SEESGEN-ICT

15°Workshop of ETP SmartGrids WG3 “Demand and Metering/Retail”

Brussels – EC MEEUS building, July 6th 2011

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Findings of SEESGEN-ICT Project

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CONTENTS

- Few information on SEESGEN-ICT
- SEESGEN-ICT Recommendations
- An operational proposal
- Conclusions

- **Thematic Network** under

- Call CIP ICT-PSP 2008
- ***Objective 2.3:*** *Consensus building and experience sharing in ICT for energy efficiency and sustainability in urban areas*
- ***Topic 1:*** *Consensus building for smart distributed power generation*
- **Main goal:** develop awareness raising actions, identify best practices, provide scenarios and roadmaps for facilitating the integration of distributed energy resources through ICT based solutions

- **Funding:** 478.000 €
- **Start date:** 1st June 2009
- **Duration:** 2 years

- Coordinator: RSE SpA – Milan – Italy
- Technical Coordinator: Maher Chebbo S.p.A.

Objectives of SEESGEN-ICT

General

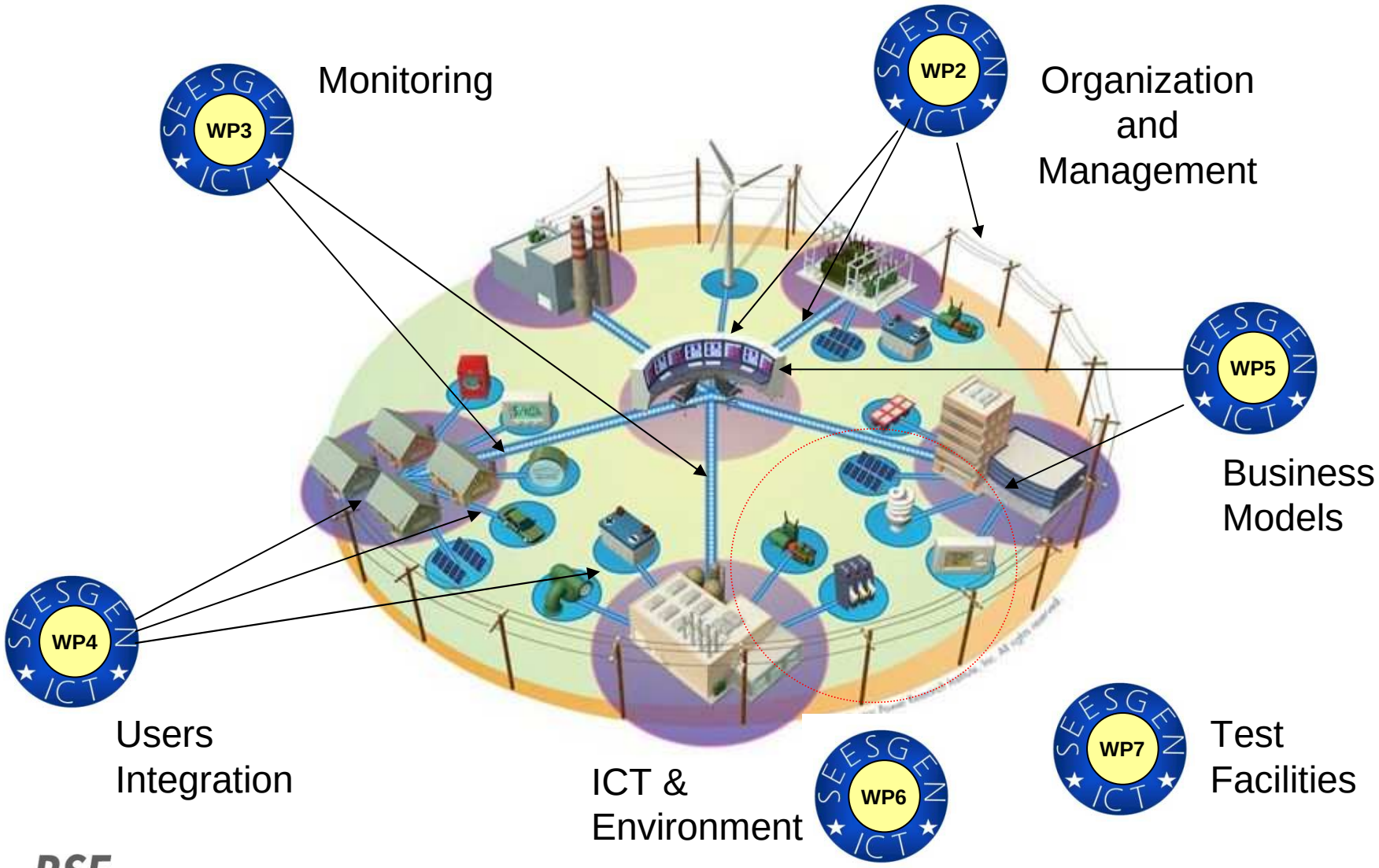
- Fostering the best use of ICT for the implementation of Energy Efficiency in the Power Distributed Generation Grids

Actions

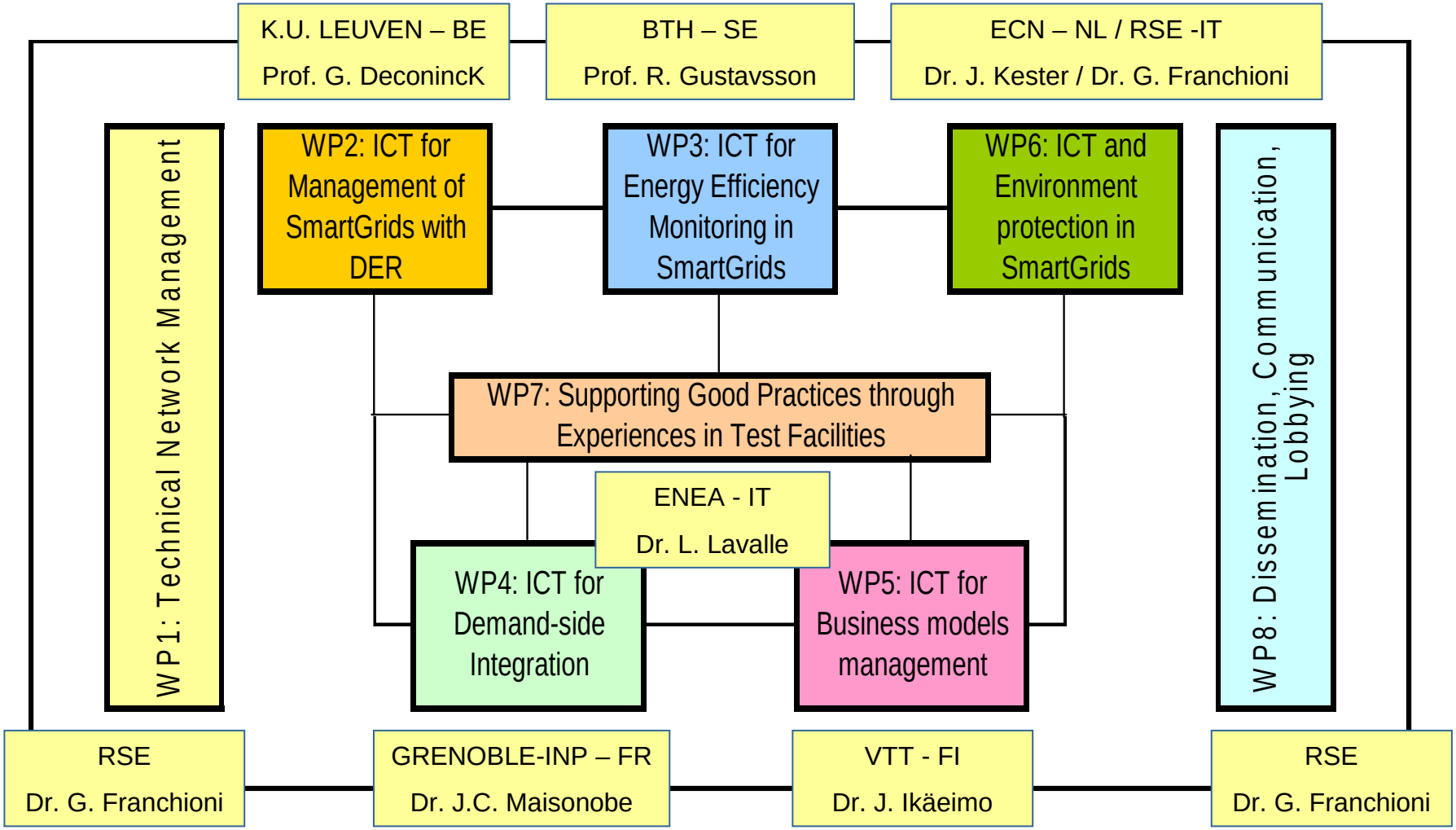
SEESGEN-ICT aims at:

