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SGSG Workshop 3 Results

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Abstract:
The Smart Grid Stakeholder Group (SGSG) has been established to create a liaison between all the industry organisations involved in the evolution and roll out of the Smart Grid. The Group is open to all industry organisations who have or who intend to have an involvement in the Energy or ICT/Future Internet arena.

On 24th September 2012 the 7th SGSG Workshop has been organized by FINSENY. The workshop presented the current status of different Smart Grid activities in Europe including OpenNode, activities by ESB and the newest results from FINSENY from all scenario work packages. Moreover, a demo was shown by the RegModHarz project. The discussions and results of this workshop are summarized in the document at hand.

Keyword list:

Smart Grid Stakeholder Group, Smart Energy, Smart Grid, Future Internet, FINSENY, FI-PPP, FI-WARE, OpenNode, RegModHarz, ESB

Disclaimer:

Not applicable.

Executive Summary

Formed in June 2010, the so-called ‘Smart Grid Stakeholder Group’ (SGSG) is an open group of industrial players interested in the Smart Energy arena. Six meetings of the group were organised since it has been founded, and the number of participating organisations has grown to over 60 organisations.

Further developing the SGSG and organising the information exchange between the SGSG and the project is a major activity in FINSENY. A close link with the SGSG has been established to foster the information exchange between the whole European Energy and ICT community.

The main topics of this seventh SGSG meeting on September, 24th 2012 in Munich were to

- Provide an overview on FINSENY’s approach and methodology
- Present the newest results from FINSENY’s scenarios Distribution Network, Microgrid, Smart Buildings, E-Mobility and Electronic Marketplace for Energy
- Provide an overview on the functional architecture of the FINSENY’s scenarios and present ideas on trial candidates
- Present results from other Smart Grid research projects like “OpenNode” and “RegModHarz” also by showing a demonstrator
- Illustrate first trial experiences on E-Mobility and Smart Metering in Ireland
- Provide feedback how FINSENY addressed the recommendations of the 6th SGSG Meeting

The objectives of this SGSG meeting were to update the community about the current status on the FINSENY scenarios with a special focus on functional architecture and trial candidates, the presentation of other Smart Grid activities in Europe and to provide room for discussions on early-trials in FI-PPP Phase 2 and other upcoming research opportunities.

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1. Introduction

The objectives of this seventh SGSG meeting were the introduction of new projects, the information sharing with the Smart Grid Stakeholder Group and to reinitiate the discussion about further relevant topics for the community in order to stimulate the SGSG tasks:

- advance the mutual understanding between the energy and ICT industries on common challenges and technical solutions
- Identify business & research cooperation opportunities in European and national programs
- Form new cooperation / strong consortia for common research activities, including common or federated trial implementations
- Stay in contact with relevant players, communities, the relevant European project activities (e.g. FP7, national projects, FIA) and assure a high awareness of their results and open issues

Therefore the main topics of this seventh SGSG meeting on September, 24th 2012 in Munich were to

- introduce the Functional Architectures and Trial Candidates of the FINSENY Work Packages Smart Distribution (WP2), Microgrids (WP3), Smart Buildings (WP4), Electric Mobility (WP5) and Electronic Market Place for Energy (WP6)

- present results from other Smart Grid projects like OpenNode and RegModHarz with an focus on a Secondary Substation automation solution and a exemplary implementation of a Virtual Power Plant, that combines different local renewable energy generators under a control instance and offers the integration and registration of local power generators into a VPP

- highlight trial experiences in the E-Mobility and Smart Metering rollouts

To achieve these objectives, the agenda has been setup as described in Section 1.1.

1.1 Agenda

10:00 – 10:30 Demo by RegModHarz Project
& Welcome Coffee

10:30 – 10:45 Welcome & Approval of Agenda

10:45 – 11:00 FINSENY: Overview & Methodology -
Dr. Kolja Eger, Siemens

11:00 – 11:30 Smart Distribution (WP2): Functional Architecture and Trial Candidates -
Timo Kyntäjä, VTT

11:30 – 12:00 Microgrids (WP3): Functional Architecture and Trial Candidates -
Dr. Kolja Eger, Siemens

12:00 – 13:00 Lunch

13:00 – 13:30 Smart Buildings (WP4): Functional Architecture and Trial Candidates -
Dr. Gilles Privat, Orange

13:30 – 14:00 Electric Mobility (WP5): Functional Architecture and Trial Candidates
Dr. Fiona Williams, Ericsson

14:00 – 14:30 Electronic Market Place for Energy (WP6): Functional Architecture and Trial Candidates –
Luigi Briguglio, Engineering

14:30 – 15:00 OpenNode:
A Smart Secondary Substation Node and its Integration in a Distribution Grid of the Future
Martin Wagner, Atos Spain

15:00 – 15:30 Coffee break

15:30 – 16:00 ESB Trial Experiences in E-Mobility and Smart Metering -
Mark Daly, ESB

16:00 – 16:30 Open time-slot for presentations of SGSG members

16:30 – 17:00 AOB

17:00 – 17:30 Demo by RegModHarz Project

1.2 List of Participants

Name	Company	FINSENY Partner
Begaße, Simon	Power Plus Communication AG	
Benze, Jörg	T-Systems	
Briguglio, Luigi	Engineering	x
Bytschkow, Denis	FORTISS	
Christiani, Kai	UL International Germany GmbH	
Daly, Mark	ESB	x
deMeer, Jan	smartspacelab.eu GmbH	
Dillinger, Markus	Huawei	
Eger, Kolja	Siemens AG	x
Eigenmann, Robert	Huawei	
Fernandes, Bosco Eduardo	Huawei	
Fries, Steffen	Siemens AG	x
Heiles, Juergen	Siemens AG	x
Höfer-Zygan, Renate	Fraunhofer-Einrichtung für Systeme der Kommunikationstechnik ESK	
Huitema, George	TNO	
Jagwitz, Alexander von	BAUM	x
Kyntaja, Timo	VTT	x
Lehmann, Heiko	Deutsche Telekom AG T-Labs	
Lucio, Javier	Telefonica	x
Müller, Dirk	UL International Germany GmbH	
Nauck, Enrico	Fraunhofer-Einrichtung für Systeme der Kommunikationstechnik ESK	
Nikolaou, Nikos	Synelixis	x
Privat, Gilles	Orange	x
Raquet, Christoph	Power Plus Communication AG	
Rusitschka, Sebnem	Siemens AG	
Schulz, Egon	Huawei	
van Hest, Marcel	Alliander	
Wagner, Martin	ATOS	x
Williams, Fiona	Ericsson	x
Winter, Martin	Siemens AG	

2. Presentations and discussion

In this section a detailed summary will be given on the presentations hold during the 7th SGSG meeting and the discussions which came along. This is done by showing some selected slides from the presentations and providing further explanations and background information.

2.1 Demonstration by RegModHarz Project

Presenter: Martin Winter, Siemens AG

The „regenerative Model Region Harz“ (RegModHarz) is one of six model regions that have developed business models and technologies for the ICT-based energy systems of the future in the framework of the German programme E-Energy funded by the Federal Ministry of Economics and Technology (BMWi) in partnership with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

The basic objective was to show that with the coordination of generators, storages and consumers it is possible to provide sufficient, reliable electric energy with a maximum part of regenerative energies in the “Harz”, a region in central Germany. This coordination is done within a regional control centre with optimized management of the decentralized energy production sites connected by modern communication systems to the control centre. An effective market platform was realized to provide transparent information about the actual electricity generation and consumption. In addition, also the consumers have access to the consumption and evaluation of their own consumption.

The objectives of the project have been developed by the virtual power plant “Harz”, the functional control centre with “live” data and information has been demonstrated at a demonstration system in Munich. On this system, different de-central energy units like biogas systems, wind power units and PV facilities positioned in the “Harz” region and connected by Internet links with the control centre demonstrator in Munich have been presented. It was possible to provide an overview of the connected systems including a registry, the market platform with the current win and loss of money and the technical data of the different running systems. At the moment, about 12 systems producing renewable electricity are accessible.

Network monitoring of the different renewable power systems is possible; these systems are controlled at the control centre by using algorithms developed in the project respecting economical and technical requirements. Thus, the electrical networks can be operated in a safer and more economical manner.

2.2 Welcome and Approval of Agenda

Presenter: Dr. Kolja Eger, Siemens AG

At the beginning, Dr. Kolja Eger, technical manager of project FINSENY, provided a short introduction on the history and the tasks of the SGSG group that is currently funded by the EU project FINSENY (fig.2). He presented the proposed agenda for this meeting (fig. 3 and 4) which was accepted by all participants. Mainly, the meeting was subdivided in the presentations of the WPs in project FINSENY, and an overview on similar EU funded projects. Mr. Huitema asked to provide information on upcoming research projects in which TNO is involved. This was added to the open time slot of SGSG members in the afternoon.

Figure 1: Start Page of welcome presentation

Figure 1: Start Page of welcome presentation

Figure 2: Facts about SGSG

2.3 FINSENY: Overview and Methodology

Presenter: Dr. Kolja Eger, Siemens AG

As an introduction, Dr. Kolja Eger presented an overall description on the project FINSENY. The project is embedded in the FI-PPP framework, which is explained in Figure 5 and Figure 6. FINSENY is one of the 13 projects of FI-PPP. Some details to this project are shown in Figure 7where vision and mission are described; the project comprises 35 partners in 12 countries, and lasts from April 2011 to March 2013.

FINSENY is applying a 4-step approach (see Figure 8); in this 7th SGSG meeting we will concentrate on step 3 (functional architecture). It is built on the usage of the 3-dimensional SGAM model. The basic idea and the layers of this model are presented in Figure 9and Figure 10. Finally, in Figure 11 you will see the scenarios on which FINSENY is focussing, being electrical marketplace, distribution network, microgrids, smart buildings and EV. The work in these scenarios will be detailed in the next presentations.

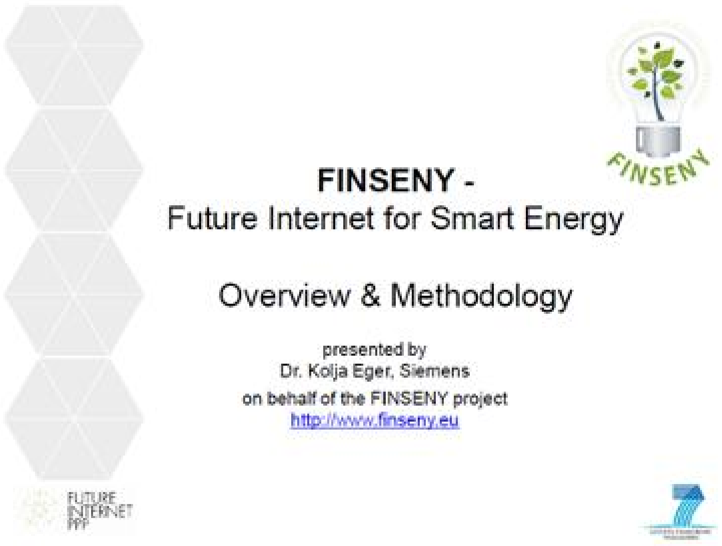


Figure 3: Start Page for overview and methodology presentation

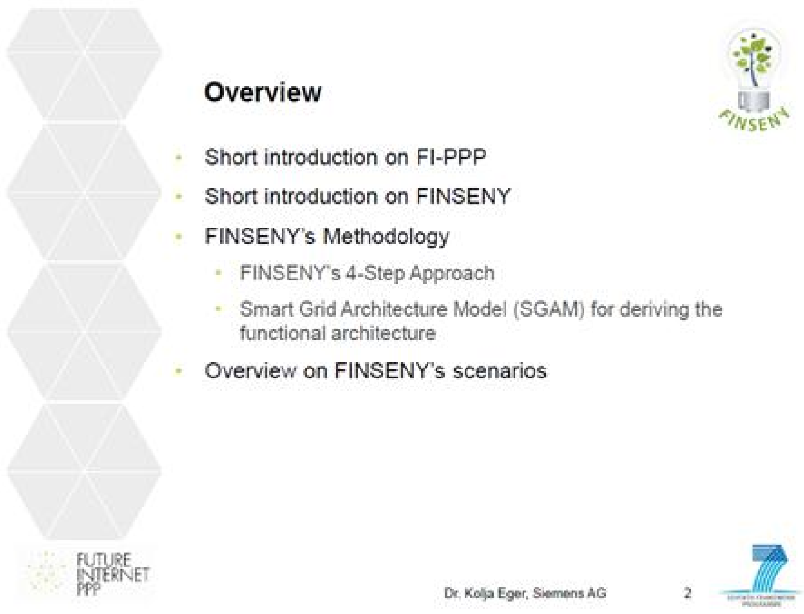


Figure 4: Overview

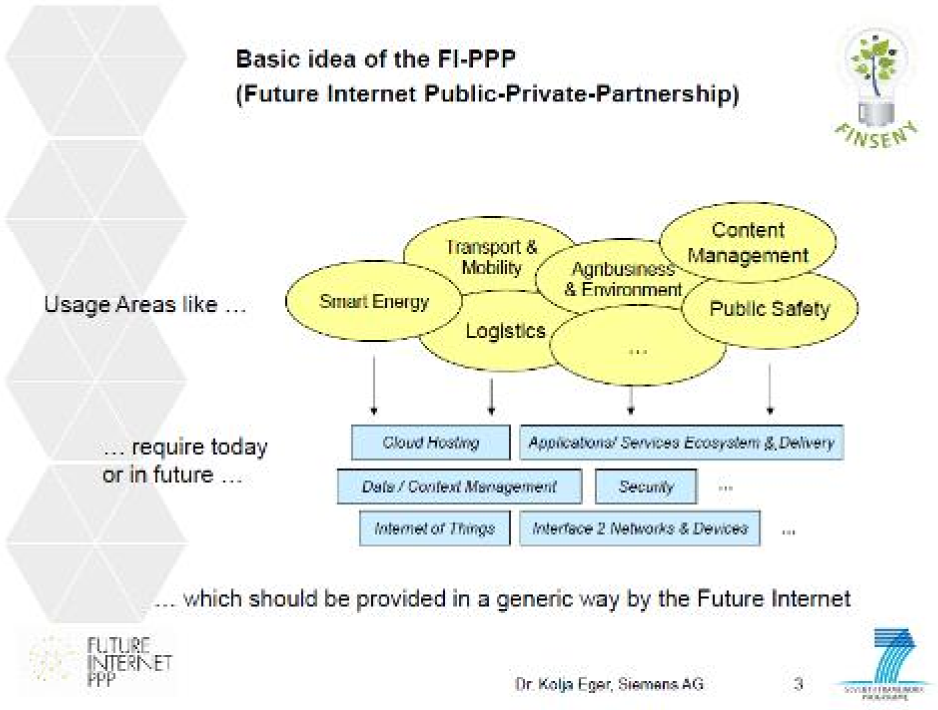


Figure 5: FI-PPP Basics

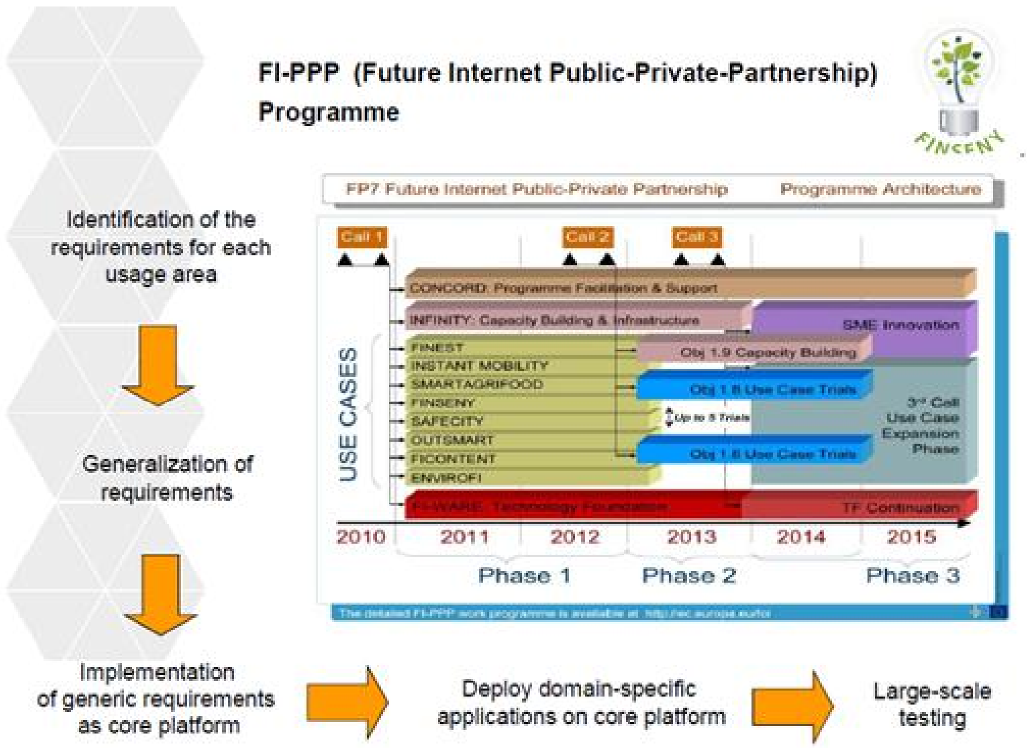


Figure 6: FI-PPP Programme

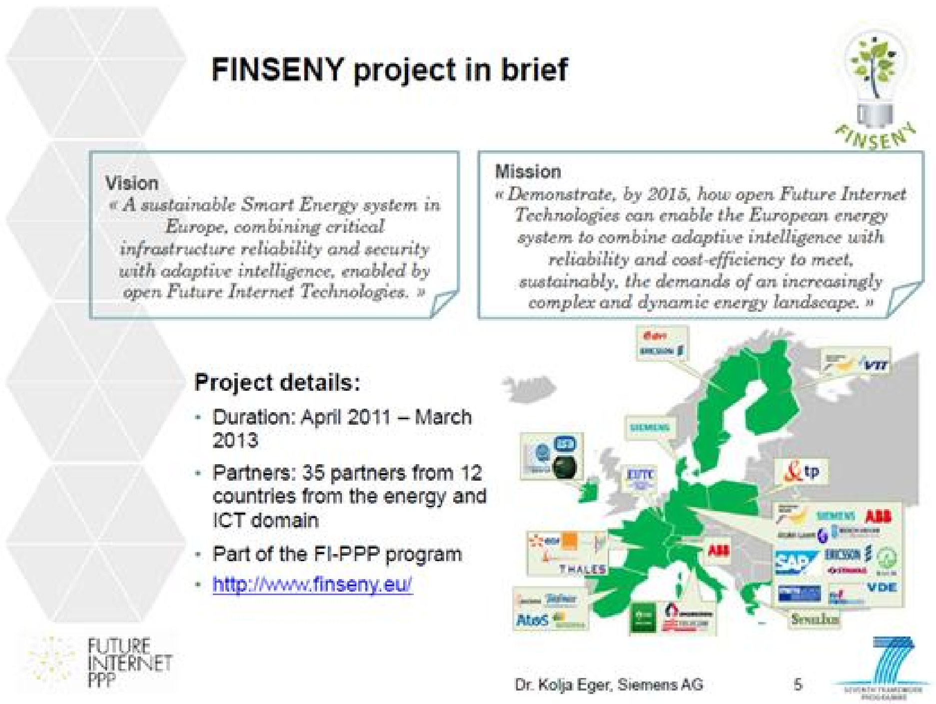


Figure 7: Summary on FINSENY Project

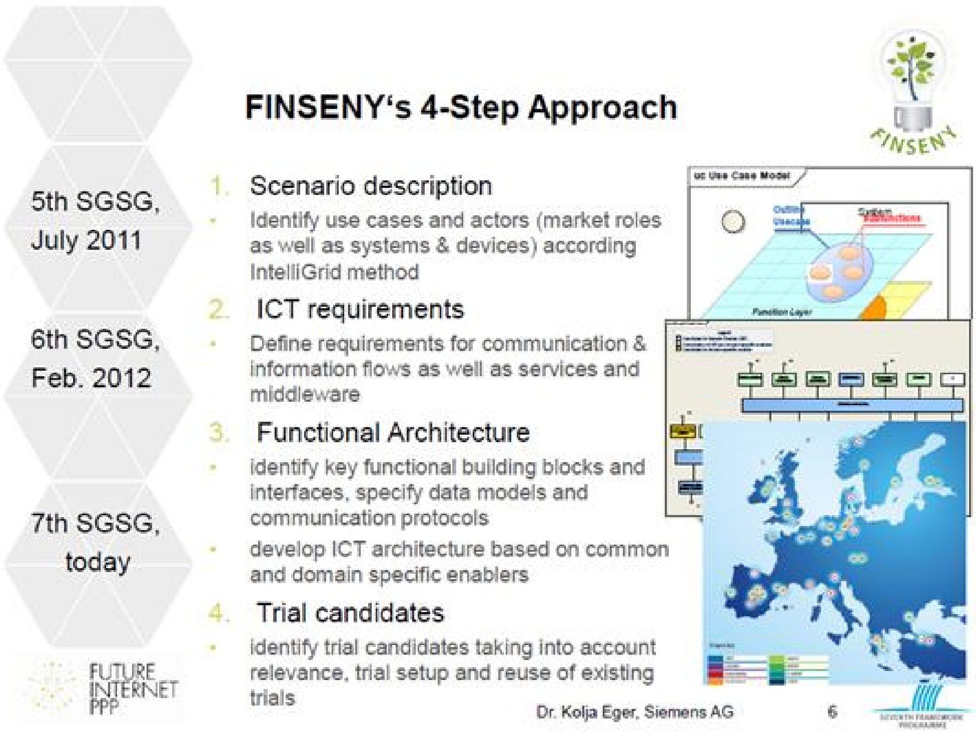


Figure 8: FINSENY's 4-Step Approach

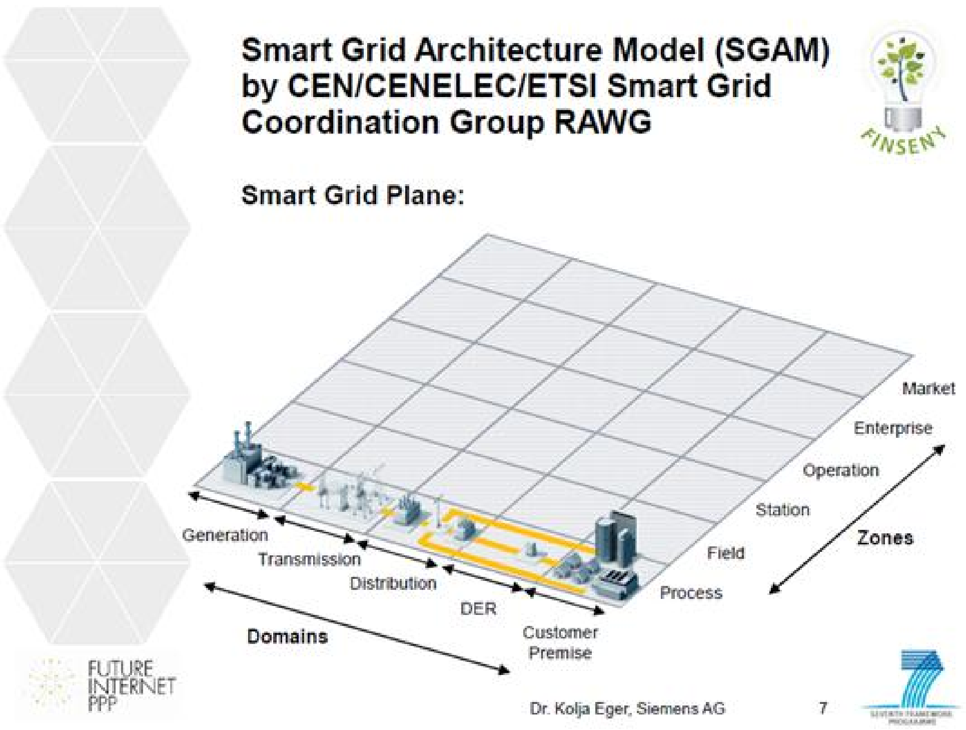


Figure 9: SGAM Model

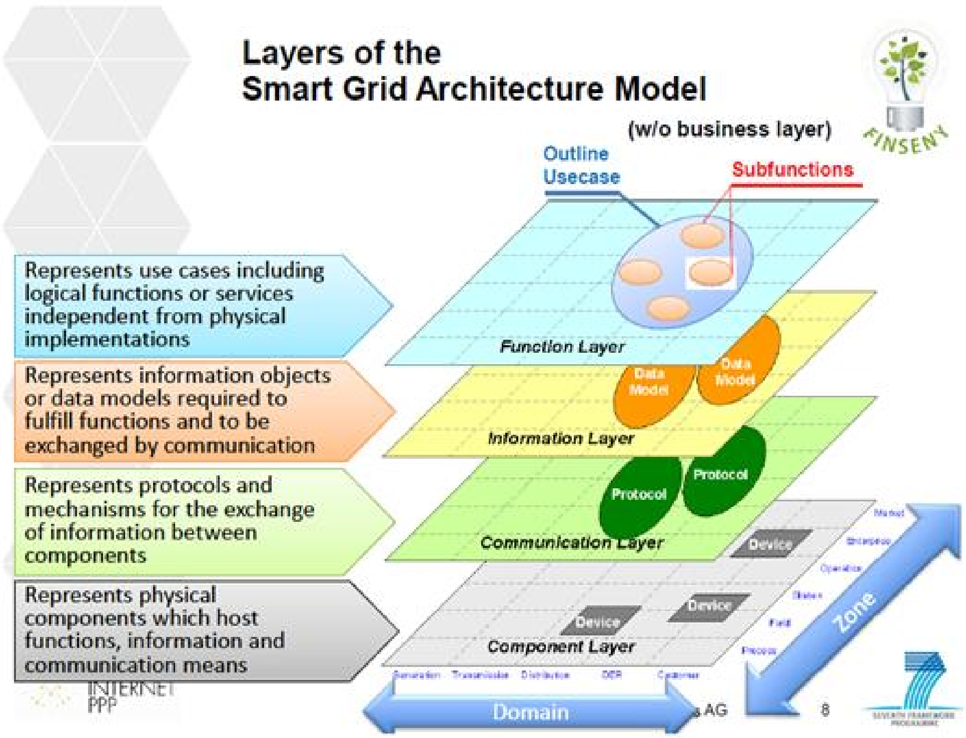


Figure 10: SGAM Layers

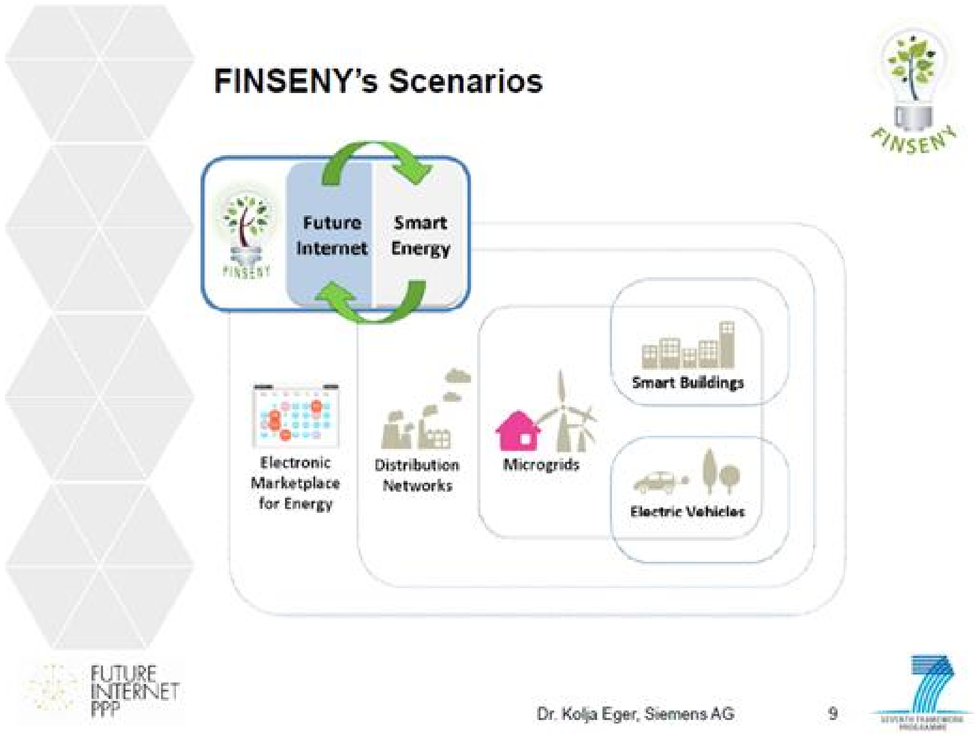


Figure 11: Scenarios of Project FINSENY

2.4 Smart Distribution (WP2): Functional Architecture and Trial Candidates

Presenter: Timo Kyntäjä, VTT

Timo Kyntäjä (VTT) gave an overview on the work and results of WP2 of FINSENY. This WP deals with Distribution Networks (DNs). After an introduction and definition of DNs (Figure 14) Timo reported on the status of the WP and the defined building blocks, data models and interfaces (Figure 15 and Figure 16). It was emphasized that although security is not shown as an own building block, it is integrated to all key building blocks.

The next task in WP2 was how to map and align the results for DN to the FI-WARE technology foundation (Figure 17 and Figure 18) and to derive generic and domain specific enablers for DNs. Five use cases have been derived in this WP:

- fault location, isolation and service restoration
- dynamic control of active components
- MV data acquisition and control,
- SG energy control of power inverter
- Mobile work force management.

The architecture for DNs (Figure 19 and Figure 20) as well as discovered issues (Figure 21) have been presented. Main issue is the result that some DN scenarios have strict ICT requirements (time critical requirements, QoS challenges) that are not covered by generic enables in FI-WARE, and therefore some extensions or own developments are required.

Finally, in Figure 22 to Figure 24Timo summarized the results within WP2 with respect to trial sites as potential candidates for the next phases to demonstrate the different use cases.

