanding among stakeholders and put priority on them.

Goal: Determine long term SRA 2035 SmartGrids research topics, establish common understanding among experts, put priority on them.

The SG ETP intends to work out an implementation plan for the long-term and urgent SmartGrids research areas, covered in the SRA 2035.

As part of this process, the SG ETP stakeholders need to determine,

1) what type of urgent research questions need to be handled by
2) what type of research stakeholders in
3) what type of cooperation project.

The planned result is a long-term SmartGrids research implementation plan to be revised periodically. Initially, the SmartGrids research community together with advanced industrial and SME research will have central roles in setting up this research plan. The other stakeholders, particularly Network Operators associations (ENTSO-E and EDSO for Smartgrids) and the consumer and ancillary service related new service providers will need to pronounce their needs. Some of these needs will come from the experiences of the early EEGI and national SmartGrids projects, currently or soon underway in Europe.

The coordination and cooperation between the researchers in academia (basic and applied), in the System-Developing-Industry and -SMEs is important to ensure that all necessary new requirements concerning long-term grid-based system questions are addressed.

In Oct. 2012, the SG ETP has initiated a SmartGrids stakeholder process for answering the following questions:

Question 1: Which of the SRA 2035 research topics need to be elaborated among the SmartGrids stakeholders in more detail to get an improved common understanding of what results, projects, types of collaboration are needed? Which of the SRA 2035 SmartGrids research topics are of longer term interest? I.e. which topics need to be covered by fundamental and applied research? These priority topics could later be used as part of EERA, TSO and TSO/DSO plans.

Three priority levels are used for SmartGrids research topics:

Category 1 (long-term needs) SRA 2035 topic is only weakly or not covered by current research work (these are the long-term research topics) THIS RESEARCH IS VERY CHALLENGING, COMPLEX AND URGENTLY NEEDED; NOT YET ONGOING WITH ENOUGH INTENSITY.
Category 2 (medium-term needs) SRA 2035 topic is covered with minor gaps by current research work (these are the medium-term research topics) THIS RESEARCH WORK IS ALREADY ONGOING TO LARGE EXTENT
Category 3 (short-term needs) SRA 2035 topic is mostly covered by current research work (i.e. these are short-research topics) THIS RESEARCH WORK IS ALREADY ONGOING

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66 **Question 2:** What is the priority among the urgently needed long-term research topics?

Answers to this question should help to find the most important topics among those considered as category 1 research topics.

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The following table summarizes the top priorities among the many SmartGrids SRA 2035 Research Topics. For all topics mentioned in the table below, more and new SmartGrids research is urgently needed.

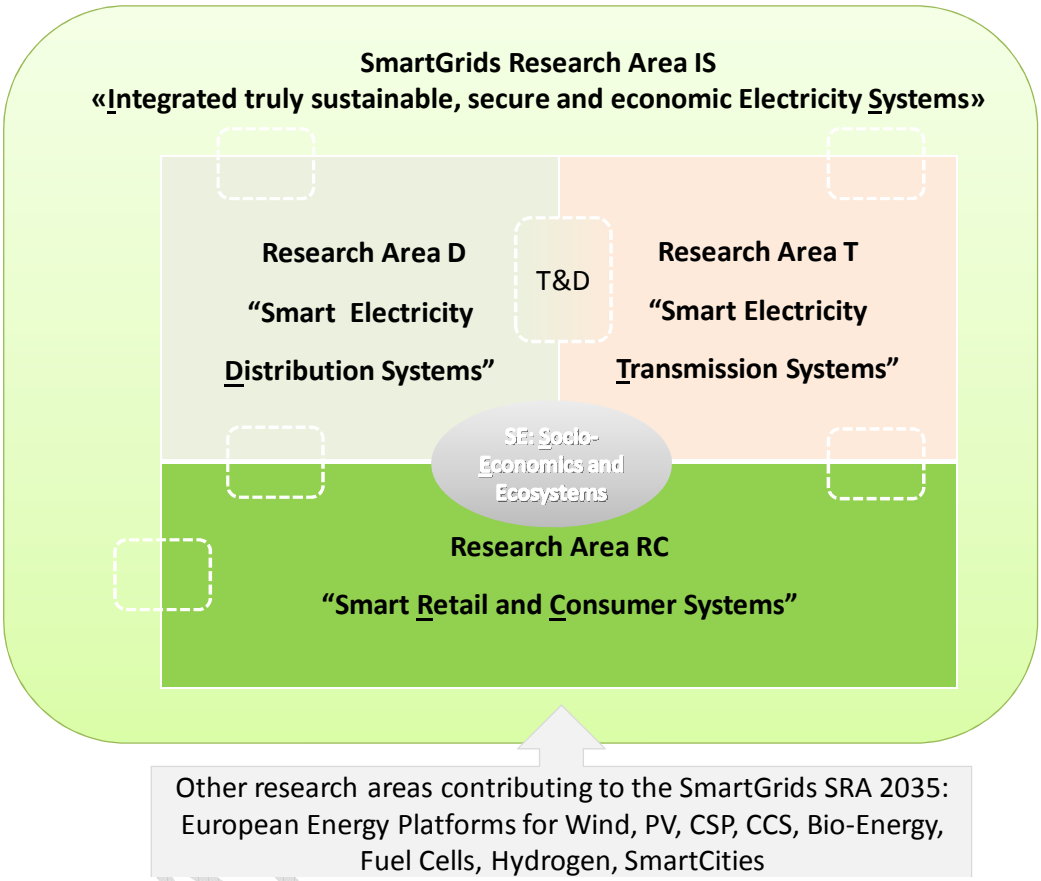
Research Area	Priority (1: highest)	High Priority Research Topic
IS	1	Observability and Control (including ICT for Control)
	2	Widespread Storage within the Grid
		Self-healing
	3	Advanced components
		VPP (Virtual power plants) and market
	4	Operator Issues, Training and Education
D	1	Modelling Power Systems and ICT together
		Observability at Distribution Level
	2	Power Electronics Technologies
	3	DC distribution grids & DC distribution integrated into to AC grids
	4	Risk based operation
	5	Microgrids
		Cyber Security
		EVI (Electric Vehicle Integration)
RC	1	Distributed self-organisation vs. central control
	2	Energy Cloud
	3	The NEW Infrastructure integrating both Energy/Electricity and ICT
SE	1	Consumer Maturity
	2	Legislation/Regulation: New energy-markets designs

The following chapters give insights into these priorities for each of the four research areas. We also describe the most relevant research topics and the rationale behind the priority setting. We start with a summary of the SRA 2035 research areas, tasks and topics.