- producing harmonized frame of the priorities to accelerate the introduction of ICT within the complex system of the Smart Distributed Power Generation Grids
- exploring requirements, barriers and proposing solutions
- producing policy recommendations, identify best practices and drawing scenarios and roadmaps
- proposing requirements for Test Facilities supporting the best practices and ICT solutions validation

Priority Topics



Structure and WP Interaction

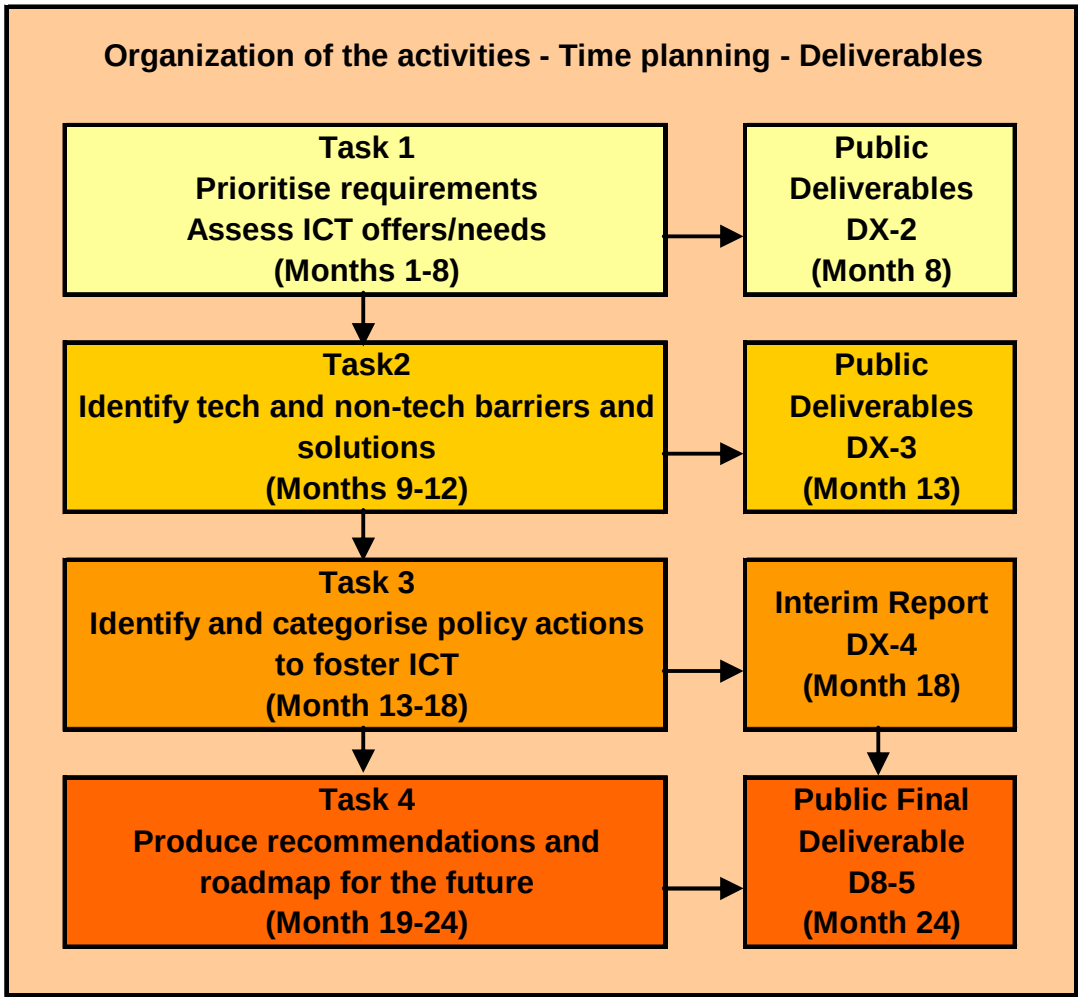


The Consortium

RSE (*COORDINATOR*)	IT	VITO N.V.	BE
ENEA	IT	CARDIFF UNIVERSITY	UK
K.U. LEUVEN	BE	IWES	DE
VTT	FI	ICCS-NTUA	GR
GRENOBLE/INP	FR	GeSI	BE
BTH	SE	UNIVERSYTET LODZKJ	PL
FUNDACION TECNALIA	ES	ICEMENERG	RO
ECN	NL	SINTEF Energiforskning	NO
SAP AG	DE	ASEW GbR	DE
AIT	AT	ENEL Distribuzione	IT
CRES	GR	Public Power Corp. S.A.	GR
DTU	DK	ECPE E.V.	DE

INDUSTRY	RESEARCH	EN. AG.	EDUCATION

Workplan & Deliverables



Public Deliverables available for downloading from

fttp://seesgen-ict.rse-web.it

Recommendations by WPs (template)

RECOMMENDATION SHEET BY WP2 of SEESGEN-ICT					
Recommendation Identification					
SEES-WP2-001	**Go for interoperable communication protocols and information models based on open standards and open source**				
ICT Focal Topic					
Communication Standards					
Specific Issue Addressed					
Proprietary Standards and Software					
Recommendation (Title and description)					
The use of interoperable and open communication standards will help in avoiding proprietary standards. Communication standards should be independent from communication technologies which will help the standards to be future-proof even if new communication technologies displace the old communication technologies[1]. Additionally to open standards, the implementation and tools for open standards should be based on open source software, to foster the spread and robustness of the standards, which will lead to its success.					
Suggested Action/Initiative/Existing solutions and limits					
Promising examples are 4DIAC[2] for distributed control, Mango[3] for monitoring and SCADA, openPOWERLINK [4] as well as OpENer [5] for Industrial Ethernet, OSADL [6] for Linux-based real-time operating systems, openPMU [7] for Phasor Measurement Units, CIMTool [8] for the Common Information Model, mySmartGrid [9] and OPENmeter for Smart Meters and many more.					
Priority of the Action					
☑	Immediate need	❑	To be prepared	❑	To think about
Scope/Objective of the Action					
☑	Standardization objectives				
☑	Development of new technologies				
❑	Sharing of Best Practices				
☑	Improvement of existing technologies/practices				
☑	Investment Protection				
❑	Social consensus				
❑	Environment protection				
☑	Market opportunities				
Target of the Recommendation					
☑	Policy Makers				
❑	Regulators				
☑	Standardization Bodies				
Suggested further consultancy on the Recommendation					
☑	Distribution System Operators				
☑	Transmission System Operators				
☑	ICT Industry				
❑	Consumers				

Source			
☑	SEESGEN-ICT	Additional References	[1]
❑	External	Specify:	
		SEESGEN-ICT View:	Validate:

First Impacted Stakeholders			
☑	Industry	❑	Producers
		☑	Distributors
		☑	Manufacturers
		☑	ICT
❑	Consumers		
☑	Market operators (ESCo, Service Providers, Retailers, Aggregators, etc.)		
❑	Public Institutions		
☑	Research & Academia		