Figure 12: Start Page of WP2 Presentation

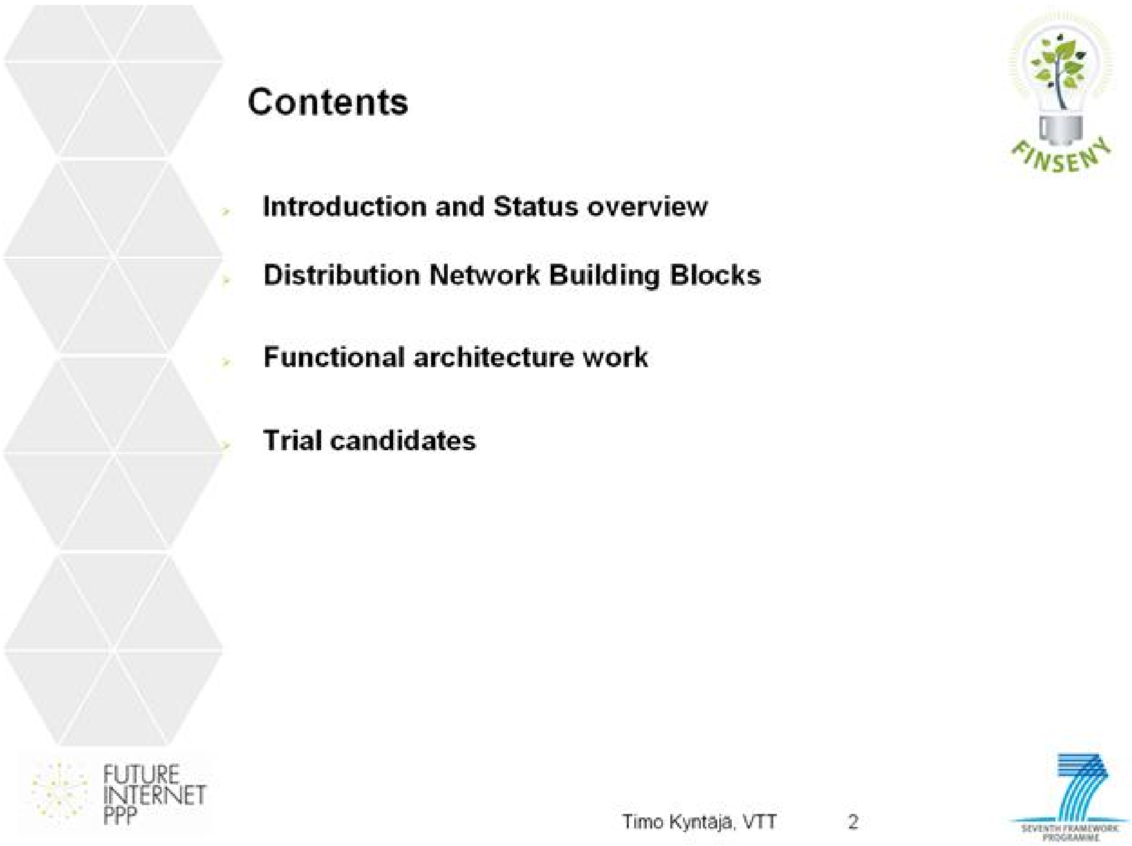


Figure 13: Contents of WP2 Presentation

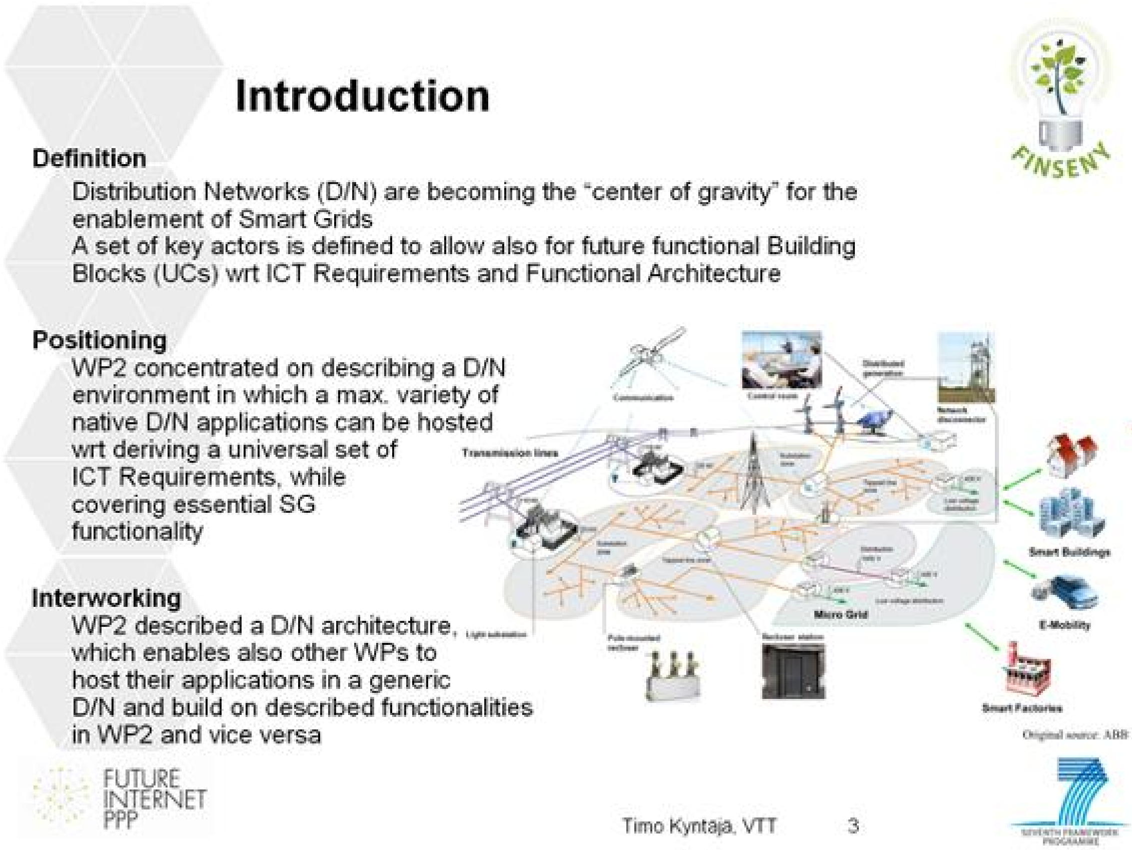


Figure 14: Introduction on Distributed Networks

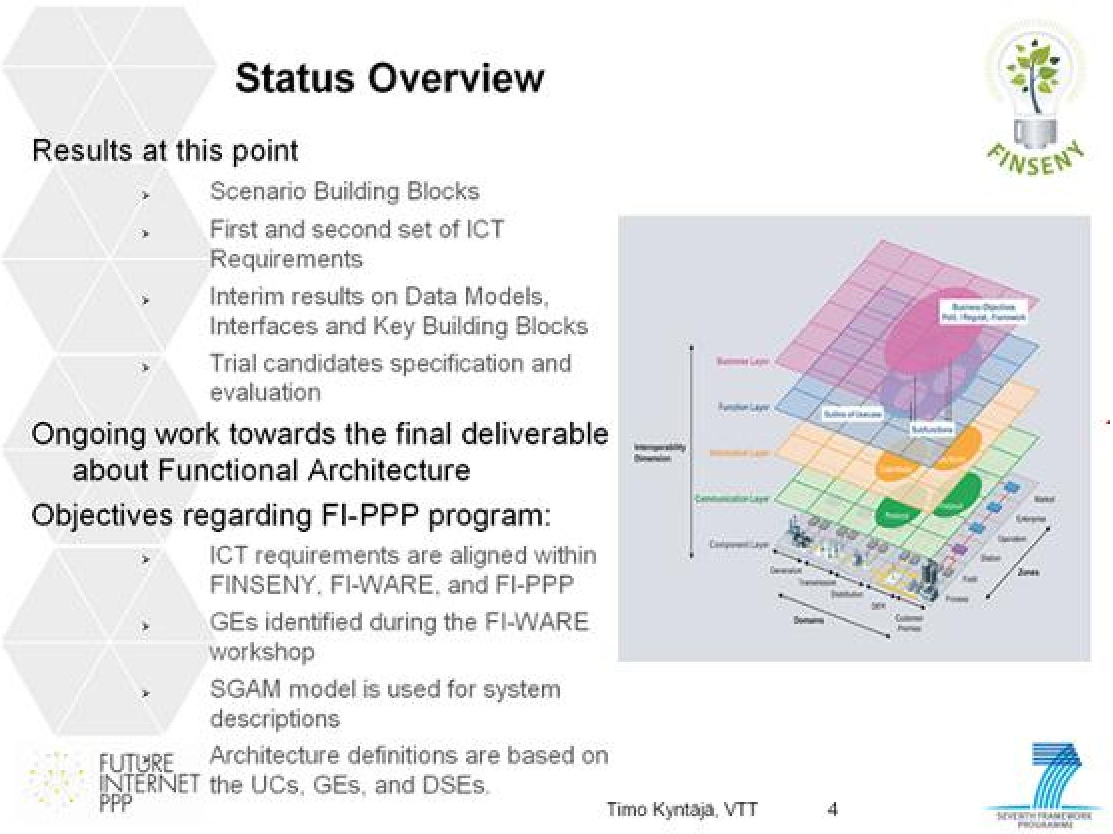


Figure 15: Status of WP2

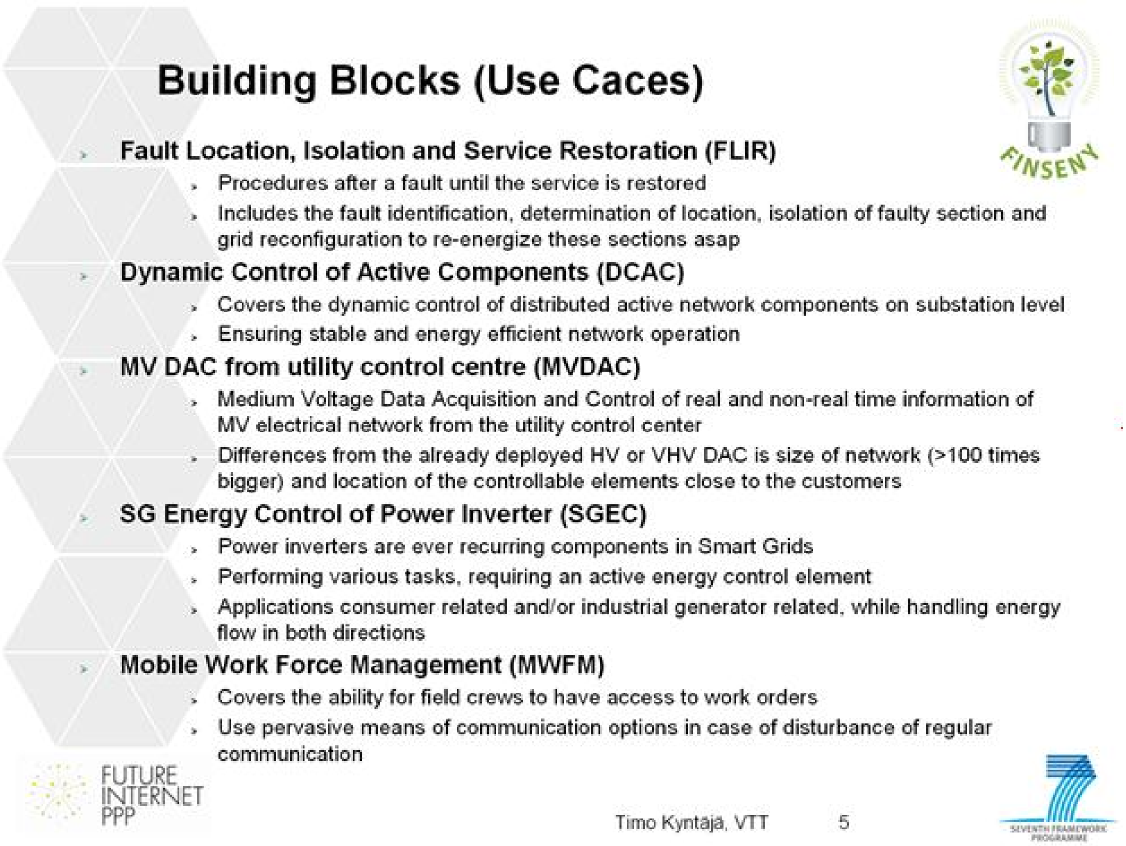


Figure 16: Building Blocks or DN

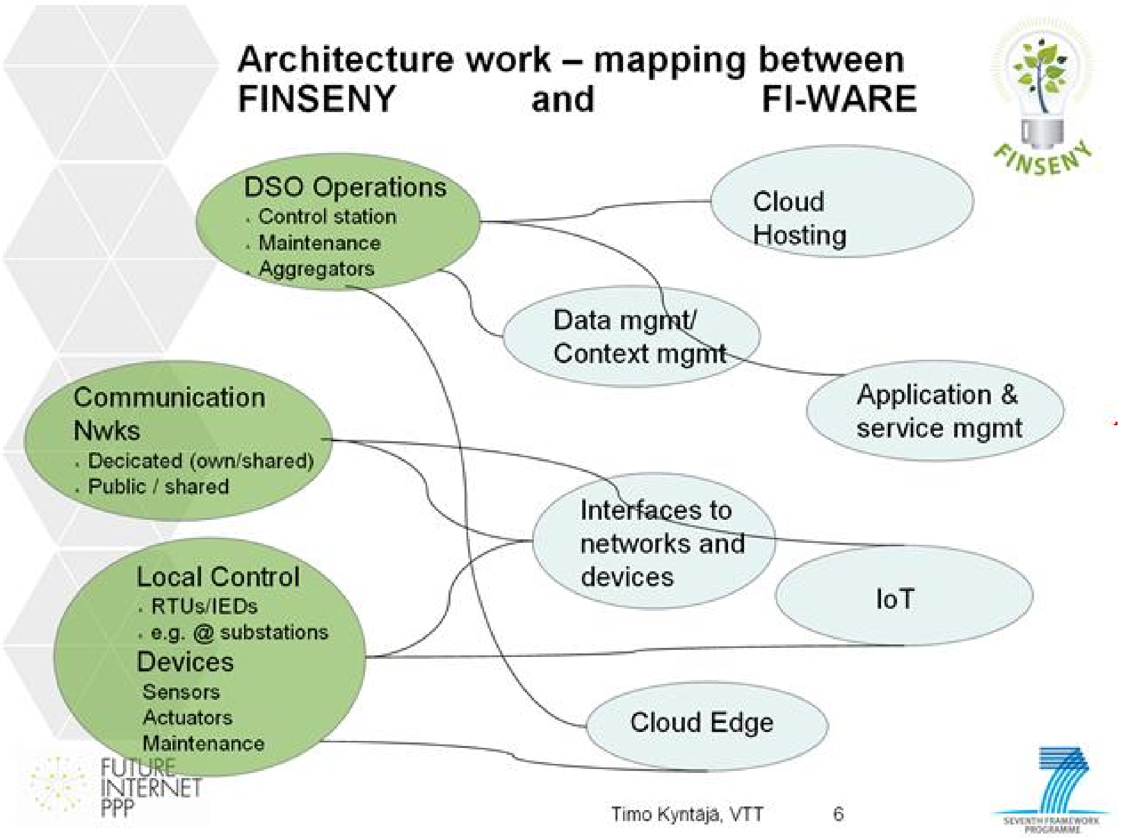
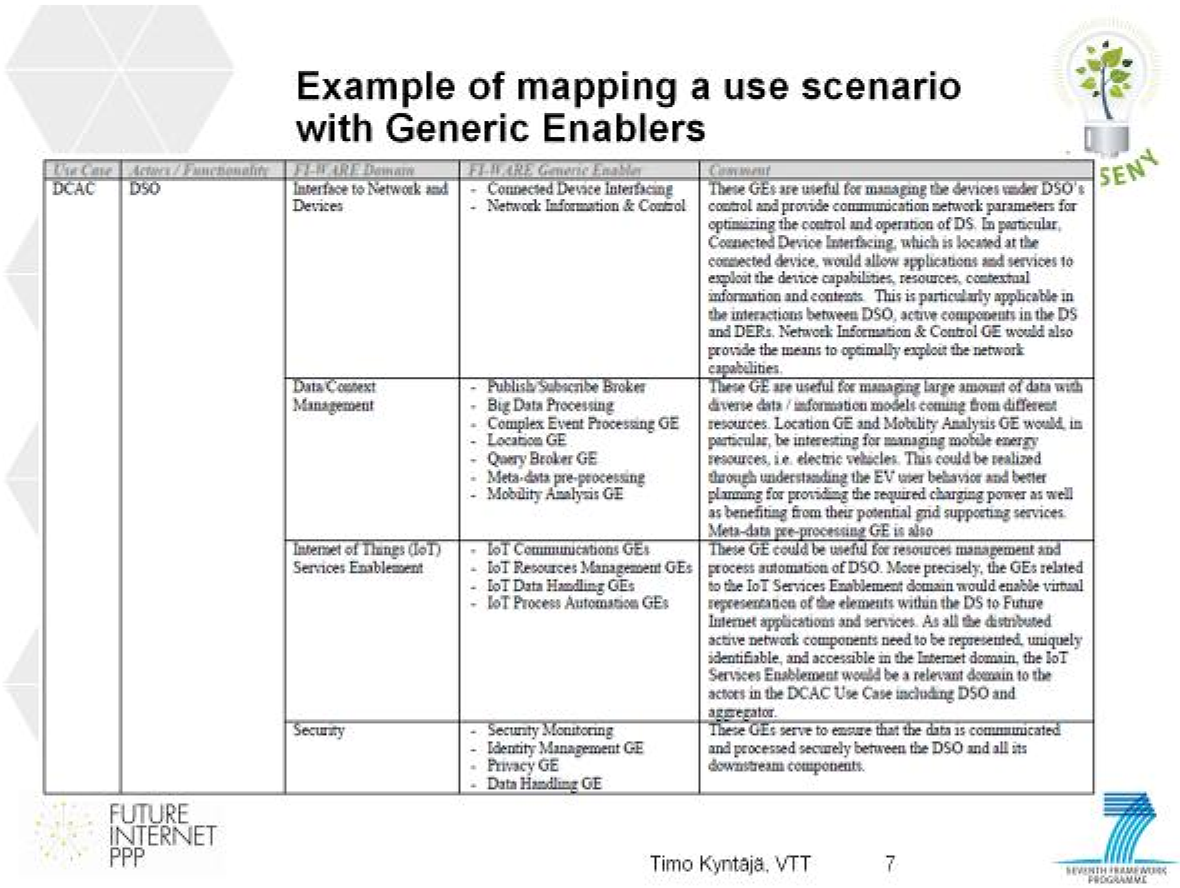


Figure 17: Mapping to FI-WARE



Use Case	Actors / Functionality	FI-WARE Domain	FI-WARE Generic Enabler	Comment
DCAC	DSO	Interface to Network and Devices	- Connected Device Interfacing - Network Information & Control	These GEs are useful for managing the devices under DSO's control and provide communication network parameters for optimizing the control and operation of DS. In particular, Connected Device Interfacing, which is located at the connected device, would allow applications and services to exploit the device capabilities, resources, contextual information and contents. This is particularly applicable in the interactions between DSO, active components in the DS and DERs. Network Information & Control GE would also provide the means to optimally exploit the network capabilities.
		Data/Context Management	- Publish/Subscribe Broker - Big Data Processing - Complex Event Processing GE - Location GE - Query Broker GE - Meta-data pre-processing - Mobility Analysis GE	These GE are useful for managing large amount of data with diverse data / information models coming from different resources. Location GE and Mobility Analysis GE would, in particular, be interesting for managing mobile energy resources, i.e. electric vehicles. This could be realized through understanding the EV user behavior and better planning for providing the required charging power as well as benefiting from their potential grid supporting services. Meta-data pre-processing GE is also
		Internet of Things (IoT) Services Enablement	- IoT Communications GEs - IoT Resources Management GEs - IoT Data Handling GEs - IoT Process Automation GEs	These GE could be useful for resources management and process automation of DSO. More precisely, the GEs related to the IoT Services Enablement domain would enable virtual representation of the elements within the DS to Future Internet applications and services. As all the distributed active network components need to be represented, uniquely identifiable, and accessible in the Internet domain, the IoT Services Enablement would be a relevant domain to the actors in the DCAC Use Case including DSO and aggregator.
		Security	- Security Monitoring - Identity Management GE - Privacy GE - Data Handling GE	These GEs serve to ensure that the data is communicated and processed securely between the DSO and all its downstream components.

Figure 18: Example for Mapping to Generic Enabler of FI-WARE

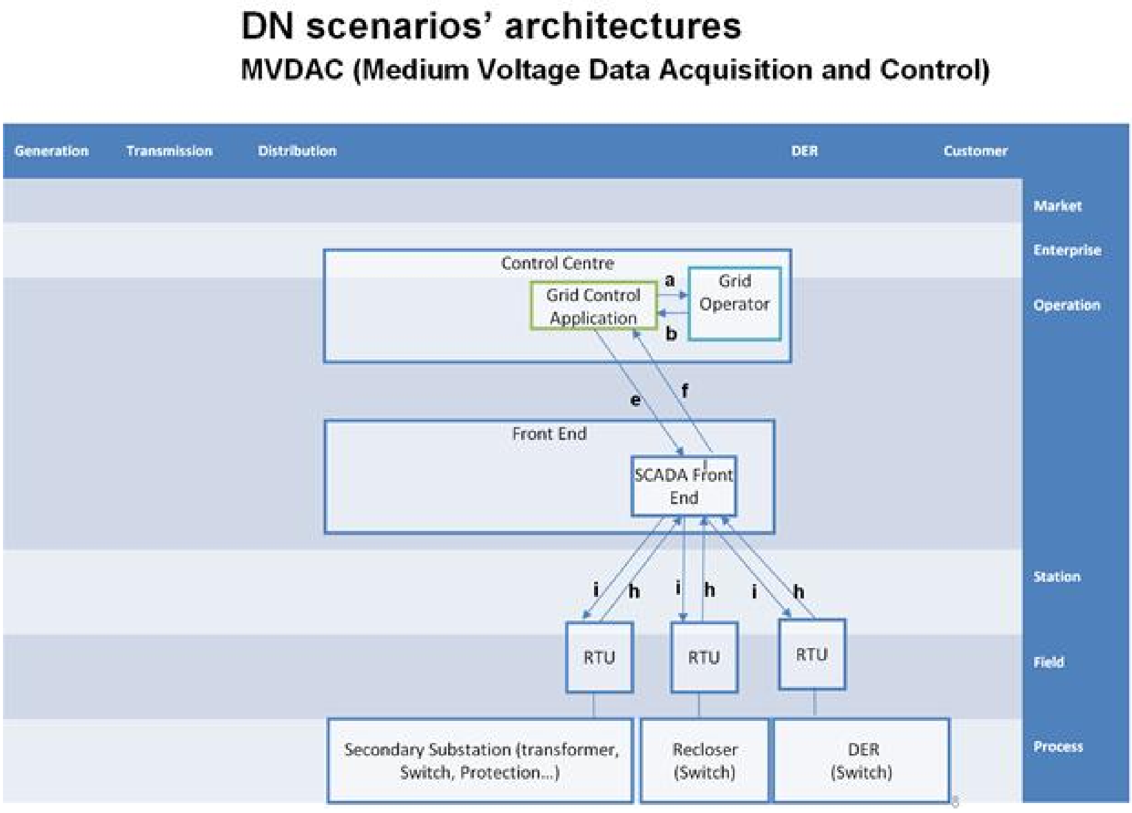


Figure 19: Scenario Architecture for DN Part I

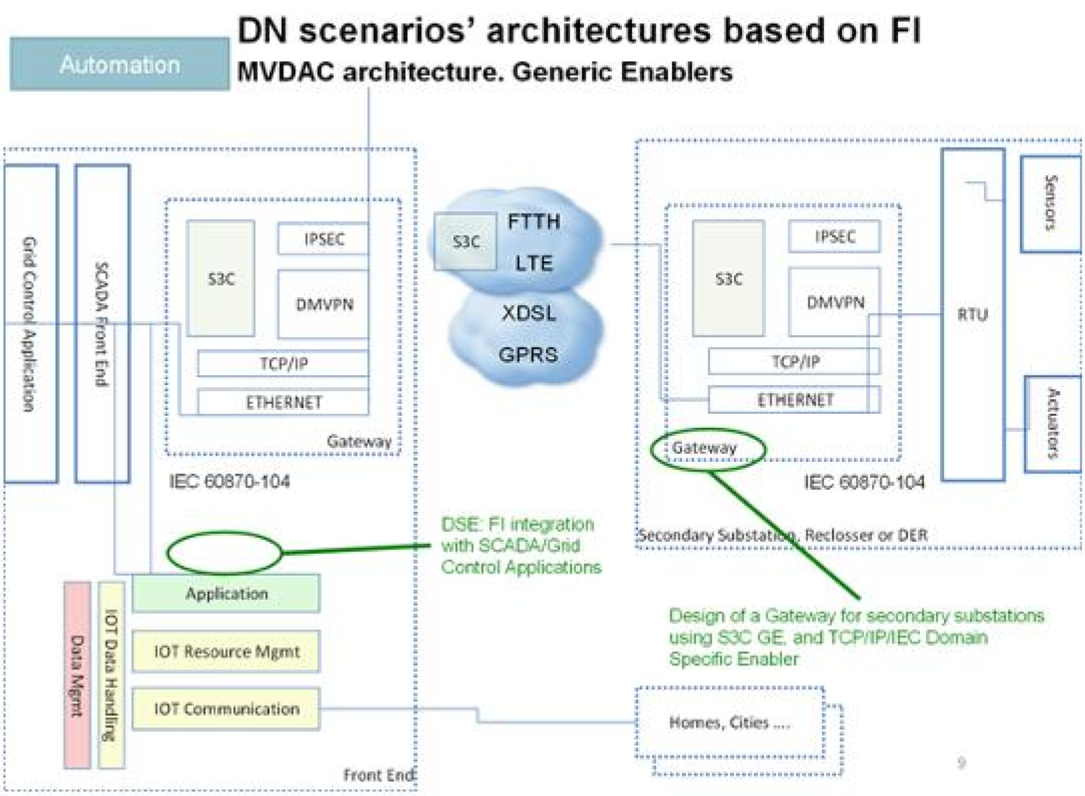


Figure 20: Scenario Architecture for DN Part II

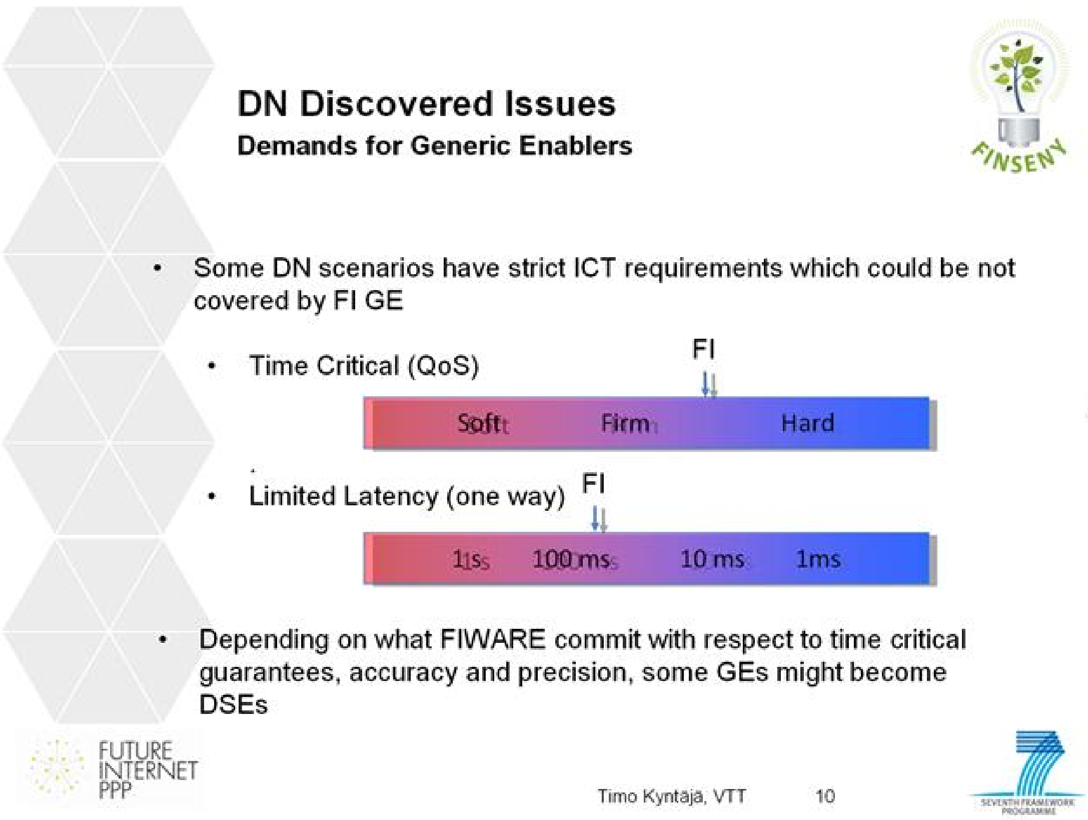


Figure 21: Discovered Issues for DB

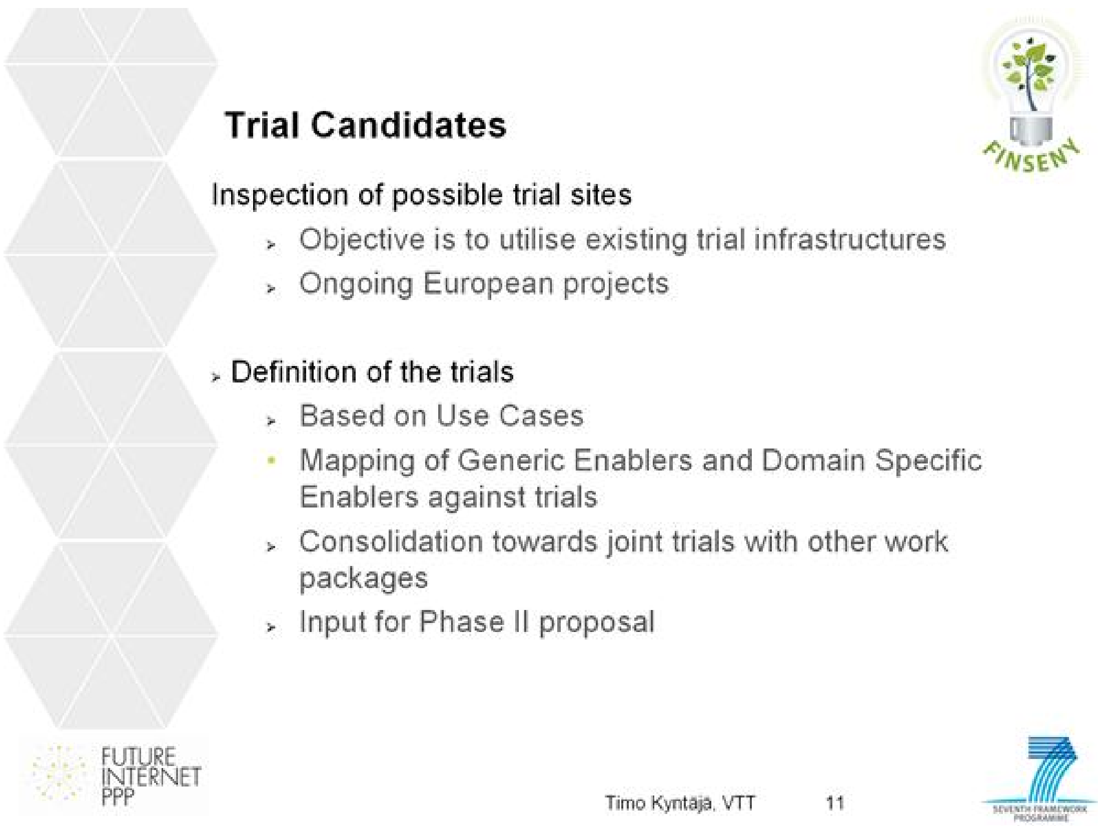


Figure 22: Trial Candidates WP2

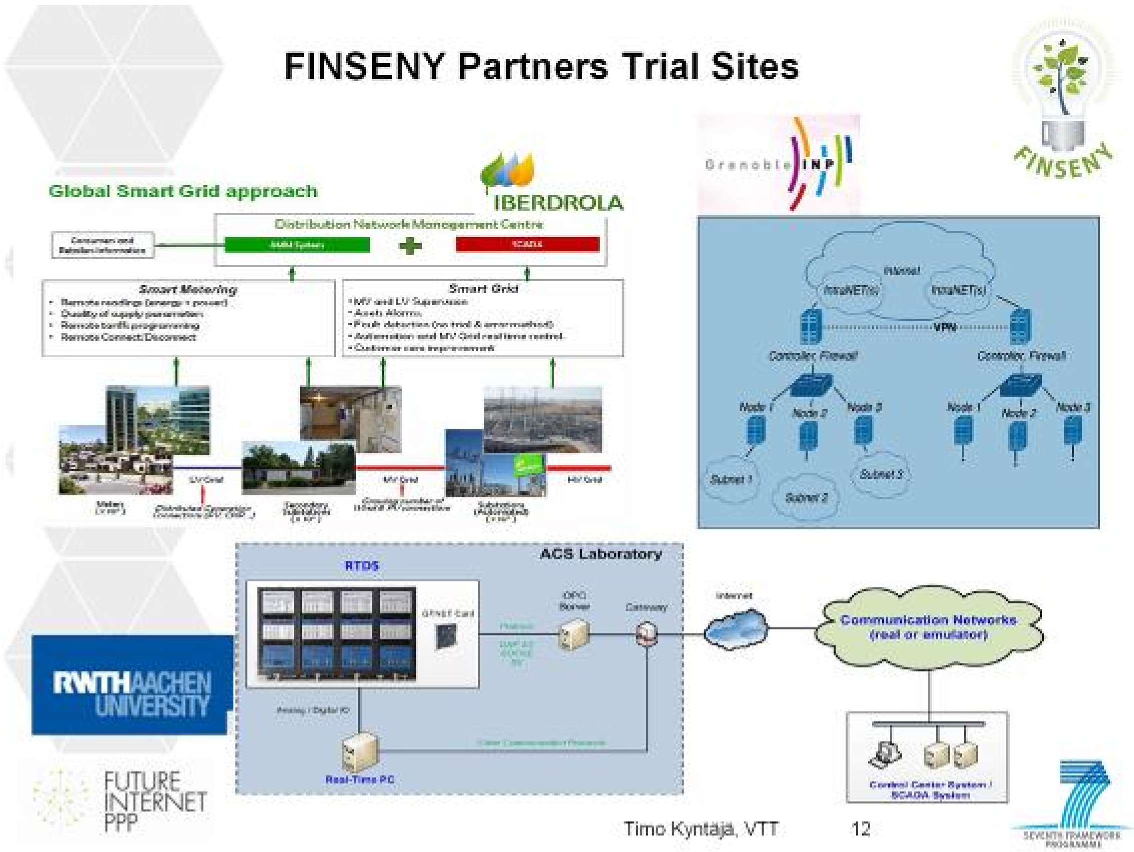


Figure 23: Trial Sites WP2

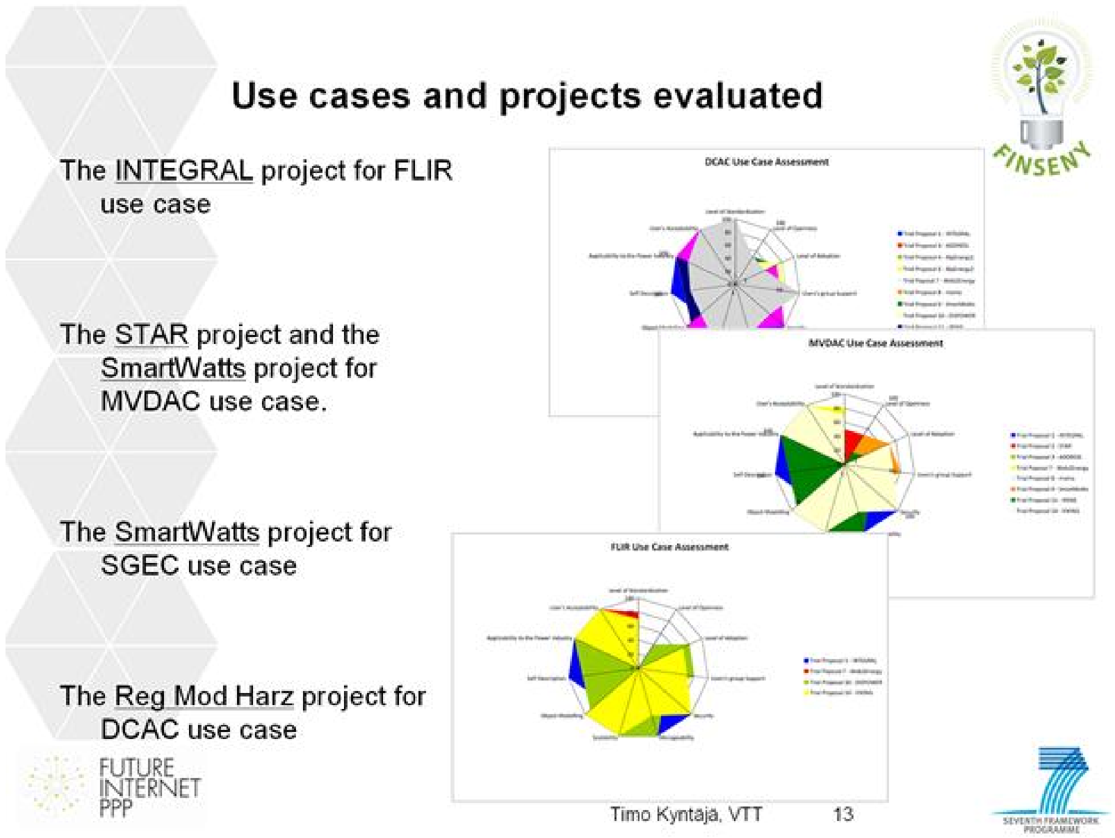


Figure 24: Use Cases and Projects Evaluated

2.5 Microgrids (WP3): Functional Architecture and Trial Candidates

Presenter : Dr. Kolja Eger, Siemens AG

WP3 of FINSENY concentrates on Microgrids (MGs), which are essentially a substructure of the global grid and comprise local low-voltage and even medium-voltage distribution systems with distributed energy resources and storage devices in order to satisfy the demands of energy consumers. Such systems can be operated in a semi-autonomous way, if interconnected to the grid, or in an autonomous way (islanding mode), if disconnected from the main grid.

With the help of ICT a Microgrid could improve the technical performance of a local distribution grid. For example, by reduction of line losses due to generation closer to the loads, by mitigation of voltage variations through coordinated reactive power control or islanding mode in case of connection loss to the main grid. The benefits of a MG are also summarized in Figure 27.

In a first step, use cases have been defined for MGs (Figure 28). There are two groups of use cases, the business use cases and the control & management use cases. From these use cases, we derived an interim functional architecture (Figure 29) and used them for a drill-down based on the SGAM model. The functional layer (Figure 30) and the information and communication layers (Figure 31) of this drill-down process are shown in an example for the auto-configuration use case.

Furthermore, we derived the ICT requirements of MG based on the use cases (Figure 32 and Figure 33). To satisfy these ICT requirements, we developed a functional architecture for control centres for a MG in Figure 34 and Figure 35and divided it with respect to generic enablers defined and provided by FI-WARE and domain specific enablers. We harmonized the component layer of the MG model (Figure 36) and defined the required networks (Figure 37) to be able to link these components. For the communication on these links, the required QoS was discussed, QoS classes have been defined (Figure 38).

Finally, trial candidates for MGs have been identified that can be used for phase II (Figure 39). This was done by using a top-down (based on the use cases) as well as a bottom-up (looking on existing trial sites from other projects) process. A conclusion of the work in WP3 is presented in Figure 40.

In the discussion afterwards we discussed different types of Microgrids and its limitation w.r.t. geography. It was mentioned that WP3 use cases are not only valid to Microgrids, but a subset applies also for aggregators and Virtual Power Plants (VPPs).