1 SmartGrids SRA 2035 Research Areas

The SmartGrids SRA 2035 describes the research topics and priorities necessary for the advancement of the electricity networks and intelligent electric systems by 2035. The research activities and goals for the years leading up to 2020 were discussed in the previous SmartGrids SRA from 2007.

The following SmartGrids research areas have been identified in the SRA 2035:



The dashed white lines indicate research areas which clearly appear in both affected areas. Research in the two areas cannot be fully separated. The area covering both T and D (i.e. T&D) has been specified as a sub-area with explicit own self-standing goals.

Research area IS "Integrated Systems" deals with all issues where a special separation is not possible between distribution, transmission, consumer and other stakeholders such as generators, wholesale traders, balance responsible groups, service providers and aggregators, etc. Research in this research area IS is necessary to satisfy the needs of all stakeholders as an integrated group towards a truly sustainable, secure and economic electricity system.

Research Areas D and T deal with Distribution and Transmission Grids related research respectively to cover the needs of all stakeholders for designing, building, operating and maintaining a secure, sustainable and economical electricity system by 2035, including the interactions between D and T.

Both D and T include research related to interfaces to other energy carriers and storage devices. The optimal integration of all electricity grid related issues as the core energy system by 2035 is the primary goal. Both D and T also include research related to ICT integration needs for smart distribution and transmission.

Due to the increased importance of the active role of the consumer in a SmartGrids system by 2035 and later, a new research area RC around the retail and consumer as key stakeholders has been established. Area RC includes research for the specific needs of the retail business and consumers within and for SmartGrids.

In addition to these four core technology oriented SRA 2035 research areas, area SE is seen as important for the overall SmartGrids developments. It deals with the research related to "Socio-Economical and Ecosystem SmartGrids barriers and opportunities".

2 SmartGrids SRA 2035 Research Tasks and Topics

For each of the research areas (RA), the SRA 2035 defines research tasks which are mapped to research areas IS, D, T, T&D, RC and SE. Each research task covers more than one research topic.

Research Area	Research Task	Research Task No
Integrated truly sustainable, secure and economic electricity Systems IS	Ancillary services, sustainable operations and low level Dispatch: *Smart Integrated Ancillary System Services*	*IS.1*
	Advanced forecasting techniques for sustainable operations and power supply: *Smart Look-Ahead System Demand and Supply*	*IS.2*
	Architectures and tools for operations, restorations and defence plans: *Smart System Large-Scale Disturbance Defence and Restoration*	*IS.3*
	Advanced planning, operation and maintenance of electricity systems - seamless SmartGrids: *Smart electricity system planning, operation and maintenance*	*IS.4*
	Pre-standardization - Information and Communication needs for SmartGrids: *Smart standardization of DER interconnections*	*IS.5*
	Smart Materials for SmartGrids	*IS.6*
Distribution systems D	Distribution system power and energy management strategies including storage and demand response: *Smart Network, Demand and Storage Response for Distribution System Control*	*D.1*
Transmission Systems T	Transmission networks of the future – long distance power wheeling at affordable costs: *Smart Long Distance Electricity Wheeling*	*T.1*
	HVDC and under-ground / under water transmission grids of the future – new architectures & new equipment: *HVDC and under-ground / under-water transmission grids*	*T.2*
	System technologies and incentives for flexible electricity consumption of large scale consumers	*T.3*
T&D	Network asset management	*TD.1*
Consumer Sys	Retail and Consumer Information and Communication Technology Infrastructures: *Smart Service architectures for secure, private and standardized consumer services*	*RC.1*

	Retail and Consumer Energy Services & Management: *Smart Consumer participation for Energy Service Requirements*	*RC.2*
	Consumer Interfacing Technologies: Smart Interfaces to the Consumers	RC.3
	Consumer Driven markets: *Smart Consumer Driven, Local Markets*	*RC.4*
	Active Consumer Programs: *Smart Active Consumers*	*RC.5*
Socio-Economics and Ecosystem SE	SmartGrids Business Models	*SE.1*
	Economic SmartGrids Models	*SE.2*
	New legislation for markets, grids, energy carriers and involved stakeholders	*SE.3*
	Compatibility of SmartGrids and SmartCity Evolution	*SE.4*
	SmartGrids Evolution and Transition	*SE.5*
	Opposition and Support to Proposed Power Line Projects	*SE.6*
	Interactions between Industry, Regulatory Authorities and NGOs	*SE.7*

For each of the tasks mentioned in this table, the SRA 2035 defines research topics. For details see, annex I of this document and the SRA 2035 itself.

3 Setting Priorities

Between Oct. 2012 and 05 Dec 2012 (workshop in Berlin) the SG ETP has undertaken a SmartGrids stakeholder process for answering the two questions mentioned in the executive summary of this document. These questions were initially answered by 12 experts and discussed at a workshop which took place on 05 December 2012 in Berlin[2].

At the workshop the answers to questions were used as input together with the expert opinions of those present at the meeting. The experts were divided into two groups: One group dealt with the priority setting of the research areas D (Distribution) and RC (Retail and Consumer), the other group determined priorities for the areas IS (Integrated Systems) and SE (Socio-Economic questions). Due to the fact that ENTSO-E and EDSO for Smartgrids are undertaking their own research agenda and in order to avoid duplicating efforts, areas T and T&D were not discussed at the meeting in Berlin. In the future, the SG ETP will have a critical look at the research agendas proposed by the two organization to integrate also the areas T and T&D with D, RC, IS and SE with a view towards 2035 research topics going beyond those of the EEGI with its 2020 demonstration focus.

The following paragraphs report on the conclusions of the two groups.

Note that the highest priority in each of the four discussed research areas IS, D, RC and SE begin at number 1. Priorities such as e.g. 3a, 3b indicate the same importance within this priority 3.

[2] For participant list, see Annex II of this document.

The following table summarizes the top priorities among the SmartGrids SRA 2035 Research Topics. For all topics mentioned in the table below, more and new research is urgently needed.

Research Area	Priority (1: highest)	High Priority Research Topic
IS	1	Observability and Control (including ICT for Control)
	2	Widespread Storage within the Grid
		Self-healing
	3	Advanced components
		VPP (Virtual power plants) and market
	4	Operator Issues, Training and Education
D	1	Modelling Power Systems and ICT together
		Observability at Distribution Level
	2	Power Electronics Technologies
	3	DC distribution grids & DC distribution integrated into to AC grids
	4	Risk based operation
	5	Microgrids
		Cyber Security
		EVI (Electric Vehicle Integration)
RC	1	Distributed self-organisation vs. central control
	2	Energy Cloud
	3	The NEW Infrastructure integrating both Energy/Electricity and ICT
SE	1	Consumer Maturity
	2	Legislation/Regulation: New energy-markets designs

The following tables give insights into these priorities for each of the four research areas. The tables also describe the most relevant research topics and the rationale behind the priority setting. We also summarize expert remarks related to the SRA 2035 research topics.