Expected Impact			
On Smart Grid evolution		**On Impacted Stakeholder**	
Informed participation by Customers		New Products	++
Integration of DER	+++	Current Products Modification	+
New Products/Market	++	Security/Privacy adequacy	++
Power Quality		New Market development	++
Asset Utilization and Oper. Efficiency	++	Loss of market privileges	- +
Resilience to disturbances/attacks	- +		

Impact Term					
☑	Short (2020)	☑	Medium (2030)	❑	Long (2050)

Reference	
1	Cigre, Technical and Commercial Standardisation of DER / microGrid Components, Working Group C6.10, August 2010

All WPs' Recommendation Sheets available in public Deliverable D8-5

Analysis of the Rec Sheets and Synthesis

Interoperability definition ***"The capability of two or more networks, systems, devices, applications or components to exchange and readily use information, securely, effectively and with little or no inconvenience to the user. The system will share a common meaning of the exchanged information and this information will elicit agreed-upon types of response."*** **[definition by NIST].**	□ **Exchange of meaningful, actionable information;** □ **Shared understanding of the exchanged information;** □ **Agreed expectation for the response to the info exchange;** □ **Quality of service: reliability, fidelity and security** **[GridWise Architectural Council]**
Relevance to the main objectives of the overall transformation process of the energy/electric system	□ **Build on the ICT Infrastructure for Smartgrids** □ **Evolution to the SmartGrid** □ **Shaping the context**
Impact on the development of each of the High Level Services as identified by the EG1 of the EU Smart Grids Task Force	□ **Enabling the Network to integrate Users with new requirements** □ **Enhancing efficiency in the day-to-day grid operation** □ **Ensuring Network security, system control and quality of supply** □ **Enabling better planning of future network investment** □ **Improving market functioning and customer service** □ **Enabling and encouraging stronger and more direct involvement of consumers**
Potential contribution to the Mandates already committed	□ **M441: development of an open architecture for utility meters** □ **M490: to support EU Smartgrids deployment** □ **(M468: charging of Electric Vehicle)**
Compliance with other authoritative suggestions	□ **EEGI initiative (spc. roadmap 2010-2018 and the detailed Implementation Plan 2010-2012)** □ **E-Energy (D), RdS (I) and other National Projects** □ **Industry ini: e.g. SAP: Smart Grids for Europe, SEDC: Smart Energy Demand Coalition** □ **ETP, SG Task Force, CEN/CENELEC/NIST/ITU** □ **Address, Integral, Smart A, ICT4Smartgrid, Etc**

SEESGEN-ICT RECOMMENDATIONS

- **R1: Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security**
- **R2 : Intelligent embedded ICT components**
- **R3 : Cross-cutting structural and social recommendations**
- **R4 : Energy Efficiency and CO2 emissions**
- **R5 : EU large scale demonstrators, social and economic testing facilities**
- **R6 : Intelligence for the T&D Networks required for SmartGrids**
- **R7 : Out of the box Demand Side Services oriented Platform (DSSP)**

ADRESSEES: the "Policy Makers", i.e. those who have the "initiative right" to move in order to fulfil the requirements of the stakeholders.

- The Commission, proposing policies and strategies made concrete by Directives
- The Energy Regulators (at EU or National level), who work to facilitate the creation of a single, competitive, efficient and sustainable EU internal Energy Market
- The Standardization Bodies, who provide the technical standards of products and services as necessary

RECOMMENDATION SEESGEN-ICT_01

SEESGEN-ICT_R1: Recommendations Family on Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security

SHORT SUMMARY

COMMUNICATION & STANDARDIZATION	❑ Go for interoperable communication protocols and information models based on open standards and open source software ❑ Go for unified open Standard ❑ Harmonize standards & Enforce the Standardization framework
COOPERATION	❑ Enhance cooperation and funding for research ❑ Foster a cooperation framework on common standards ❑ Enhance exchange of validated descriptive information and grid models ❑ Enhance exchange, validation and sharing models to develop intra-grid applications ❑ Favour exchange of information and data and improve coordination among TSOs and DSOs ❑ Interconnect local and wide area systems
SECURITY AND PRIVACY	❑ Strengthen a Legislation Framework to ensure Data Privacy and Security ❑ Enhance awareness of access to personal data by stakeholders ❑ Ensure safety of Data Handling (through anonymity and aggregation)
RELIABILITY AND SECURITY	❑ Enhance redundancy of information to improve robustness ❑ Map interdependencies of Infrastructure and decrease vulnerability

RECOMMENDATION SEESGEN-ICT_01

C	R	S			
			SEESGEN-ICT_R1: Recommendations Family on Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security		**1**
			R1_11 Go for interoperable communication protocols and information models based on open standards and open source software ☐ *Avoiding proprietary technologies (market-competitiveness limitation)* ☐ *Independent from communication technologies. Future-proof standards (new vs old products)* ☐ *To foster spread and robustness of standards*	*Examples: 4DIAC for distributed control, Mango for monitoring and SCADA, openPOWERLINK as well as OpENer for Industrial Ethernet, OSADL] for Linux-based real-time operating systems, openPMU for Phasor Measurement Units, CIMTool for the Common Information Model, mySmartGrid] and OPENmeter for Smart Meters and many more.*	**COMMUNICATION and STANDARDIZATION**
			R1_12 Go for Unified open Standards, i.e. Harmonize standards ☐ *Avoiding Redundant and repetitive work (at EU, USA and Asia levels)* ☐ *Cooperation attitude of std bodies (essential and speed job) (es. M441)* ☐ *Inform and promote stakeholders about benefits and limits*	*Example M441 as the standardization mandate to CEN, CENELEC and ETSI in the field of measuring instruments for the development of an open architecture for utility meters involving communication*	
			R1_40 Enforce the Standardization framework ☐ *to guarantee an effective interface between electric and telecommunication/ICT worlds* ☐ *Ref to standards, guidelines, codes and practices already in place in sectors other than energy (Electronic banking, Telecommunication, etc.)*	*Ref to IEC standards (i.e. 61970, etc.) ready for considerations by regulators*	

RECOMMENDATION SEESGEN-ICT_01

C R S

SEESGEN-ICT_R1: Recommendations Family on Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security

2-1

R1_21 - Enhance cooperation and funding for research; foster a Cooperation framework on common standards
R1_14 - Enhance research on exchanging models
R1_16 - Enhance research and exchange of information

- ☐ *Ontological information model of the electric system which is standardized by the CIM (Common Information Model IEC 61970/61968)*
- ☐ *Common descriptive and validated exchange of distribution grid and DER models and their control information*
- ☐ *The exchanging, validating and interfacing of various models for different applications (e.g. real time, offline simulation) and domains (e.g. transient, quasi static), which can be shared between different stakeholders (like research institutes, utilities and manufacturers) will lead to reuse and evolvement of the developed intra-grid applications.*
- ☐ *TSOs and DSOs must exchange information and improve their coordination especially in mutually affecting activities such as power flow management, voltage control, alarm surveillance & fault management, in order to maintain a safe, reliable and stable system*

EU Research Agenda and Lighthouse Projects for Smart Grids - Smart Grids must be a top priority of FP7 and especially the upcoming FP8 in order to ensure the development of the appropriate security, safety and risk concepts and architecture. -The EU should launch large-scale lighthouse projects possibly taking the existing technical "standard-like" infrastructure in early mover countries as a starting point.

Examples. Currently projects CIM for Dynamics (models at Transmission level) and the CDPSM (Common Distribution Power System Model) within the CIM standard are developed to cope with these issues.

Accompanying research work on distribution level with DER is undergoing within EU research activities (EX. DERri)

Cooperation of TSOs and DSOs with focus on bi-directional electricity flows and co-operation among EU regions to provide sufficient funding for fundamental research, academia and education has to be promoted.