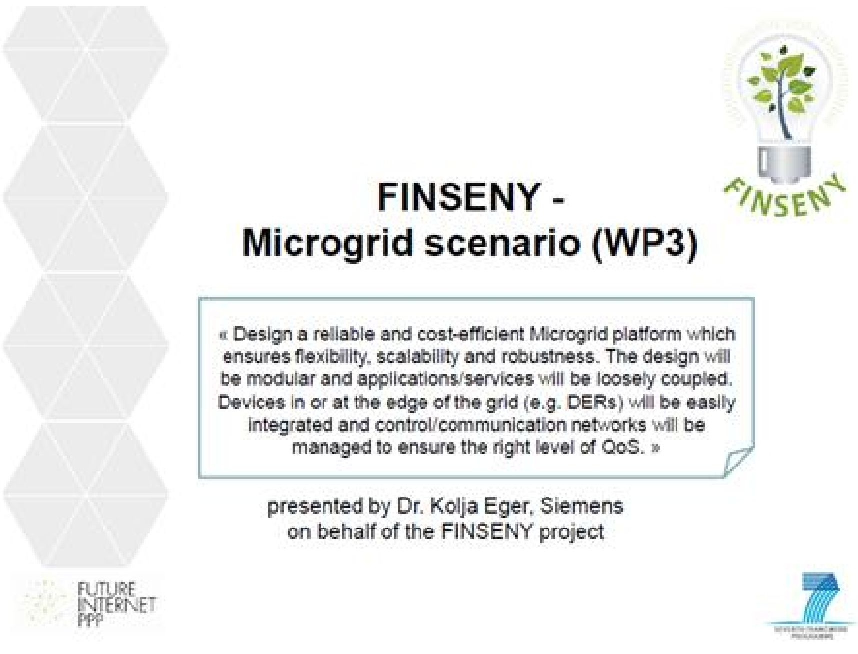


Figure 25: Start Page of Microgrid Presentation (WP3)

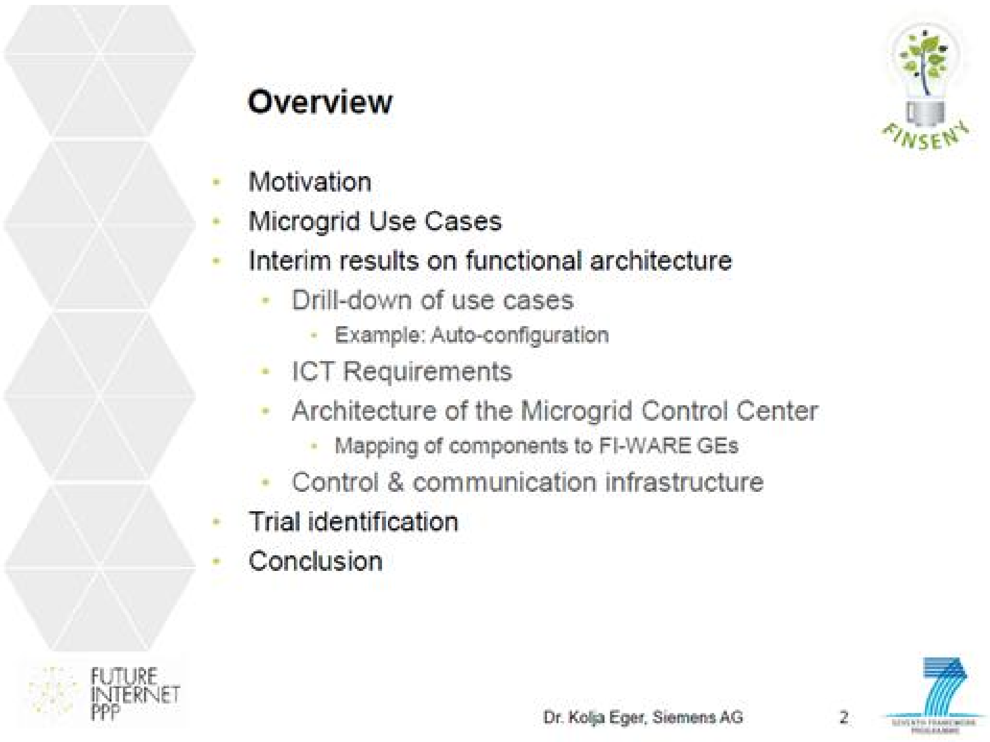


Figure 26: Overview of Microgrid Presentation (WP3)

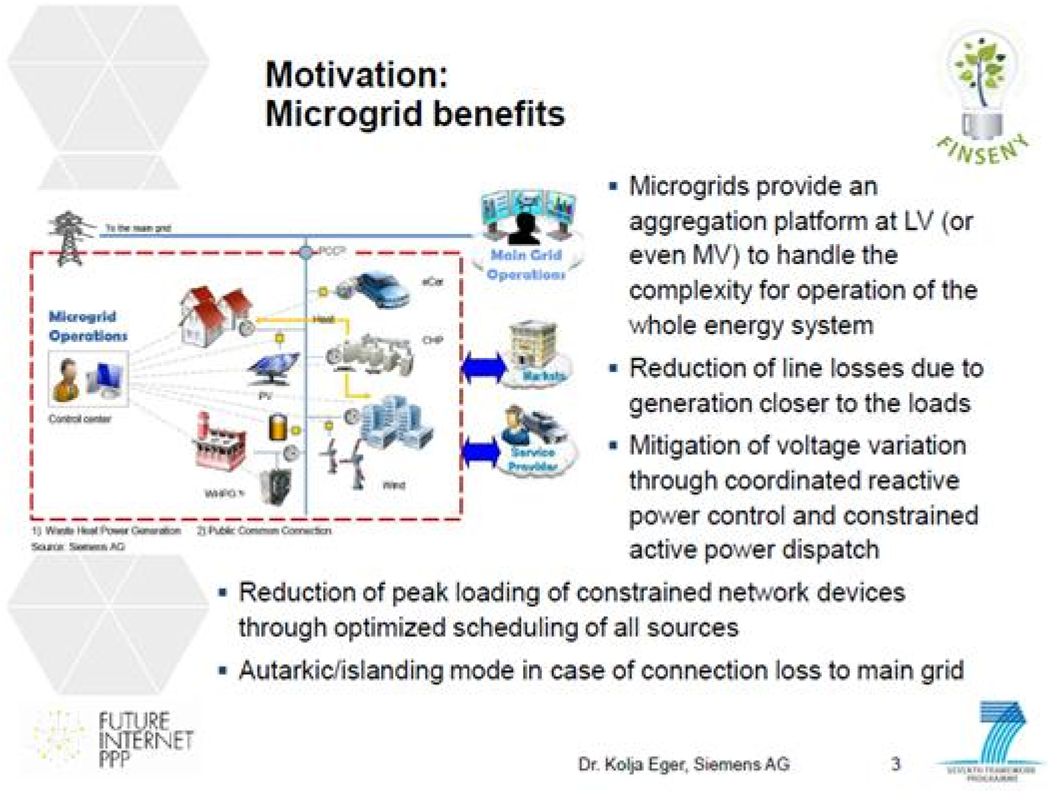


Figure 27: Benefits of Microgrids

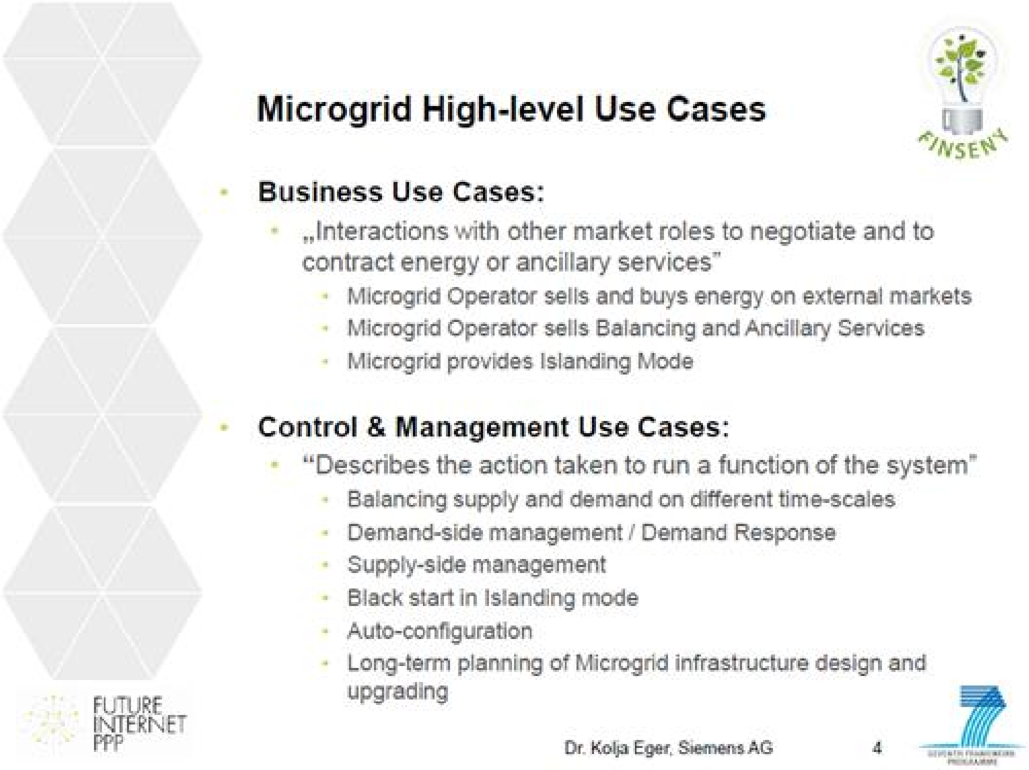


Figure 28: Use Cases of Microgrids

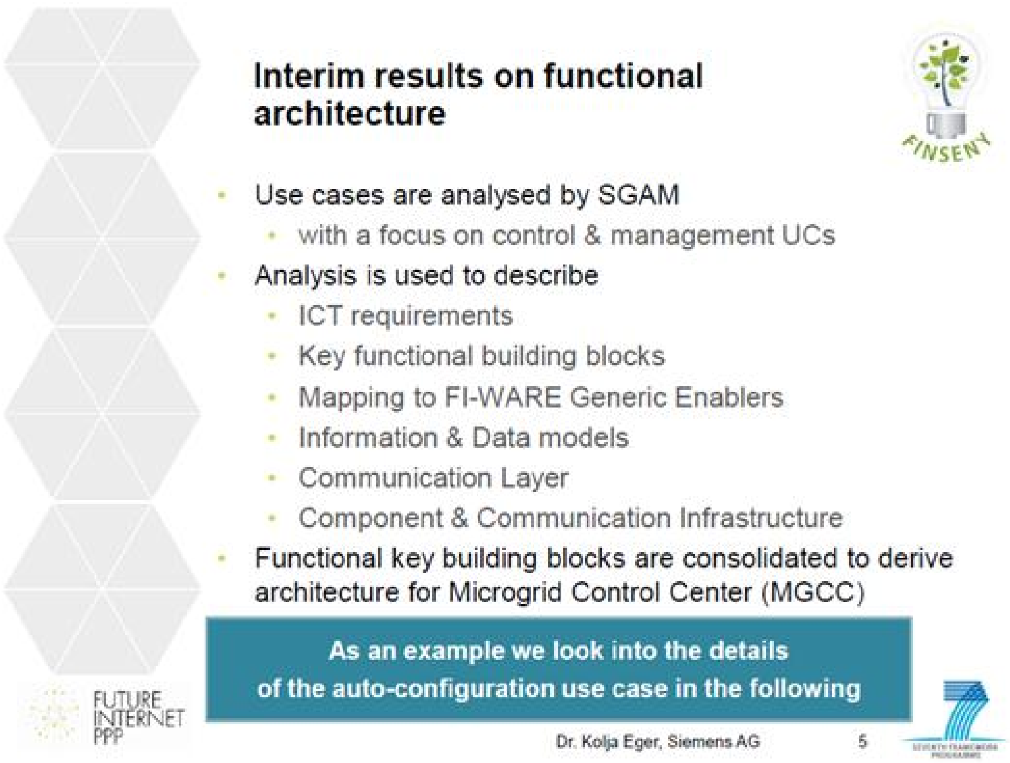


Figure 29: Interim Results concerning Functional Architecture

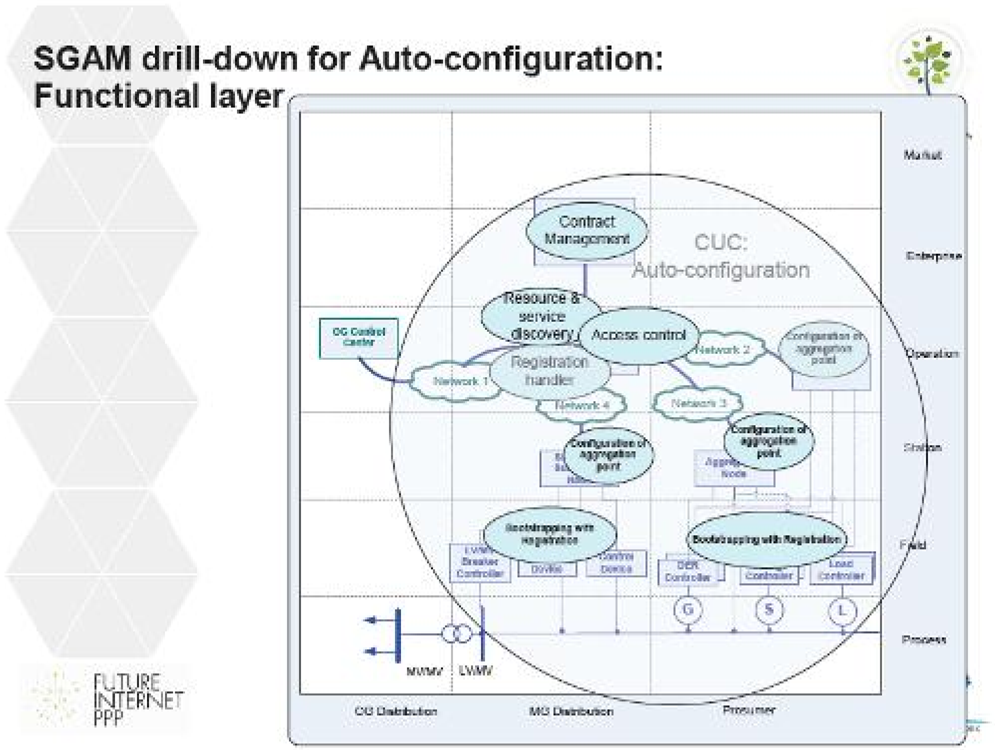


Figure 30: SGAM Functional Layer for Auto-configuration

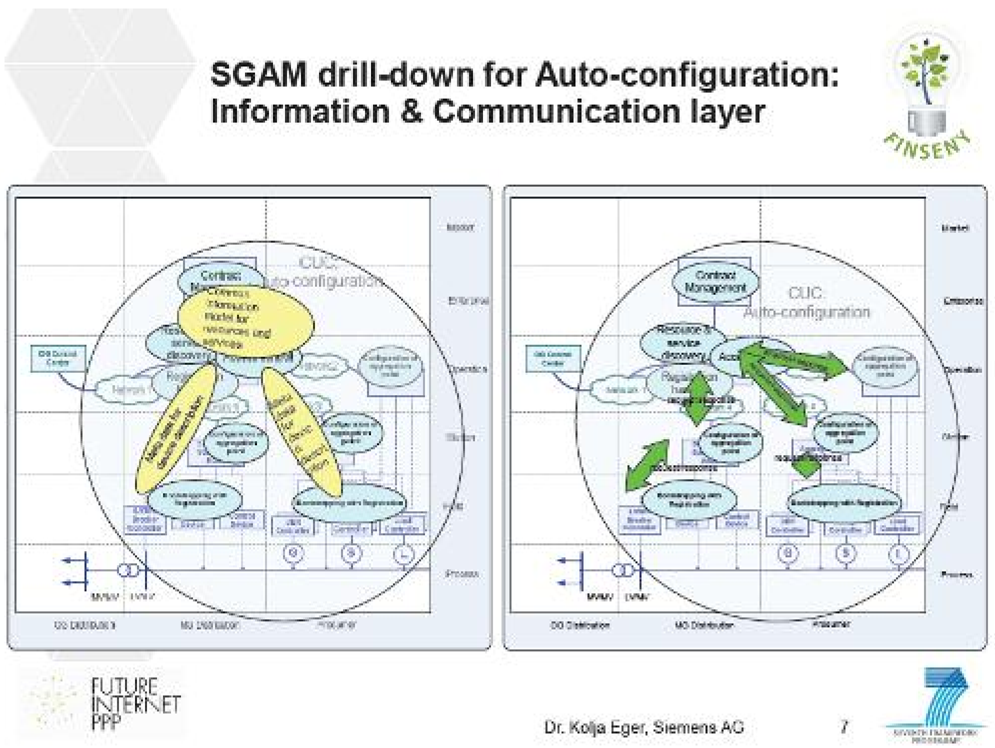


Figure 31: SGAM Information & Communication Layers for Auto-configuration

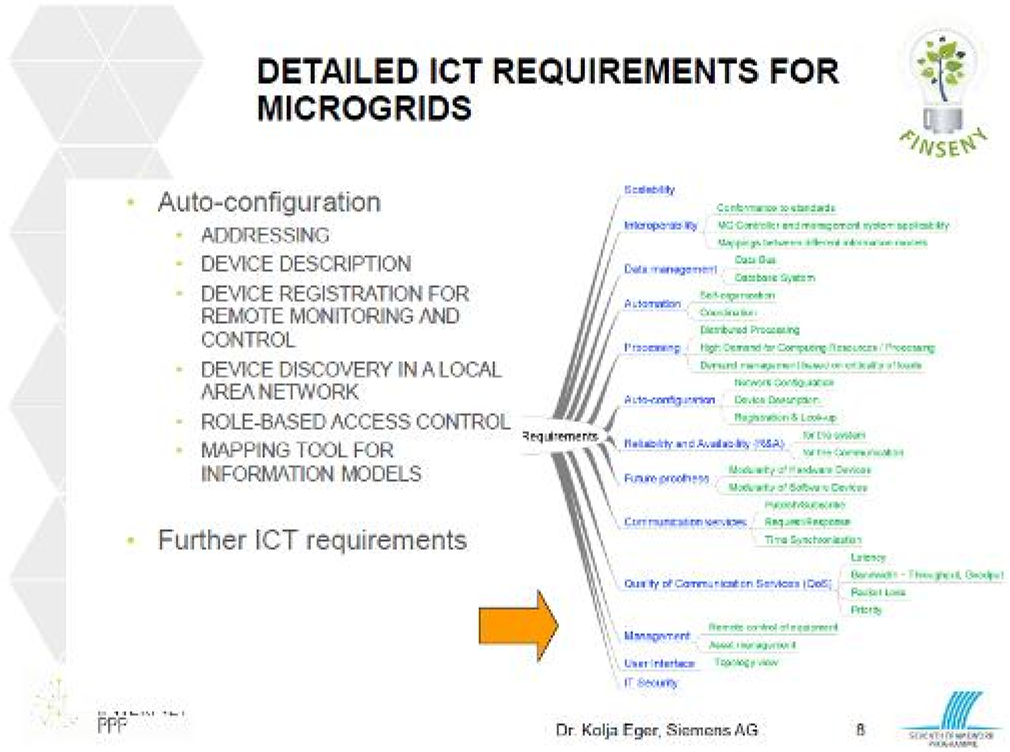


Figure 32: ICT Requirements for Microgrids

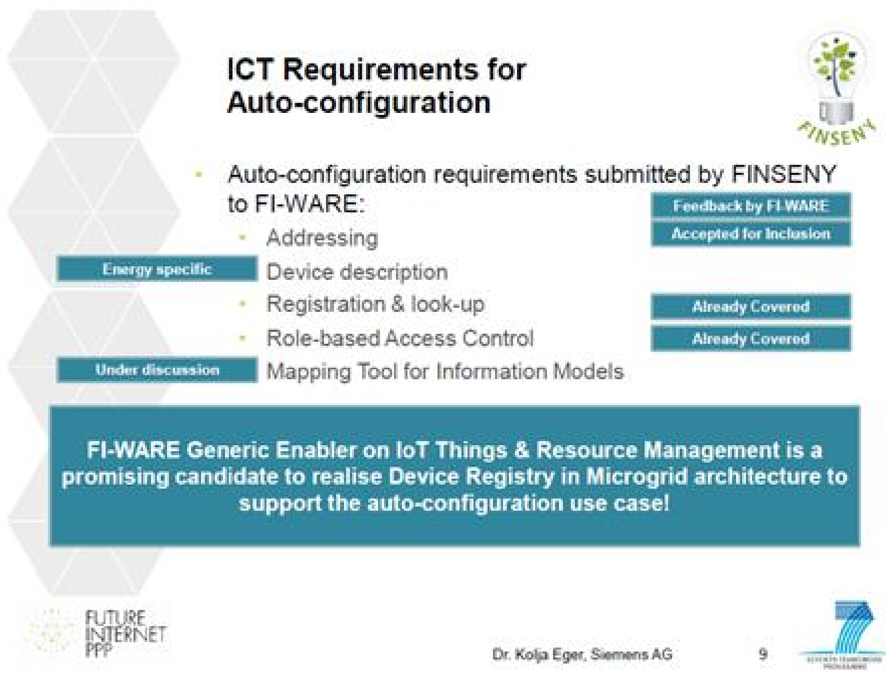


Figure 33: ICT requirements for Auto-configuration provided to FI-WARE

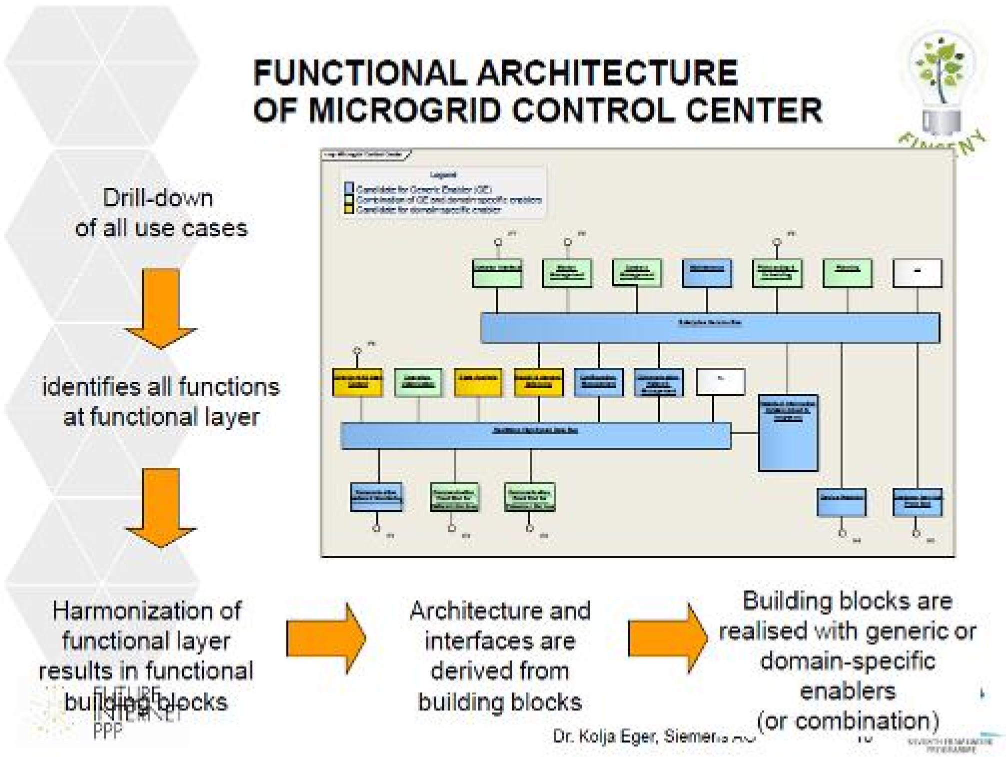


Figure 34: Functional Architecture for Microgrid CC

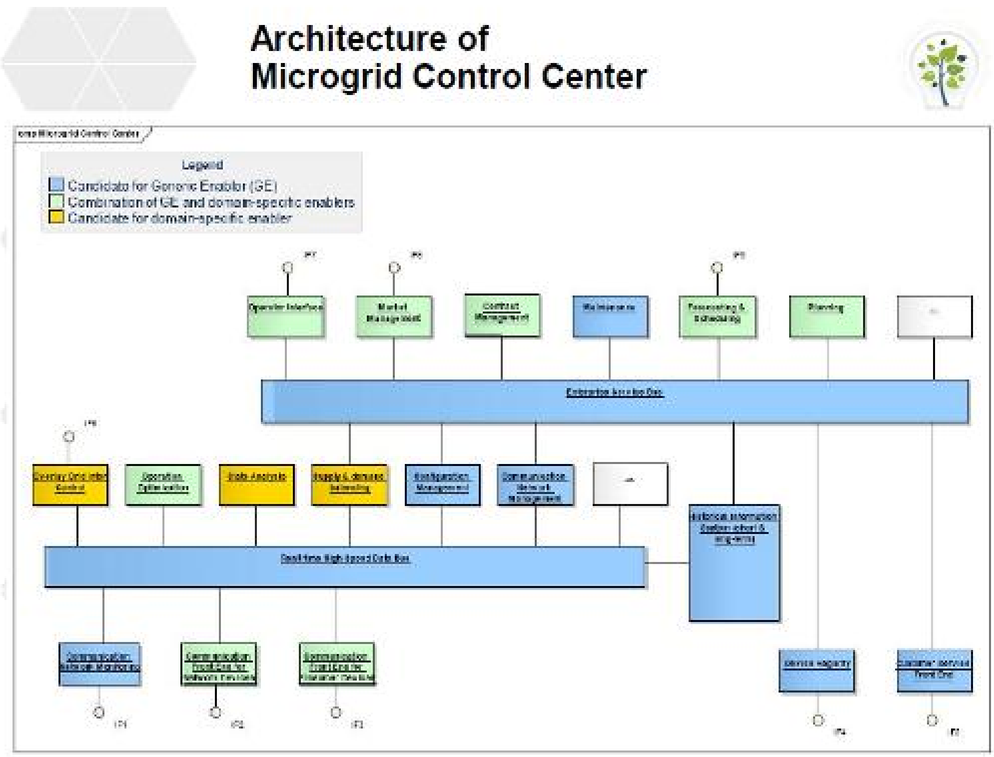


Figure 35: Architecture of MG CC

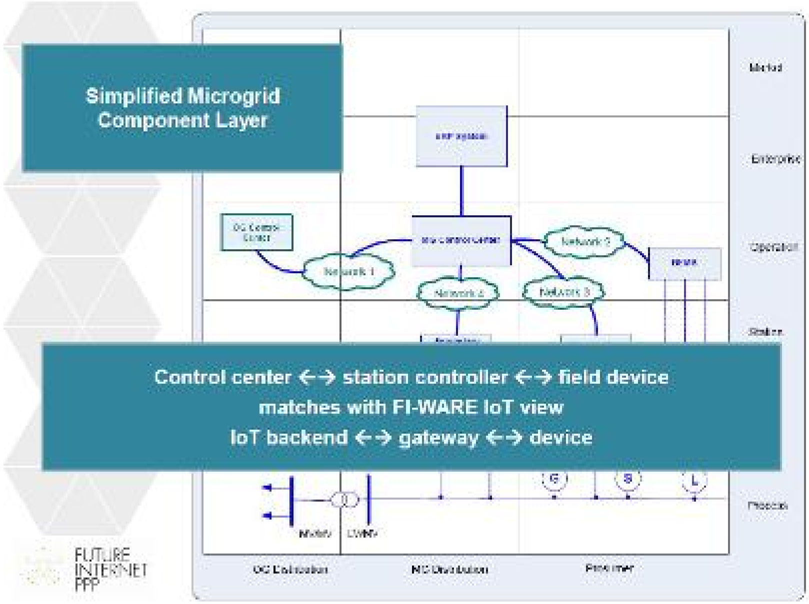


Figure 36: MG Component Layer

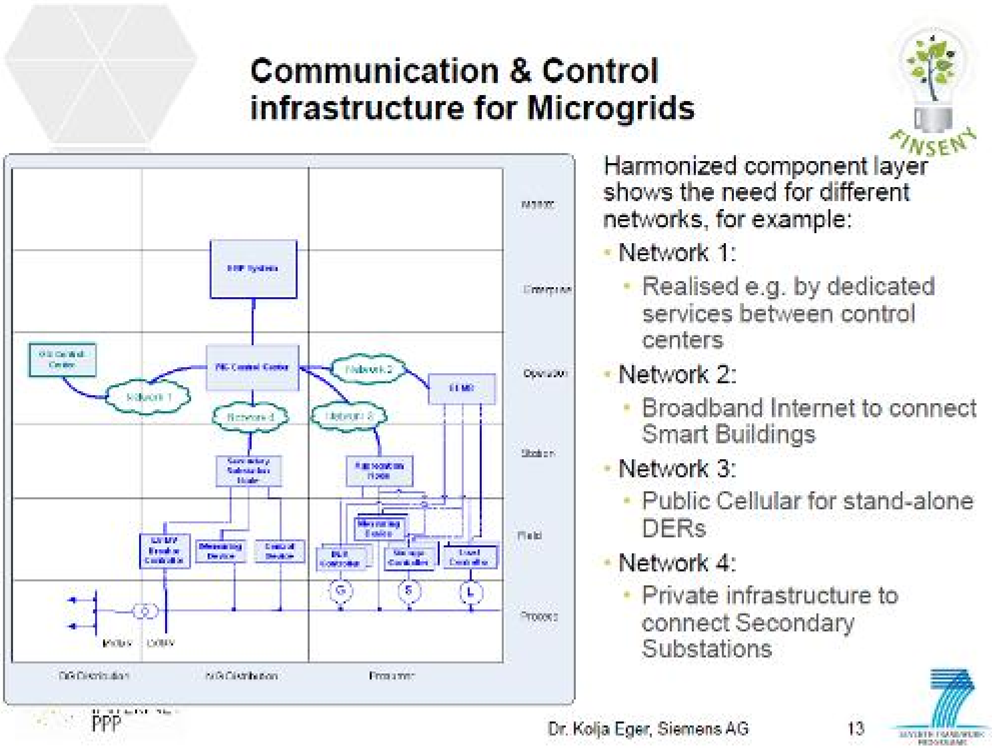


Figure 37: Networks for MGs

QoS Requirements

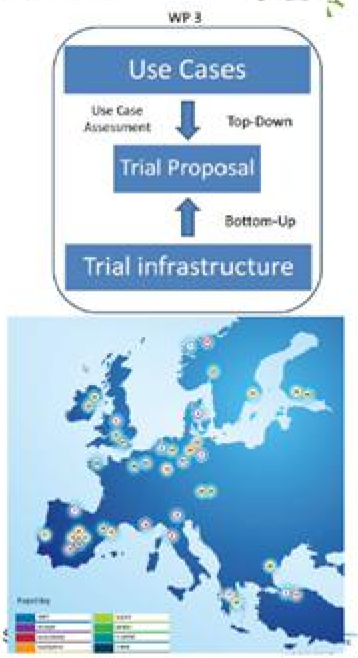
- To ensure the stable operation of the Microgrid different connectivity services are needed with QoS guarantees
  - Four Classes of Service were derived
- Cost-efficient solution has to be designed with the best mix of private, NSP-owned and public infrastructure

	Connectivity Service 1: Safety critical	…	Connectivity Service 2B: Operational critical (Monitoring(	…	CS 4: Background
Priority	Highest		Medium		Low
Latency	< 10 -100ms		< 1s		Best effort
Data occurrence	Event triggered		Periodically		Event triggered & periodically
Bandwidth / Data volume	< 1500 Bytes		< 100 kbps		Best effort
…	…		..		

Figure 38: QoS Requirements of MGs

Identification of Trial candidates

- Top-down
  - Assessment of all 37 use cases defined in Microgrid scenario
    - ANALYSIS OF POTENTIAL, RELEVANCE AND FEASIBILITY OF USE CASES WITH REGARD TO A TRIAL FROM A BUSINESS AND A TECHNICAL PERSPECTIVE
  - Mapping of Microgrid use cases to
    - GENERIC AND SPECIFIC ENABLERS, ONGOING PROJECTS AND STANDARDIZATION ACTIVITIES
- Bottum-up
  - Existing trial sites & components



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Dr. Kolja Eger,

Figure 39: Trial Candidates for WP3

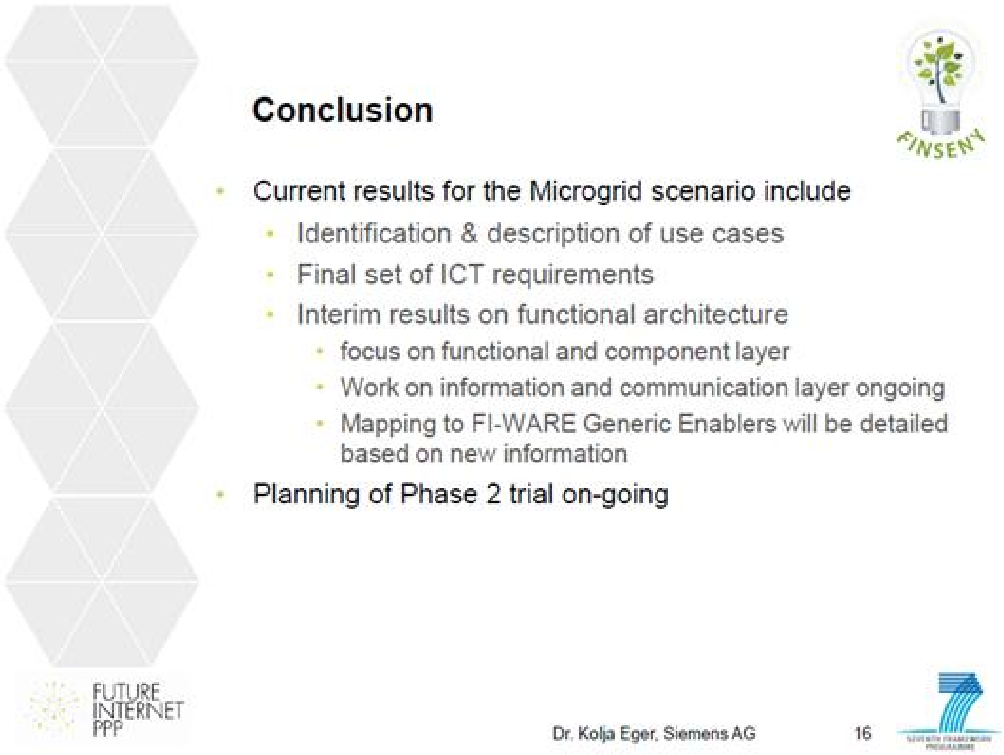

Figure 40: Conclusion of WP3

2.6 Smart Buildings (WP4): Functional Architecture and Trial

Presenter: Dr. Gilles Privat, Orange

At first Dr. Privat introduced briefly the FINSENY Smart Building Work Package and the target to focus on a Building Energy Management System which steps beyond a pure vertically integrated energy management system. A comprehensive system integration of all energy-relevant building entities (like loads, storages, sources or building components) is the main target based on a decentralized, scalable approach. The FINSENY Smart Building Objectives are outlined in Figure 41 with the clear description that the Future Internet building ICT infrastructure is more than a pure connectivity network. It enables the evolution path from legacy infrastructure support to a comprehensive energy management support that integrates different smart building applications and building types. On top of that the security functionality is integrated vertically in the building service layer.

Five different building types are considered (Figure 42):

- home and residential
- office
- data centers (industrial) and
- hotel

The Smart Building Architecture explicitly considers things or entities that currently do not have a connection to the network like certain sensors. ICT devices, Sensors & Actors, Energy Sources & Storages and Building Components are interconnected with an energy control entity (EnergyBox) that communicates via the Home Gateway to an Energy Service Platform. The Smart Grid Building Architecture (Figure 45) defines 4 layers

- Building Applications
- Building Service Layer
- Building Entity Layer
- Building Device Layer

and the Service, Entity and Device Layer are forming an Operation System. The building blocks of the smart building architecture have been mapped into SGAM to the functional and information layer (Figure 46). The building-specific enablers at the Application, Service and Entity level are outlined in Figure 48.

As use case scenario the “Supervisory Control” for a smart home has been introduced (Figure 49) and the proposed trial examples are (Figure 51 - Figure 53)

- the Energy@Home in the Telecom Italia Lab
- the Energy@Home in private homes
- the BeyWatch System available from a previous European project

In summary building grids are semi-autonomous microgrids and must support “plug and play” capabilities and a dynamic self-configuration functionality of non-networked entities. The architecture must be defined in a generalized form to support the home building as well as non-residential buildings and buildings of other domains.

In the Q&A part the following Question was discussed:

“What are the differences between residential and non-residential Buildings?” The important difference between these types of building clusters is the complexity. Residential buildings are well known and show always a similar setup but on the other hand the non-residential buildings vary in complexity and different specific requirements.