139 **IS: Priorities related to SRA 2035 research area IS (Integrated Systems):**

Prio Position in IS	Prerequisite for other research, but not really research itself.
Sub-topics Cluster	Standards & Protocols
Sub-topics Involved	IS08 b: Protocols and standards: Joint task force on IT system
Rationale	Standards & Protocols are a kind of pre-requisite and must be available as soon as new devices need to be deployed since they have to comply with them (e.g., to allow interoperability). The main objective should be to ensure interoperability. Ideally, protocols allowing for a "Plug & Play" feature that supports new functionalities.
Dependencies	

140 This position "0" is not really research but rather a pre-requisite for research. The outcome of this
141 position "0" is seen as a basis for the following research topics:

Prio Position in IS	1
Sub-topics Cluster	Observability and Control (including ICT for Control)
Sub-topics Involved	IS06 i: Extended applications of Wide Area Monitoring Systems (WAMS); Similar solutions may be adopted by DSOs, introducing fine-grained measuring devices and advanced prosumer grid interfaces to keep under control the evolution of the grid status IS06 g: Advanced integrated communication and control systems for gathering a wide set of informa-tion from the field and communicating with local and remote devices to enable rapid analysis and initiation of automatic corrective actions IS05 a: Tools for pan-European network observability IS05 c: Tools for pan-European network reliability assessment IS05 d: Increased observability of the electric system for network management and control IS06 a: Advanced sensors on network equipment: to identify anomalies and communicate with nearby devices when a fault or another issue occurs; Sensors have to detect patterns as precursors to faults
Rationale	This topic is considered to be already on going but it will have to evolve according to future context. The grid operator needs a way of estimating / visualizing the state of a Grid whose structure is changing and also beyond 2020.
Dependencies	

142

Prio Position in IS	2a
Sub-topics Cluster	Widespread Storage within the Grid
Sub-topics Involved	IS07 b: Storage of bulk quantities of electricity from fluctuation renewable sources production with low losses IS07 d: Synergies between storage technologies IS07 c: Off-shore energy storage associated on-site with off-shore wind farms (e.g. marine hydro pumped storage)
Rationale	Storage: bulk storage, dispersed storage, synergies… are important at every level for the upcoming energy context to a low very high RES penetration.
Dependencies	

143

Prio Position in IS	2b
Sub-topics Cluster	Self-healing
Sub-topics Involved	IS06 k: Options for self-healing grids i.e. the ability of a power system to automatically prevent, detect, counteract and repair itself IS05 h: Autonomous self-controlling and healing grids (dynamic topology, power re-routing)
Rationale	More R&D is needed to address the self-healing functionality and avoiding default on the grid for future complex scenarios.
Dependencies	Observability, sensors, real-time monitoring

144

Prio Position in IS	3a
Sub-topics Cluster	Advanced components
Sub-topics Involved	IS06 c: Advanced component and switching equipment to respond quickly to emerging problems by using strategies like promptly changing flow patterns and voltage conditions
Rationale	Adoption of new technologies is needed. ICT + Real-time monitoring are key features of these advanced components New devices based on innovative technologies (e.g., HTS, power electronics) for SG enhanced functionalities must be developed.
Dependencies	

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Prio Position in IS	3b
Sub-topics Cluster	VPP (Virtual power plants) and market
Sub-topics Involved	IS05 e: Multi-VPP system operation: Technical and business processes, interfaces, and operations
Rationale	The integration of RES (Renewable Energy Sources) should be managed in a way that RES generation can be considered as a VPP from the end-user point of view. Advanced VPP systems and operations are necessary.
Dependencies	Observability, sensors, real-time monitoring

146

Prio Position in IS	4
Sub-topics Cluster	Operator Issues, Training and Education
Sub-topics Involved	IS09 a: Tools and methods for SmartGrids training and education: New tools, simulators, methods and training facilities for operators of SmartGrids IS06 h: Advanced models to provide new visualization tools revealing congestion issues, overlays of failure probabilities and resulting threat levels
Rationale	There is the need to prepare the new generation of electrical engineers and technicians able to understand the new grid functionalities and to operate smart grids. Education and training of future electrical engineers and technicians should be more focused on electronics and communication. New learning tools to be developed for the new scenarios.
Dependencies	

147

148 **General Remarks about research area IS**

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
IS 06	k	Options for self-healing grids i.e. the ability of a power system to automatically prevent, detect, counteract and repair itself	The two topics could be merged
IS 05	h	Autonomous self-controlling and healing grids (dynamic topology, power re-routing)	
IS 08	a	Tools for the integration of active demand in the electrical system operations	Could be put into research area SE (Socio Economics)
IS 02	a	Local/national flexibility markets versus a pan-European commodity market: Allow multiple local players to trade flexibility. The different kinds of present and possibly future ancillary services. The necessary regulatory evolutions.	Could be put into research area SE (Socio Economics)

149

150

151 **D: Priorities related to SRA 2035 research area D (Integrated Systems):**

Prio Position in D	1a
Sub-topics Cluster	Modelling Power Systems and ICT together
Sub-topics Involved	D06 b: Modelling of electrical power systems and IT systems to assess the impacts of failures in both systems operating with close interactions
Rationale	There is a need for further development regarding the volatility of the grid and corresponding response times of distributed ICT systems.
Dependencies	

152

Prio Position in D	1b
Sub-topics Cluster	Observability at Distribution Level
Sub-topics Involved	D01 f: Observability of the LV and MV distribution grids in a cost effective way (e.g. number of sensors, coupling with AMM data management) D01 g: LV and MV Advanced monitoring and operational planning
Rationale	R&D is already ongoing, but it will be still considered as an issue after 2020. With more demanding applications, it will always be necessary to get more data from the field.