SAP AG: "Smart Grids for Europe: Benefits, challenges and Best Practices (Jan 2011)

COOPERATION

RECOMMENDATION SEESGEN-ICT_01

C	R	S	SEESGEN-ICT_R1: Recommendations Family on Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security		2-2
			R1_15 - Interconnect local and wide area systems □ *Wide Area Monitoring System (WAMS) adapted to the properties of Low Voltage(LV) and Medium Voltage(MV) networks will be of benefit for the operation of the grid by Distribution System Operators (DSOs) in the future.* □ *Synergies in the means of LV and partly of MV networks in terms of utilization of smart meter data and the necessary infrastructure for data concentration and meter data management systems should be proposed and standards accordingly extended.*	*WAMS are already being used by Transmission System Operators (TSOs) to get a view of wide-area phasor oscillations and detect dynamic instabilities and this concept can be extended to DSOs as well with required modifications.*	**COOPERATION**

RECOMMENDATION SEESGEN-ICT_01

C	R	S	SEESGEN-ICT_R1: Recommendations Family on Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security	3-1
			R1_31 Take a security mindset ☐ *Dedicated set of security controls in all aspects of ICT (e.g. perimeter security, access control, security standards, security of physical hard ware etc) to protect the smart grid needs has to be comprehensively developed*	Example: ISA, NIST and IEC TC57 are working on generic policies and procedures
			R1_39 Strengthen a Legislation Framework to ensure Data Privacy and Security ☐ *Clarify the monitoring data nature (personal/technical) as well as the agreements between different stakeholders necessary to overcome bottlenecks for investments, align the business models of the different electricity stakeholders, address consumer concerns and channel national initiatives to create an internal EU market for Smart Grid equipment and services*	SAP AG: "Smart Grids for Europe: Benefits, challenges and Best Practices (Jan 2011)
			R1_33 Design ICT infrastructure in a way that will not violate privacy **R1_34 Take care of conflicts between Privacy and Cyber Security** **R1_37 Improve awareness of access to personal data by stakeholders** ☐ *Design of ICT infrastructure should be done in its core regarding both issues (Privacy and Security) and their importance equally balanced* ☐ *ICT infrastructure should collect and handle data that are regarded as technical* ☐ *when personal data are collected there should a clear statement and agreement between the involved parties* ☐ *Service Level Agreement mechanisms (proposed by SEESGEN-ICT for Energy Sector) could support* ☐ *ICT infrastructure such as smart meters should provide (easy) access to the customer into monitored quantities and awareness of what is monitored and/or by whom* ☐ *This could prevent possible unauthorized access to personal data form parties that should not have it*	**SECURITY and PRIVACY**

RECOMMENDATION SEESGEN-ICT_01

C	R	S	SEESGEN-ICT_R1: Recommendations Family on Interoperability: Standardization, Communication, Data Aggregation, Data Handling and Security	3-2
			R1_32 Ensure information security ☐ *Already available standards must be reviewed, adapted and enhanced to support security across wireless and wired connections. Newly developing standards should take security aspects into account. Awareness of the new risks and threats are important.* ☐ *Well established security objectives such as privacy, integrity, availability, non-repudiation and confidentiality must be assured*	SECURITY and PRIVACY
			R1_35 Enhance redundancy of information to improve robustness ☐ *implies the principle of automatic alternative communication routing.* ☐ *help in achieving Quality-of-service (QoS), essential for mission-critical applications wherein there is a situation of choosing among many different applications.* ☐ *To meet the heavy requirements on bandwidth, latency and dependability of the communication channel by the mission-critical applications like adaptive protection, grid reconfiguration for protection applications.* *Example: principle of automatic alternative communication routing is already supported by existing standards for tele-control like TCP/IP,IEC 60870-5-104*	
			R1_36 - Map interdependencies and decrease vulnerabilities ☐ *Mapping of the interdependencies between the communication and the electricity infrastructure will help in making the communication system resilient in the event of failure of the electricity network.* ☐ *Simulation and testing in real time will help in knowing the impact and implications of communication failures, hardware / IEDs (Intelligent Electronic Devices), data acquisition etc and in developing solutions to decrease vulnerabilities (see SEESGEN-ICT_R5)*	
			R1_38 – Set up Data aggregation for securing privacy ❑ *Anonymity to data (e.g. through aggregation) eliminates the possibility the monitored data to reveal any individual behaviour* ☐ *Not only with privacy but also with security responsibilities by Aggregators*	

RECOMMENDATION SEESGEN-ICT_02

SEESGEN-ICT_R2: Recommendations Family on "Intelligent embedded ICT components"	SHORT SUMMARY
EMBEDDED INTELLIGENCE AND MONITORING	❑ Develop a coherent Technological Ecosystem based on embedded ICT components ❑ Ensure Inter-changeability and Interoperability of components and applications ❑ Improve inside the monitoring Network
SERVICE IMPLEMENTATION	❑ Develop Coordination Mechanisms as the Service Level Agreement for the implementation of Services ❑ Define criteria and KPI for the assessment of the Quality of the Active Demand provided by Aggregators ❑ Develop /Foster Technology for service implementation and security
OPERATIONAL TOOLS	❑ Develop optimization tools for DER aggregation and management ❑ Enhance Smart Meters functionalities and requirements tied to the applications ❑ Standardize the exchange of information on demand elasticity and response

RECOMMENDATION SEESGEN-ICT_02

C	R	S	SEESGEN-ICT_R2: Recommendations Family on Intelligent embedded ICT components		1
			R2_10 Develop a coherent Technological Ecosystem ☐ *Concerning Smart meters, Smart appliances and Smart distribution Networks (ref DSI)* ☐ *Regulatory framework; Technical guidelines; Economical incentives needed* ☐ *Agreeing and standardizing the minimum functionalities the Smart devices should have; establishing the interoperable communication media and protocols at grid level and building level; designing information models based on open standards and open source.* ☐ *Establish policies for roadmap and roll-out of distributed Smartness*		**OPERATIONAL TOOLS**
			R2_02 – Ensure Inter-changeability and Interoperability in monitoring ☐ *Inter-changeability and Inter-operability of monitoring, measurements and control components.*	*Examples: R&D to integrate data management and data processing in SCADA systems Push for standard interfaces to connect SCADA and other systems (DMS, NIS, AMR, etc.) to enterprise applications*	**OPERATIONAL MONITORING**
			R2_01 - Incorporate additional knobs and sensors for improved controllability ☐ *Various hardware components are required to be installed near to distributed load, generators and charging stations of Electric Vehicle (EV) in order to have improved controllability of the distribution system* ☐ *Without monitoring and control possibilities inside the grid itself (so not only at the endpoints), there is no smart grid possible)* ☐ *Retrofitting the existing components instead of replacing the old ones with new will help in curbing the cost of implementing intra-grid control applications*	*Example: Fault detectors needed for Adaptive Protection*	

RECOMMENDATION SEESGEN-ICT_02

C	R	S	SEESGEN-ICT_R2: Recommendations Family on Intelligent embedded ICT components	2
			R2_03 – Develop Coordination mechanisms for Services implementation ☐ *Coordination mechanisms among the stakeholders exchanging Services to allow the implementation of the Services and the Monitoring and Control of the Quality of the Service* ☐ *Support the adoption of Service Level Agreements (SLA) in the Energy Sector as a mean to enable QoS assurance.* ☐ *Define Minimum Requirements for SLAs design and implementation (including KPIs), considering the different applications (e.g. power quality, smart metering, Demand-Response), the actors involved and the service performances monitoring.* ☐ *Define strategies for coordination and governance of SLAs*	*Action: Intersectoral Mandates to define the Minimum Requirements and governance strategies.*
			R2_04 – Define criteria for the assessment of the Quality of the Active Demand Service provided by the Aggregator ☐ *Fix rules (ex: a-priori thresholds) and define shared Key Performance Indicators to assess the Quality of Service provided by a Provider (ex. Aggregator).* ☐ *Include in a Service Level Agreements a methodology for Quality of Service assessment*	**SERVICE IMPLEMENTA-TION**
			R2_05 – Develop/Foster Technology for Services implementation **R2_06 - Develop technologies to improve security in Service implementation** ❑ *Support the development, implementation and use of technologies (Internet based) enabling the implementation of Services and associated monitoring.* ☐ *Explore solutions already partially rolled out (suitable for the application and to the criticality of the situation) such as OPC-VPN-Semantic web- Service oriented Computing- Cloud Computing, etc* ☐ *Explore the effectiveness and the suitability of technologies for managing SLAs and associated information exchange.*	*Actions: Use of Virtual Private Networks and data encryption as solutions that could provide cyber security and data privacy against unauthorized access. Moreover Power Line Communication could provide some additional security in the connection between customer (especially residential) and provider.* *Support pilot projects related to different applications and situations*