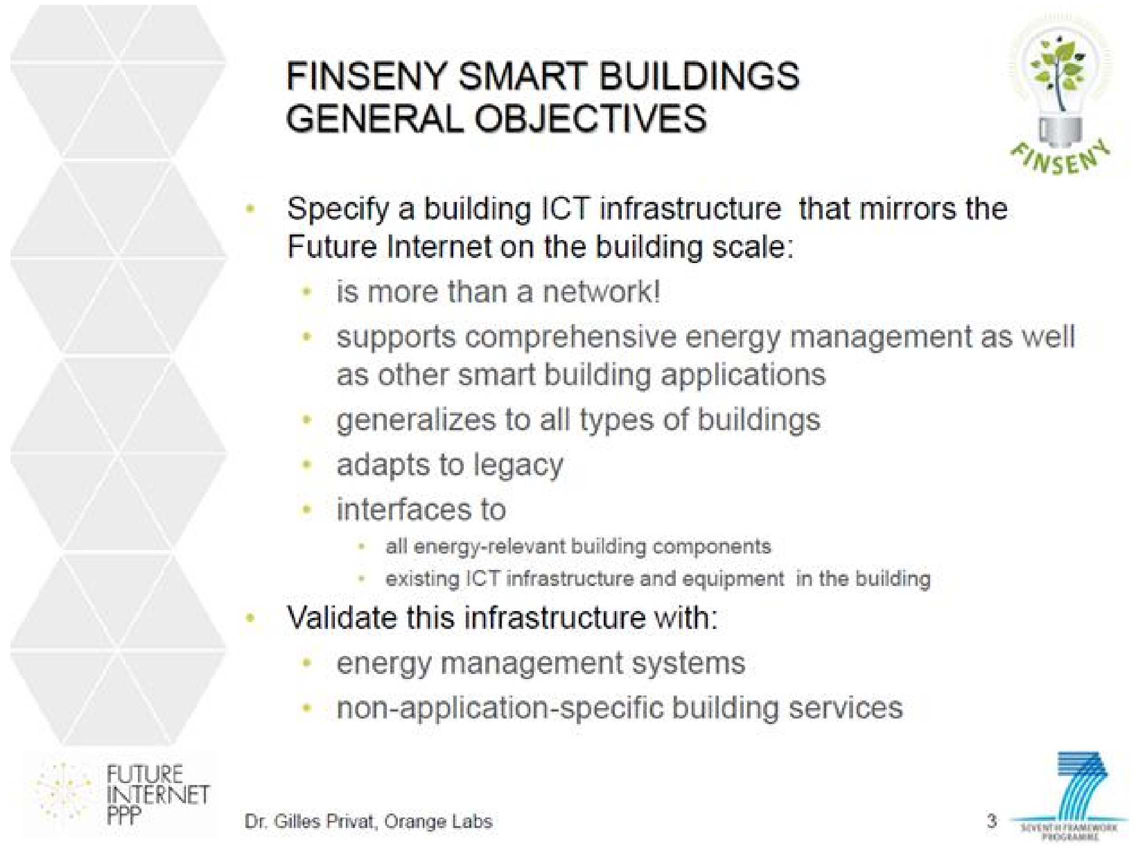

Figure 41: Smart Buildings – Objectives

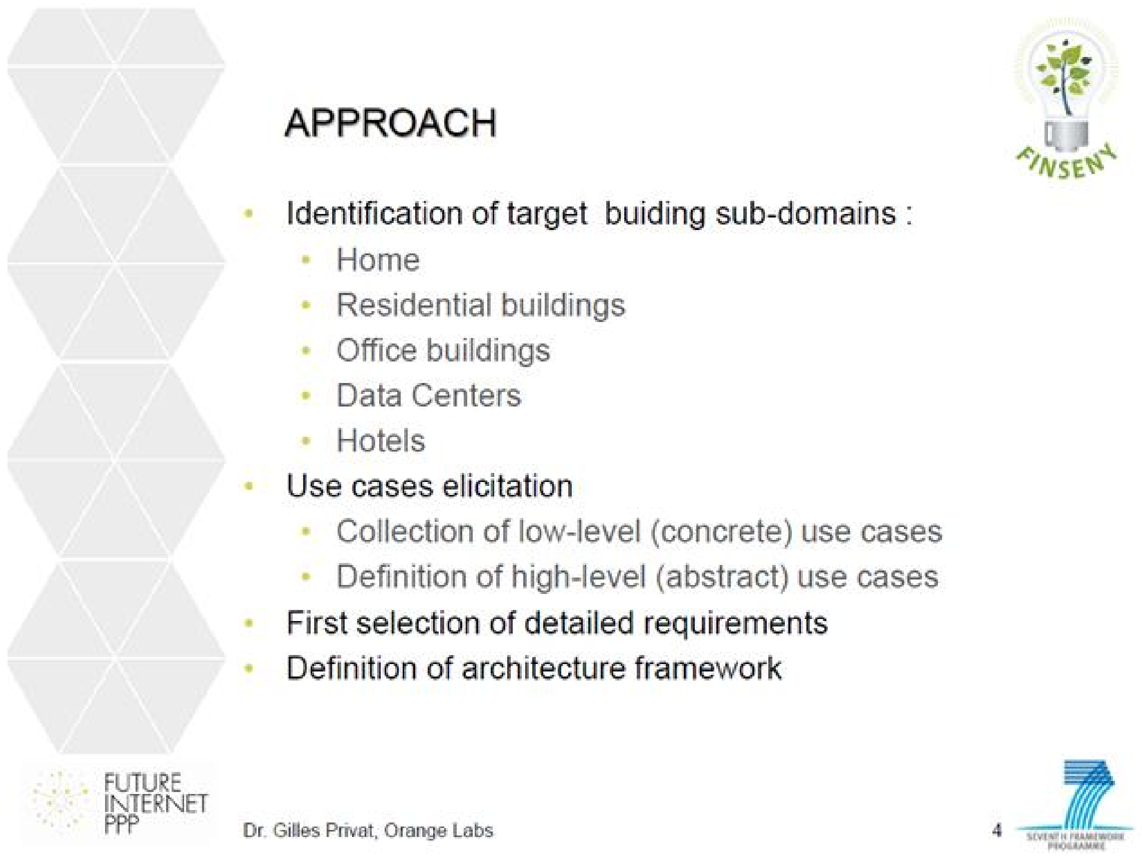

Figure 42: Smart Buildings – Approach

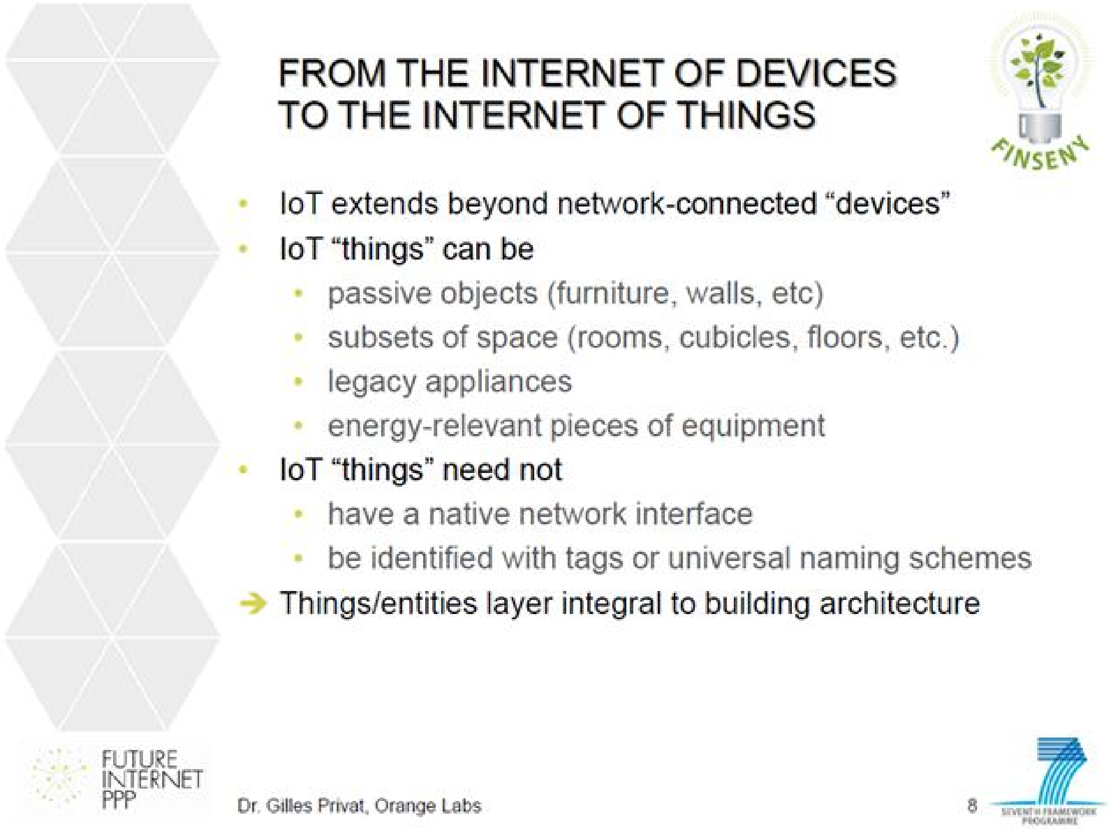

Figure 43: Smart Buildings – Things/Entities

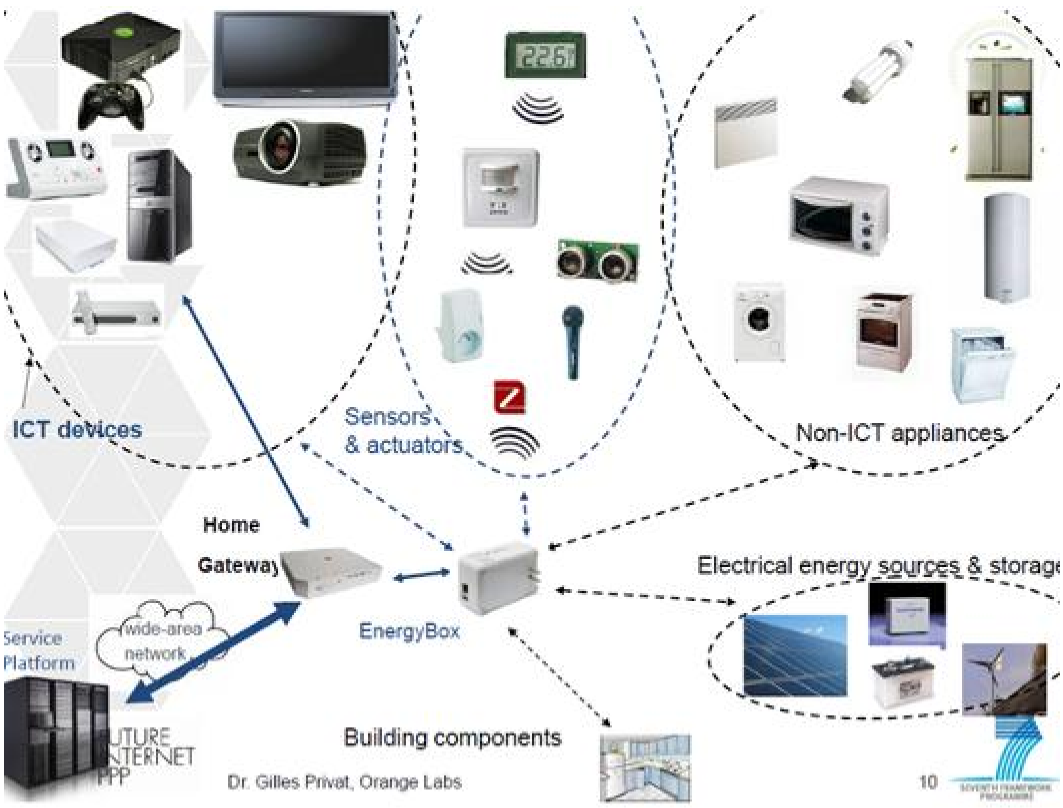

Figure 44: Smart Buildings – EnergyBox

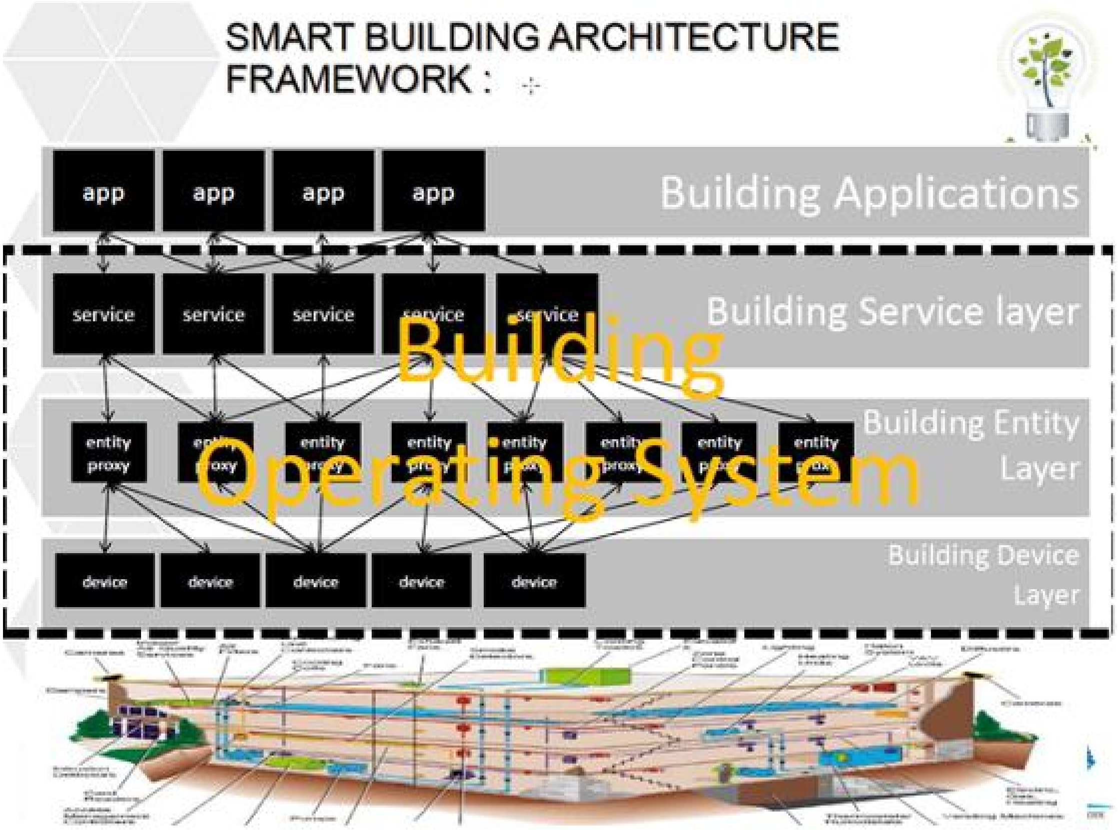

Figure 45: Smart Buildings – Architecture

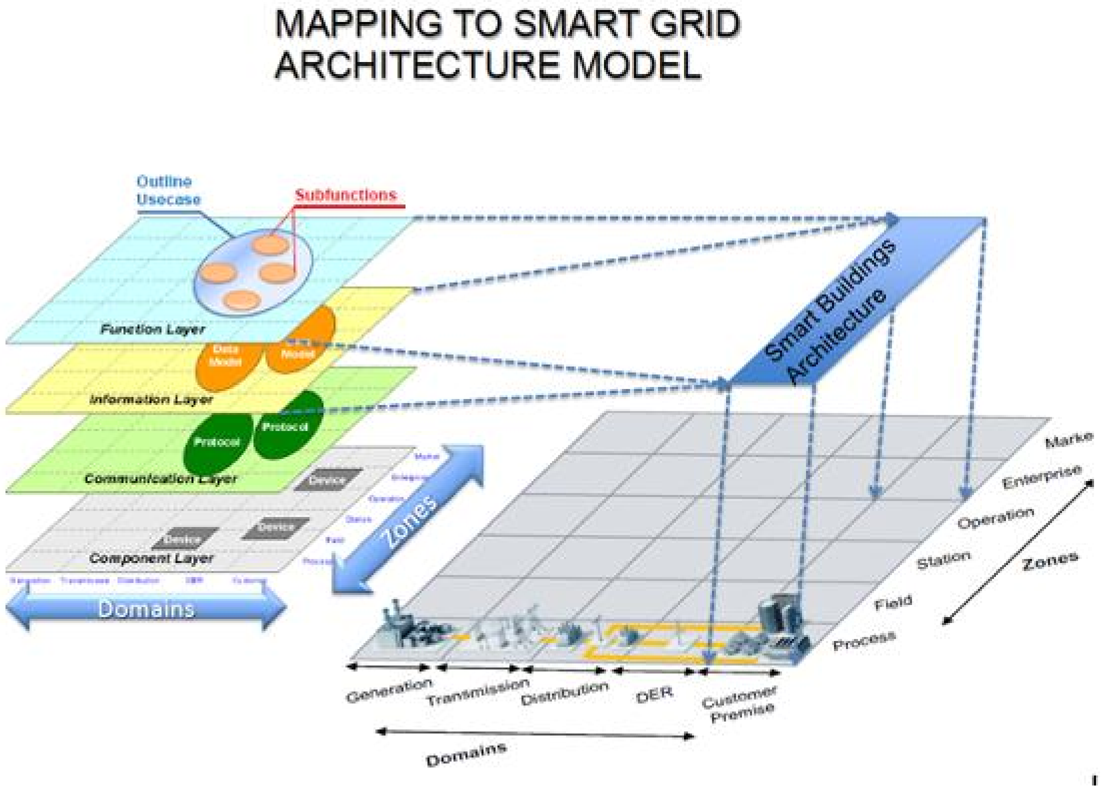

Figure 46: Smart Buildings – SGAM Mapping

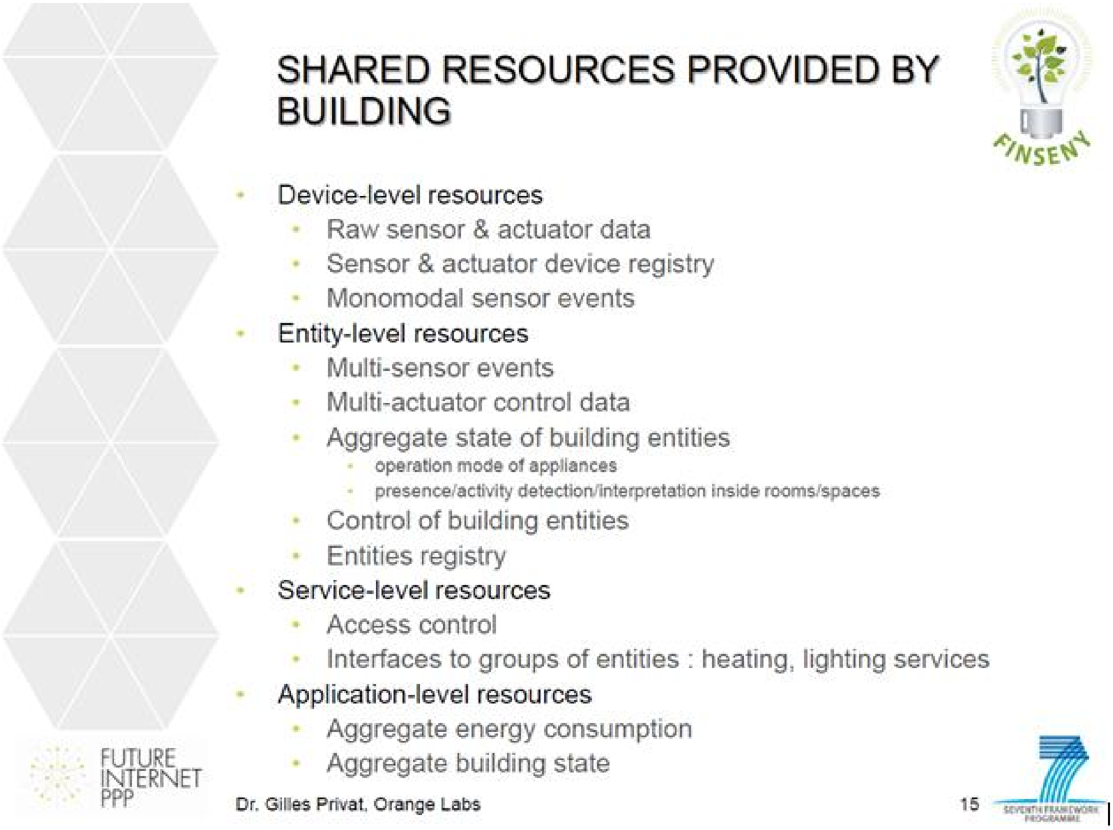

Figure 47: Smart Buildings – Shared Resources

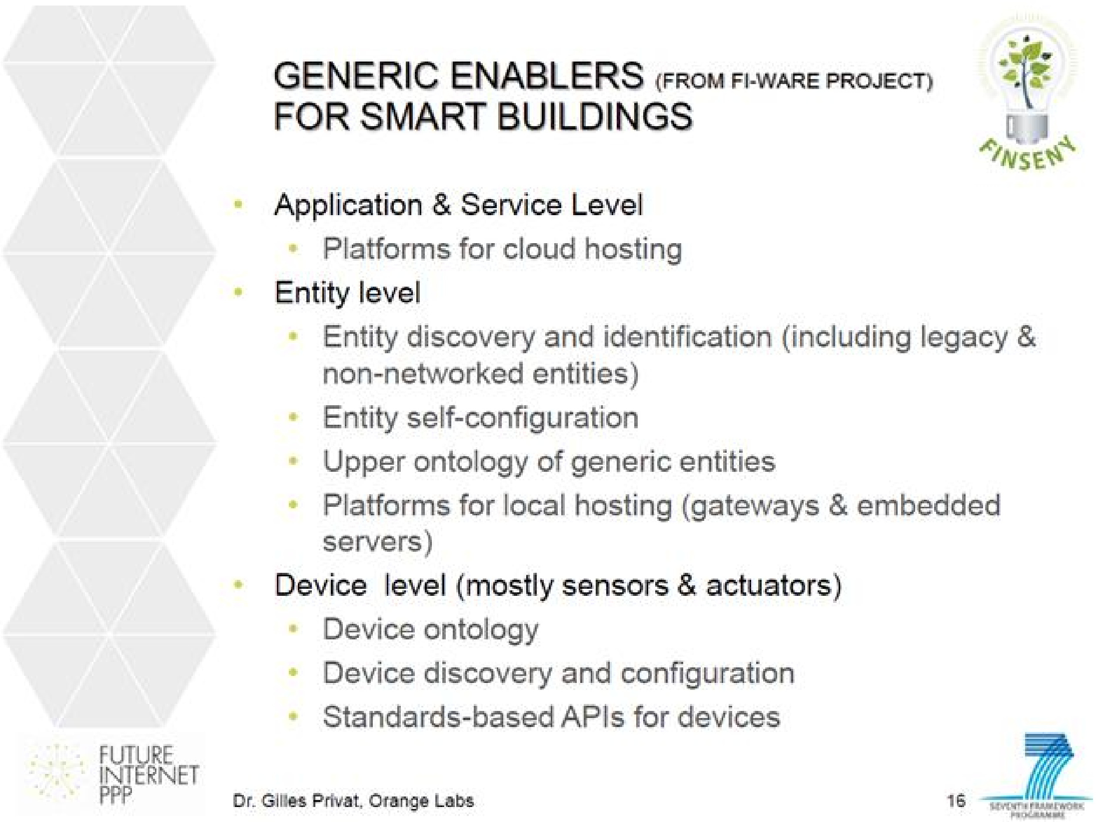

Figure 48: Smart Buildings – Generic Enablers

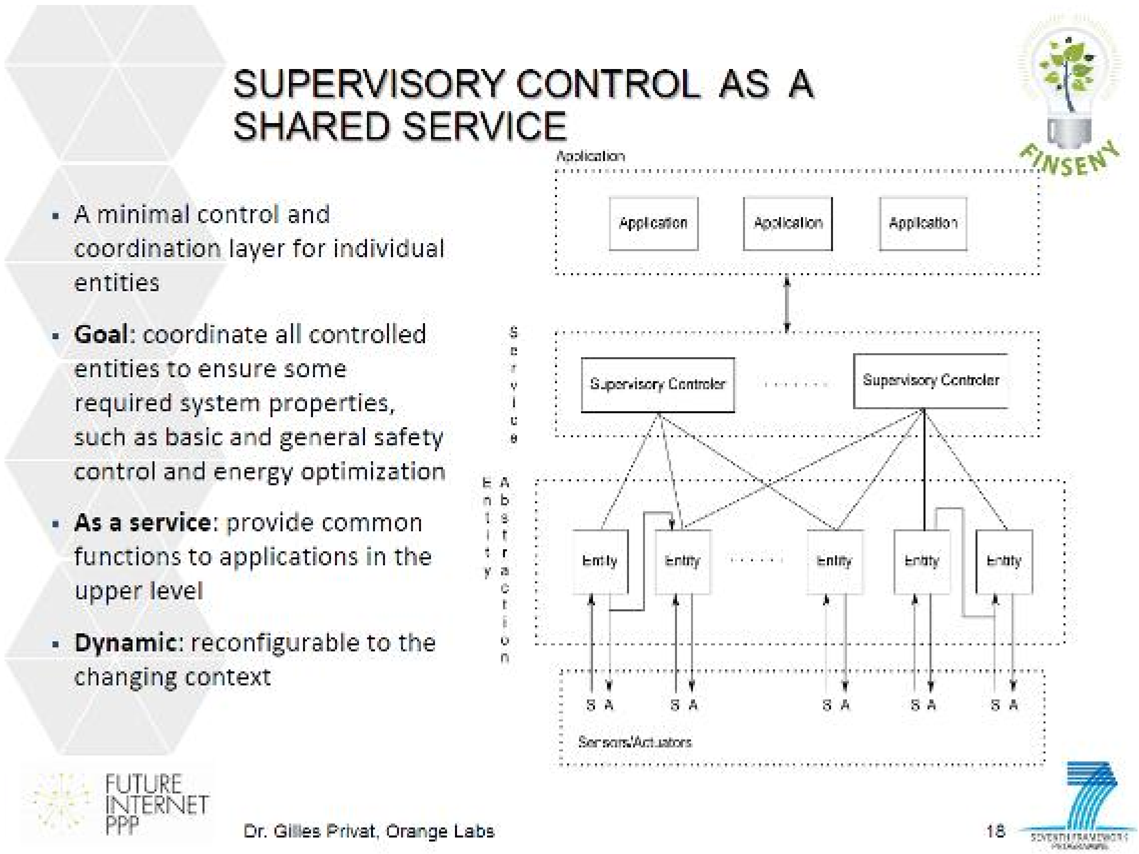

Figure 49: Smart Buildings – Use Case: Supervisory Control

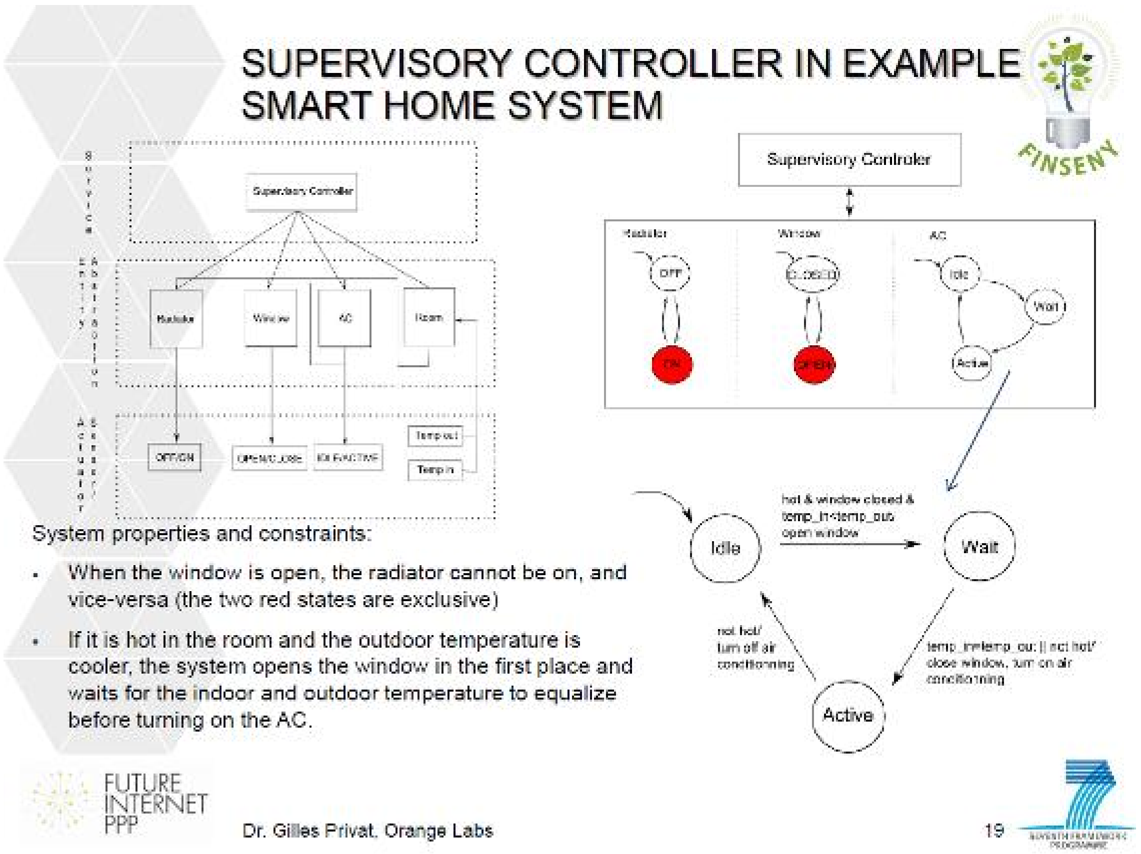

Figure 50: Smart Buildings – Supervisory Control

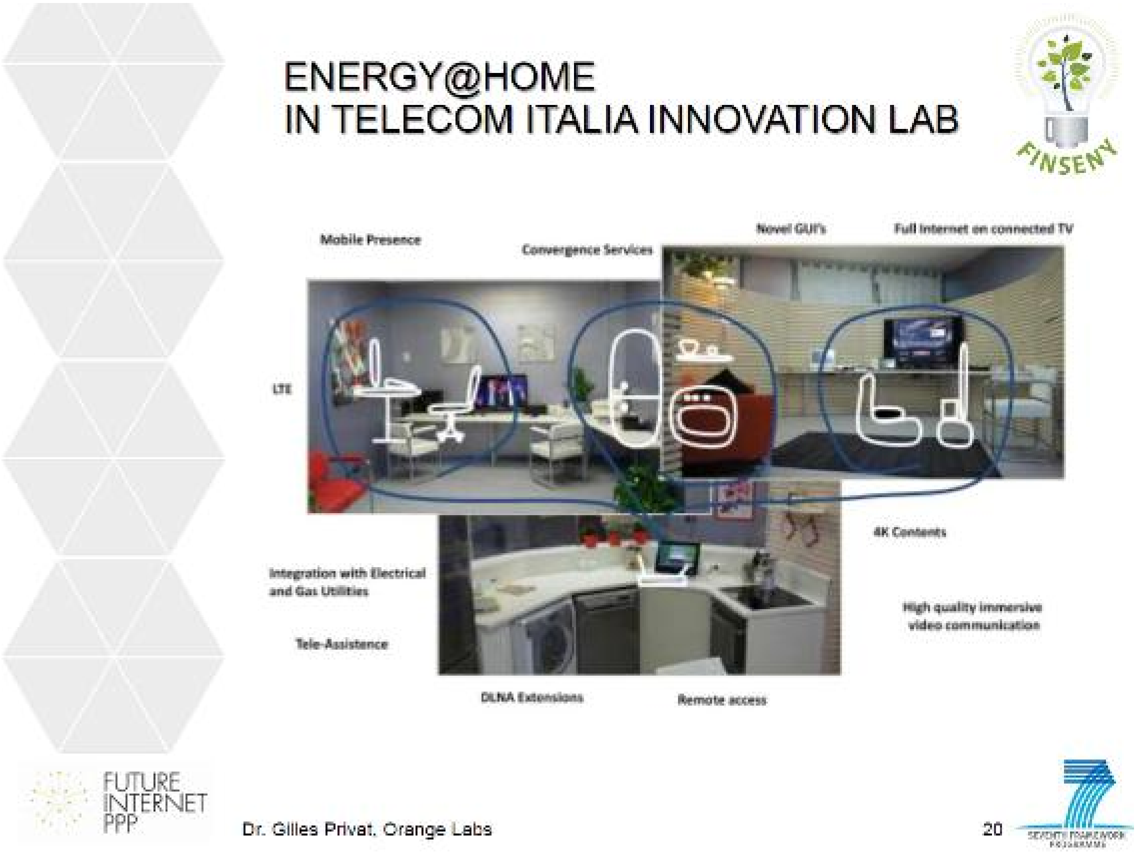

Figure 51: Smart Buildings – Trial Examples: Energy@Home LAB

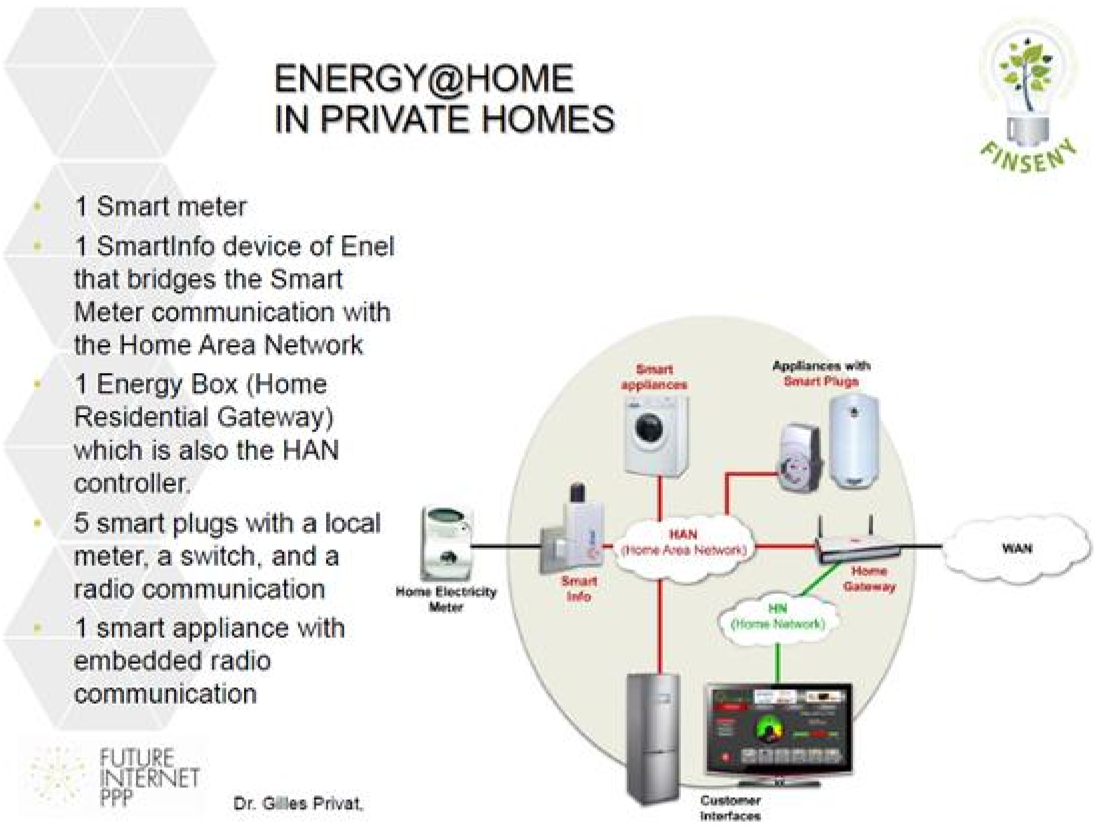

Figure 52: Smart Buildings – Trial Examples: Energy@Home Privat

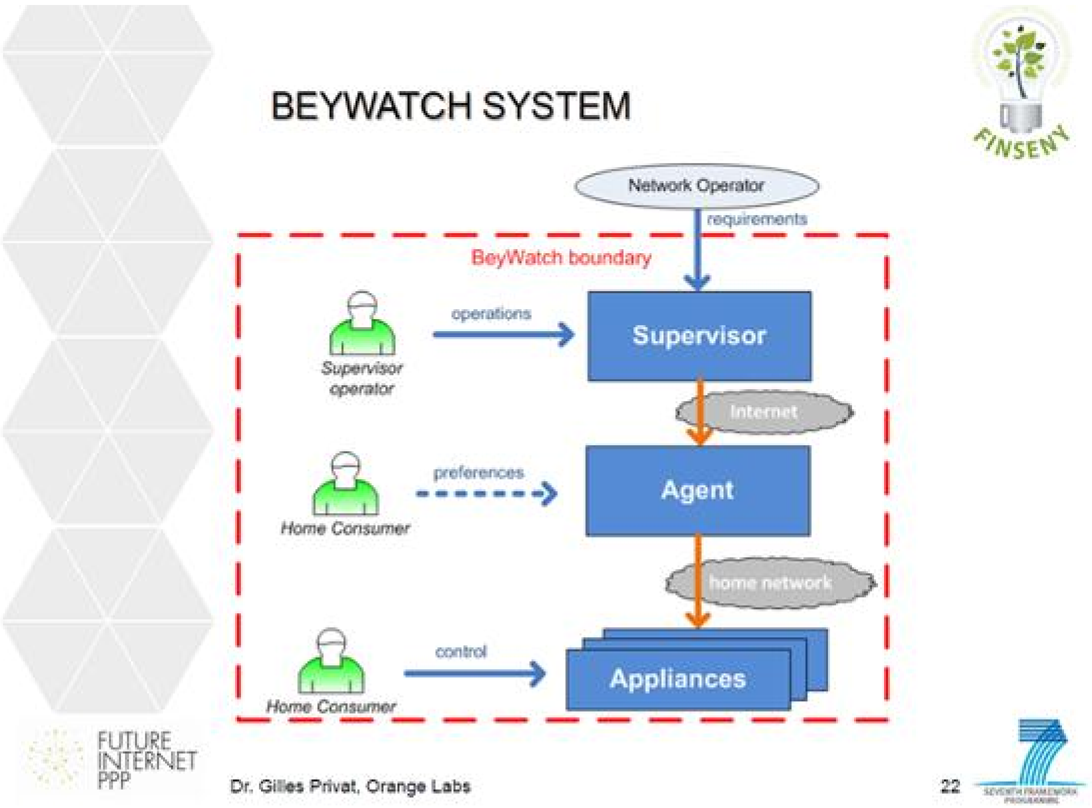

Figure 53: Smart Buildings – Trial Examples: BEYWATCH System

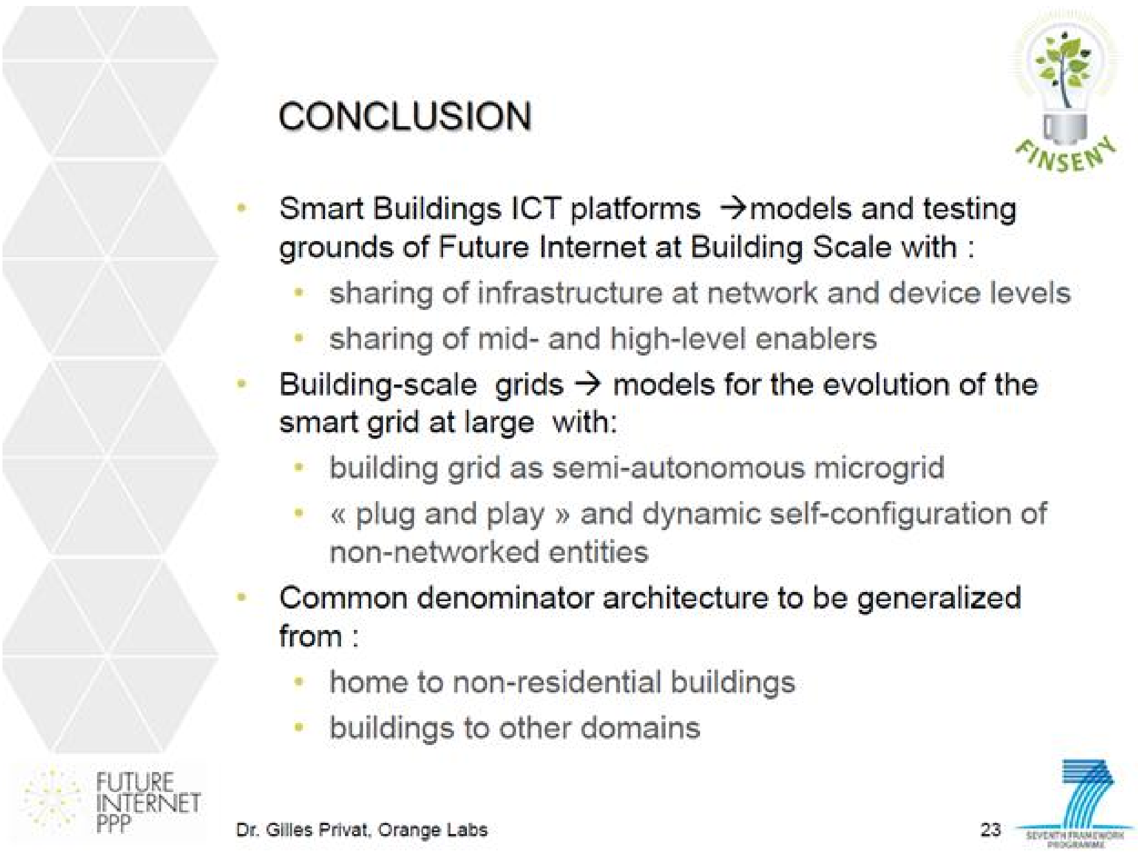

Figure 54: Smart Buildings – Conclusion

2.7 Electric Mobility (WP5): Functional Architecture and Trial Candidates

Presenter: Dr. Fiona Williams, Ericsson

The E-Mobility scenario was presented by Dr. Fiona Williams. Many individual electric mobility use-cases were identified and evaluated over the course of the FINSENY project. Initially, in a bottom up approach, all major electric mobility use-cases were identified, documented and organized into various categories including Short Trip, Medium Trip, Long Trip, Grid Operations and Value Added Services.

The stakeholders and the entities in the E-Mobility working area were introduced and explained for the SGSG audience on Figure 57. The main functional building blocks and their mapping between the entities explain the functional architecture and the interworking (Figure 58).

The trial candidates presented in the talk were selected based on top down requirements. These were primarily based on commercial innovation and novelty and secondly with respect to the use of FI-WARE Generic Enablers and FINSENY Domain Specific Enablers.

The main issues regarding the trial candidate “Demand Control Management” (Figure 61) are

- the load shedding event in the grid that slows down the charging of the e-cars. That topic should be covered at a trial side in Ireland.
- the scalability test is planned to consider in a Germany trial side

The Atlantic Labs are forming the Demand Control setup in Ireland. And Figure 65 shows how the Energy Supply Company, the Grid Operator, the Home Energy Managers and the interworking with FI-WARE is planned in the Dublin datacenter.

The E-Roaming trial candidate was explained on Figure 67 and would supply very good trial experiences. Nevertheless, the organizational effort should not be underestimated.

As third trial candidate the “Vehicle to Grid” topic war presented by Dr. Williams and beside others the question how to “Use the aggregated storage potential of the vehicle batteries within a micro-grid to build a “virtual storage cloud” should be investigated.

Summarized, E-Mobility can be implemented and offers the potential for new innovative services and will be an essential component of all Smart Energy solutions in the future.

In the upcoming discussions after the presentation it became apparent that the real issues are rather expected with batteries as compared to issues through ICT.