Dependencies	

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Prio Position in D	2
Sub-topics Cluster	Power Electronics Technologies
Sub-topics Involved	D07 a: Power Electronics Technology for Smart Distribution
Rationale	Alternative distribution network layouts/ Planning and devices
Dependencies	

154

Prio Position in D	3
Sub-topics Cluster	DC distribution grids & DC distribution integrated into to AC grids
Sub-topics Involved	D08 a: Structure and equipment of a DC network: in home area or in a secondary substation area D08 c: Impact on power quality, stability of DC networks, protection schemes
Rationale	Increase efficiency and flexibility in future distribution systems
Dependencies	Power Electronics Technologies

155

Prio Position in D	4
Sub-topics Cluster	Risk based operation
Sub-topics Involved	D05 a: Risk Based DSO Operation: Real time calculations to identify additive margins offered by line monitoring, could help to solve critical situations D01 e: Flexible LV and MV network control strategies with increasing automation and making the best use of new equipment in an economically suitable way
Rationale	
Dependencies	

156

Prio Position in D	5a
Sub-topics Cluster	Microgrids
Sub-topics Involved	D01 c: Distribution Cell Structures: Local energy management for partly or full self-supplied local distribution areas even with degraded operating
Rationale	This sub-topic is not being covered by the EEGI (European Electricity Grid Initiative)
Dependencies	

157

Prio Position in D	5b
Sub-topics Cluster	Cyber Security
Sub-topics Involved	D06 d: Ability to keep a high level of security of supply of electricity even if telecommunication net-works fail or are attacked (redundancy of information, degraded modes) D06 a: Cyber security of electrical power systems through the protection of all IT systems linked to the operation, metering, end-use of electricity
Rationale	Cyber Security is an established R&D topic in the ICT domain; however, it will continue to be important as it has to continuously evolve to handle new and upcoming threats.

Dependencies	

158

Prio Position in D	5c
Sub-topics Cluster	EVI (Electric Vehicle Integration)
Sub-topics Involved	D04 g: To investigate how EVs could be utilised as an energy storage/back-up generation capacity during forced outages. The benefit of energy storage during an outage is much higher than during normal operation. D04 f: EV integration into distribution planning D04 d: Establishment of clear roles and interactions amongst EV and relevant stakeholders (DSOs, retailers, aggregators, municipalities etc.) D04 a: Charging of EV's shifted to valleys of demand if the grid state is fragile, e.g. with local RES sup-ply at times when the load on the grid must be reduced
Rationale	Sub-topics to be tackled when EV penetration becomes critical. Research projects not to be done before others but rather in parallel.
Dependencies	

159

160 **General Remarks about research area D**

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
D06	c	New standards for IT systems based on their potential impact on power system security	Could be put into research area IS
D01	b	Development of self-adapting and self-healing distribution networks and assessment of reliability, redundancy and self-healing	Could be put into research area IS

161

162 **RC: Priorities related to SRA 2035 research area RC (Retail and Consumers):**

Prio Position in RC	1
Sub-topics Cluster	Distributed self-organisation vs. central control
Sub-topics Involved	RC01 c
Rationale	HIGH priority for research. That topic needs R&D beyond EEGI. It is missing in today's on-going SmartGrids research. Open questions are e.g.: what are the metrics for stability in the future (maybe not frequency and voltage)? How can mostly self-organized systems be stabilized? What central actors will be needed? Which part of the system should be fully self-organized, where is central control needed?
Dependencies	

163

Prio Position in RC	2
Sub-topics Cluster	Energy Cloud
Sub-topics Involved	RC 02a
Rationale	Cloud technology is of great relevance for the electricity sector and associated energy carriers. Cloud issues are addressed in many ICT research programs and projects, but not with respect to SmartGrids questions. "Cloud" is a technology which is rapidly maturing.
Dependencies	

Prio Position in RC	3
Sub-topics Cluster	The NEW Infrastructure integrating both Energy/Electricity and ICT
Sub-topics Involved	(New explicit research topic compared to SRA 2035)
Rationale	Build the ICT-infrastructure based on the internet (the dichotomy internet and facebook may serve as a metaphor) Beyond 2020 new challenges are arising: How do we build this new combined infrastructure to guarantee reliability, security of supply? What are the necessary steps? What are the mutual dependencies of ICT and energy in this intertwined infrastructure in the system of millions of active components? What are the necessary steps?
Dependencies	

Note: Detailed remarks on many of the RC research topics can be found in Annex II of this document

Recommendation for SRA for research area RC:

- Many topics in RC are still based on today's scenarios, frameworks and architectures, not based on transition and future network scenarios (at least beyond 2020). There is a need to go beyond today's thinking.
- Standardization is not research per-se.
- It should be clarified when pre-standardization is meant.

SE: Priorities related to SRA 2035 research area SE (Socio-Economics):

Prio Position in SE	1
Sub-topics Cluster	Consumer Maturity
Sub-topics Involved	SE 01 h
Rationale	It is not yet understood, on which timescales consumers react or change their behaviour. How do they learn? How and how fast do they adapt (e.g. to variable tariffs, new technologies...). AND: there is not such a thing than THE customer. Consider viable groupings which react similarly (similar values and economic conditions/habitus)

	What about the customers that cannot or do not want to be engaged?
Dependencies	
Process	Discuss the questions concerning social, psychological issues with experts from social etc. sciences or similar to embed these ideas in the right context and to address the right research priorities.

172

Prio Position in SE	2
Sub-topics Cluster	Legislation/Regulation: New electricity-markets designs
Sub-topics Involved	SE 09 b
Rationale	The future electricity system consists of tens of millions of active components and actors.
Dependencies	
Process	Priority should be given to the following questions: What are the regulatory options to create and allow for creativity of the market on the one hand and economic stability and security of supply on the other hand? How can the regulatory framework proceed and adapt in an uncertain environment?

173

174 **Note: Detailed remarks on many of the SE research topics can be found in Annex III of**
175 **this document.**

176 **General Remarks about research area SE**

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
SE05	e	Smart Grid/Smart Cities: Ancillary services and relationship with Smart Cities, Smart Transportation, etc.: Packaged SmartGrids technologies for a smarter city? Transition roadmap towards less net consumption, more prosumers, 100% EVs, Scheduling capacity locally. Think about a labelling program for smart cities compliant with SmartGrids requirements	Door to door transportation is important and missing. The topic seems to be too much technology oriented. It includes many non-technological issues, beyond the scope of the SG ETP.
Recommendation for SRA: Establish R&D for synergies between the SmartGrids and SmartCity platform activities (e.g. provide shared platform and services)			

177

Recommendation for research area SE:

Clarification of terms needed

- Buzzwords such as "Smart living" should be avoided; Clarify what is meant with these buzzwords.

Prerequisites for research projects

- SG ETP and associated experts should discuss questions concerning regulatory issues together with experts from economics etc. sciences or similar to embed these ideas in the right context. Economic experts are needed also, in order to understand better the economic drivers and social costs of future grid infrastructure.