RECOMMENDATION SEESGEN-ICT_02

C	R	S	SEESGEN-ICT_R2: Recommendations Family on Intelligent embedded ICT components	3
			R2_08 – Develop optimization tools for aggregators ☐ *Development of operational optimization tools for DER aggregator. Existing solutions do not simultaneously consider different markets and contracts or stochastic effects such as price peaks.* ☐ *Specific reference to:* • price forecasting simulation tools • load forecasting simulation tools • DER scheduling and trading optimization tools	**OPERATIONAL TOOLS**
			R2_09 - Create a standard format for the load curve ☐ *A standard data format for the consumer or consumer cluster load curves, which also include the information about demand elasticity or response to different types of control signals, would be developed.* ☐ *This data could be used by aggregator's optimization tool in order to decide the proper control signals in each situation.* ☐ *The data format would serve purpose of separating response forecasting from operational optimization.*	
			R2_07 – Allow flexibility in the accuracy of Smart Meters ☐ *To limit the amount of stored data,* ☐ *Accuracy and the frequency of the measurements and of the communication should depend on the specific application and needs (5 to 15 min should be considered, depending on the application and the country regulations)* ☐ *Include flexibility of accuracy and frequency of measurements and communication among the minimum functionalities of the Smart Meters.*	*To be taken into consideration in M441 Mandate*

RECOMMENDATION SEESGEN-ICT_03

SEESGEN-ICT_R3: Recommendations Family on "Cross-cutting structural and social issues"	SHORT SUMMARY
MARKET AND REGULATORY ISSUES	❑ Ensure adequate market context and regulatory framework to motivate and foster the Market ❑ Enhance shift from passive to active system by incentivizing DGs ❑ Foster a specific Market for flexible resources in Europe ❑ Facilitate the Coordination of Aggregators activities with System Operators and rule the management of sensible information ❑ Limit uncertainties to Avoid Economic risk related to market operation
BENCHMARKING	❑ Put Benchmarking on a firm basis for validation of ICT solutions ❑ Adequate Test Facilities to Benchmarking purposes (especially with ref. to interoperability)
SOCIAL CONSENSUS	❑ Sustain research and development initiative about economical and sociological aspects of the ICT for DSI ❑ Surveys on consumers ❑ Provide education and awareness ❑ Ensure Data availability and information transparency

RECOMMENDATION SEESGEN-ICT_03

C	R	S	SEESGEN-ICT_R3: Recommendations Family on Cross-cutting structural and social issues		1
			R3_05 - Ensure adequate market context and regulatory framework ☐ *The regulatory framework should make sure that it creates sufficient motivation for fostering the market.* ☐ *Adequate market context can be achieved with the help of cooperation between different TSOs and DSOs which can include exchange of information on the amount of energy produced, the quality of the electricity that was provided to the consumers, the percentage of renewable energy in the total energy mix etc.* ☐ *These data can be exchanged as frequently as required by the energy market.*	*Example: Incentivizing certain aspects of electricity sold, e.g. quality of the electricity sold to the consumer*	
			R3_01 - Enhance shift from passive to active system by incentivizing DGs ☐ *Appropriate framework and incentives for Distributed Generation (DG) can provide a range of ancillary services (e.g. voltage-reactive power control, etc) and can help to make the system an active one.*	*Detailed analysis on the impact of DG and high-power charging of EV on reliability and systems stability has to be elaborated and standardized indices has to be developed for assessing and estimating intra-grid applications.*	**OPERATIVE MARKET**
			R3_02 – Foster a specific Market for flexible resources in Europe ☐ *A clear structural analysis should be performed by the Commission on how market balancing structures currently impact Systems Efficiency measures and industry investment.* ☐ *The Commission should have a strong role in supervising the development of balancing markets, in order to guarantee that the development in all regional markets follows the same principles, encourages competition and improves total systems efficiency*	*SEDC: Smart Energy Demand Coalition Recommendation supported*	

RECOMMENDATION SEESGEN-ICT_03

C	R	S	SEESGEN-ICT_R3: Recommendations Family on Cross-cutting structural and social issues	2
			R3_03 – Put Benchmarking on a firm basis for validation of ICT solutions ☐ *The existing best practices from member states where considerable distributed generation already exists should be benchmarked in developing new approaches* ☐ *Regional and national demonstrations of communication technologies should be carried out which will help in creating interest, excitement and provide the societal, political and economic stimuli that will accelerate their deployment.* ☐ *Reference models and validated systems should be provided.* ☐ *Newly developed algorithms should be based on standards, like the IEC 61499 and provided with reference implementations or benchmark models to verify and validate the expected results* ☐ *This increases the interoperability and workflow of the application. The concept of E-energy should also be taken into account while benchmarking the different smart grid approaches.*	*For objective comparisons and evaluations of benchmarking studies, test facilities and necessary infrastructures should be as much interoperable as possible, supporting common information models, references and descriptions. (see also SEESGEN-ICT R5)*	
			R3_04 – Ensure Coordination of Aggregators activities with System Operators and rule the management of sensible information ☐ *Coordination of control actions by the Aggregators with DSOs (and in some cases with TSOs) should be ruled.* ☐ *To allow the coordination, integration and deployment of Active Demand Programs, without undermining the operational constraints of the network, sensible information should be made available and manageable by the System Operators to the Service Provider (Aggregator). Information deals with network topology, constraints and operation procedures. Regulatory provisions on the level of information to be made available.*		**OPERATIVE MARKET**
			R3_06 - Avoid Economic risk related to market operation for aggregators ☐ *The uncertainty of the price development in the target market (Day Ahead (DA), Intraday (ID), Balancing Market (BM)) is a potential source of economic risk.* ☐ *The price forecasting methodology involves complex assessments depending on the market structure/rules in the respective system.* ☐ *Data availability and information transparency should be focused by the authorities in order to secure sound market participation*	*Contractual clarification related to imbalance costs is needed*	

RECOMMENDATION SEESGEN-ICT_03

C	R	S	SEESGEN-ICT_R3: Recommendations Family on Cross-cutting structural and social issues		3
			R3_09 - Sustain research and development initiative about economical and sociological aspects of the ICT for DSI **R3_08 - Surveys on consumers** **R3_10 - Provide education** **R3_07 – Ensure Data availability and information transparency** ☐ *Research and development initiative about economical and sociological aspects of the participation of the Users in the DSI are still needed.* ☐ *Sociological aspects to be surveyed are, for instance:* • The segmentation: of users and of their energy use behaviour • The use of ICT and the impact • The perception of the threats to the security and the privacy ☐ *The consumers <u>should be well informed about the substantial benefits</u> that can be obtained when the modern vision is achieved.* ☐ *Education of the grid operators and energy providers is also equally important since they are required to actively participate in the energy market* ☐ *Data availability and information transparency are additional factors that should be focused by the authorities in order to secure sound market participation*	*Disseminate the results of different projects as education tools in two levels.* *Technological experts (from energy operators, ICT Industry, Academia) should work jointly with human sciences experts (sociologist, human engineer) and economists.* *<u>Demonstrators at real and significant scale</u>, including complete and representative samples of population should be supported*	**SOCIAL CONSENSUS**