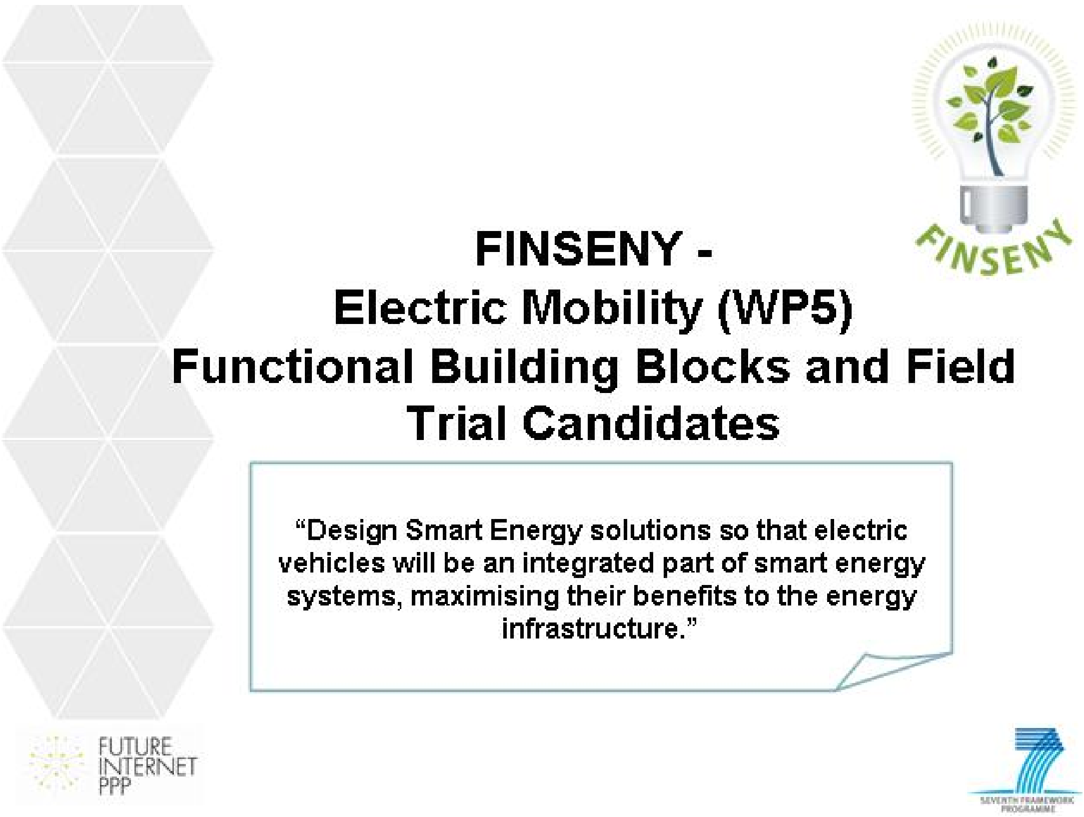

Figure 55: eMobility – Electric Mobility (WP5)

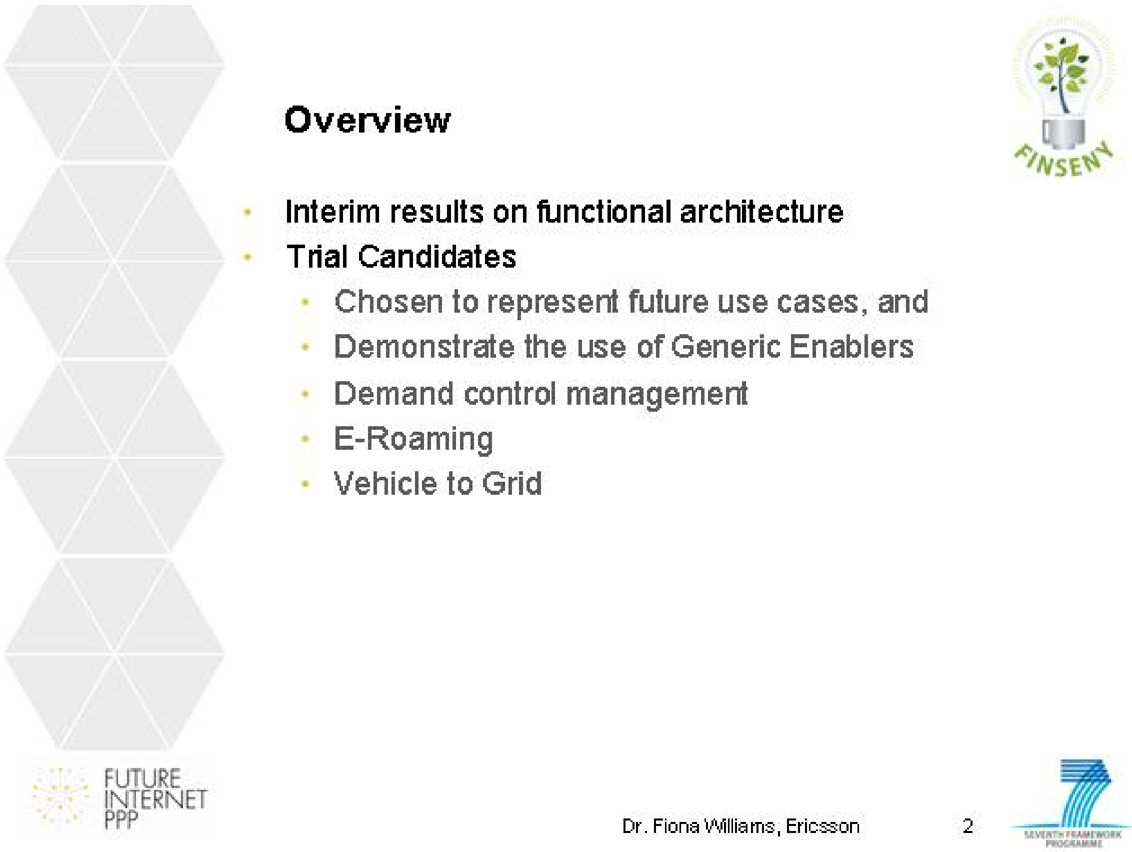

Figure 56: eMobility - Overview

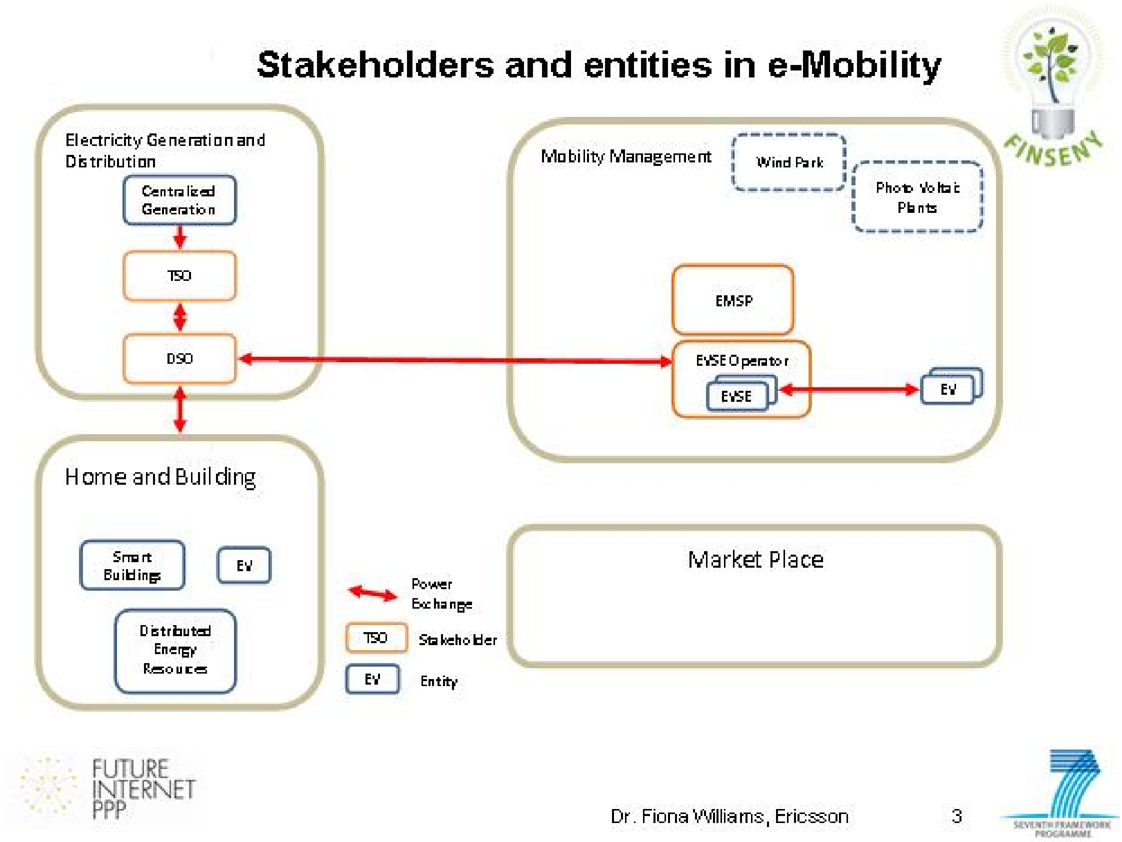

Figure 57: eMobility - Stakeholders

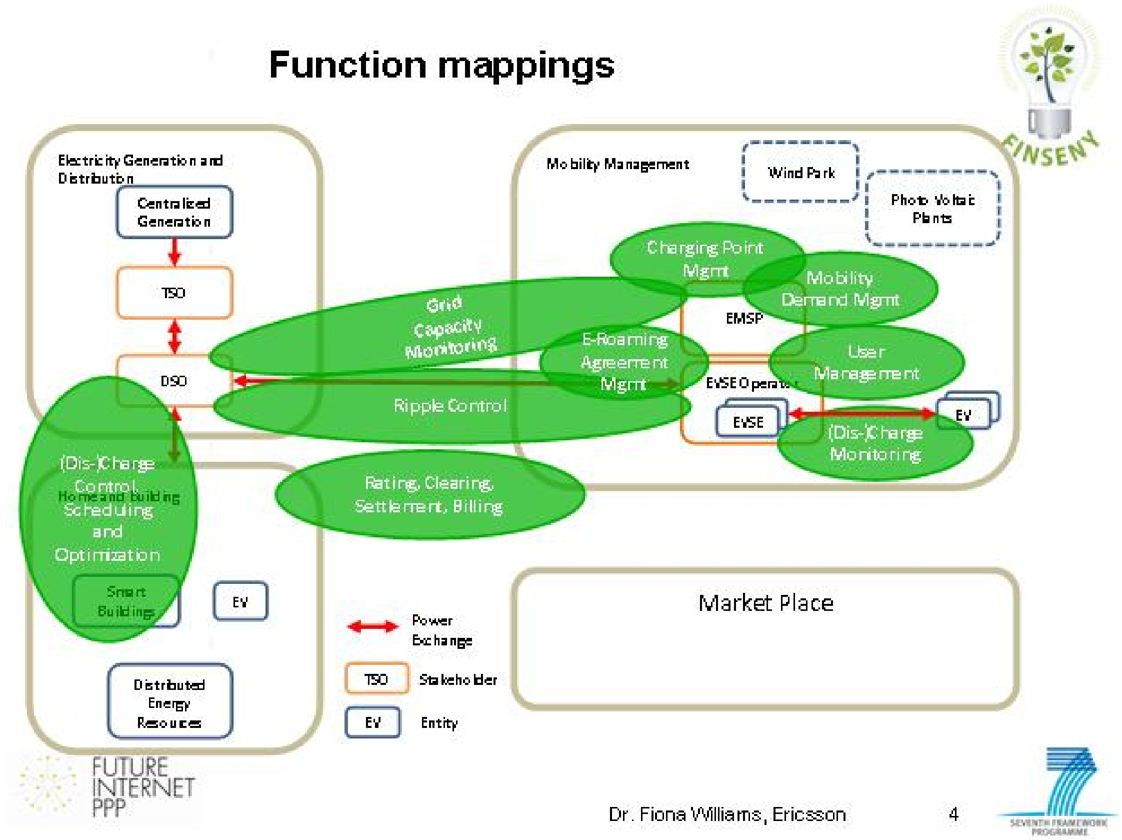

Figure 58: eMobility – Function Mappings

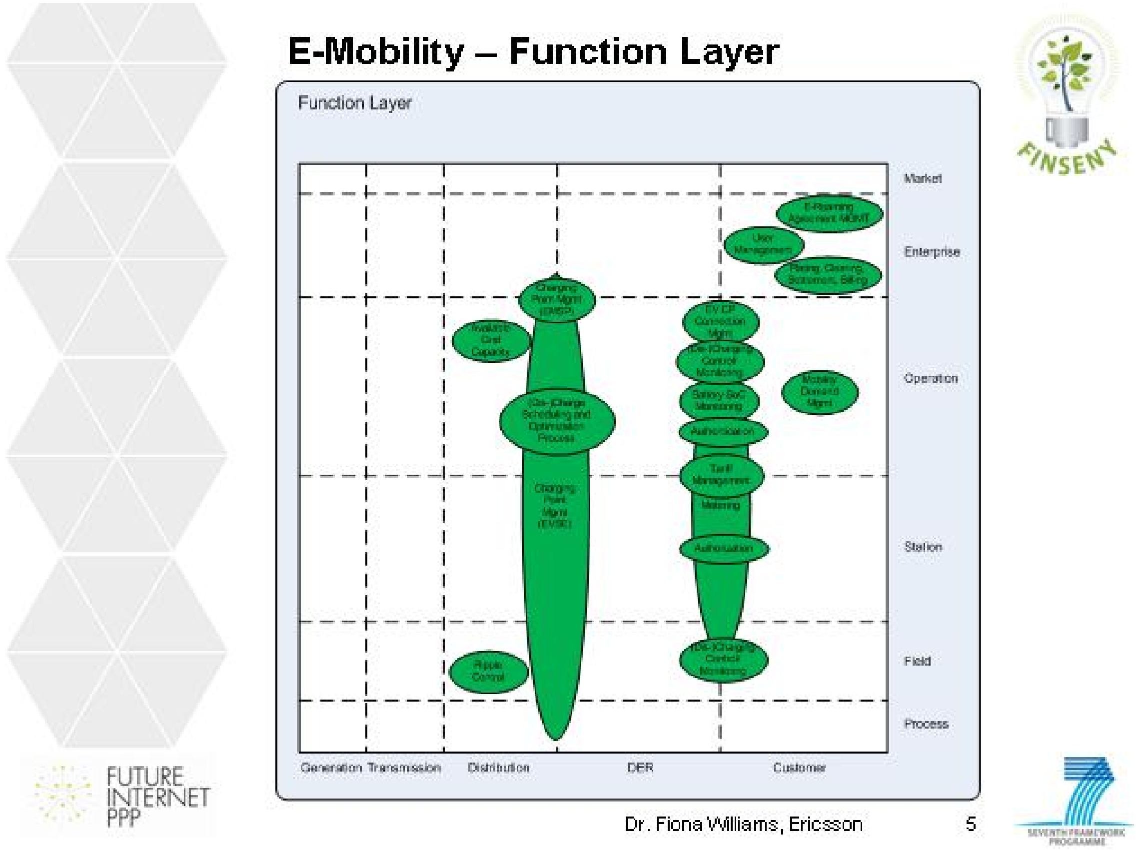

Figure 59: eMobility - SGAM

Use cases related to Trial Candidates

Use case Scenario	Subscenario	ICT Enabled Demand Side Management	E-Roaming	Vehicle to Grid
Use Cases Short Trip (UC ST)	Home (UC-ST-H)	X		X
	Public (UC-ST-P)		X	
	Workplace (UC-ST-W)	X	X	
Use Cases Medium Trip (UC MT)	Charge Point Accessibility (UC-MT-CPA)	X	X	X
	Alternative Method (UC-MT-AM)	X	(X)	
	Inter-Modal (UC-MT-IM)		X	
Use Cases Long Trip (UC LT)	Authentication (UC-LT-A)	X	X	X
	International Roaming Charge Point (UC-LT-IRCP)		X	
	Payment Methods (UC-LT-PM)		X	
	EV User in another country (UC-LT-EVC)		X	
Use Cases Grid Operations (UCGOps)	Charge Load Management (UC-GO-CLM)	X		X
	Stationary Energy Stores (UC-GO-SES)	X		
Use Cases Value Added Service (UC VAS)	Enhanced Services (UC-VAS-ES)	X	X	X

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Figure 60: eMobility – Trial Candidates