Recommendations for types of research projects and types of participants

- Put emphasis on projects which embed new regulation needs into technical research topics. Technical scientists also knowledgeable in the area of regulation and macro-economics are needed. Questions to be answered include: What do we need to create efficient markets? What is the enabling market infrastructure needed? What regulatory frameworks will make electricity grids an enabler of other services and players?
- Include these questions in technical R&D projects (NOT a separate socio-something research on this issues). Give regulation a high priority in R&D and address these questions in technical R&D projects. Involve experts from economics or similar in the projects.
- Don't emphasize "regulatory research" in own programs or projects.
- Policy and social scientists need to be part of research in this research topic, together with technical oriented academia and industry. There is a need to understand how to prepare stakeholders for decisions taking into account "energy social responsibility" concepts.

4 Summary and Conclusions

The experts have determined clear priorities among the many topics proposed by the SRA 2035. In addition, a few topics mainly in the Socio-Economic SmartGrids research area have been determined which are beyond the research scope to be treated by te SG ETP. The experts have also highlighted the need to summarize some of the SRA 2035 topics into fewer, better grouped topics. Some of the redundancies mainly towards the socio-economical and retail-and consumer research topics need to be eliminated in future updates of the SRA.

Next, the SG ETP will need to interface to the research roadmaps of ENTSO-E and EDSO for Smartgrids in order to determine those topics which are not treated yet and where research should focus even more.

The SG ETP also intends to formulate its own SmartGrids research roadmap based on the priorities worked out in this document. This will include the type of research stakeholders and the type of type of cooperation projects needed for successful SmartGrids research projects.

193

Annex I: Research topics as specified in the SRA 2035

Integrated truly sustainable, secure and economic electricity systems IS

IS01	**Interactions and responsibilities between distribution grid operators and other stakeholders**
a	Options for responsibility partitioning and sharing the stakeholder interface issues and costs between stakeholders (TSOs, DSOs and DGs...)
b	Strategies for managing the voltage level and the reactive power flows between the different levels: HV – MV – LV grids
c	Nature and value of the services that distributed generation should provide at the MV and LV levels for managing all grid layers
d	Combine consumer load management, and voltage management at the MV-LV transformer
IS02	**Compatibility issues between Pan-European and national markets and stakeholders**
a	Local/national flexibility markets versus a pan-European commodity market: Allow multiple local players to trade flexibility. The different kinds of present and possibly future ancillary services should be considered for the foreseen markets structures in 2035. The necessary regulatory evolutions should also be studied (see research area SE)
IS03	**Ancillary system services, sustainable system operations and low level system user dispatching**
a	Optimized ancillary services by simplified Retail and Network data exchange and interaction
IS04	**Advanced forecasting techniques for sustainable operations and power supply**
a	Forecast line capacity margins at least 4 hours ahead to be integrated in operation process
IS05	**Grid State monitoring**
a	Tools for pan-European network observability
b	Tools for coordinated operations with stability margin evaluation
c	Tools for pan-European network reliability assessment
d	Increased observability of the electric system for network management and control
e	Multi-VPP system operation: Technical and business processes, interfaces, and operations
f	Improved system state visualization
g	Autonomous, distributed control systems
h	Autonomous self-controlling and healing grids (dynamic topology, power re-routing)

	IS06	**Architectures and tools for operations under abnormal conditions, restorations and defence plans**
	a	Advanced sensors on network equipment: to identify anomalies and communicate with nearby devices when a fault or another issue occurs; Sensors have to detect patterns as precursors to faults
	b	Advanced monitoring technologies to provide detailed information of component and equipment conditions
	c	Advanced component and switching equipment to respond quickly to emerging problems by using strategies like promptly changing flow patterns and voltage conditions
	d	At transmission level, Flexible AC Transmission Systems (FACTS) or superconducting synchronous condensers to provide instantaneous voltage support to reduce sags;
	e	At distribution level, high-speed transfer switches instantly remove disturbed sources and replace them with backup power supplies
	f	Voltage control equipment to control reactive power are designed and deployed in order to overcome fast and slow voltage variation
	g	Advanced integrated communication and control systems for gathering a wide set of information from the field and communicating with local and remote devices to enable rapid analysis and initiation of automatic corrective actions
	h	Advanced models to provide new visualization tools revealing congestion issues, overlays of failure probabilities and resulting threat levels
	i	Extended applications of Wide Area Monitoring Systems (WAMS); Similar solutions may be adopted by DSOs, introducing fine-grained measuring devices and advanced prosumer grid interfaces to keep under control the evolution of the grid status
	j	Applications of dynamic islanding using Distributed Energy Resources and intelligent switching at the distribution level
	k	Options for self-healing grids i.e. the ability of a power system to automatically prevent, detect, counteract and repair itself
	l	Dynamic Security Assessment: defence plans covering part of the automatic detection and counteraction phases necessary by 2035
	IS07	**Storage in all energy carrier forms**
	a	Real-time simulation and demonstrations of storage power technologies
	b	Storage of bulk quantities of electricity from fluctuation renewable sources production with low losses
	c	Off-shore energy storage associated on-site with off-shore wind farms (e.g. marine hydro pumped storage)
	d	Synergies between storage technologies
	e	Energy storage associated to conventional generation
	IS08	**Information and communication needs for SmartGrids**

	a	Tools for the integration of active demand in the electrical system operations
	b	Protocols and standards: Joint task force on IT system
	IS09	**Training tools**
	a	Tools and methods for SmartGrids training and education: New tools, simulators, methods and training facilities for operators of SmartGrids
	IS10	**Pre-Standardization Models and functions**
	a	Standardized object models and functions towards open source use of standards
	b	Zero energy / Energy-efficient / energy-producing buildings and grid model based forecasting: The advent of the highly energy-efficient building will affect the deployment of SmartGrids
	IS11	**Materials**
	a	Structural materials; Fibre reinforced materials; High temperature, low temperature and corrosion resistant materials
	b	Functional materials; High temperature; superconducting materials, (High temperature) insulating materials, Materials for power electronics: Catalyst and electrolytes, High temperature heat storage materials
	c	Manufacturing techniques; Condition monitoring techniques
	d	HVDC technology for under water grid connection (capsulation etc.) and under water offshore substations; HVDC technology for offshore grids beyond using onshore technology
	e	UHV AC, UHV DC, Gas insulated lines, UHV XLPE cables, superconductors, compact but optimized tower designs