RECOMMENDATION SEESGEN-ICT_04

SEESGEN-ICT_R4: Recommendations Family on "Energy Efficiency and CO2 emissions"	SHORT SUMMARY
ENERGY EFFICIENCY IN DATA CENTRES	❑ Promote solutions for saving energy since the design and effective management applications of DC ❑ Standardize Energy performance metrics for Data Centres. Encourage metering and benchmarking. Foster labelling ❑ Introduce requirements of best design for efficiency of data centres in commercial building codes and elaborate procurement guidelines ❑ Foster Cloud Computing as an Energy Efficiency solution. Incentivise the use of new technologies. Foster the sharing of the existing resources instead the creation of duplicate solutions
CO2 EMISSIONS AND TRADING SYSTEMS	❑ Provide a suitable legal framework for the inclusion of distribution companies and consumers in an open Emission Trading System ❑ Standardise methods and tools for the measurement, calculation, data collection and reporting of CO2 emissions

RECOMMENDATION SEESGEN-ICT_04

C	R	S	SEESGEN-ICT_R4: Recommendations Family on Energy Efficiency and CO2 emissions	1
			R4_01 – Foster Energy Efficiency Solutions in Data Centres ☐ *Promote energy efficiency solutions starting from the design phase* ☐ *Promote Research for saving solutions from better application management* ☐ *Favour the development of new high efficiency technologies.*	**DATA CENTRES EFFICIENCY**
			R4_02 – Standardize Energy performance metrics for Data Centres ☐ *Standardize energy performance metrics* ☐ *Encourage metering in DC energy use.* ☐ *Develop and benchmark energy performance metrics.* ☐ *Fix a minimum energy performance standard* ☐ *Foster labelling of DC based on measured efficiency*	
			R4_03 – Issue Guidelines for Energy Efficiency in Data Centres ☐ *Define Procurement Guidelines and Regulations* ☐ *Introduce requirements of best design for efficiency of data centres in commercial building codes.* ☐ *Elaborate procurement guidelines (energy performance specifications) which support the development of energy efficient data centres.*	
			R4_04 - Foster Cloud Computing as an Energy Efficiency solution ☐ *Foster a framework for the deployment of Cloud Computing solutions.* ☐ *Set up financial incentives for efficient DC and best practices (virtualization, cloud computing solutions).* ☐ *Step up efforts to create guidelines as well as a proper legal framework for cloud computing* ☐ *Incentivise the use of new technologies rather than the replacement of the old one* ☐ *Foster the sharing of the existing resources instead the creation of duplicate solutions*	

RECOMMENDATION SEESGEN-ICT_04

C	R	S	SEESGEN-ICT_R4: Recommendations Family on Energy Efficiency and CO2 emissions		2
			R4_06 - Foster an open Trading Emissions System ☐ *Provide a suitable legal framework for the inclusion of distribution companies and consumers in the Emission Trading System.* ☐ *Open a discussion with stakeholders: DNOs, TSOs and energy companies* ☐ *Not based on voluntary bases but part of a specific Directive, broaden to include TSOs and DSOs* ☐ *Training the players through EU projects on the topic*	*Take examples from applications in UK (Manchester City Council)*	**GREEN HOUSE GAS EMISSIONS**
			R4_05 - Standardise methods for CO2 emissions evaluation ☐ *Standardise methods and tools for the measurement, calculation, data collection and reporting of CO2 emissions.* ☐ *Decisions on the level of accuracy should be made among TSOs DNOs and Utilities and involve new stakeholders* ☐ *The method for CO2 calculation and the accuracy that should be agreed should be linked to the Standards on the CO2 Data that should be communicated to the customers.*	*Ref to Good Practices like "Smart metering & home management" application by Deutche Telecom* *Use Standards ISO 14064 as Reference for reporting*	

RECOMMENDATION SEESGEN-ICT_05

SEESGEN-ICT_R5: Recommendations Family "EU large scale demonstrators, social and economic testing facilities"	SHORT SUMMARY
RESEARCH INFRASTRUCTURES AND TEST FACILITIES	❑ Strengthen research infrastructure through reality set-ups and virtual test facilities ❑ Improve Test Range and Simulation capability ❑ Foster synergies and complementary activities among the Test Facilities
TEST FACILITIES RELIABILITY	❑ Improve Test Facilities reliability through the standardization of methods and tests ❑ Set up a Mutual Accreditation system for laboratories in the field of the Smartgrids validation
APPLICATIONS NEEDED FOR SMARTGRIDS VALIDATION	❑ Feasibility and economical benefit of Smartgrids approach ❑ Impact of Regulatory policies ❑ Cyber security ❑ Social Barriers and incentivising models ❑ Education and awareness
TEST FACILITY INVESTMENT OPTIMIZATION	❑ Adopt investment policies for the improvement of TF tied to the application of priority Projects ❑ Foster investments on synergies and complementarities among the facilities ❑ Coordinate investments through independent supervisor entity

RECOMMENDATION SEESGEN-ICT_05

C	R	S		
			SEESGEN-ICT_R5: Recommendations Family "EU large scale demonstrators, social and economic testing facilities"	**1**
			R5_01 – Strengthen research infrastructure through reality set-ups and virtual test facilities ☐ *To support the transition to smart intra-grid applications, research infrastructures must be able to develop new methods and control strategies, which must be investigated and validated in close to reality setups, especially hardware-in-the-loop (HIL), controller - hardware-in-the-loop - (C-HIL) or power-hardware-in-the-loop (P-HIL)* ☐ *Develop performance computational (real-time and multi-agent) simulation environments (open standards based on open source technologies)* ☐ *Elaborate an interoperable operation to realize bigger virtual test facilities and enable multiple co-simulation environments (e.g. electrical-communication-mechanical-thermal)* ☐ *Support of cloud-computing for appropriate investigation of the high complexity of the intra-grid applications*	
			R5_02 - Strengthen EU Test Range capability **R5_03 - Improve EU simulation capabilities** ☐ *Improve assets and capabilities at the facility level based on a gap analysis* ☐ *Establish synergies among different facilities which have complementary assets and capabilities, both sharing assets and expertise/know how* ☐ *Go for the "Virtual Test Facility" concept* ☐ *Keep promoting pilot sites and large-scale system-wide demonstrations* ☐ *Equip the simulation platform with a powerful analyse feature, additionally designed to help in quantifying cost/benefit analysis* ☐ *Develop and set up a simulation platform able to include people behaviour*	*Main Topics:* •*reliability and robustness of the control models* •*responsiveness/suitability of the existing or proposed ICT infrastructure* •*performance and the interoperability of Smart Grid devices* •*solutions against privacy and security issues*
			R5_04 - Improve Test Facilities' reliability ☐ *Test Facilities should start a process of cooperation to Standardization* ☐ *Foster the mutual accreditation of the technical competence in this specific area (ICT for Energy Efficiency in Smart Grids)*	*Main Topics:* •*test and method validation* •*calibration methods equipment* •*accommodation and environmental conditions* •*qualification and training of the personnel*

STRENGTH CAPABILITY AND RELIABILITY

RECOMMENDATION SEESGEN-ICT_05

C	R	S	SEESGEN-ICT_R5: Recommendations Family "EU large scale demonstrators, social and economic testing facilities"		2
			R5_05 - Develop Test Facilities to disseminate feasibility and economy of smart grids. ☐ *Use Test Facilities to demonstrate feasibility and cheapness of smart grids* Smart Grid Consumer Awareness Campaigns Consumer buy-in will require industry to actively demonstrate and raise awareness about the benefits of Smart Grids in terms of greater reliability, greener energy, and cost savings, while demonstrating that smart technologies, especially Smart Meters, provide high levels of data protection and security	SAP AG: "Smart Grids for Europe: Benefits, challenges and Best Practices (Jan 2011)	**FEASIBILITY AND ECONOMY**
			R5_06 - Develop Test Facilities to enable regulatory policies studies. ☐ *Assess the impact of proposed regulatory policies on the energy market and Smart Grids, by paying special attention on the impact on Smart Grid investments and protection plan.* ☐ *Find transition strategies and policies which can support Smart Grid development while considering opposition by some consumer advocates to smart metering deployment and associated pricing changes* ☐ *Special attention needs the modelling of the end-user's behaviour, which should take into account the user's confidence with ICT*		**REGULATORY POLICIES IMPACT**
			R5_07 - Develop Test Facilities to study smart grids cyber security ☐ *Although the final control architecture has not been fixed, in fact, security assessments are worth being carried out and can even contribute to define the more suitable architecture with built-in security* ☐ *promoting research projects to identify metrics to evaluate cyber security and resilience of the whole system* ☐ *Assess suitability of existing high European standards for data privacy and security*	Main Topics: • vulnerabilities' identification and assessment • comparison of proposed control architectures and equipments • countermeasures' assessment • validation of existing risk analysis methods and security standards • harmonization of the approach for designing and running experiments	**CYBER SECURITY IN SMART GRIDS**