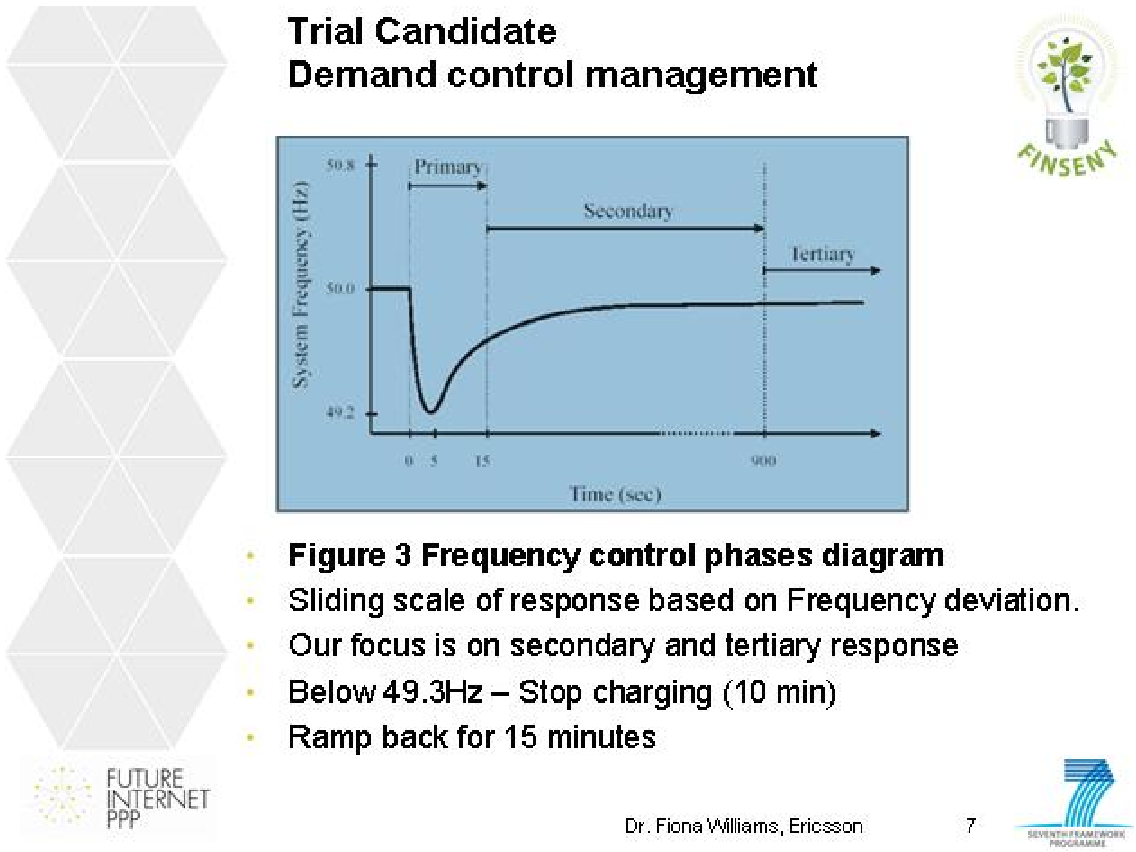


Figure 61: eMobility – Demand Control Management

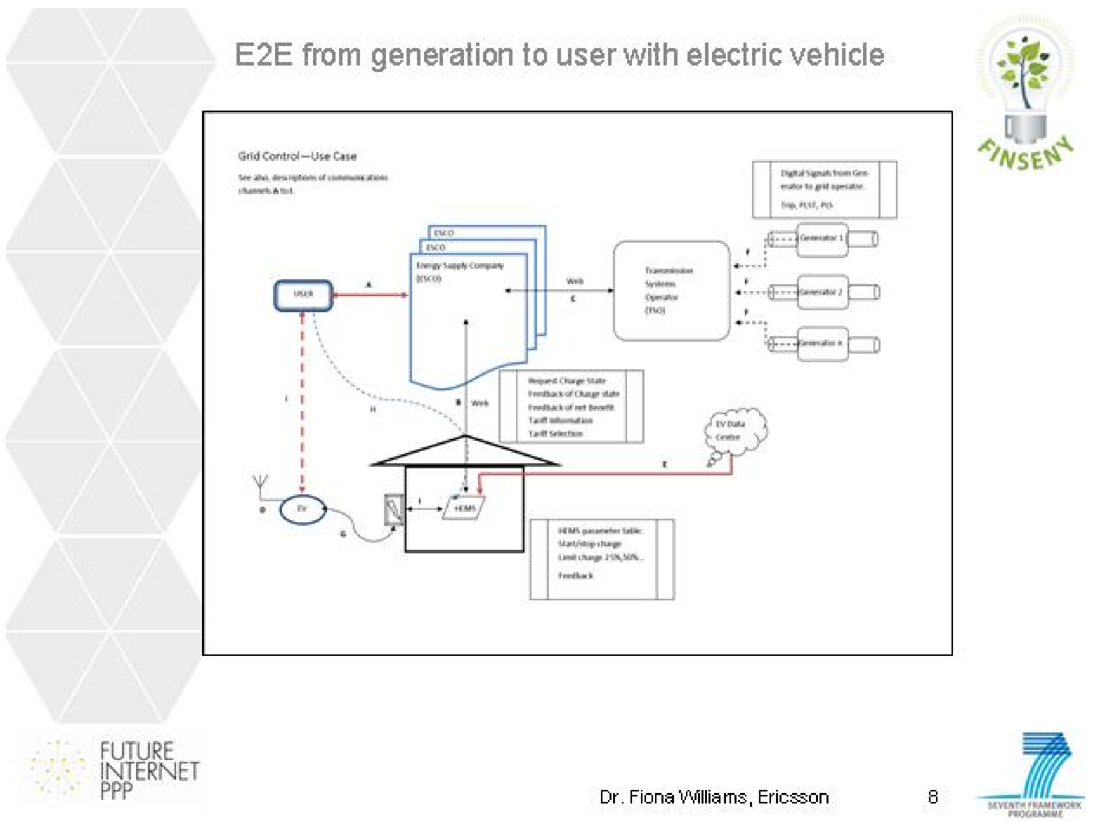


Figure 62: eMobility – E2E

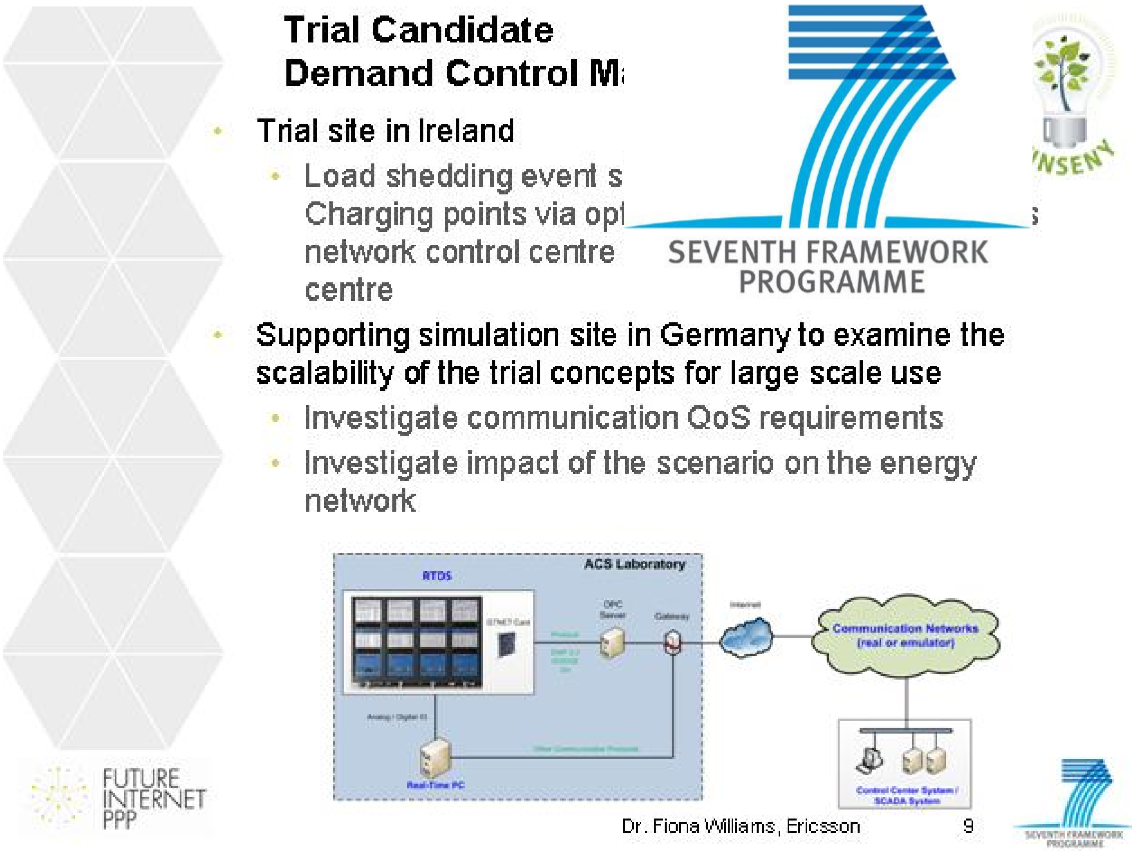


Figure 63: eMobility – Trial Candidate 1

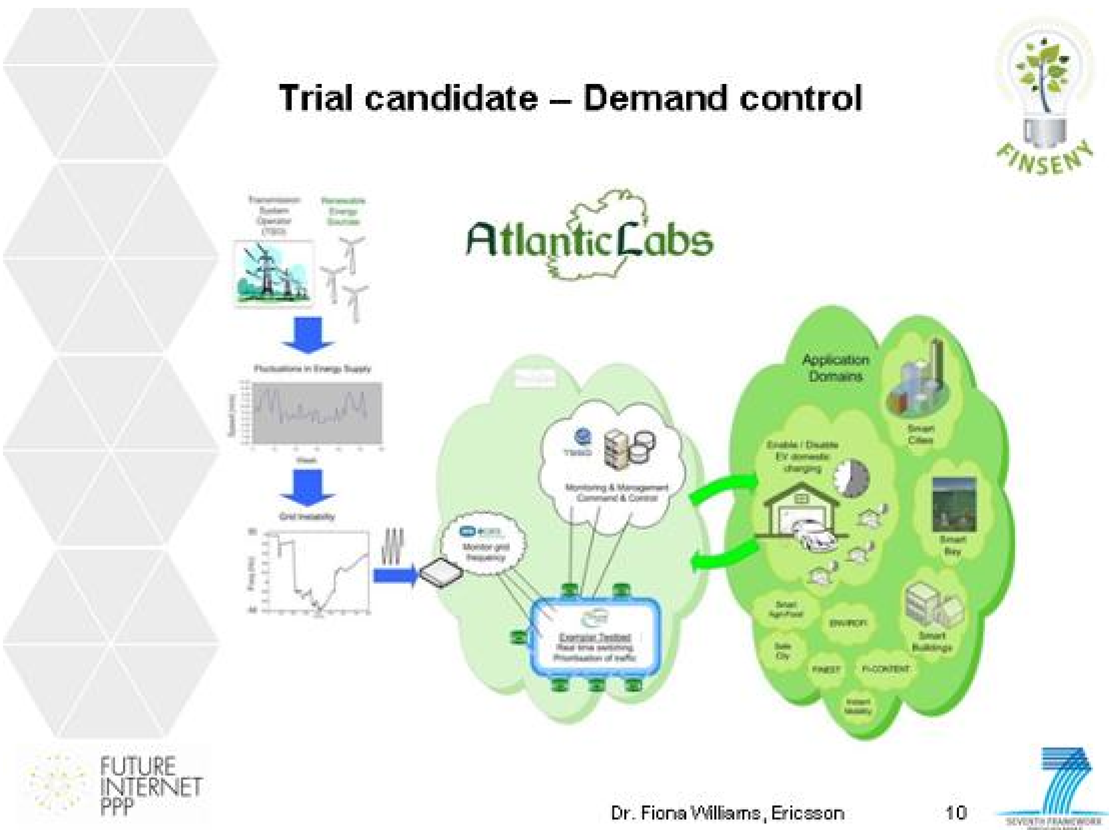


Figure 64: eMobility –Trial Candidate

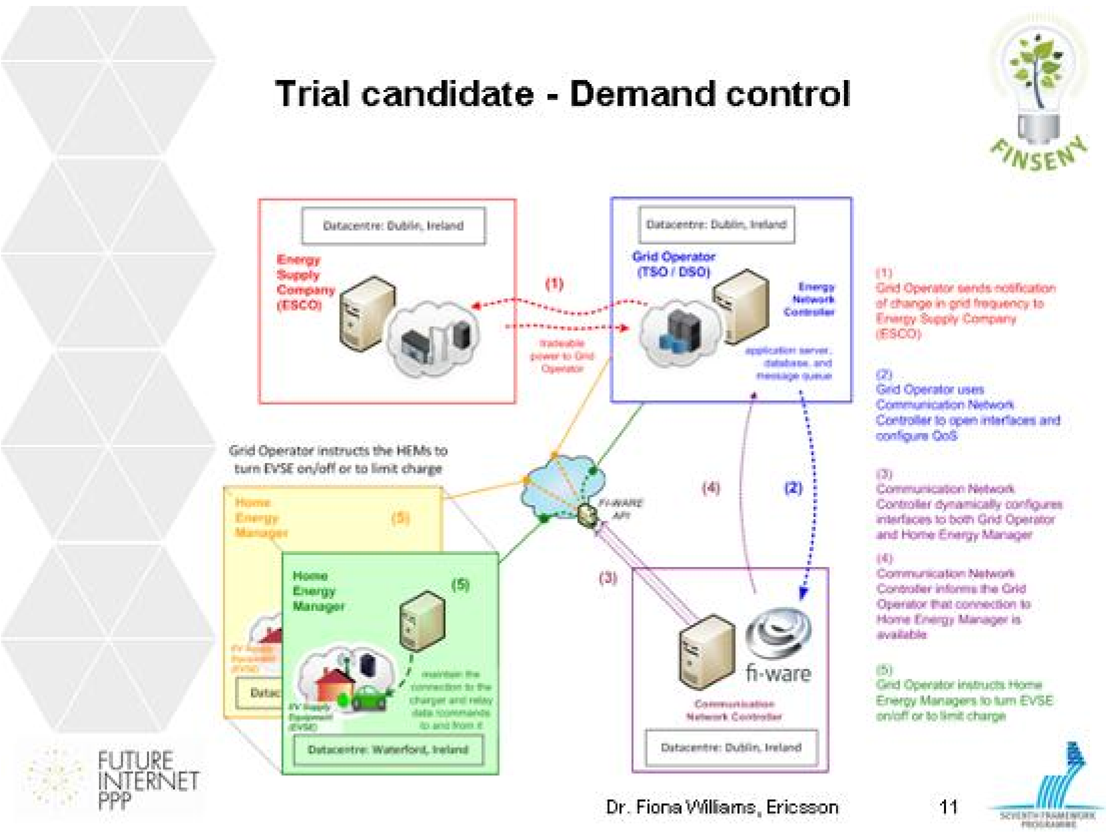


Figure 65: eMobility – Trial Candidate

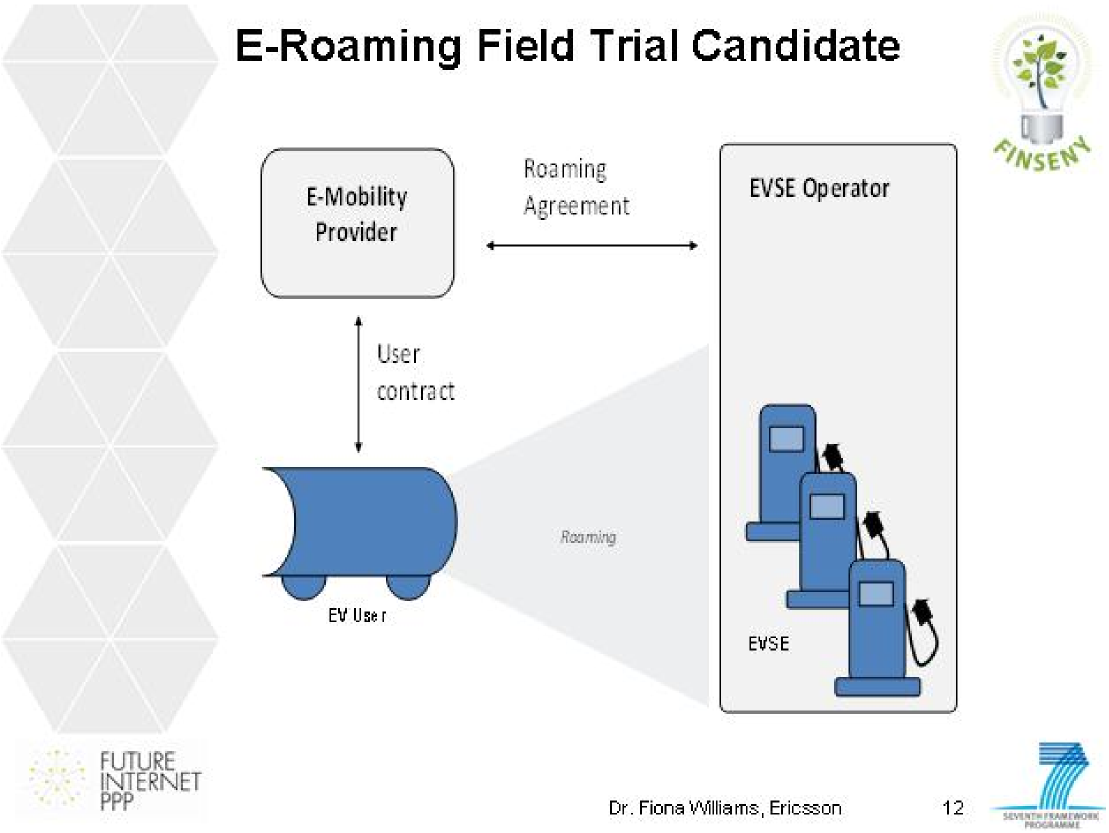


Figure 66: eMobility – E-Roaming

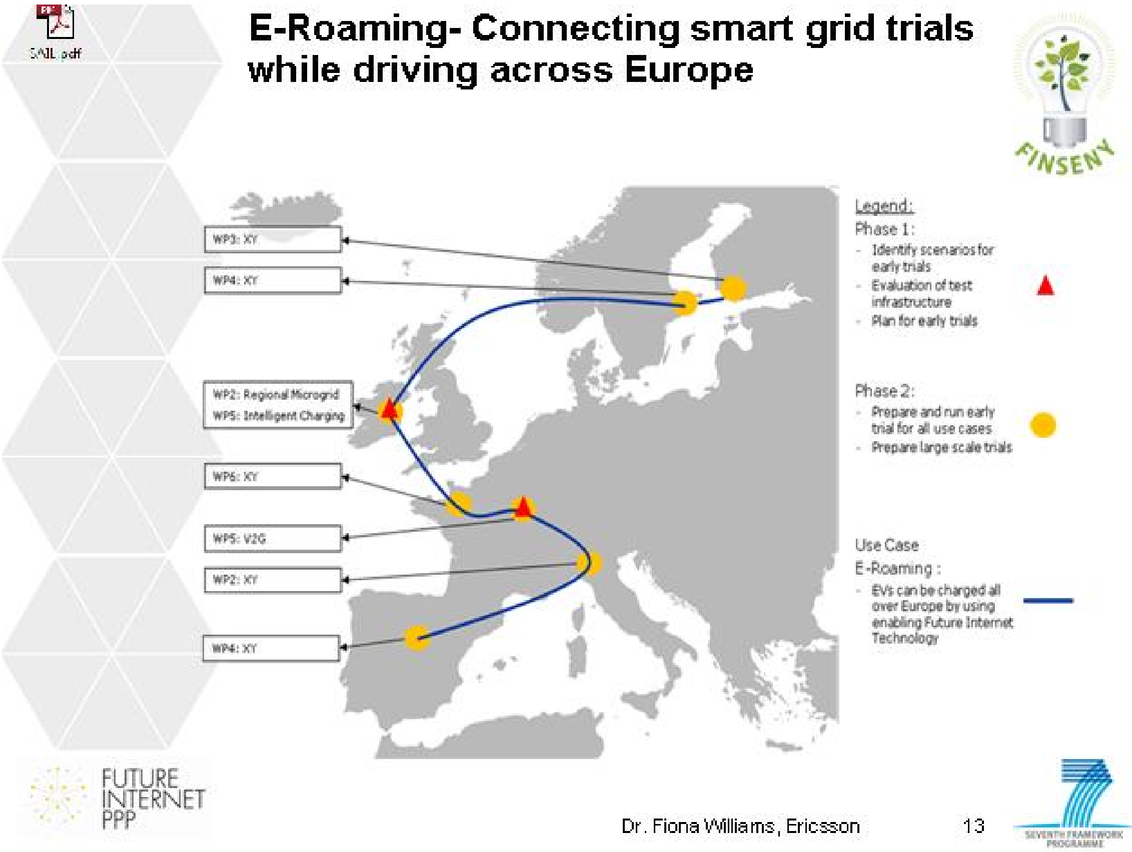


Figure 67: eMobility – E-Roaming across Europe

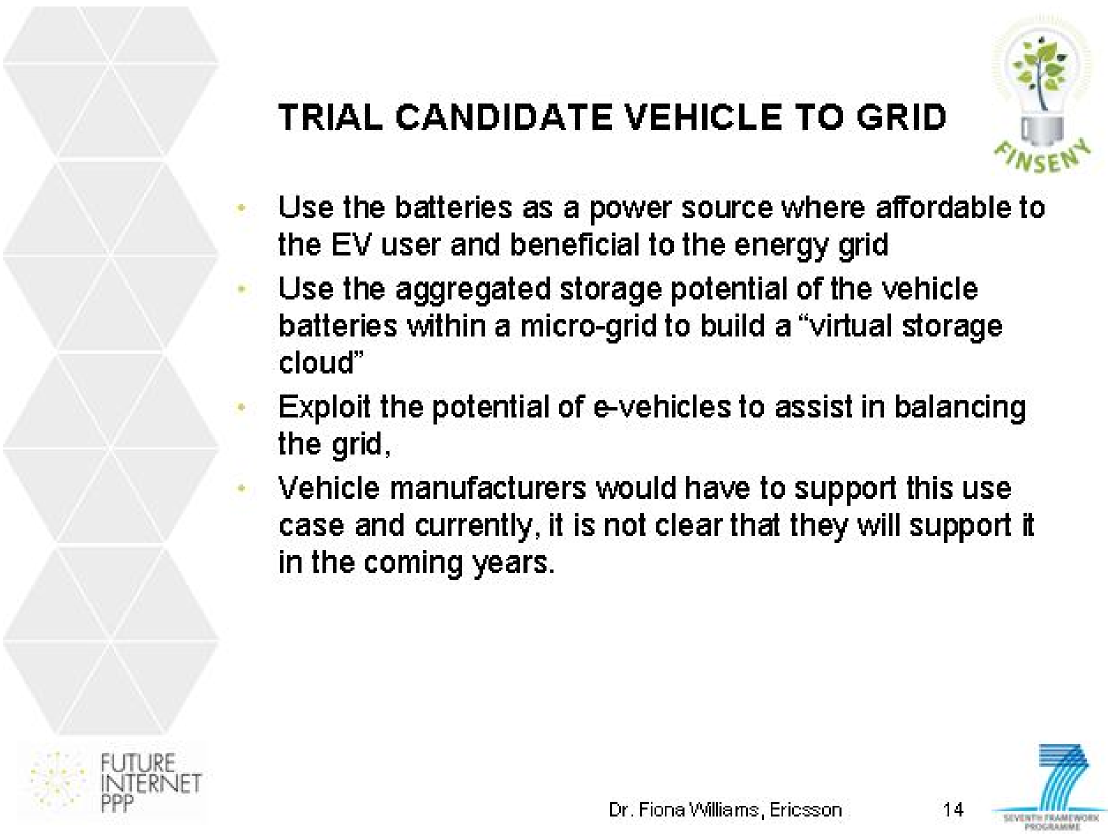


Figure 68: eMobility – Vehicle to Grid

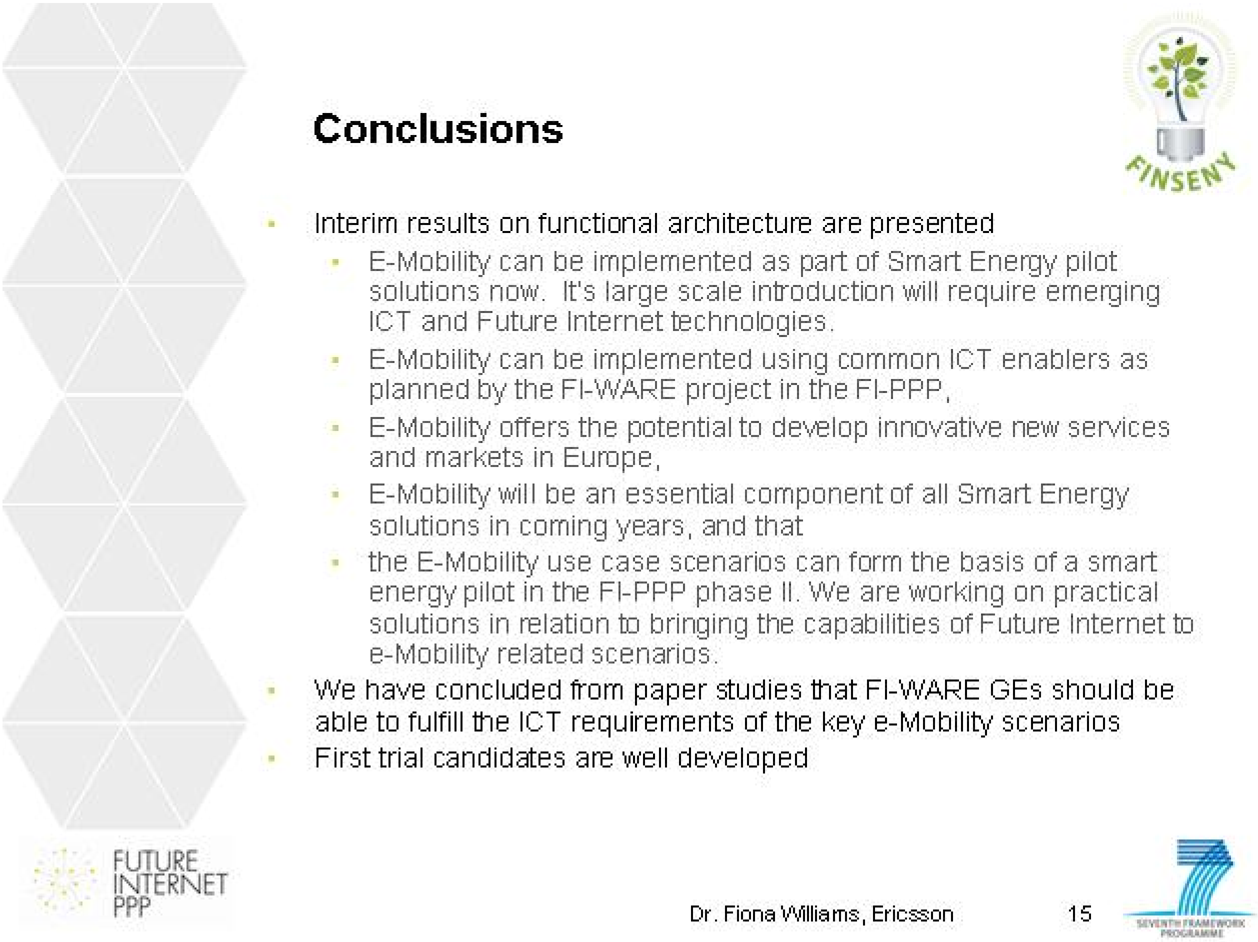


Figure 69: eMobility - Conclusion

2.8 Electronic Market Place for Energy (WP6): Functional Architecture and Trial Candidates

Presenter: Luigi Briguglio, Engineering

Luigi Briguglio presented the work on the electronic marketplace for energy. Electronic marketplaces are a central component of the future electricity smart grid. Various marketplaces are perceivable and facilitate information and final user contracts about energy use, demand-side management and energy trading.

Like explained on Figure 3 the eEnergyMarket addresses three market areas:

- Energy Information
- DSM (Demand Side Management)
- Local Markets

Therefore, at first energy and price information are collected and special users' contracts are offered about energy usage. In the next step a demand side management will shape the electricity demand curve and shave demand peaks using different market mechanisms like dynamic prices. And, at last, trading services offer customer/prosumer a better integration in energy markets and supports the trading of electricity between homes and micro-grids while coping with the inherent real-time dynamics in electricity demand and supply.

Figure 77 explains the election process for the trial candidateswith which resulted three trial candidates were selected:

- Flatten Demand Curve
- Trading Flexible Capacity
- Supplier Side Local Trading

Furthermore, it was outlined how energy marketplaces can be realised using FI (Future Internet) technology and how this can be facilitated with comparably low effort using Generic Enablers and Domain specific Enablers.