196

197

198 Distribution systems D

	D01	**Smart, flexible distributed demand and generation response for Secure Distribution System Control**
	a	Smart demand response and renewable, distributed generation control for secure Distribution System Control and services
	b	Development of self-adapting and self-healing distribution networks and assessment of reliability, redundancy and self-healing
	c	Distribution Cell Structures: Local energy management for partly or full self-supplied local distribution areas even with degraded operating
	d	Devices and systems for more automation and flexibility in the LV network in an economically suitable way

e	Flexible LV and MV network control strategies with increasing automation and making the best use of new equipment in an economically suitable way
f	Observability of the LV and MV distribution grids in a cost effective way (e.g. number of sensors, coupling with AMM data management)
g	LV and MV Advanced monitoring and operational planning
D02a	**Extended Distribution System Protection across the value chain**
D03	**Integrated Distributed Energy Storage infrastructure planning in distribution systems**
a	Stationary storage integration into distribution planning
b	Effects and use of very dispersed energy storage: very small size storage technologies included in domestic appliances, PV panels and domestic networks
c	Portable energy storage (tens or hundreds watts range), with intelligent grid charging
D04	**EV integration into Distribution systems**
a	Charging of EV's shifted to valleys of demand if the grid state is fragile, e.g. with local RES supply at times when the load on the grid must be reduced
b	Development and assessment of technical EV options (connection, charging,...) and communication technologies and systems allowing EV management
c	Assessment of feasibility and value of flexibility services generated by EV deployment - identification of key factors influencing the value
d	Establishment of clear roles and interactions amongst EV and relevant stakeholders (DSOs, retailers, aggregators, municipalities etc.)
e	Clear definition of the terms and conditions of the e-roaming related agreements among involved market players
f	EV integration into distribution planning
g	To investigate how EVs could be utilised as an energy storage/back-up generation capacity during forced outages. The benefit of energy storage during an outage is much higher than during normal operation.
D05a	Risk Based DSO Operation: Real time calculations to identify additive margins offered by line monitoring, could help to solve critical situations
D06	**ICT System security for Distribution Operation**
a	Cyber security of electrical power systems through the protection of all IT systems linked to the operation, metering, end-use of electricity
b	Modelling of electrical power systems and IT systems to assess the impacts of failures in both systems operating with close interactions

c	New standards for IT systems based on their potential impact on power system security
d	Ability to keep a high level of security of supply of electricity even if telecommunication networks fail or are attacked (redundancy of information, degraded modes)
D07a	**Power Electronics Technology for Smart Distribution**
D08	**DC: an option for the LV grid in the future**
a	Structure and equipment of a DC network: in home area or in a secondary substation area
b	Number of connections with the AC network; number of DC converters, impact on global losses, compared to an AC network
c	Impact on power quality, stability of DC networks, protection schemes
d	Mastering the level of harmonics on AC networks facing the massive use of DC converters in everyday use
e	New DC standards
f	Assessment of retrofit strategies of already built existent LV networks

199

200

201 Transmission Systems T

T01	**Transmission Grid Infrastructures**
a	Transmission infrastructure in the sea and densely populated areas with cables, gas insulated lines, overhead lines and super conductive links.
b	Transmission Grid Infrastructure Research for - Capacity: long distance links with much more capacity compared to today's 400 kV overhead lines - Cost expressed in €/GW.km driven down, depending on the technology - Reduced relative losses
T02	**HVDC Grid based system**
a	HVDC models, combined HVDC and HVAC system models and algorithms
b	HVDC Systems Research for - handling much more wind and PV - designing the DC offshore grid - meshed overlay grid - improved interoperability between suppliers - new grid codes - new architectures of the transmission HVDC grid and effects on the distribution grid including voltage, flow and cable temperature control
T03a	**Bulk Energy Storage infrastructure, planning, integration, operation**

	T04	**Long distance electricity wheeling**
	a	Control / flatten the variability of transmission grid flows by connecting uncorrelated renewable energy sources
	T05	**Energy carrier technologies for the energy service consumer**
	a	Hybrid consumer flexibility to choose between different energy carriers (heat, electricity, gas). Technologies to obtain an integral view and a hybrid optimization method and convergent control.
	T06a	**Incentives, monitoring and controls for large scale consumers, actively contributing to an all-time secure operation of the (transmission) grids**

202

203 Subjects common to both Transmission and Distribution T&D

	TD01	**Grid Asset System Planning (life cycle)**
	a	Decision support for grid planning: Asset management tools to support decisions related to network design and planning taking into account the deployed grid but also the available technological solutions
	b	Risk Based Asset Management: Stochastic models and methods for operation, based on the reliability of each component to decide the safest network topology and operation scheme
	c	Economics of Asset Management: designed solutions and proposed equipment as possible compatible, interoperable and standardized
	d	Models for physical ageing phenomena: To be able to predict expected lifetime and over load capabilities of critical components in the grid, better models for physical ageing phenomena on components and materials are needed. The models should take into account input from existing and future sensors installed in the smart grid.

204

205 Retail and Consumer Systems RC

	RC01	**Consumer Driven local services, markets considering distribution grid constraints**
	a	Advanced demand response and demand side management techniques and technologies for low-cost, secure and sustainable distribution system operation
	b	Electronic Energy Market places to enhance small consumer and local generator participation in the distribution constrained power
	c	Centrally Controlled or Distributed/Federated energy markets, Command & Control or Peer2Peer “everything?: The new energy service company – local for local
	d	Potential of consumer demand to interact and support DER generation in various markets: The ability of wind to bid into high priced markets in cooperation with Demand Response aggregators
	e	Local and national Demand Response programs: Possible conflicts between requirements to lower peak demand and network capacity issues

f	Capacity and reserves Markets: What consumer types and demand response programs types are most appropriate for each market and how could these best be integrated.
g	Residential and small commercial consumers and consumer based Ancillary Services Markets: How can this become a reality? What impact would such access have on the cost/benefit of residential programs and home automation
RC02	**ICT for Smart Consumers**
a	Consumer Energy Cloud ICT: The Energy Cloud is the virtual solution for the collection and distribution (at any time and at any place) of meter and control data from all nodes in the smart energy system (like the future internet of things).
b	ICT systems for Consumers Demand side participation (DSP): Autonomous ICT system solutions required of existing and potential future demand side participation applications for enabling ease of adaptability from existing dedicated solutions for seamlessly interfacing with ICT systems for the distribution and transmission networks
c	Consumer opportunities with ICT: New consumer opportunities arising from modern ICT technologies
d	Consumer information handling: Security, Privacy and Data Protection, Handling of huge amounts of data, Central vs Decentral management
e	Consumer Service Architecture: Service Oriented Architectures to integration and standardization
f	User Interface: Simple, accurate, reliable, and intuitive displays and interfaces for the consumers
RC03	**EV (Electric Vehicles) for Smart Consumers**
a	Standardization for EV integration and harmonization of ICT interfaces to EV (connected to distribution grids) within national boundaries as well as across Europe
b	Cyber security of the EV data including: storage, transmission, retrieval and the privacy