RECOMMENDATION SEESGEN-ICT_05

C	R	S			
			SEESGEN-ICT_R5: Recommendations Family "EU large scale demonstrators, social and economic testing facilities"		**3**
			R5_08 - Develop Test Facilities to support understanding of social barriers and model refinement. ☐ *Increase investments in demonstration projects that capture real-world data in order to make it possible to refine existing models* ☐ *Push consumers participation with incentives* ☐ *Sponsor long-term process of customer education and improved understanding of customer response. Both aspects are needed to consolidate technology and user interactions across the electricity system* ☐ *Invest in research projects with a strong consumers' view component (including consumer advocates)*		**SOCIAL CONSENSUS**
			R5_09 - Coordinate efforts, share results and optimize investments at EU level ☐ *Promote strengthening of EU Test Capabilities by financing enhancements instrumental to validation of financed projects (e,g. EEGI compatible Project).* ☐ *Ensure feasibility and applicability of ICT solutions which are results of EU financed projects, by fostering validation of results in one of the (accredited) Test Facilities* ☐ *Foster use of test ranges connected as Virtual Facilities in order to identify effective testing procedures. Collaboration will avoid duplicated investments, will free resources for missing equipment and will make the most of shared know now.* ☐ *Gather and disseminate case studies and lessons learned in order to avoid duplication of expensive projects.* ☐ *Coordinate investment policies to Test Facilities through Supervisor Entities (EERA?)* Creation of a European Smart Grids Knowledge Center Such a center would disseminate best practice technology hardware and software solutions for the rollout of Smart Grids; it would also establish a laboratory for utilities and technology vendors to test the performance and interoperability of products and solutions.	Grid+ FP7 Project SAP AG: "Smart Grids for Europe: Benefits, challenges and Best Practices (Jan 2011)	**OPTIMIZE INVESTMENTS IN TEST FACILITIES**

RECOMMENDATION SEESGEN-ICT_06

SEESGEN-ICT_R6: Miscellany of Recommendations on "Intelligence for the T&D Networks required for SmartGrids"	SHORT SUMMARY
STANDARDIZATION	❑ **Select scenarios and use cases of true relevance to be used as standard for Smartgrids validation** ❑ Improve Test Range and Simulation capability ❑ Foster synergies and complementary activities among the Test Facilities
TEST FACILITIES RELIABILITY	❑ Improve Test Facilities reliability through the standardization of methods and tests ❑ Set up a Mutual Accreditation system for laboratories in the field of the Smartgrids validation
APPLICATIONS NEEDED FOR SMARTGRIDS VALIDATION	❑ Feasibility and economical benefit of Smartgrids approach ❑ Impact of Regulatory policies ❑ Cyber security ❑ Social Barriers and incentivising models ❑ Education and awareness
TEST FACILITY INVESTMENT OPTIMIZATION	❑ Adopt investment policies for the improvement of TF tied to the application of priority Projects ❑ Foster investments on synergies and complementarities among the facilities ❑ Coordinate investments through independent supervisor entity

RECOMMENDATION SEESGEN-ICT_05

C	R	S	SEESGEN-ICT_R6: Miscellany of Recommendations on Intelligence for the T&D Networks required for SmartGrids	1
			R6_02 – Select scenarios and use cases of true relevance ☐ *There are a large number of use cases and scenarios for smart grids. Many of them are redundant or have unclear or blurred descriptions. Working groups should select a smaller number of scenarios, which helps in extracting the main requirements.* ☐ *To promote the cooperation among (and within) standardization bodies worldwide towards a simplified and standard set of use cases and scenarios to condensate the existing ones into a limited number of macro cases.*	See also Grid+ FP7 Project
			R6_03 – Need of a common reference architecture to standardization extents **R6_04 – Take care of the evolution in time of the Referenced Architecture** ☐ *Standardization bodies should agree on a common reference architecture. Many groups currently are considering the NIST conceptual model and reference architecture.* ☐ *Dynamic Reference Architecture.The Reference Architecture cannot be defined once and for all. It will have to be evolving over time together with the progress in the smart grid business, use cases and functionalities*	**STANDARDIZA-TION ISSUES**
			R6_05 – Foster a dynamic adaptation of the ICT operation caring the specific load ☐ *There is not a clear understanding whether current standards and protocols are suitable for smart grids or new solutions have to be devised. In particular, it is necessary to define the role of the current Internet as the base transport technology in order to optimize costs and accelerate the developments.* ☐ *Standards should also be reviewed and, where useful and possible, revised in light of optimizing the energy load of the ICT itself. Particular care should be devoted in providing standardization ground that enables the ICT devices to adapt their operational states (and energy consumption) dynamically, depending on the data traffic.*	

RECOMMENDATION SEESGEN-ICT_06

C	R	S	SEESGEN-ICT_R6: Miscellany of Recommendations on Intelligence for the T&D Networks required for SmartGrids		2
			R6_06 – The communication network should support the QoS considering the real-time constraints and the current status **R6_07 – The communication network designed to operatively support emergency and critical situations of the electric grid** □ *ICT is requested to improve the grid's resistance to perturbations, natural disasters and grid flexibility, by monitoring and protection of the power line and environment condition (current, voltage, frequency, wind-force, etc.). The design of the communication network should carefully consider QoS and real-time constraints in transmitting this information; this aspects should also seriously affect the choice of the various communication paths (wireless: GPRS, 3G, LTE, WiMAX, etc./wired: Optical fiber, etc.).* □ *The design and choice of the communication network should carefully consider capabilities such as: sufficient energy back-up in the communications nodes (time should be defined); path/systems redundancies; self healing capabilities*	See also SEESGEN-ICT_R1_35	**NETWORK OPERATION OPTIMIZATION**
			R6_08 – Consider diverse information and communication networks and transmission technologies to adapt against huge volume of data in crowded areas □ *The way of using the electric cabling in the last mile to interface home appliances could show not to be sufficient to transport huge volumes of data in particularly crowded areas. It should be taken as granted that the communication path will be provided by different information and communication networks and composed of diverse transmission technologies in the perspective of saving cost and widening the bandwidth available for applications.*		