Figure 70: eMarket – Title

Figure 71: eMarket - Overview

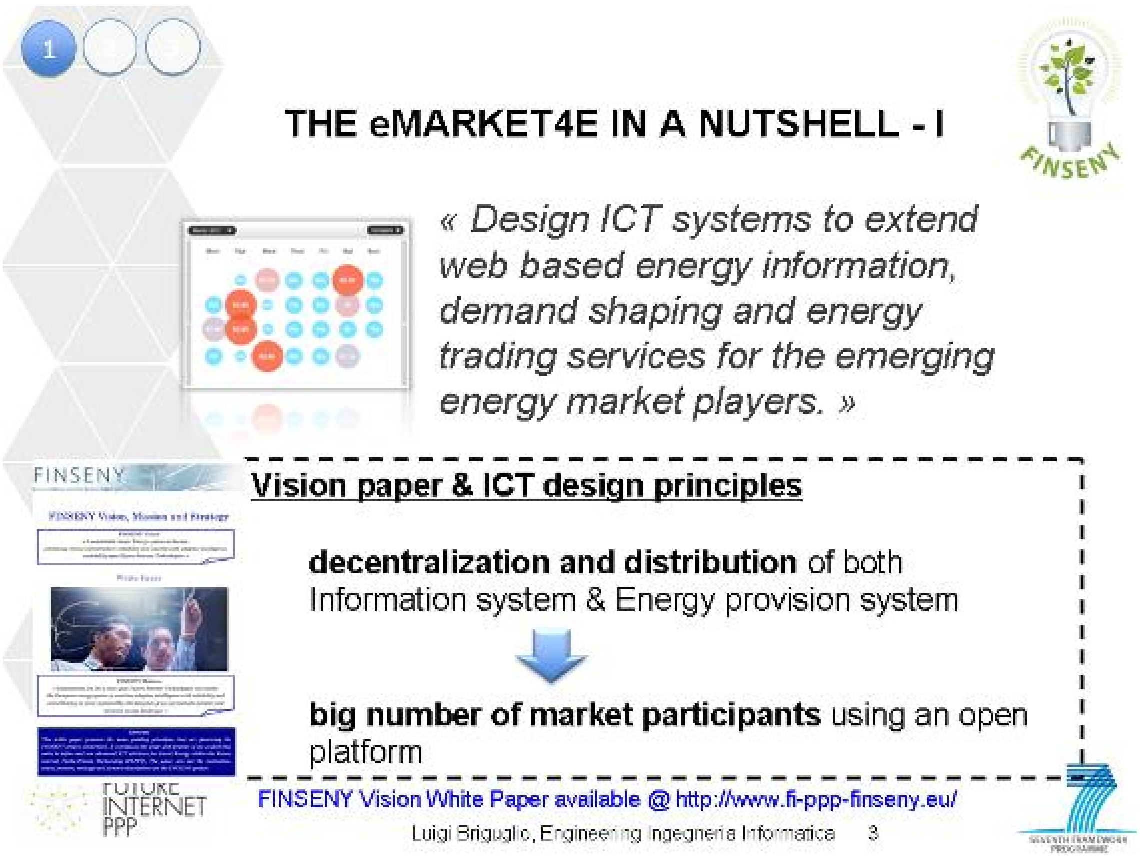


Figure 72: eMarket – In a Nutshell I

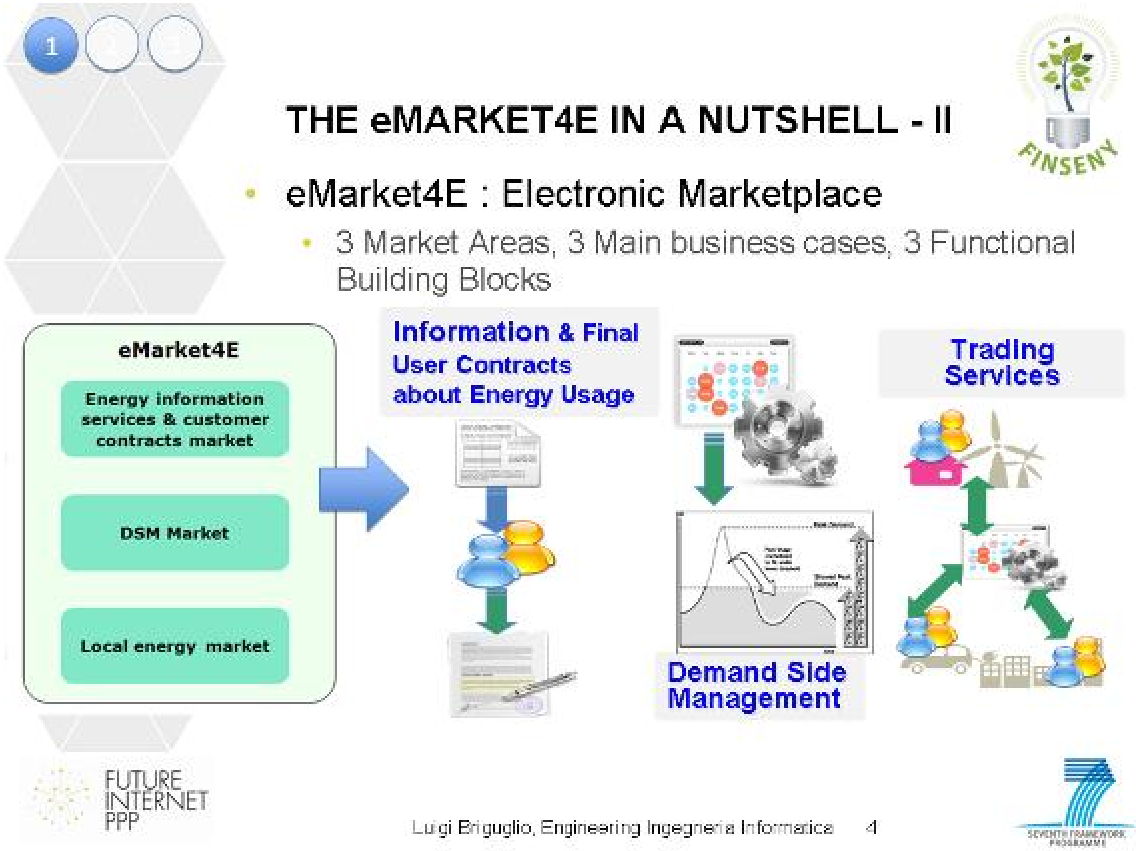


Figure 73: eMarket – In a Nutshell II

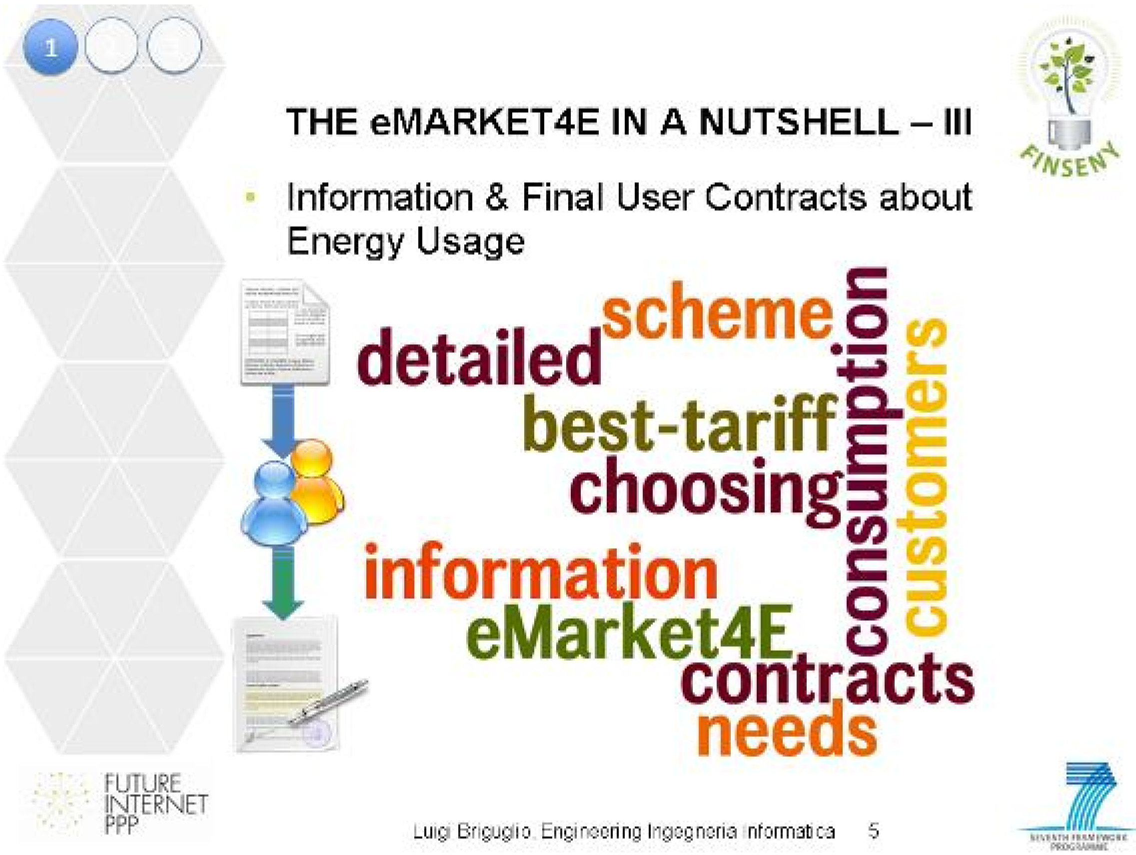


Figure 74: eMarket – In a Nutshell III

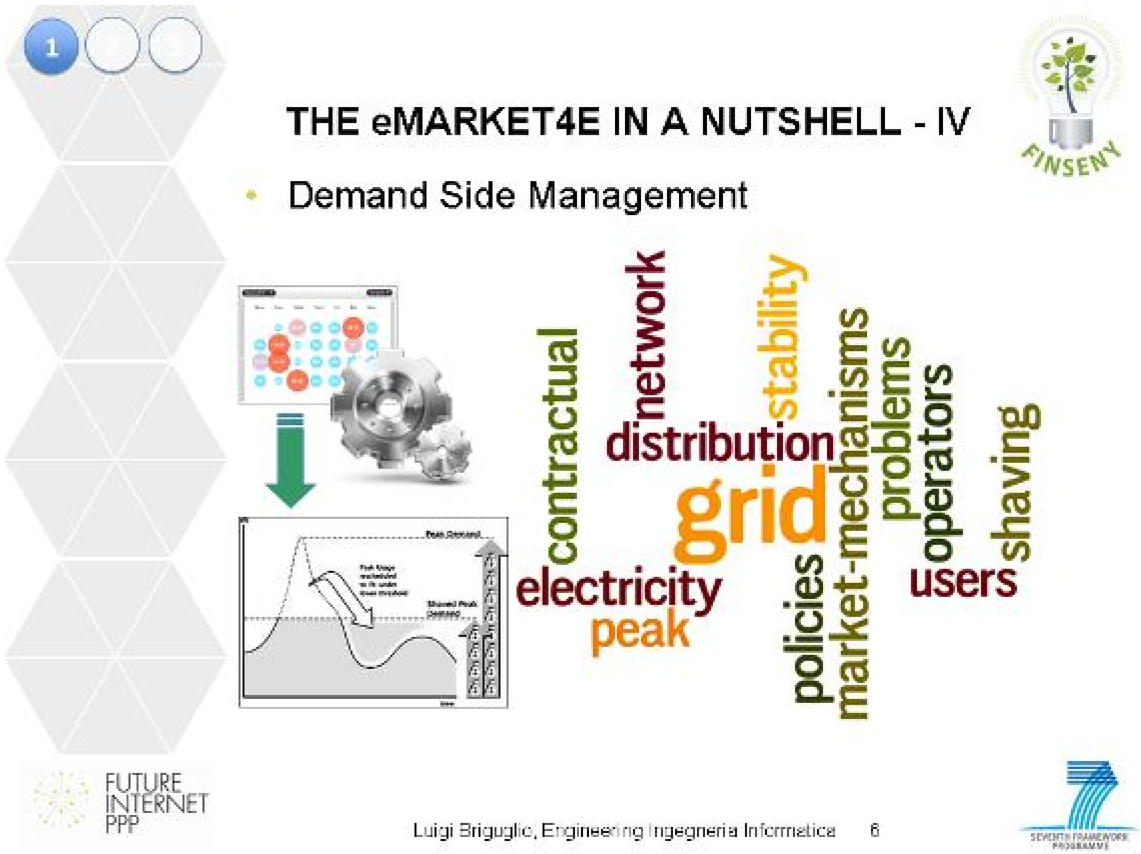


Figure 75: eMarket – In a Nutshell IV

Figure 76: eMarket – In a Nutshell V

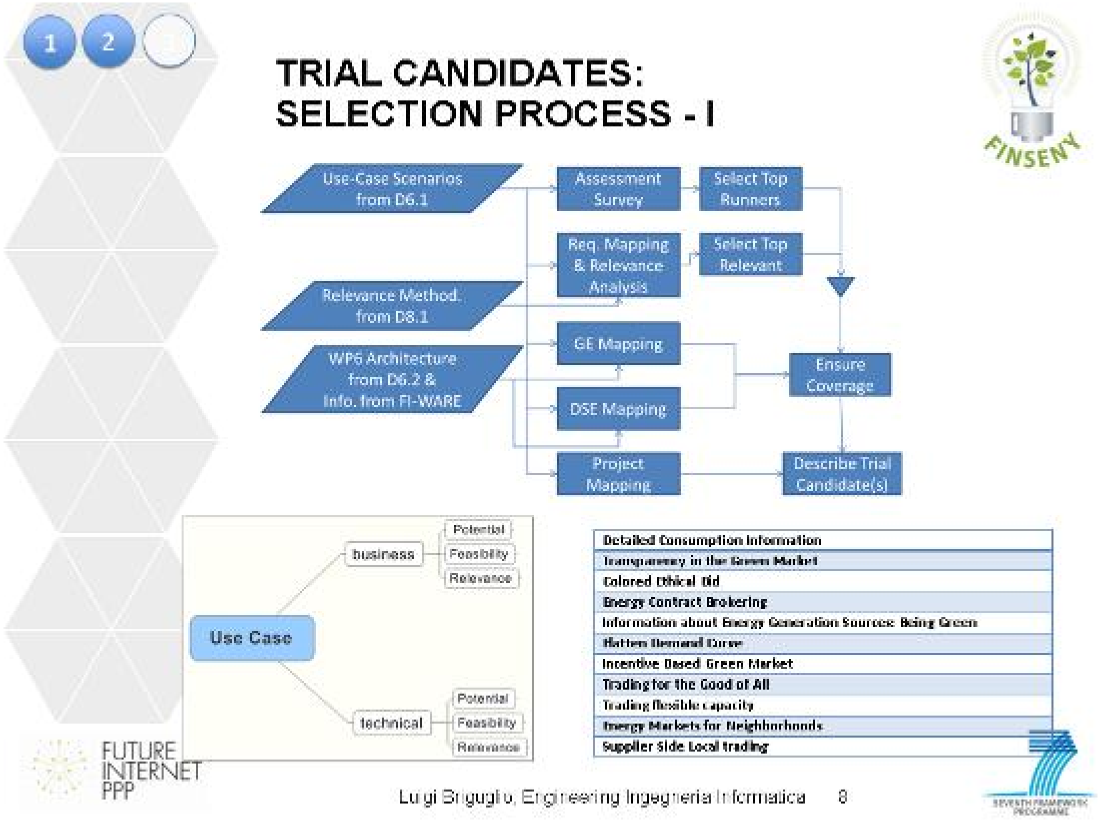


Figure 77: eMarket – Trial Candidates I

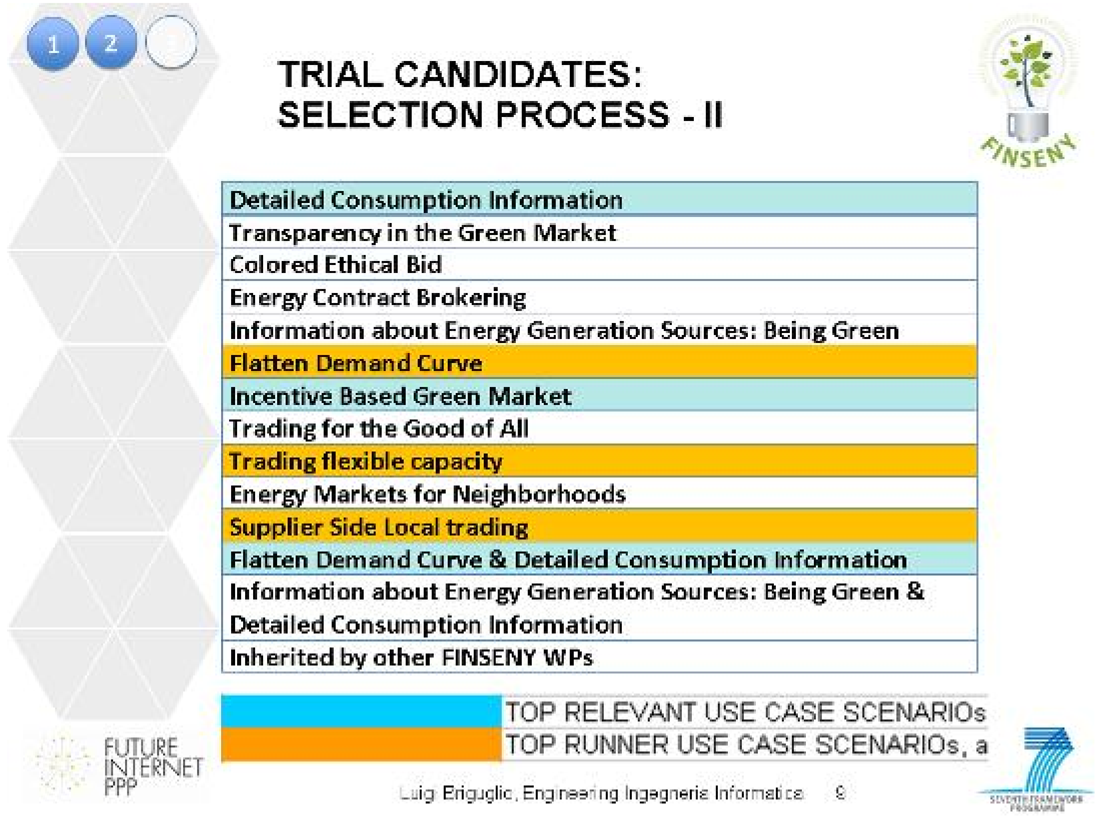


Figure 78: eMarket – Trial Candidates II

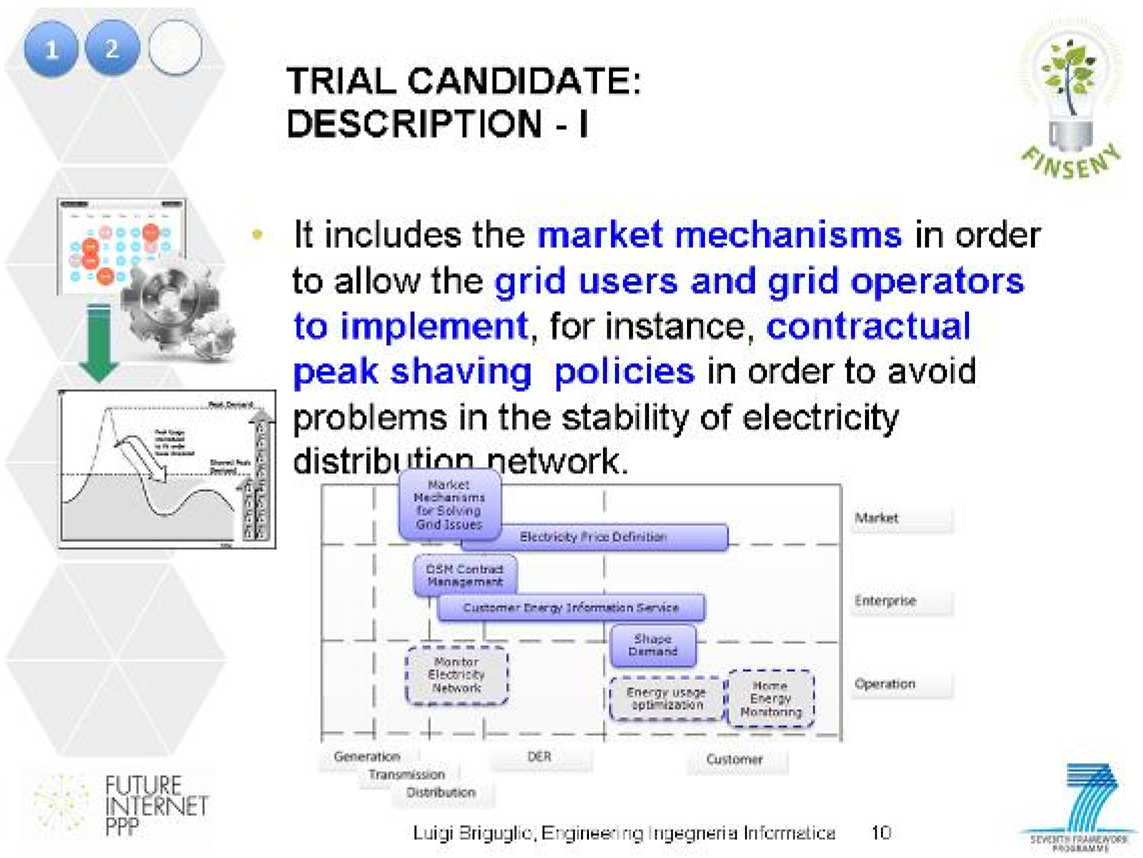


Figure 79: eMarket – Trial Description I

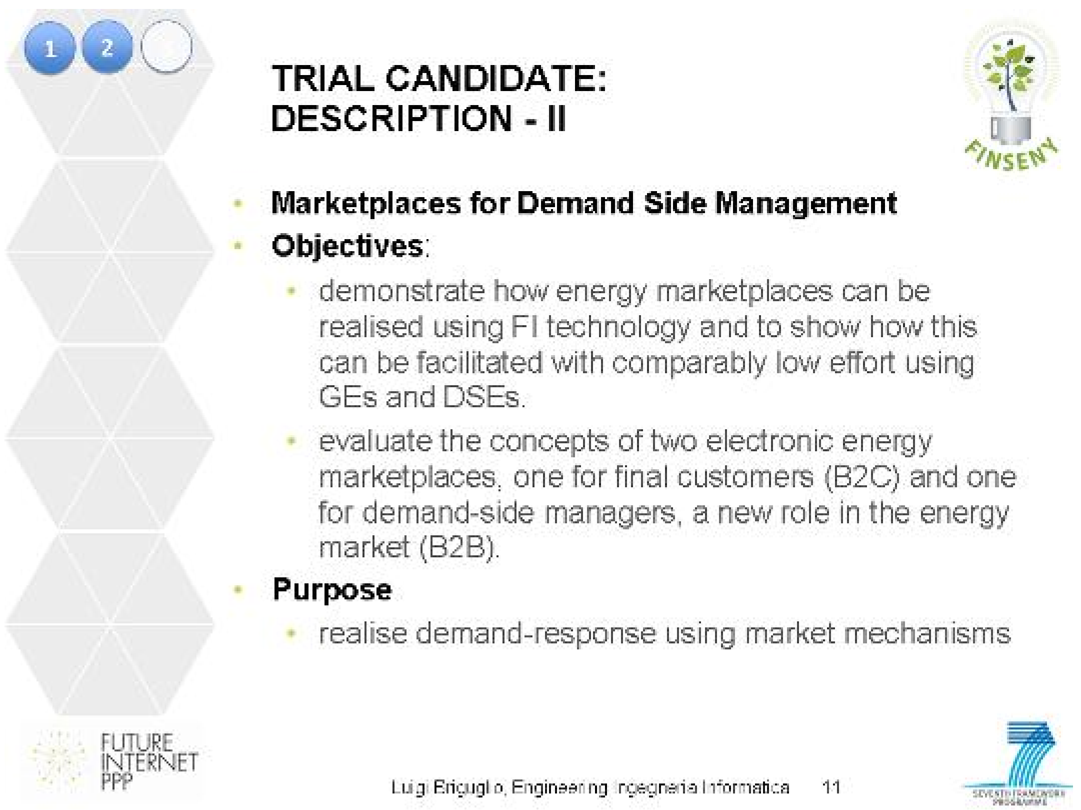


Figure 80: eMarket – Trial Description II

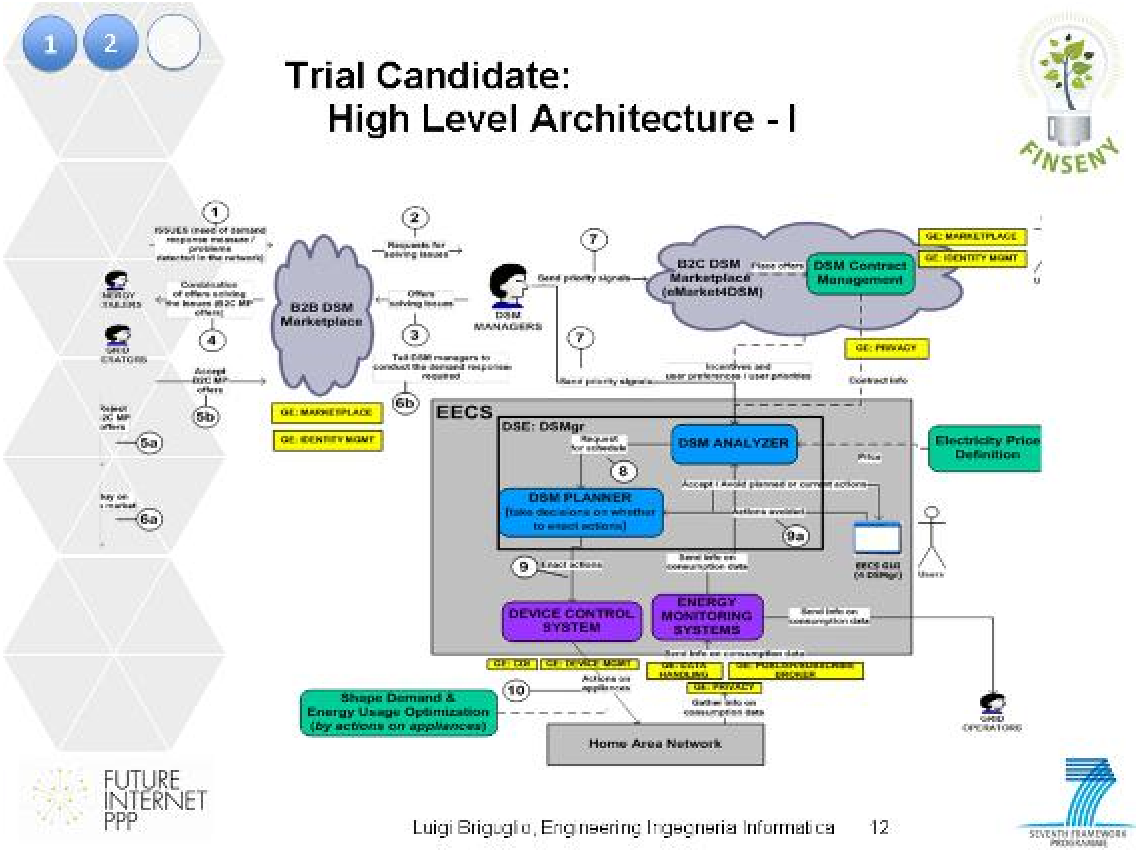


Figure 81: eMarket – Trial Description Architecture I

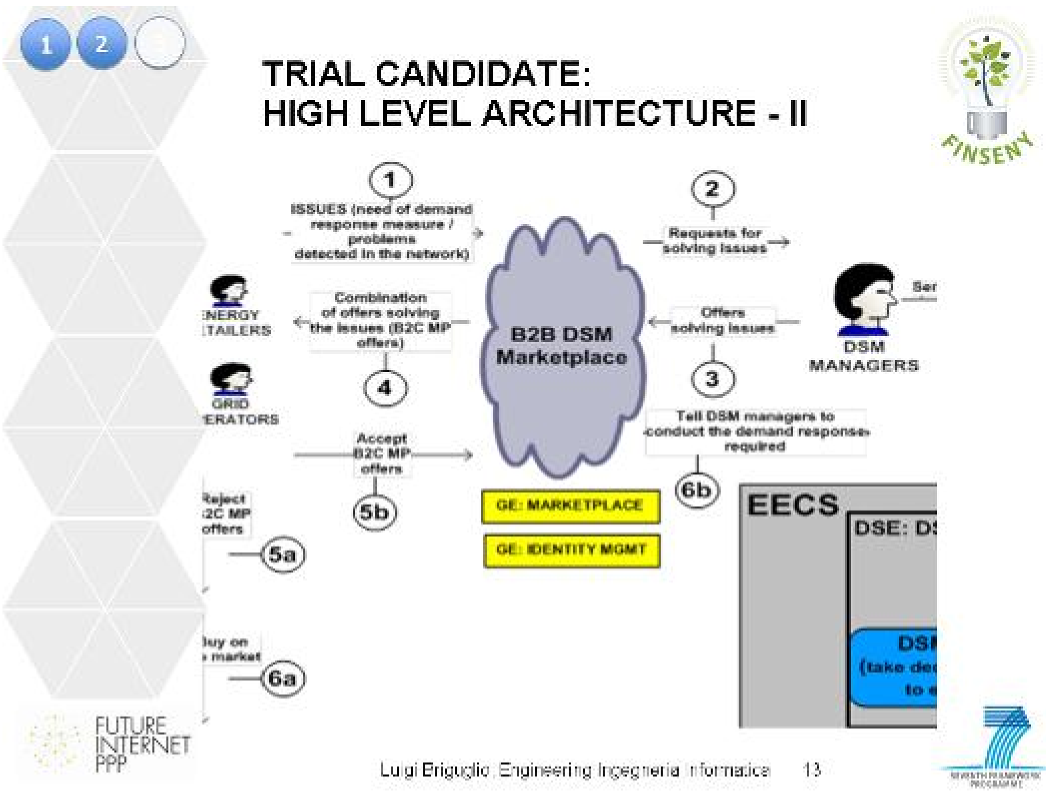


Figure 82: eMarket – Trial Description Architecture II

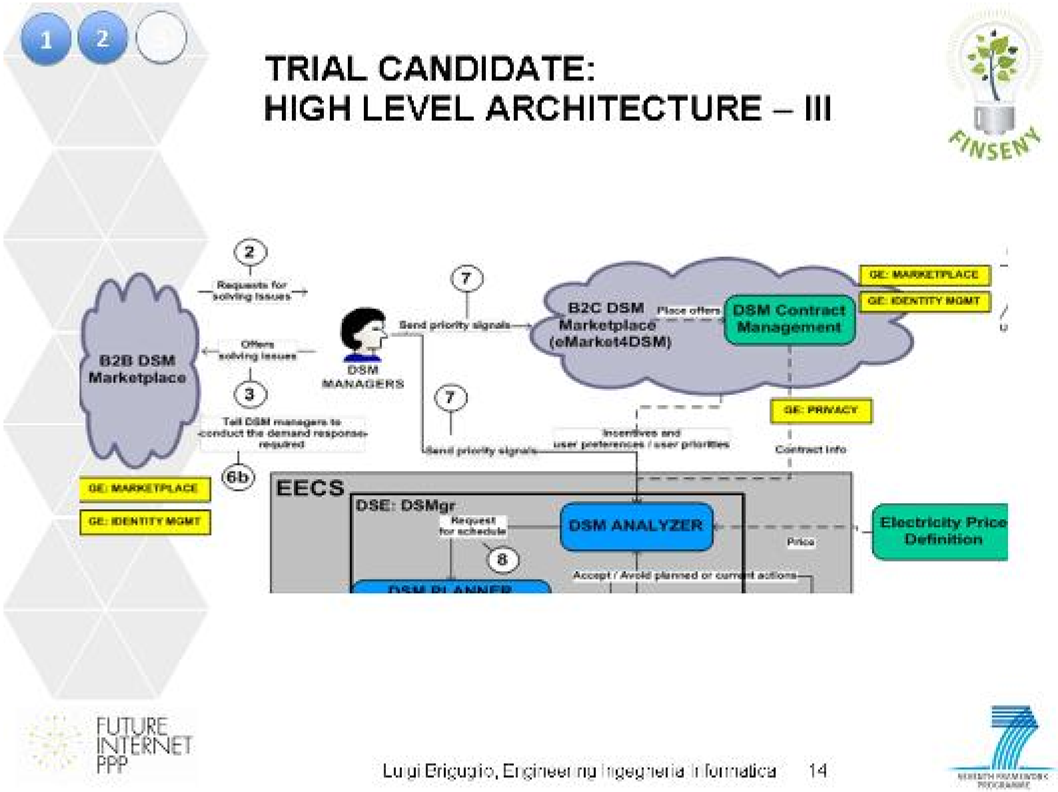


Figure 83: eMarket – Trial Description Architecture III

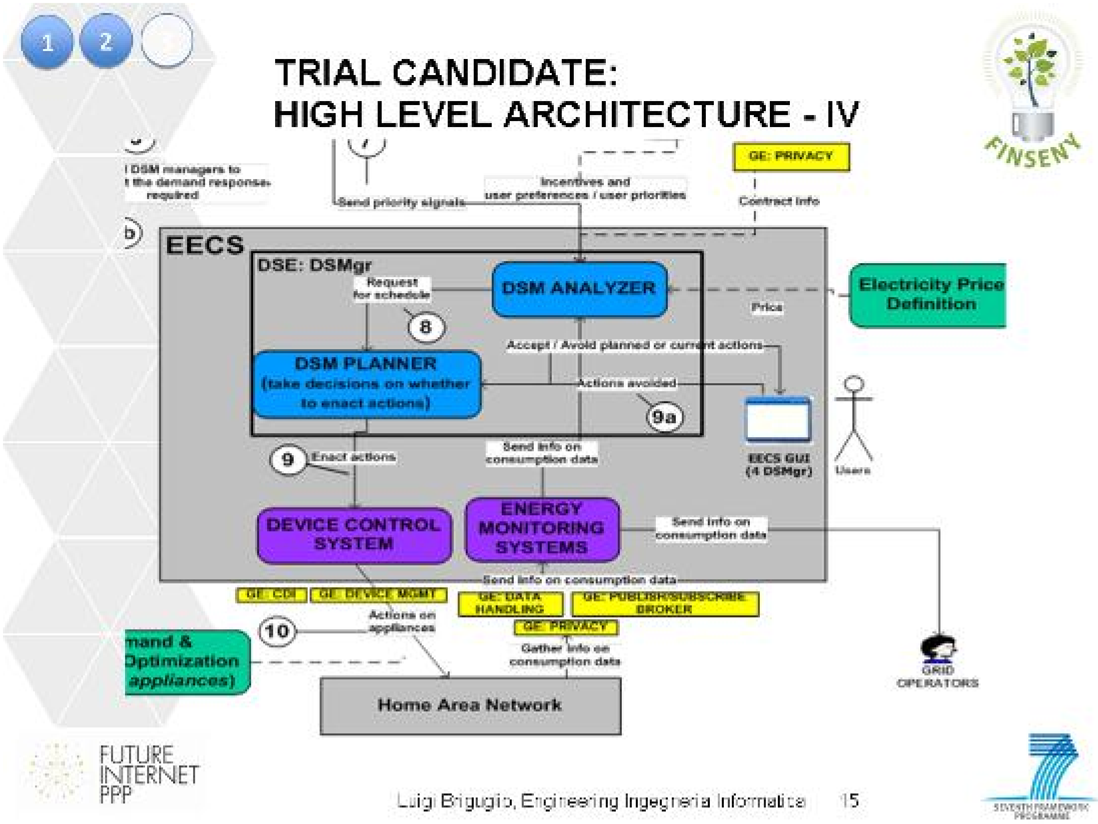


Figure 84: eMarket – Trial Description Architecture IV

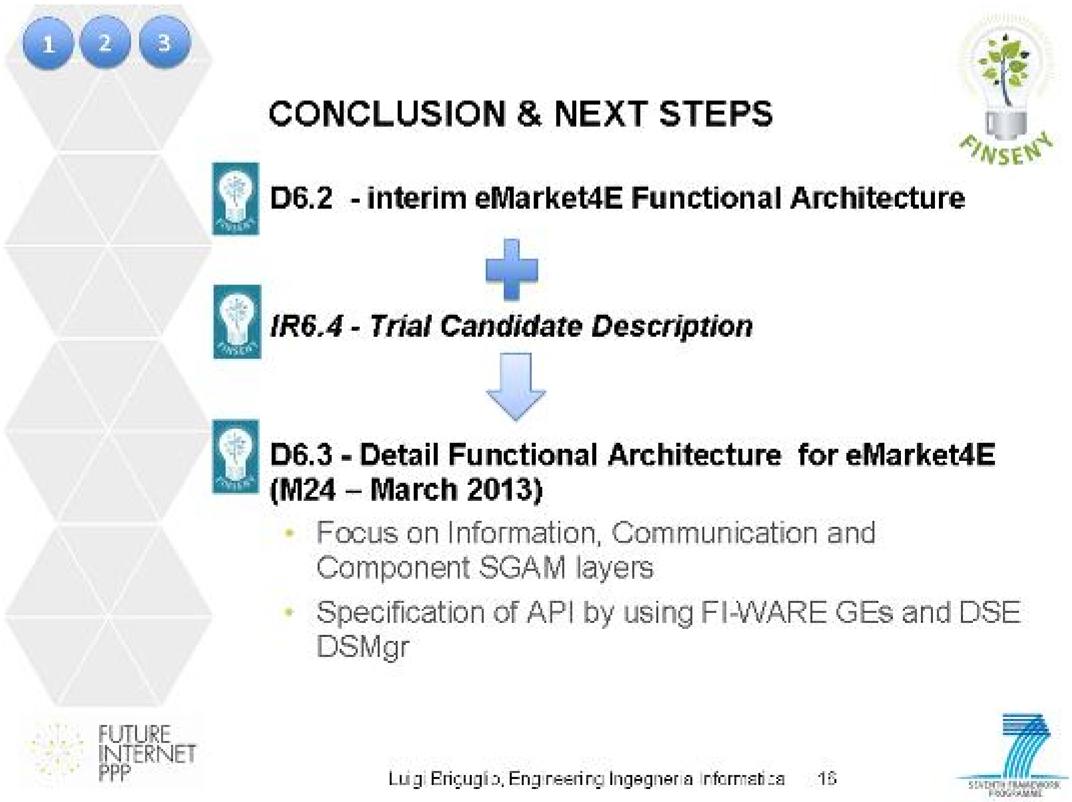


Figure 85: eMarket – Conclusion

Figure 86: eMarket – Presenter

2.9 OpenNode: A Smart Secondary Substation Node and its Integration in a Distribution Grid of the Future

Presenter: Martin Wagner, ATOS Spain

In the European energy industry three challenges are found for the near future:
- fluctuating power resources must be integrated
- increased smartness in the distribution grid is necessary
- stakeholder diversification is coming up

To face these challenges, OpenNode tries to develop a solution focussing on the central station in the distribution grid, the secondary substation, and its link to the control centre of a utility.

OpenNode is an EU-funded project in the seventh framework programme with 8 partners from 6 countries. It started beginning of 2010 and will end in September 2012. It develops an open, intelligent secondary substation node (SSN) to be embedded in secondary substation systems. These SSNs are the essential control and monitoring component of the distribution grid. They are modular and extensible devices based on OSGi, which allows third parties to extend the SSN functionality by loading and removing algorithms and functions on-the-fly. The SSN architecture is built up in a way that it enables 2 main communication paths and function areas:
- metering and monitoring: aggregation of information of up to hundreds of smart meters and local devices (IEDs, sensors, actuators)
- grid automation: control of local devices and IEDs

The SSN is linked to the control centres of the utility by a special system called “Middleware” that was developed in OpenNode to handle the new functions and use cases in the project for the distribution grid. The Middleware is a gate of information exchange and comprises measurement and events storage, supervision and initiation of autonomous actions for controlling the distribution grid via the SSN.

The communication is handled by 2 separated paths:
- the metering path uses mainly DLMS/COSEM from the SSN to the Middleware
- the grid automation path is subdivided in 2 different solutions: the “legacy” one uses IEC 60870-5-104 for communication between SSN and Middleware (“fast prototype”), the future-oriented one uses IEC 61850 – based communication by the implementation of web services (IEC 61400-25-4 protocol)

Finally, OpenNode has tested these concepts with respect to the use cases defined in the project by 2 test scenarios:
- a laboratory test at EDF in France
- a field test at Iberdrola in Madrid

The results have been evaluated and are currently distributed in comprehensive test reports.