206

207 Socio-Economics and Ecosystem SE

SE01	**Sociological questions of consumer demand response and elasticity**
a	Analytics and decision support for consumers
b	Technology acceptance issues related to new consumer roles
c	Real time personal energy footprint and interaction with the environment
d	Bundling of services to consumers
e	Consumer lifestyle needs and impact: Marketing to integrate new 'energy and other utility options' in a consumer lifestyle / lifecycle (event driven)
f	Active demand as part of energy audits
g	Consumer segmentation (Residential, small commercial, larger commercial, industrial) and grouping of consumers (neighbourhoods, communities, villages /towns, cities and their sectors): How can technology contribute to their business differentiation?
h	Consumer maturity development: learning cycle and roadmap approach
i	The interaction of Business Development Goals, and internal management and financial structures with Demand Side Program acceptance: Needs and requirements of business owners, energy management personnel.
j	Consumer Interaction: Addressing consumers themselves, for residential, commercial and small industrial players

k	Prosumer Oriented Programs for residential, commercial and industrial players: Change scenarios
l	Consumer Experience Management, Consumer Touch-points and the Consumer: Journey / Consumer Lifecycle
m	Smart City – Smart Living – Smart Grid: Integration / convergence
n	Transition strategy for moving towards Energy Efficiency and Distributed Generation: The consumer side
o	Social and consumer acceptance: Risk of SmartGrids rejection
p	Technological, psychological, sociological, economical and pre-conditions for an active consumer participation
q	How consumers really behave rather than how system designers want them to behave
r	The role of social media in influencing consumer behaviour
s	Turn energy consumption into a game? (compete with the neighbours)
t	Open source information on the energy system - Can this lead to a consumer revolution?
SE02a	**Multi-commodity and Multi-service-business for demand response and non-energy based local services for the consumer**
SE03	**Interaction Grid - Building - Districts: Energy service consumers in Smart Communities and Cities**
a	Consumer lifestyle needs & impact: Integration of 'energy and other utility options' in a consumer lifestyle / lifecycle (event driven marketing approach)
SE04	**Economic questions of consumer demand response and elasticity**
a	Business models, market parties, value web and consumer roles
b	The potential of energy consumption information (feedback) on overall small business efficiency and best practice.
SE05	**Ancillary services, sustainable operations and low level dispatching (Smart Integration)**
a	Smart employment caused by new ancillary services: study the relationship between the level of smartness compared to the number of direct operational personal.
b	Few market rules and mechanisms for ancillary services: More harmonization.
c	Financial market integration of ancillary services
d	Effect of near-ZEB (Zero energy building) on ancillary services: Assumption on the way houses will be built or renovated embedding PVs or being more isolated: what impact will this have on the demand, peak demand problem,
e	Ancillary services and relationship with Smart Cities, Smart Transportation, etc.: Packaged SmartGrids technologies for a smarter city? Transition roadmap towards less net consumption, more prosumers, 100% EVs, Scheduling capacity locally. Think about a labelling program for smart cities compliant with SmartGrids requirements.
SE06a	**Knowledge Transfer of Complex Smart Grids Issues (Training)**
SE07	**Efficiency and cost-benefit value of SmartGrids technology**

a	Cost-benefit analyses of the efficiency of SmartGrids technology for grid model based forecasting
SE08	**Economic SmartGrids models**
a	What processes are needed for which type of economic model? What are the structural parameters of an economic model?
b	Cost/benefit analysis of solutions with different levels of complexity and different scenarios of EV deployment in a cost effective way both for the power system and the consumers.
c	Research on non-economic drivers for energy storage development in domestic applications
SE09	**Legislation for markets, grids, energy carriers and all involved stakeholders**
a	From separated regulation and tasks for TSO and DSO towards a more efficient grid structure and grid operation and generation grid-level connection with dynamic task separation
b	New energy-markets designs (e.g. dynamic automated or semi-automated transactional mechanisms) and assessment of risks and opportunities for network stability and cost effective management and options for new regulatory framework by storage.
c	Development of a regulatory framework based on the coordination of different European policies to give visibility for energy storage applications and global value creation
SE10	**SmartGrids evolution transition**
a	Risks of early SmartGrids implementation in transition to CO_2 free, smart system: From risk perception of early installations towards rewarded benefits of early movers
b	Pace of change of SmartGrids: From a slow, low risk, wait and see attitude towards massive change of thousands of grid users
SE11a	**Compatibility of SmartGrids and SmartCity evolution: From policy making roles in city planning related to streets, communities, etc. towards an enhanced integration of energy, water communication and sustainability issues.**

208

209

Annex II: Comments to individual research topics of research area RC (Retail and Consumer)

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
RC01	g	Residential and small commercial consumers and consumer based Ancillary Services Markets: How can this become a reality? What impact would such access have on the cost/benefit of residential programs and home automation	Start with the low hanging fruits first It's a long term research activity. Some other issues have to be solved first to have active small customers participating in grid operation This point is addressed in ongoing research.
RC01	e	Local and national Demand Response programs: Possible conflicts between requirements to lower peak demand and network capacity issues	Not clear what research activity is needed to solve this dilemma. This is a topic which the regulators will have to solve in the next years. It is more development than research. (For the scenario RC 01 c it is a research question how the – possibly not centrally controlled - distributed resources – will come to an effective tradeoff between grid and market requirements)
RC01	f	Capacity and reserves Markets: What consumer types and demand response programs types are most appropriate for each market and how could these best be integrated.	Again, it depends a lot of regulation and market structure A lot of research is already on-going. This is a short term issue.
RC01	d	Potential of consumer demand to interact and support DER generation in various markets: The ability of wind to bid into high priced markets in cooperation with Demand Response aggregators	Very useful for certain European regions: Value depends strongly on the country primary energy type for electricity production. This is important and urgent, but is already part of on-going research.

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
RC02	a	Consumer Energy Cloud ICT: The Energy Cloud is the virtual solution for the collection and distribution (at any time and at any place) of meter and control data from all nodes in the smart energy system (like the future internet of things).	An urgent topic which is not really addressed in ongoing research (at least not enough with relevance to energy/electricity issues). This should be covered because "Cloud" is a maturing technology with a lot of applications in the energy sector. Important actors are private companies (e.g. ICT sector) as suppliers of the cloud.
RC01	b	Electronic Energy Market places to enhance small consumer and local generator participation in the distribution constrained power system	Long term topic. Cost benefit analysis have to demonstrate the real feasibility of this issue. Research is ongoing
RC02	b	ICT systems for Consumers Demand side participation (DSP): Autonomous ICT system solutions required of existing and potential future demand side participation applications for enabling ease of adaptability from existing dedicated solutions for seamlessly interfacing with ICT systems for the distribution and transmission networks	Can mean everything and nothing Some research is ongoing. Questionable if this needs public funding or should be left to the market. This topic will be better addressed in programs for "internet of things/services" and the like.
RC03	a	Standardization for EV integration and harmonization of ICT interfaces to EV (connected to distribution grids) within national boundaries as well as across Europe	Lack of standards is actually an important barrier to the development of the EV. This isn't research, but recommendation for standardization. There are many such standards, e.g. ISO 15118
RC01	a	Advanced demand response and demand side management techniques and technologies for low-cost, secure and sustainable distribution system operation	First of all, get DSM implemented in Europe Very promising for some customer segments and very dependent on country market structures. Regulation is key for SmartGrids progress Not too high priority should be given.