RECOMMENDATION SEESGEN-ICT_06

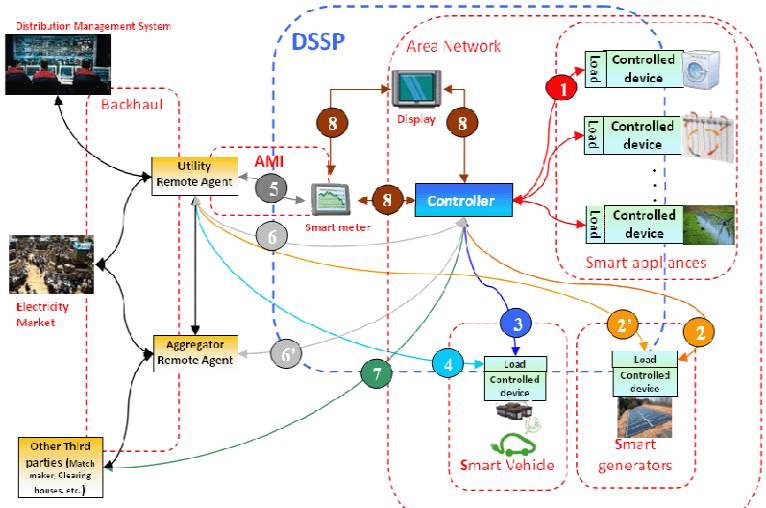
C	R	S	SEESGEN-ICT_R6: Miscellany of Recommendations on Intelligence for the T&D Networks required for SmartGrids	3
			R6_09: Enhance competition in supplying free communication services in Smartgrids □ *Regulators should put away this opportunity by suitable policies and regulations to allow free competition in supplying communication services for smart grids. All stakeholders should be guaranteed the same opportunity in this market, using different technologies as public broadband access networks, power line communications and wireless communications.*	
			R6_10 – Foster a multiple choice in communication technologies for home appliances bridging interoperability and the excessive complexity □ *The presence of multiple choices is positive towards an early and cost effective deployment of Smart Grids. On the other side, if too many options are available, interoperability issues or excessive complexity/cost/consumption may arise due to different standards present in networking equipment and appliance interfaces and the need to bridge them.*	**FLEXIBILITY OF THE MARKET**
			R6_11 – Conceive flexible and diverse communication infrastructures suitable to the different criticality of the services □ *A wide variety of requirements and constraints could not be delivered through one single communications infrastructure. Critical services and electrical network elements will have extremely high requirements to the communications network (QoS and availability), while the less critical services could be guaranteed through standard communications channels that are less costly, scale better to the needed volumes and are already largely available*	
			R6_13 – Actions to limit the carbon footprint of the home distributed smartness □ *Within the ICT, the analysis and optimization of the energy footprint of communications systems is an ongoing activity. That experience should be applied also in the Smart Grid area so to develop energy aware and optimized architectures and elements.*	**SMART GRIDS ICT CARBON FOOTPRINT**

RECOMMENDATION SEESGEN-ICT_07

C R S

SEESGEN-ICT_R7: The Demand Side Service Platform (DSSP): a proposal for an operative approach

1



STANDARDIZATION

REGULATIONS

ICT TOOLS AND PRACTICES

ICT infrastructure allowing:

- ☐ control function
- ☐ demand side participation and management
- ☐ market operation

DSSP is a concept working framework where:

- ☐ defining ICT functionalities
- ☐ harmonizing Standards for DSI (*analysis done in D8-5)*
- ☐ agreeing Regulations (country dependent)

DSSP may be also a physical infrastructure

- ☐ Providing an ICT infrastructure, that enables bidirectional communication between: end-users - grid operators-DSOs - energy market players (e.g.. aggregator)
- ☐ Supporting service architecture, which enables exchange of services between the end-users, the DSO and intermediary entities

Gen. Requirements:

- ☐ Interoperability (plug&play)
- ☐ Reliability
- ☐ Security and Privacy
- ☐ Demand Side
- ☐ Service Oriented

Issues:

- ☐ Governance and Supervision of the platform and of the infrastructure
- ☐ Follow up the developments (Dynamic Infrastructure)
- ☐ Large scale demonstration

RECOMMENDATION SEESGEN-ICT_07

C	R	S	SEESGEN-ICT_R7: The Demand Side Service Platform (DSSP): a proposal for an operative approach – OPERATIONAL STEPS TOWARDS DSSP	2-1
			R7_01 - Standardisation for the Interoperability ☐ *Coordination among standardization initiatives* ☐ *Reference to available interoperability framework*	Examples: NIST Roadmap [NIST 2010] the IEC Roadmap [IEC 2010] and the activities related the European Mission Mandate [M441] Internet of Energy ("supply-oriented demand")
			R7_02 - Definition of the interoperability architecture ☐ *Detailed picture of the interfaces between different devices to detect boundaries between domains that use different standards, at the:* • Transmission level (protocols and physical connection technologies) • Syntactical level (format) • Semantic level (meaning) • Organization level (processes enabled)	examples are mentioned as first approach towards DSSP: ADDRESS Project, OGEMA from IWES, SAP e.g. Internet Protocol Suite, Web Service protocols e.g. XML schemas, data models, data dictionaries e.g. Semantic Web technologies. e.g. Workflow languages, BPML4WS, ebBP
			R7_03 - Development of an ICT infrastructure for interoperability (DSSP infrastructure) ☐ *Interoperable smart devices* ☐ *The deployment of the smart metering (1)* • Regulatory requirements • Functionality requirements: • Integration requirements ☐ *An Open Source approach* ☐ *Tests of interoperability for services/appliances*	Ref. EPRI 2010 • Country Dependent • Ref OpenMeter and M441 • e.g. PLC or Wireless depending on nthe applications
			(1) Incentives for Investments in Smart Grid Infrastructure • Rollout of Smart Meters: Member States must commit to mandatory targets and measurable objectives for rollout. To ensure lower prices, the EU must ensure the promotion of European standards to allow economies of scale and consider establishing smart metering hubs to further reduce the cost. • Investment in Smart Grid Infrastructure: Lack of incentives for grid operators and suppliers represents a major obstacle to the deployment of Smart Grids. The EU must introduce regulatory incentives and expand funding from the Trans-European Networks, the European Investment Bank (EIB), and Member States. SAP AG: "Smart Grids for Europe: Benefits, challenges and Best Practices (Jan 2011)	

RECOMMENDATION SEESGEN-ICT_07

C	R	S	SEESGEN-ICT_R7: The Demand Side Service Platform (DSSP): a proposal for an operative approach – OPERATIONAL STEPS TOWARDS DSSP	2-2
			R7_04 - Issue Preparatory Guidelines, covering: ☐ *The interoperability* ☐ *The Societal issues, including involvement and protection of citizens* ☐ *Safety and Security* ☐ *The technical solutions fulfilling the DSSP requirements* ☐ *The evolution of the Regulatory aspects.*	Sociological and Economical aspects are essential (see R3_09 and R5_08)
			R7_05 - Assess Security issues ☐ *The following road-map to implement security in the DSSP is recommended:* 1. Find a method to identify security risks. This can be done using a simple risk matrix or a more elaborate method as suggested by CIGRE'. 2. Split the electrical system into separate domains and carefully identify the risks for each of them using the risk identification method. The domains can be defined as suggested by CIGRE' or NERC. 3. Use security measures that are aligned with existing standards	Ref: CIGRE' methods Ref: CIGRE'/NERC Ref IEC 62351 Std and Smart Grid Cyber Security guidelines by NIST
			R7_06 - "System Efficiency" as the paradigm of the overall Energy System ☐ *To describe the efficiency of the total energy system from generation to consumption* ☐ *To enable policy makers to more easily highlight possible system wide barriers/enablers (as an overall approach)* ☐ *To encourage policy makers and regulatory bodies to create regulation for cross cutting measures which impact the efficiency of the entire value chain in a holistic, consequential manner*	Ref SEDC: Smart Energy Demand Coalition
			R7-07 – Support DSSP with Demonstrators and Education ☐ *at real and significant scale* ☐ *in different national cases*	**DEMONSTRATION AND EDUCATION**

CONCLUSIONS

SEESGEN-ICT has:

- ❑ Attained the pre-fixed objectives of results:
  - Consensus building at EU level and with involvement of stakeholders from 15 different EU countries;
  - Support to implementation of Kyoto, post-Kyoto, Lisbon and EU strategies (20/20/20, ESD, i2010, etc.) for Energy Efficiency, in coordination of efforts with other European ICT networking initiatives (e.g. SmartGrids Platform) and projects (e.g. ADDRESS, OPEN Meter, ICT4SMARTDG);
  - Identification of best practices, classification of ICT solutions and prioritisation of actions and investments for ICT deployment in smart grids;
  - Identification of technological and non technological barriers and roadmap for future R&D actions;
  - Issuing of recommendations to targeted stakeholders and identification of policy actions to Policy Makers;
- ❑ Proposed new operational tools:
  - Service Level Agreement as a market operation facilitator, security&privacy, QoS monitoring mechanism; Service Coordination tool
  - DSSP platform allowing the full ICT deployment
  - TF Directory and classification methodology
- ❑ Made publicly available results of analysis (standards, Instruments, best practices, etc)
- ❑ Generated cooperation potential among stakeholders (explicit intent)