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
RC02	c	Consumer opportunities with ICT: New consumer opportunities arising from modern ICT technologies	Too general. This could be left to market forces. Needed is an ICT infrastructure as an enabler.
RC03	b	Cyber security of the EV data including: storage, transmission, retrieval and the privacy	Can be associated to Smart Meters issues. Is a key aspect. Urgency depends on the roll-out of EV.
RC02	e	Consumer Service Architecture: Service Oriented Architectures to integration and standardization	necessary
RC02	f	User Interface: Simple, accurate, reliable, and intuitive displays and interfaces for the consumers	Consumer interest for these devices proved to be very low in past and on-going projects
RC02	d	Consumer information handling: Security, Privacy and Data Protection, Handling of huge amounts of data, Central vs Decentral management	necessary

212

213

214 # Annex III: Comments to individual research topics of research area
215 # SE (Socio-Economics):

RESEARCH TOPIC	SUB TOPIC	SUB-TOPIC DESCRIPTION	REMARKS
SE09	A	From separated regulation and tasks for TSO and DSO towards a more efficient grid structure and grid operation and generation grid-level connection with dynamic task separation	Much closer cooperation DSO/TSO will be needed. Very high priority, needed before 2020. Must be solved technically and regulatory. Very important issue of dynamic role of networks. In the long run today's distinct roles of TSO and DSO can overlap and be taken over by the other or others. This should be addressed in research projects.

			Dependency on the topic TD.
SE 03	a	Consumer lifestyle needs & impact: Integration of 'energy and other utility options' in a consumer lifestyle / lifecycle (event driven marketing approach)	One result of onging R&D projects was: The term "prosumer" is generally misleading. People with PV on their rooftop are not really interested in "being a new actor producing electricity/energy", but in getting the money of feed-in-tariffs or other subsidies and maybe also want to contribute to CO2 mitigation. A real prosumer will be more active (as we see e.g. in the participators at youtube and blogging). As a consequence the prosumer should have possibilities of more active forms of engagement. This is an urgent research question which should be emphasized. In general this is today an underrepresented topic.
SE 05	e	Ancillary services and relationship with Smart Cities, Smart Transportation, etc.: Packaged SmartGrids technologies for a smarter city? Transition roadmap towards less net consumption, more prosumers, 100% EVs, Scheduling capacity locally. Think about a labelling program for smart cities compliant with SmartGrids requirements.	There are a lot of research questions concerning smart cities (esp. transportation, health and energy issues). The research should focus more on issues beneficiary for the consumer. Smart grid research should address the synergies of mutual infrastructures, particularly ICT, and relevant interfaces. In the view of the SRA: SmartGrids have a lower priority for smart cities per se and vice versa.
SE 01	k	Prosumer Oriented Programs for residential, commercial and industrial players: Change scenarios	The term prosumer is not ideal. People who have PV on the roof just want to have money, not to participate actively. (cf. SE 3 remarks) A Prosumer is active in social networks. What can we learn from this? To be involved in the smart grid the prosumer has to experience the smart grid somehow. Regarding the sagging interest in metering information after a short time this is a relevant research question which is not addressed now. Important: Distinguishing between the responsibilities of different stakeholders. Smart transportation is as a more important societal

			question, but currently treated in a too much technology-oriented way. Door-to-door transportation approach is important. Recommendation for SRA: R&D for synergies between the two. (e.g. shared platform and services)
SE 01	i	Business development goals	This topic should be left to the market
SE 01	t	Open source information on the energy system - Can this lead to a consumer revolution?	Term "open source": The consumer has a lot of new insights to the energy system: Ranking in comparison peers, specific information to own energy usage, understanding of "green tariffs" and "greenwashing", etc. In general: Citizens/consumers/customers (with right awareness) are needed who can make educated choices. How can we reach that? Research should look into correlations between information and behavior. cf. also SE 01 c, h. topic is very important, very urgent.
SE 01	h	Consumer maturity development: learning cycle and roadmap approach	Urgent and not addressed research: What is the timescale and shape of consumer learning curve? Effects must be understood which are stable in the long run. It is necessary to understand the social/psychological mechanisms. cf. also SE 01 p
SE 05	b	Few market rules and mechanisms for ancillary services	This is a topic for regulators, research is ongoing.
SE 01	p	Technological , psychological, sociological drivers for consumer participation	cf. SE 01 t
SE 08	c	Research on non-economic drivers for energy storage development in domestic applications	Non-economic drivers as a whole (not only for storage) must be better understood.

SE 06	a	Knowledge Transfer of Complex Smart Grids Issues (Training)	More and more technology products and solutions require trained people to be deployed. Research should address who, how and when these trainings are suitable/necessary for smart grids (academic, life long learning, vocational education...)
SE 01	r	The role of social media in influencing consumer behaviour	Social media are paramount and will be getting more so in influencing people and creating momentum. It is not only about influencing behaviour, but about influencing SmartGrids developments. What is the information that we want to make visible; or: what does the consumer wish to see? People are often considered acting only on economical basis. "Neighbour has it too" kind of thinking may have a stronger effect to consumer behaviour than we think. Urgent: Research should be done in the near future how social media can contribute to smart grid developments.
SE01	o	Social and consumer acceptance: Risk of SmartGrids rejection	Threat of energy poverty among some groups of people while introducing new SmartGrids market mechanisms has to be taken seriously. Education and training has an important role here. "Making an educated consumer-choice".
SE01	q	How consumers really behave rather than how system designers want them to behave	Important

216

217

218

Annex IV: List of experts and institutions answering the original questionnaire and/or participating at the workshop in Berlin, 05 December 2012

Lead of processes: The SmartGrids European Technology Platform Secretariat

Name	Company	Country
Rainer Bacher	BACHER ENERGIE AG	Switzerland
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Sini Numminen	DerLab e.v.	Germany

Experts contributing to SRA 2035 priority setting

Name	Company	Country
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Friederich Kupzog	Austrian Technology Platform	Austria
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Bostjan Blazic	Slovenian Technology Platform	Slovenia
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Fernando Garcia	FUTURED	Spain
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