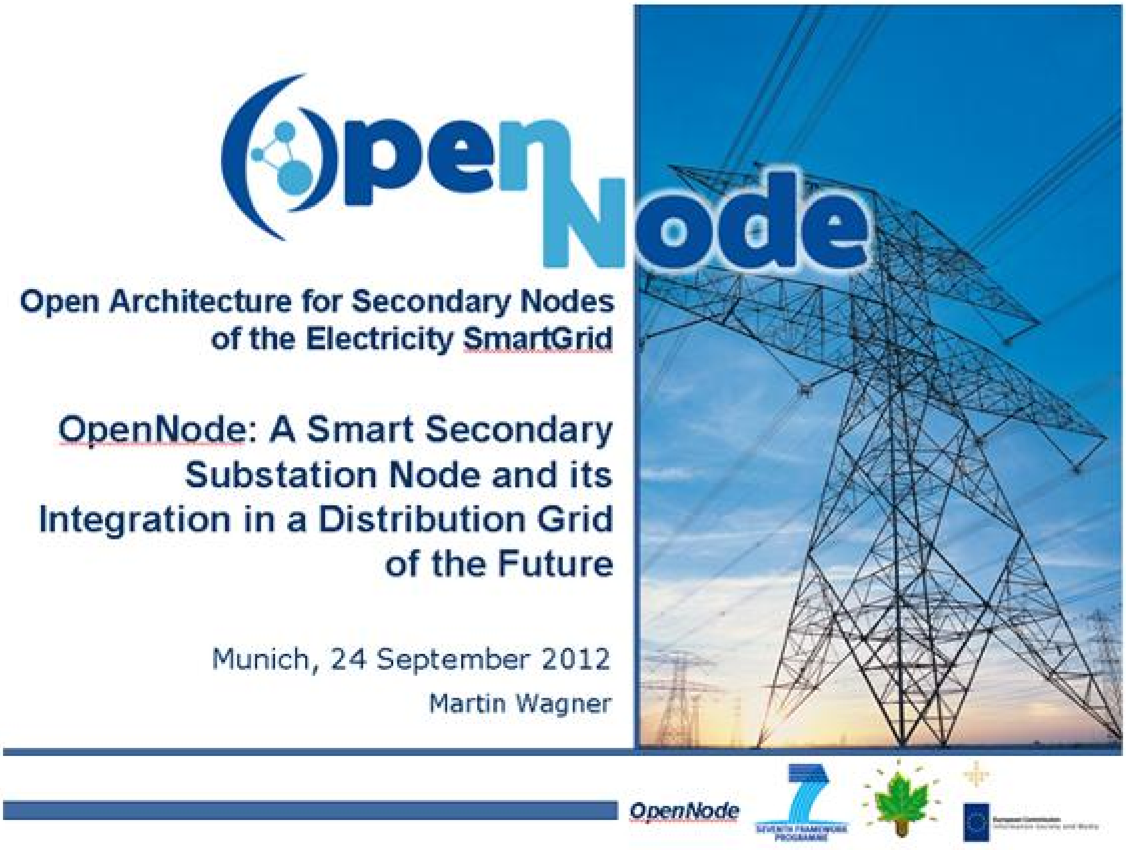


Figure 87: OpenNode – Title

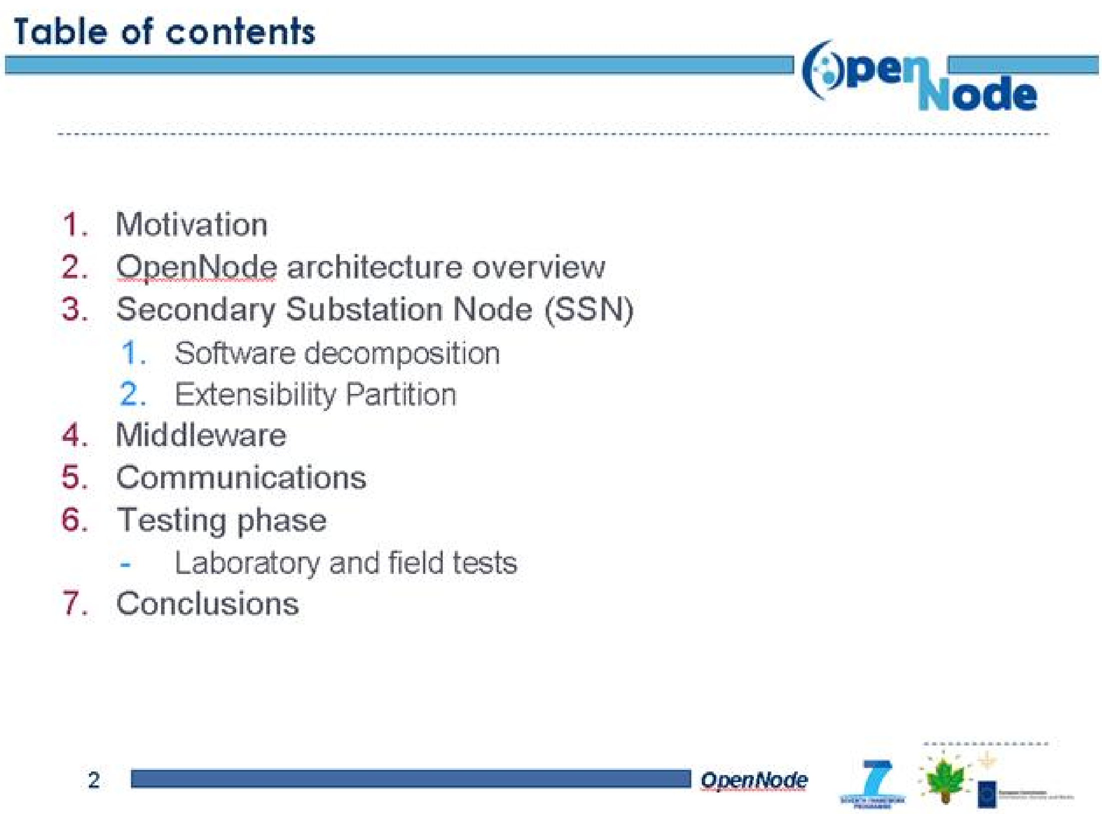


Figure 88: OpenNode – Table of Contents

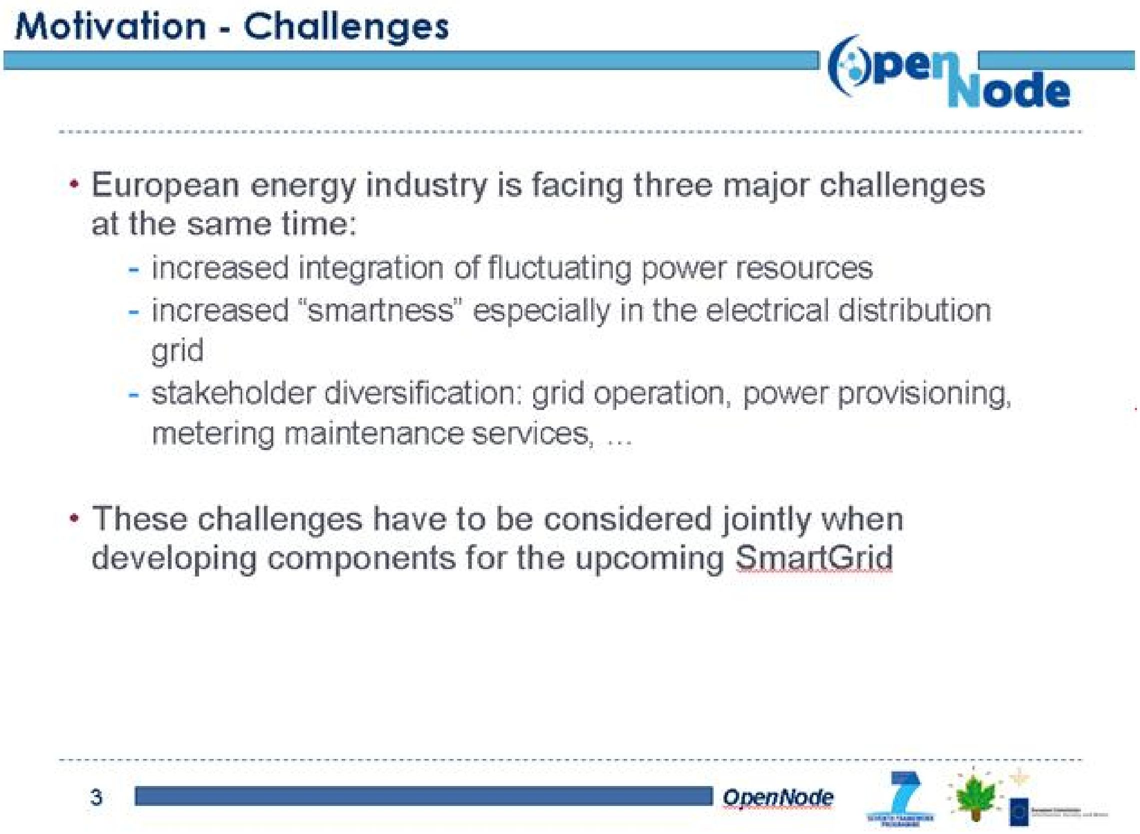


Figure 89: OpenNode – Challenges

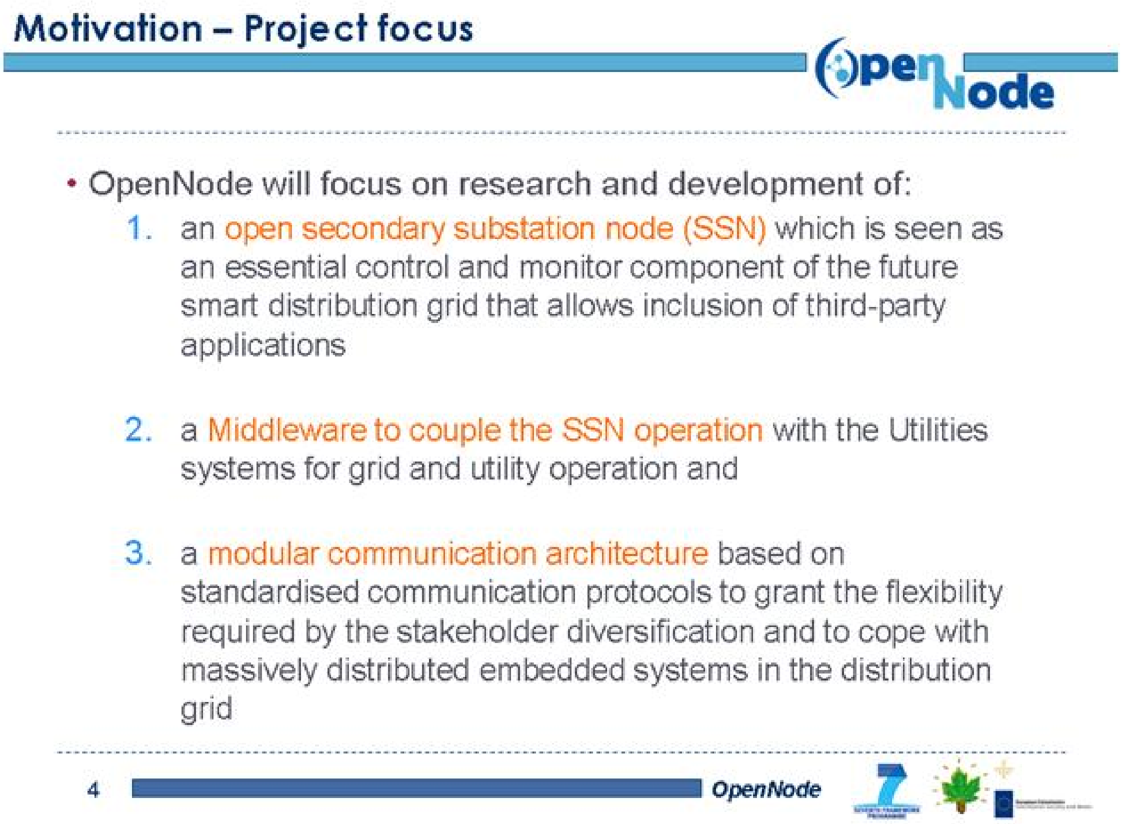


Figure 90: OpenNode – Focus

Figure 91: OpenNode – Consortium

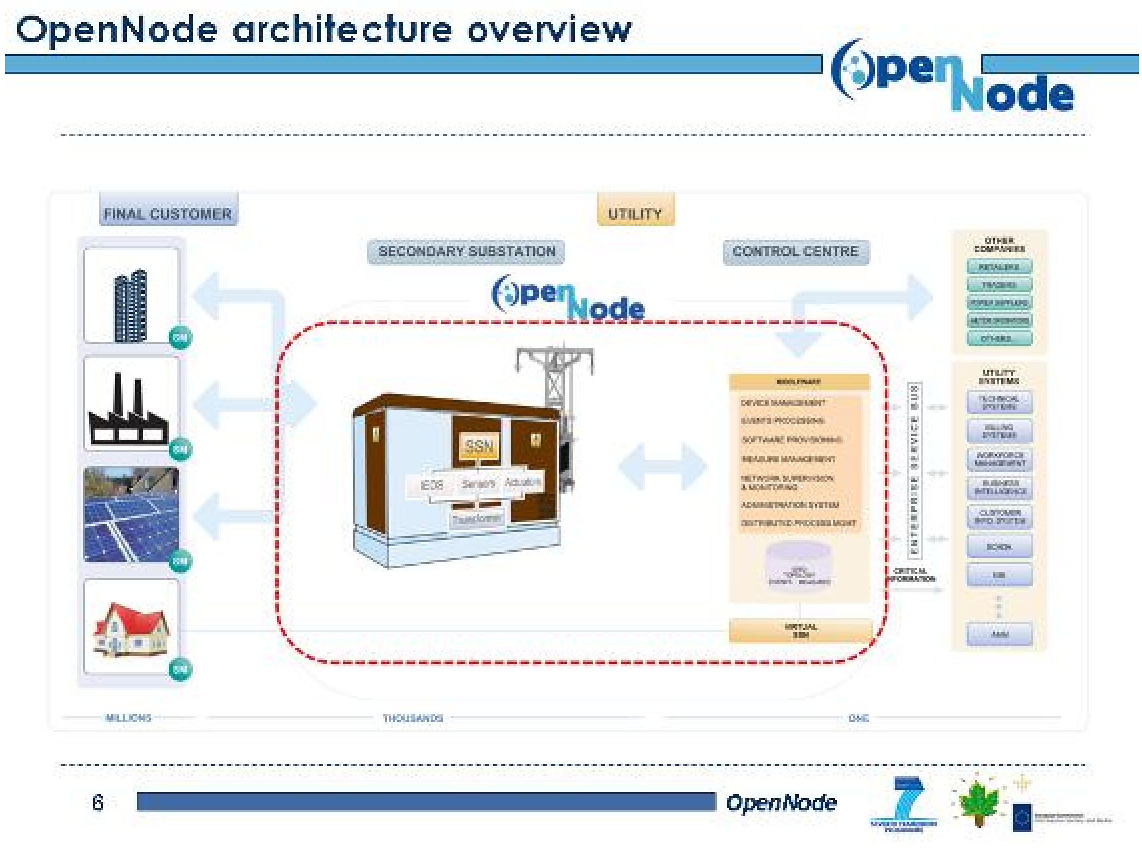


Figure 92: OpenNode – Architecture

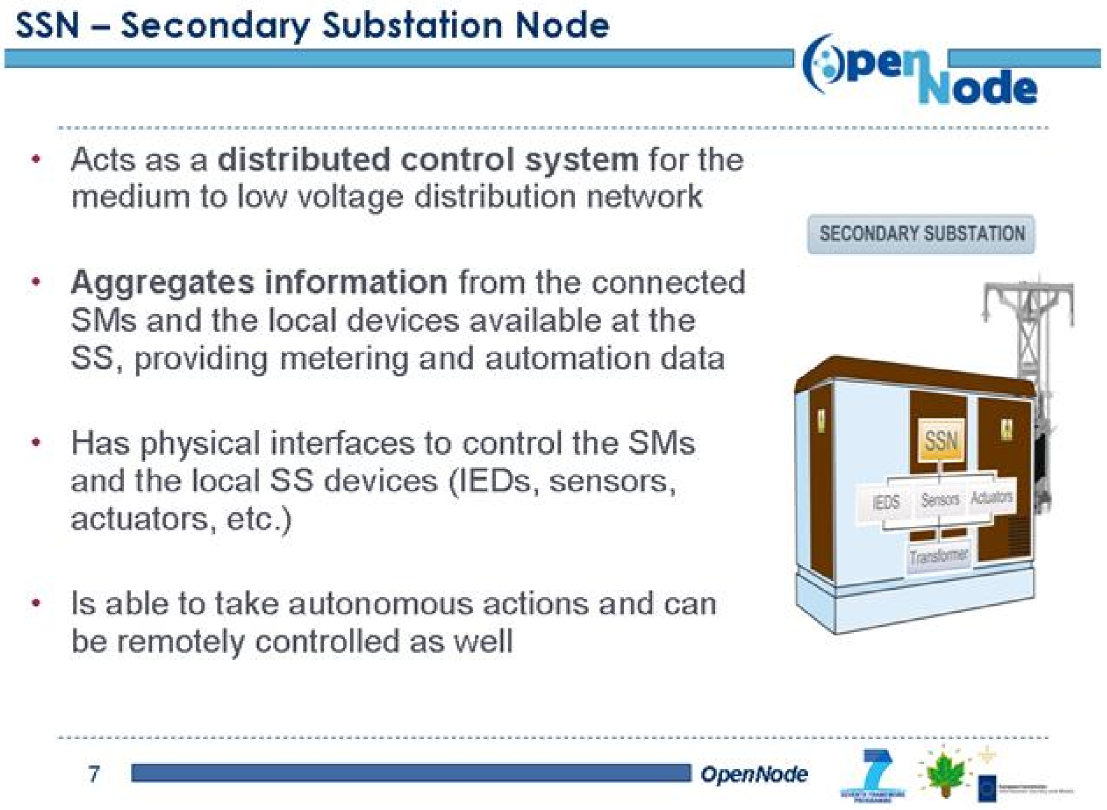


Figure 93: OpenNode – SSN

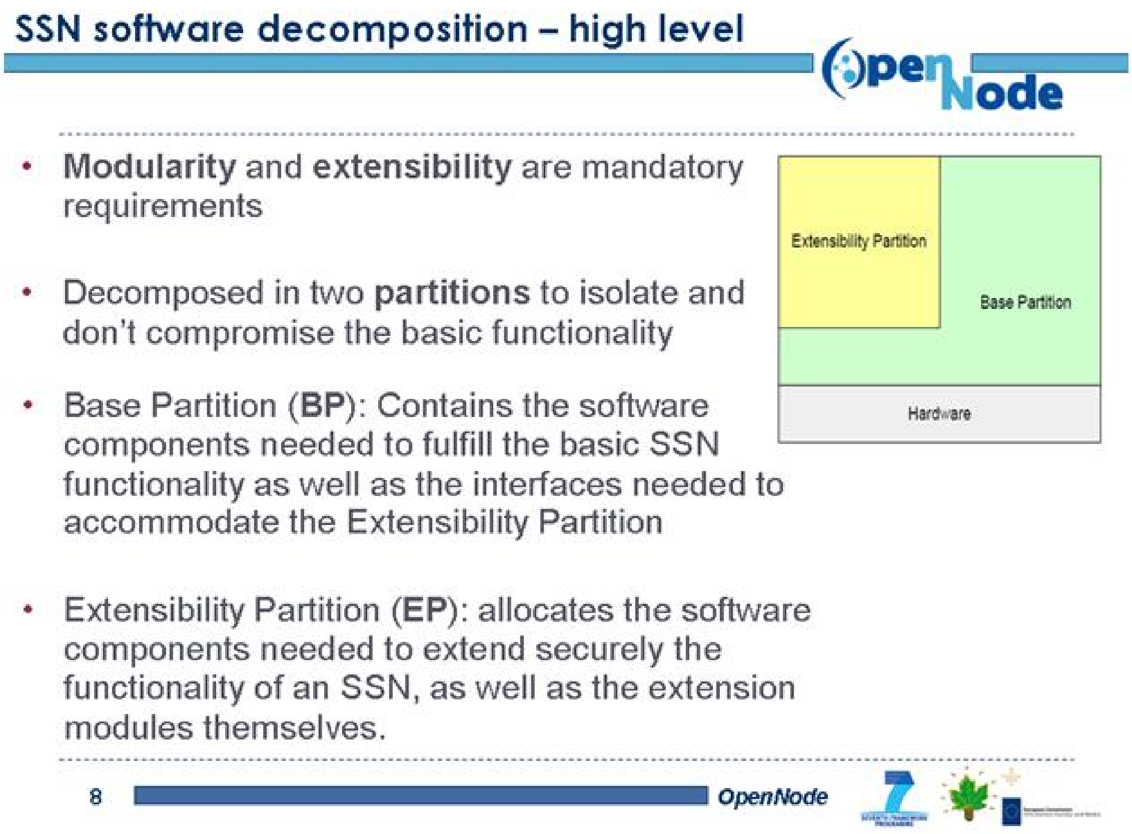


Figure 94: OpenNode – Software Decomposition

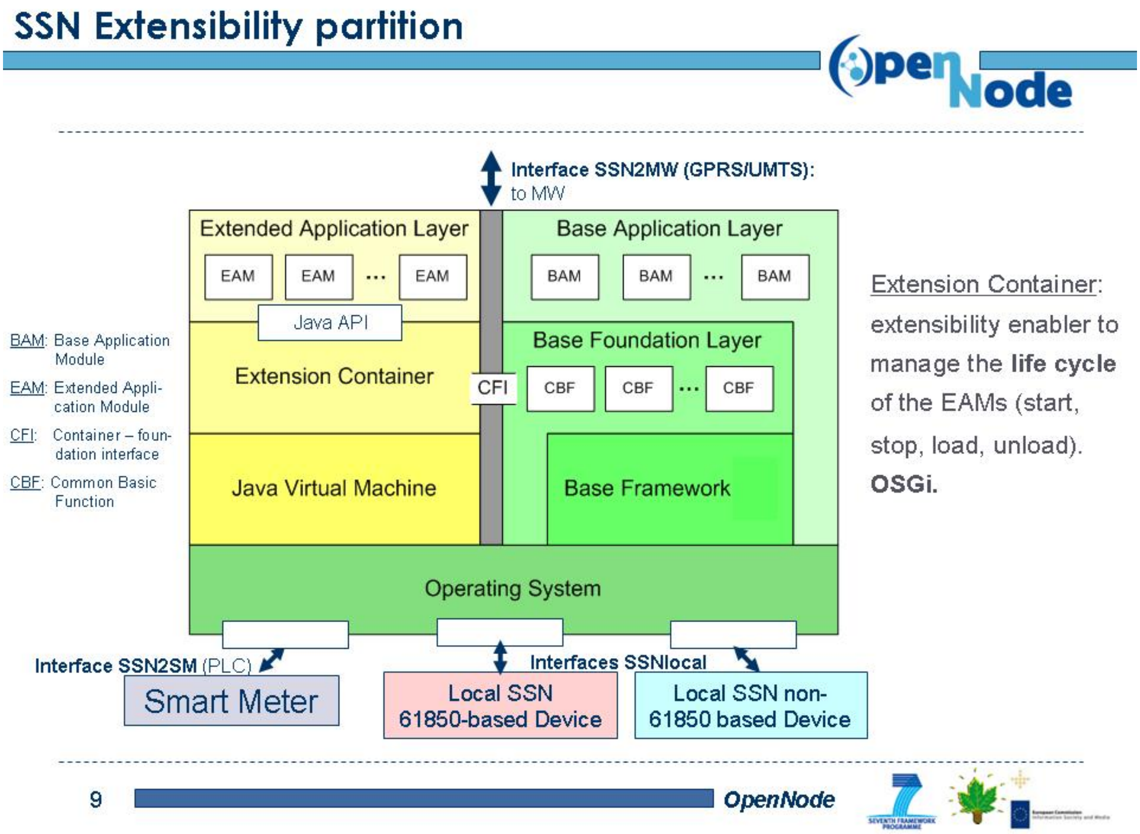


Figure 95: OpenNode – Extensibility

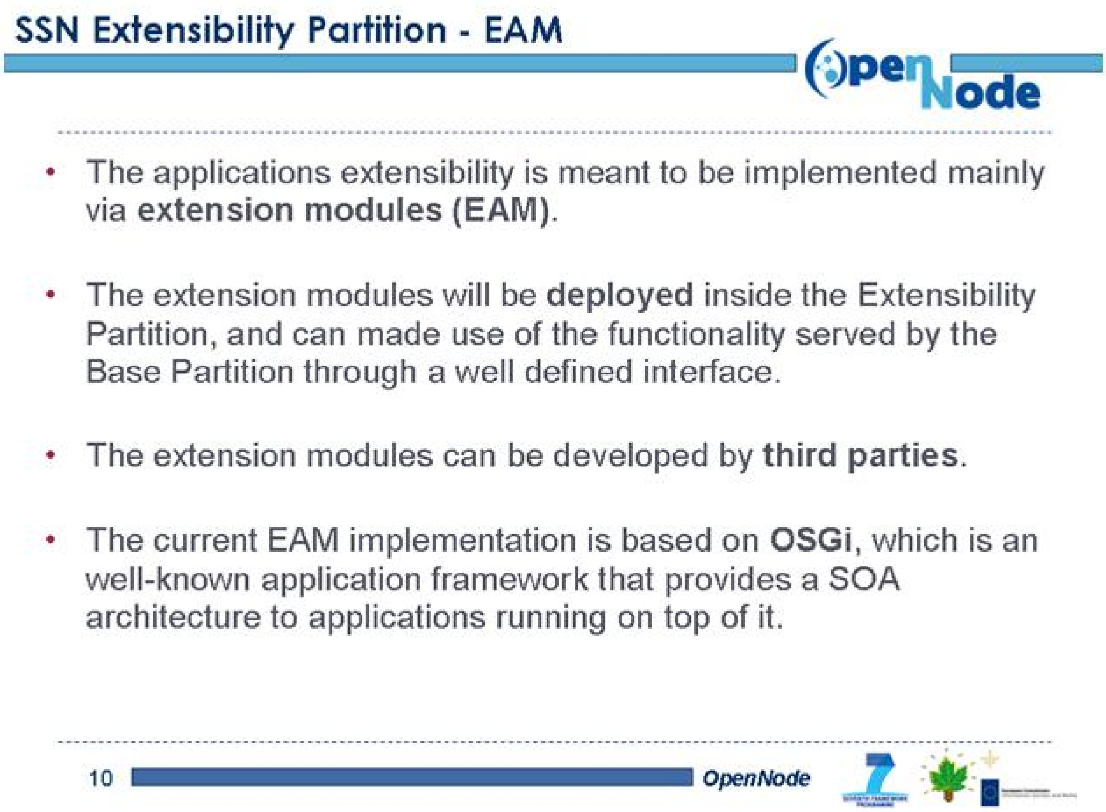


Figure 96: OpenNode – Extensibility - Modules

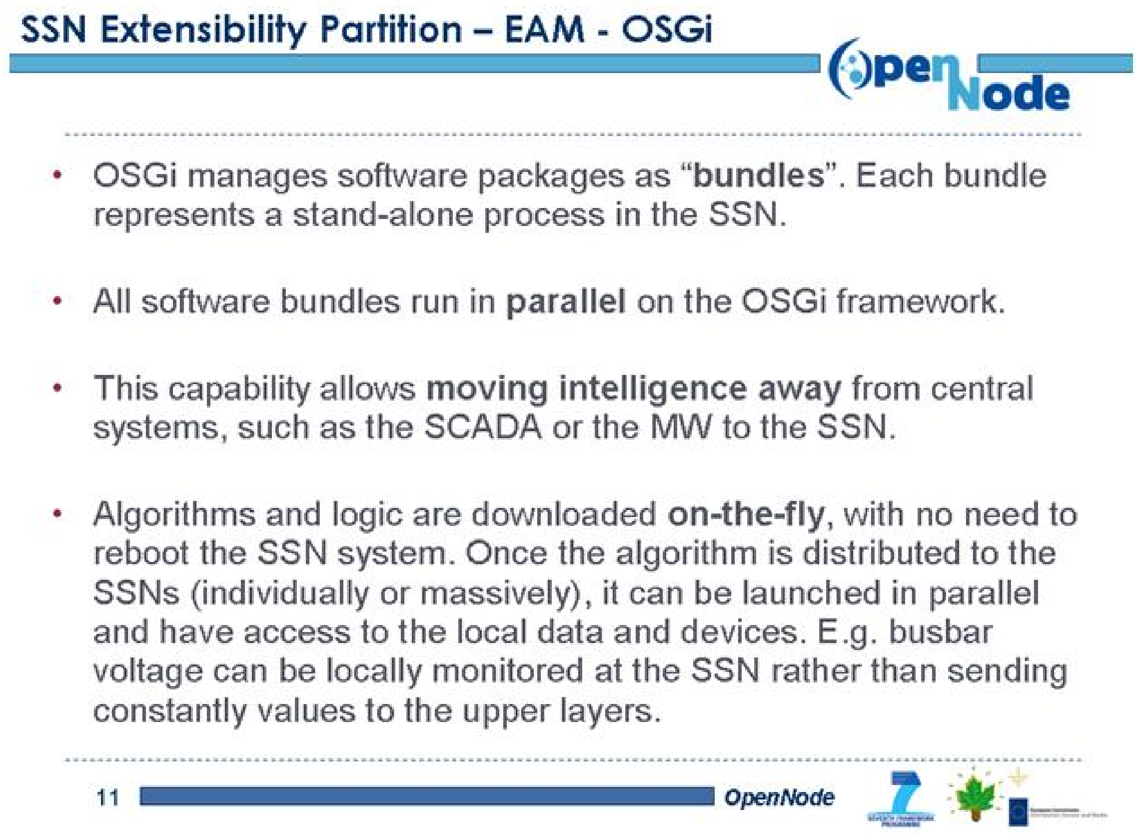


Figure 97: OpenNode – Extensibility OSGI

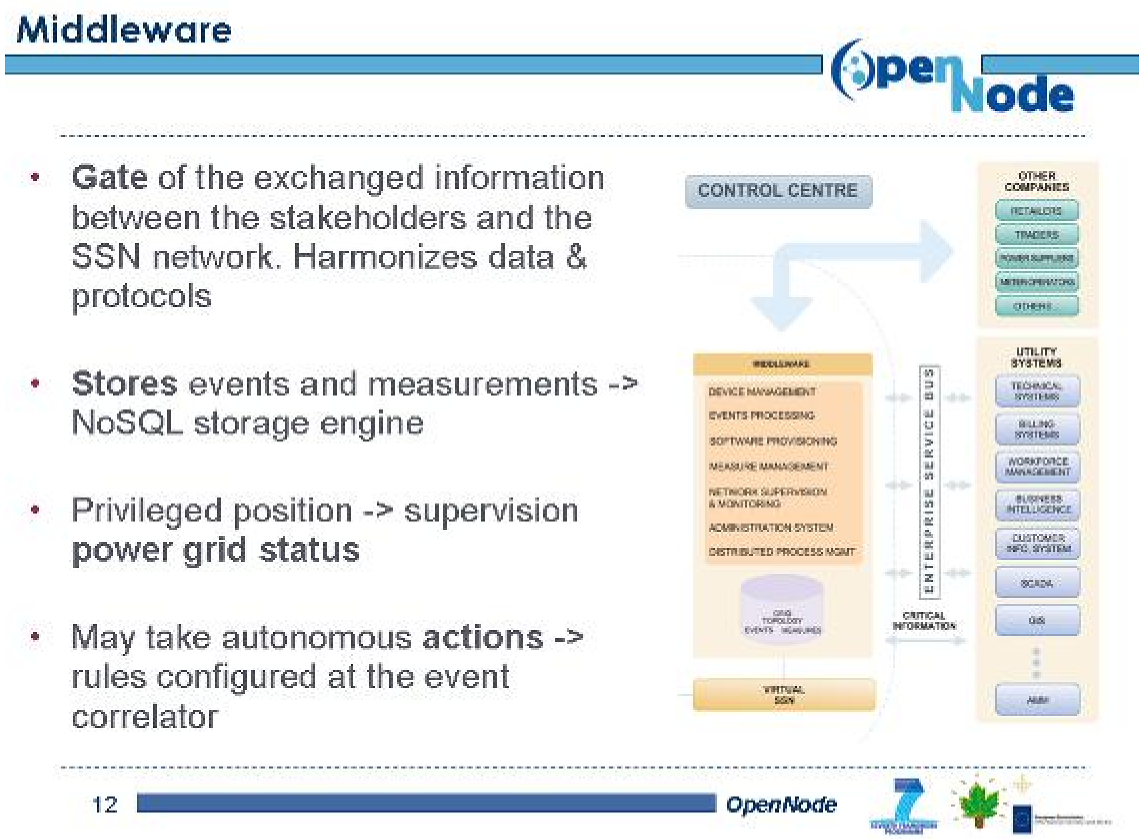


Figure 98: OpenNode – Middleware

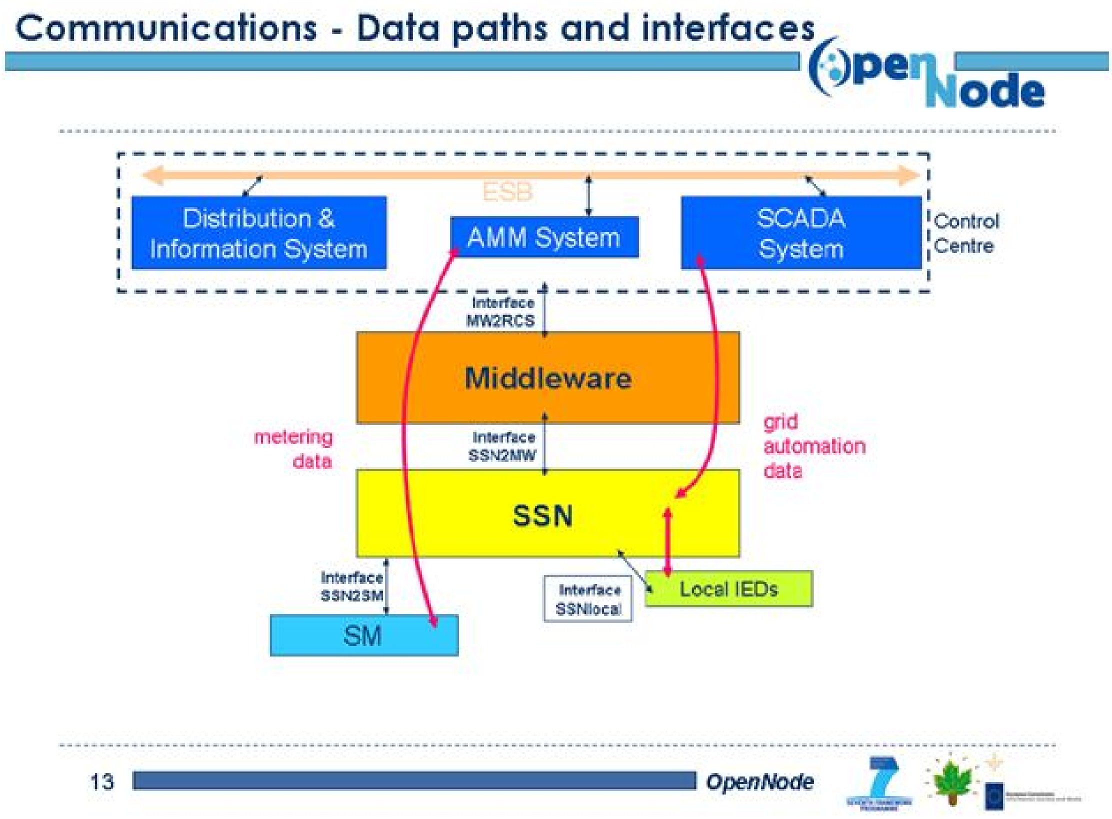


Figure 99: OpenNode – Communications

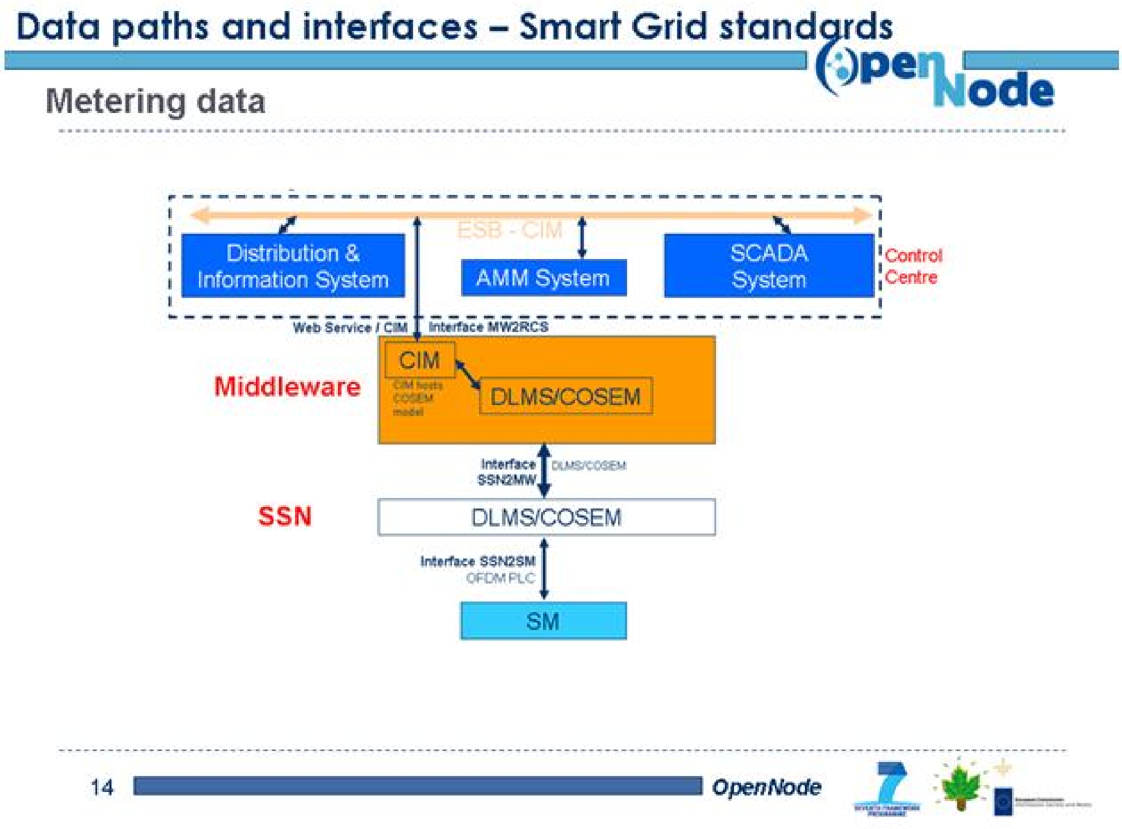


Figure 100: OpenNode – Standards

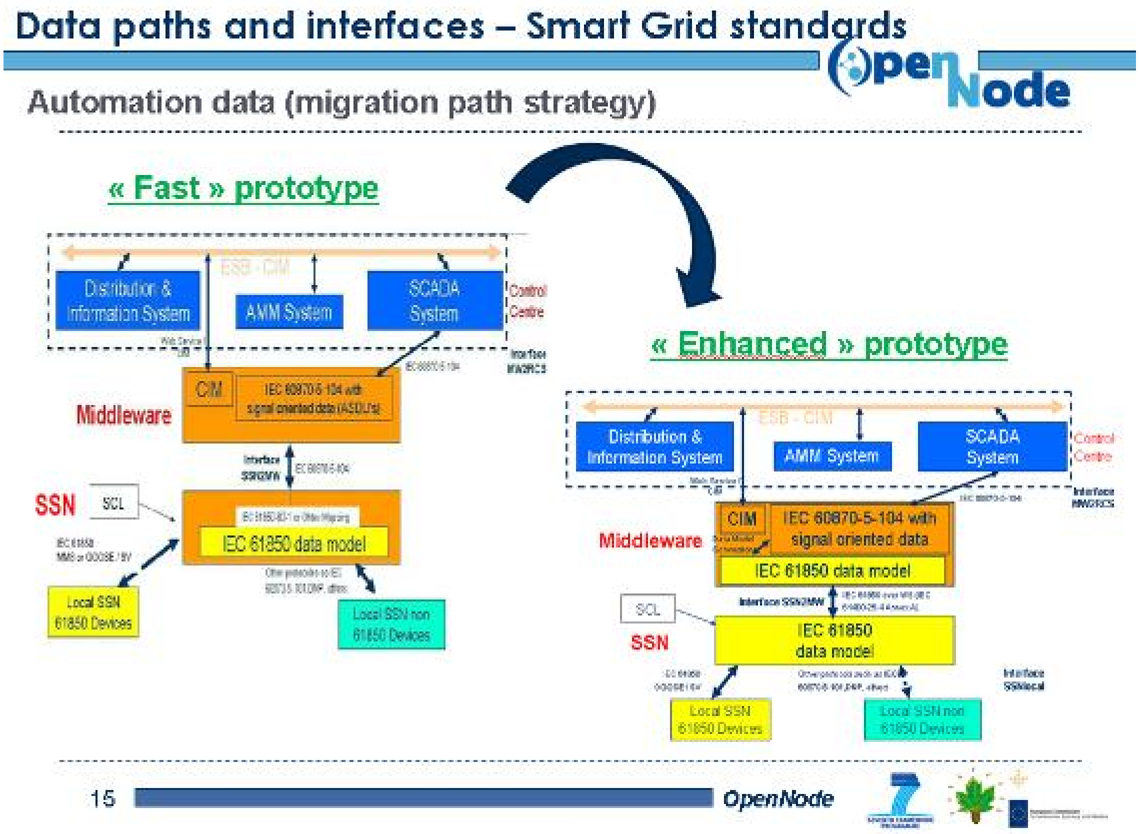


Figure 101: OpenNode – Interfaces

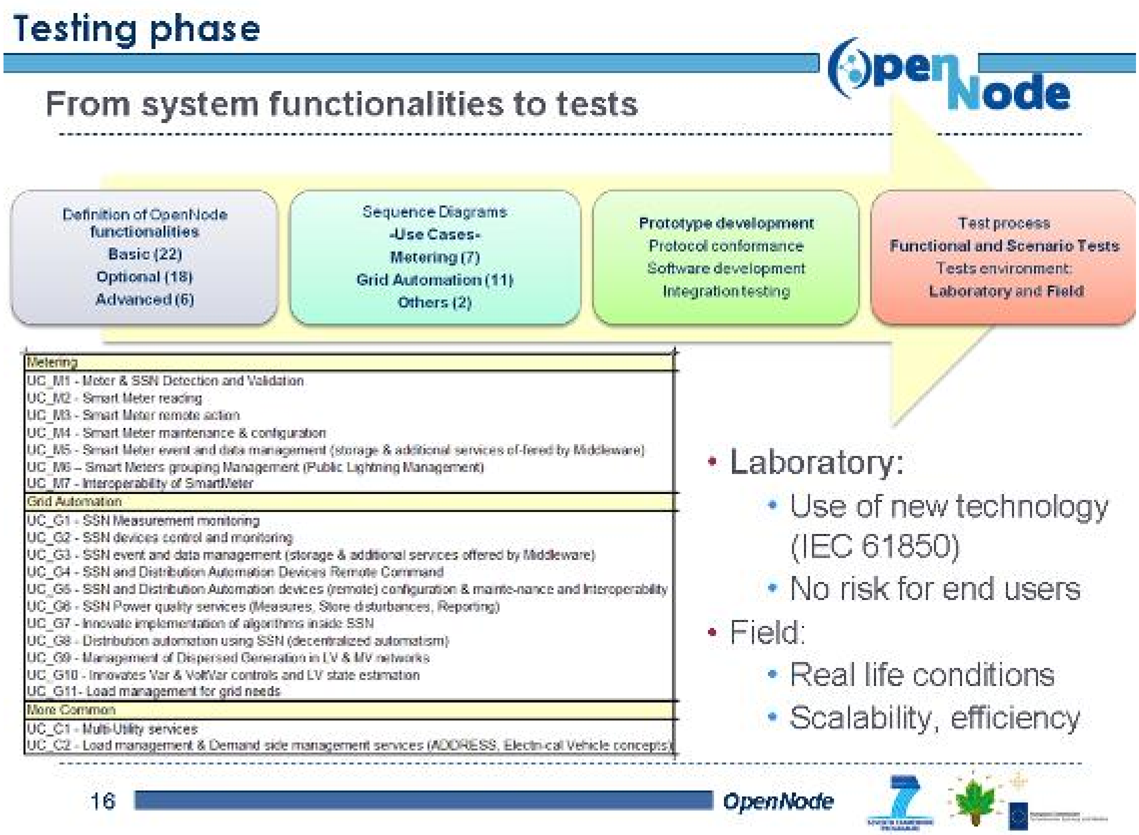


Figure 102: OpenNode – Testing

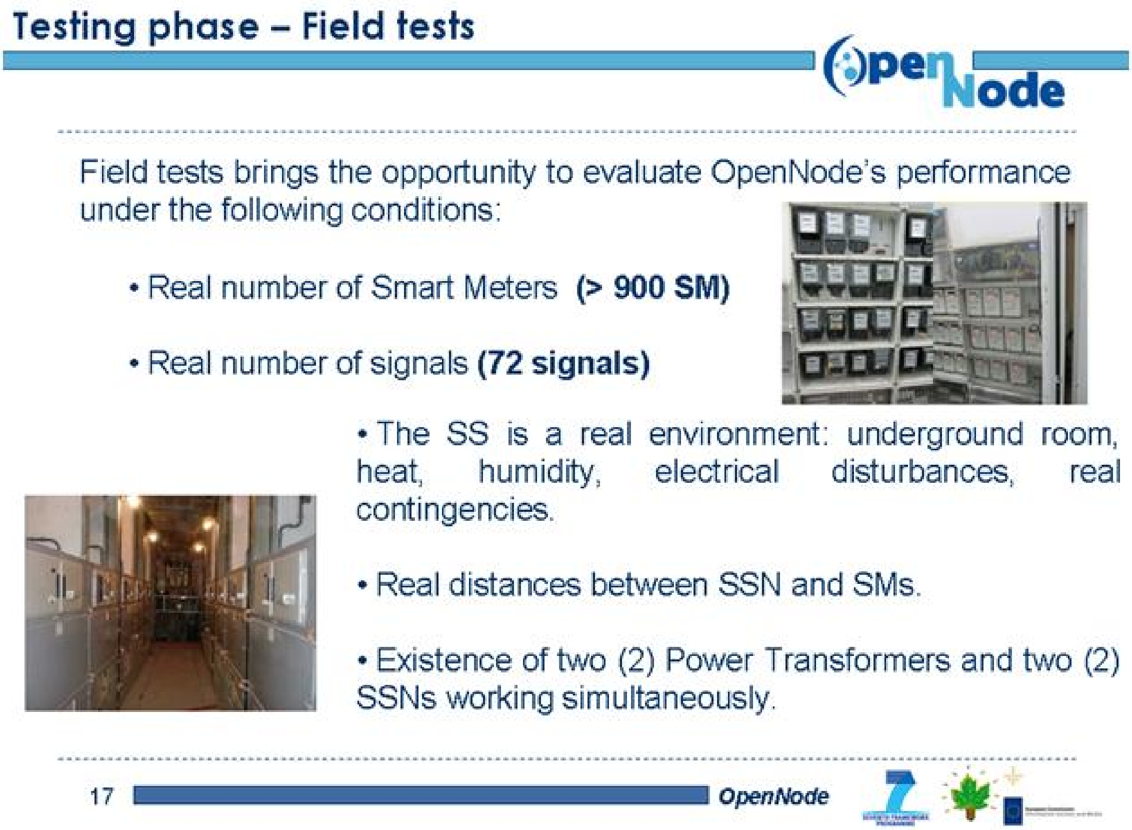


Figure 103: OpenNode – Trial

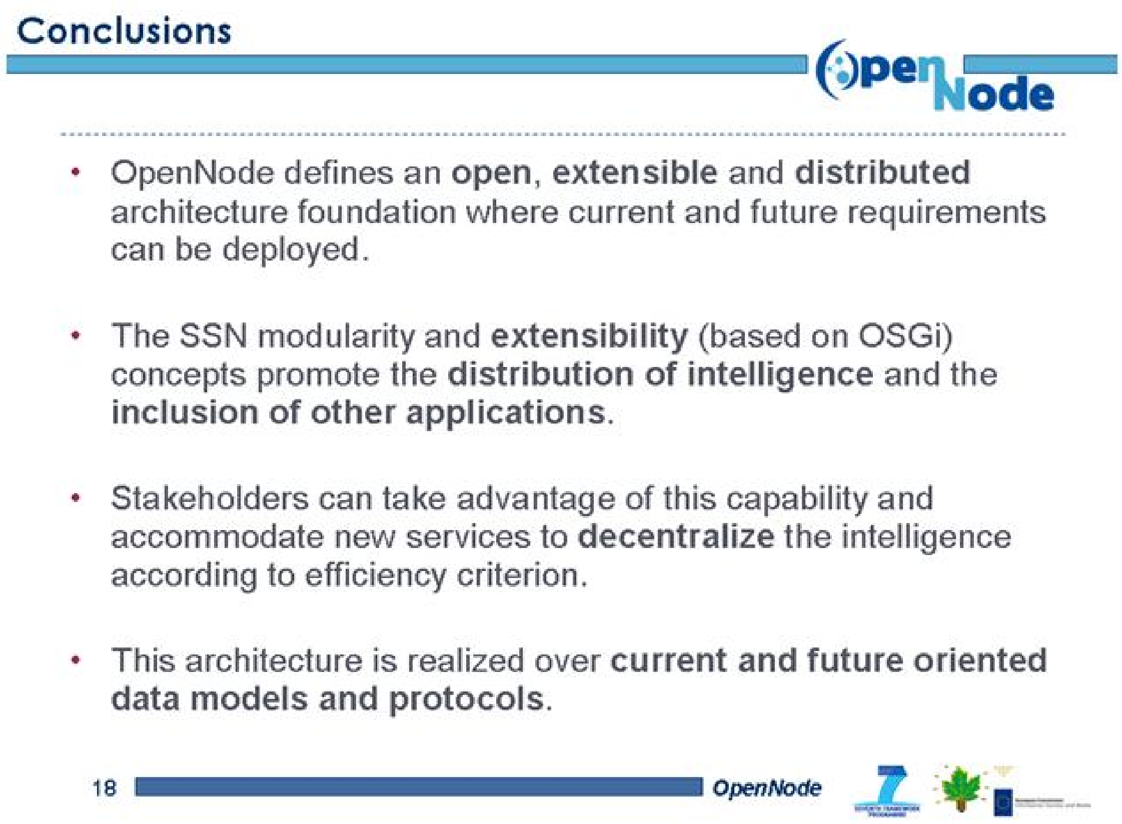


Figure 104: OpenNode – Conclusion

Figure 105: OpenNode – Presenter

2.10 ESB Trial Experiences in E-Mobility and Smart Metering - Mark Daly, ESB

Presenter: Mark Daly, ESB

In order to offer an exchange of information from a live ecar field trial the company ESB presented the ecar project realized in Ireland and additionally their experiences from the smart meter rollouts.

ESB established ESB ecars in 2010 in order to roll out a charging infrastructure for electrical cars across Ireland. ESB ecars is the single owner and operator for an ecar charging infrastructure in Ireland. Charging spots across the country and in homes were built, operated and maintained. Ireland is an ideal candidate for ecar projects on the condition of

- a small country
- high level of wind power plants
- a government support
- single provider setup
- and a high level of home ownership

Figure 109 highlights the ESB ecar program and the target to get 10% ecars of all 2 million running cars in Ireland implemented until 2020. Currently up to 30.000 ecars are supported with the installed charging infrastructure. The target for the infrastructure is to install 2,000 home charge points, 1,500 public charge points and 30 fast charge points nationwide. Like Figure 110 documents the infrastructure installation progress of the project can be tracked on a public available electric car charge point map via a mobile App for Apple OS or Android. The charging points offers different charging duration:

- @Home/@Work about 6-8 hours based on 16A
- @Public about 1-6 hours based on 32A
- @FastStations about 20-20 minutes based on 50kW DC Stations

As charging connector currently only the Mennekes Plug is used.

The electric mobility is just one piece of the electric infrastructure (consumer/storage). Like Figure 112 shows the power generation (wind farms or microgrids), the smart power distribution, the charging and billing process and the operation/maintenance of the infrastructure forming a complex integrated e-mobility infrastructure. Like documented in Figure 114 and Figure 115 a significant load shift can already be recognized. A context aware smart charging takes traffic load, weather information or personal diary data into account.

In addition to the e-mobility experiences also Smart Meter Trial Experiences were presented by Mark. With the smart meter roll out a shift of 8,8% peak load and an overall energy reduction of 2,5% could be achieved. And the in-house customer display achieved a peak shift of about 11%. (Figure 121)

In the questions & answers session questions on battery lifetime and the requirements on the communication infrastructure were discussed. The battery life is about 8-10 years if the charging range stays between 20% and 80% of the battery capacity. The used mobile infrastructure is 2G/3G and efficient for the ecar trial by the reason that no time critical data must be transport via a high speed mobile infrastructure.

Figure 106: ESB - Title

Figure 107: ESB – Introduction

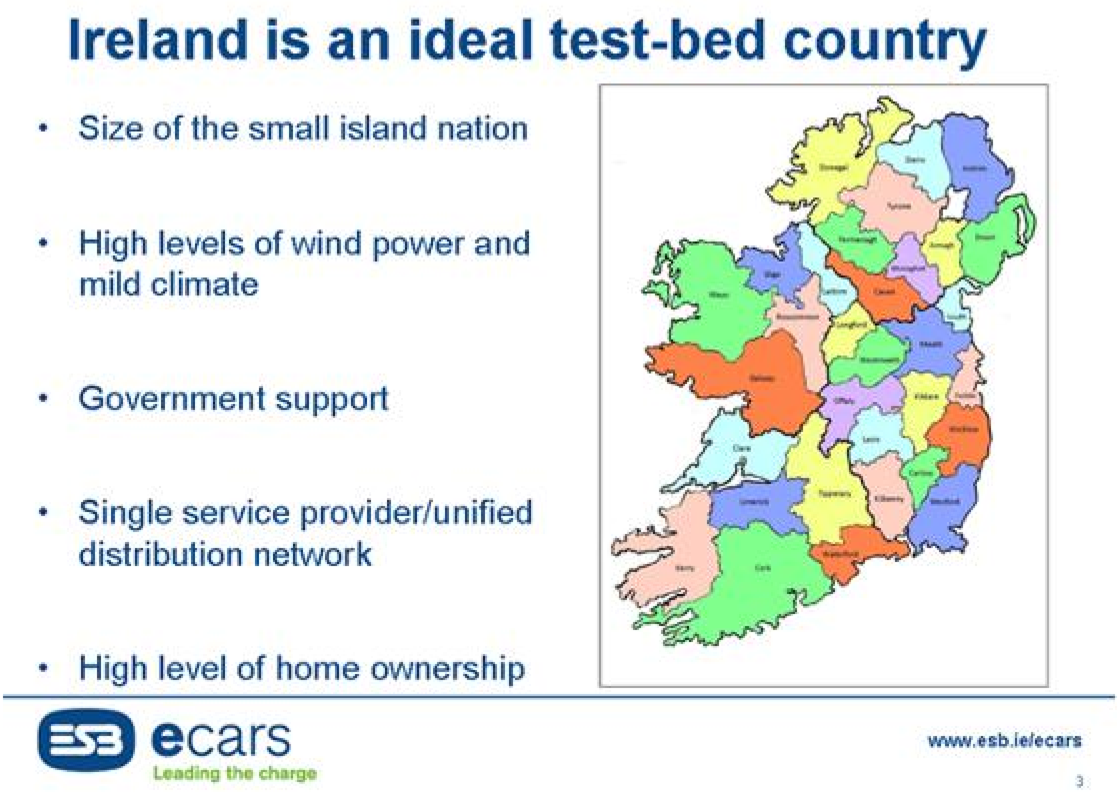


Figure 108: ESB – Test bed

Figure 109: ESB – Ireland Program

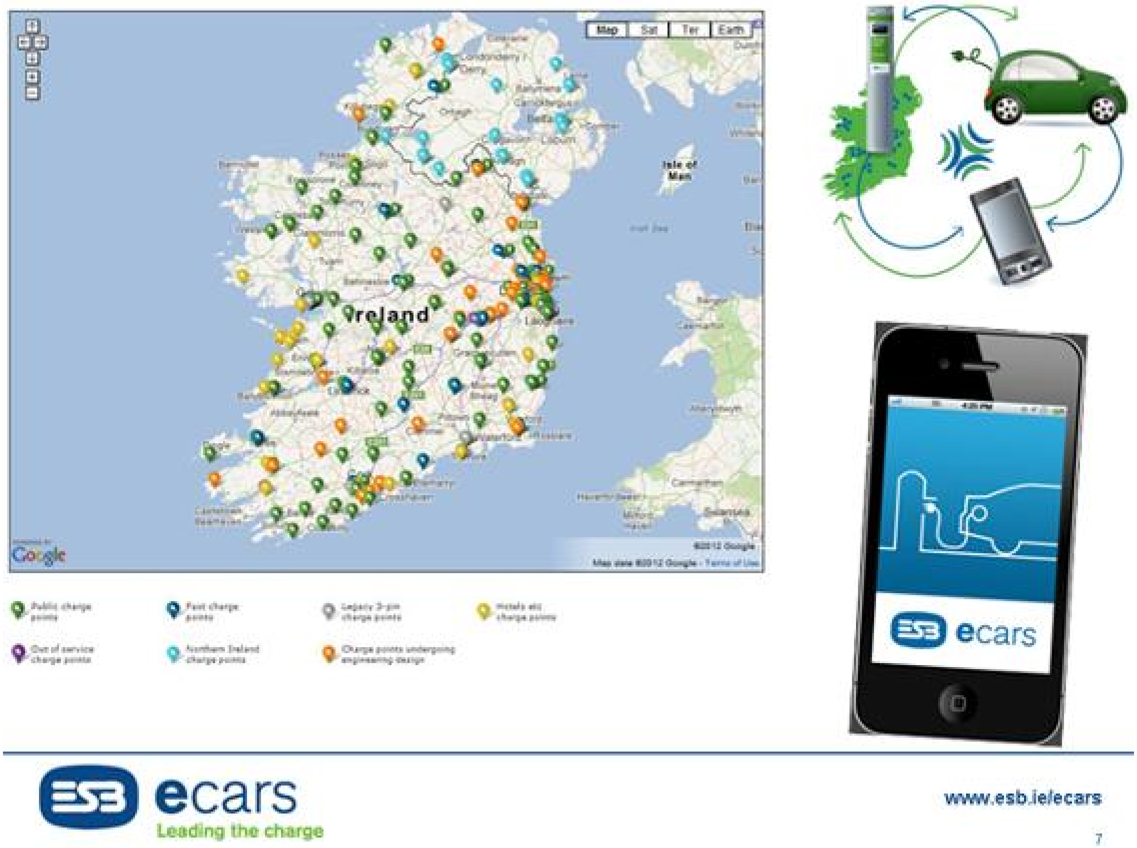


Figure 110: ESB – Charging Spots

Figure 111: ESB – Standards

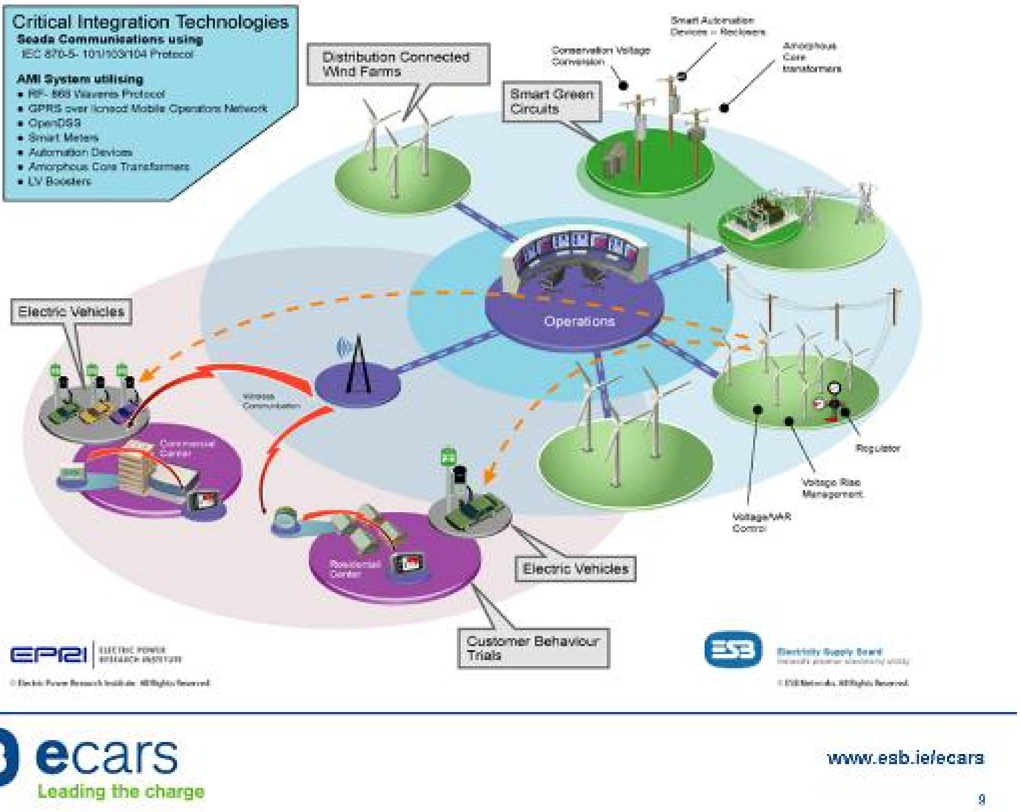


Figure 112: ESB – Operation

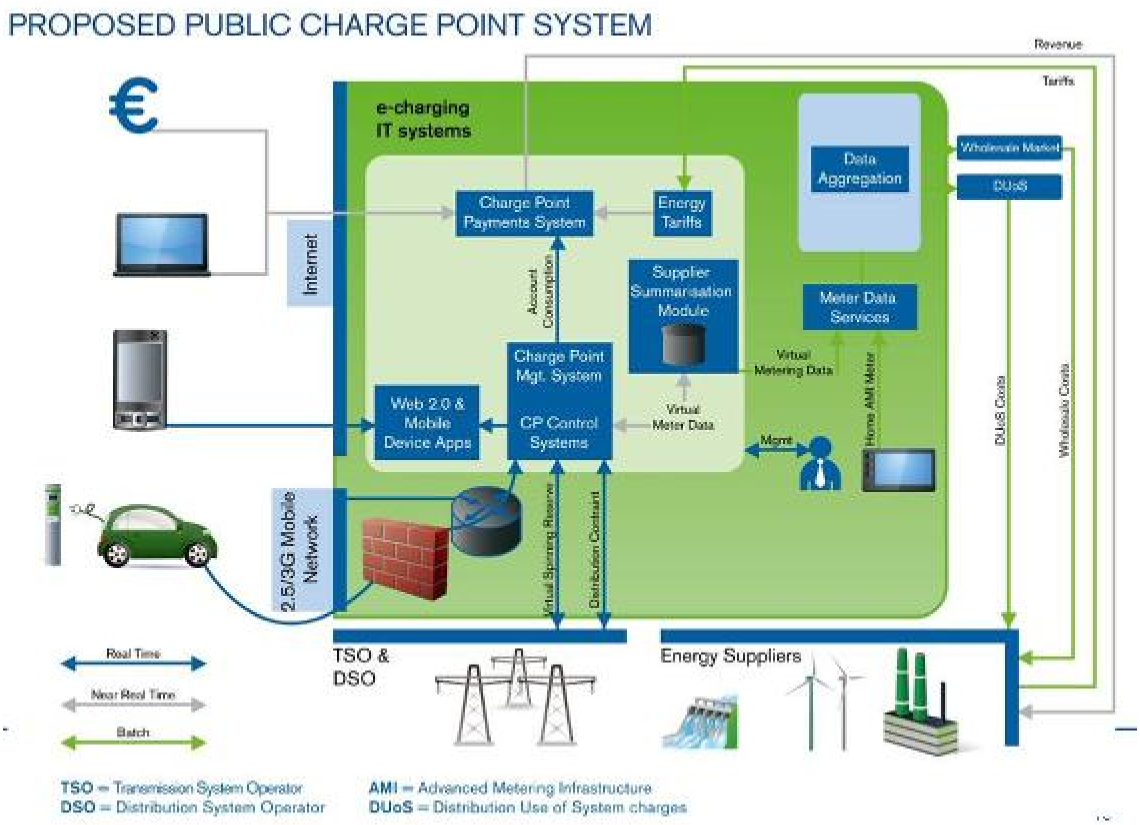


Figure 113: ESB – Public Charge Points

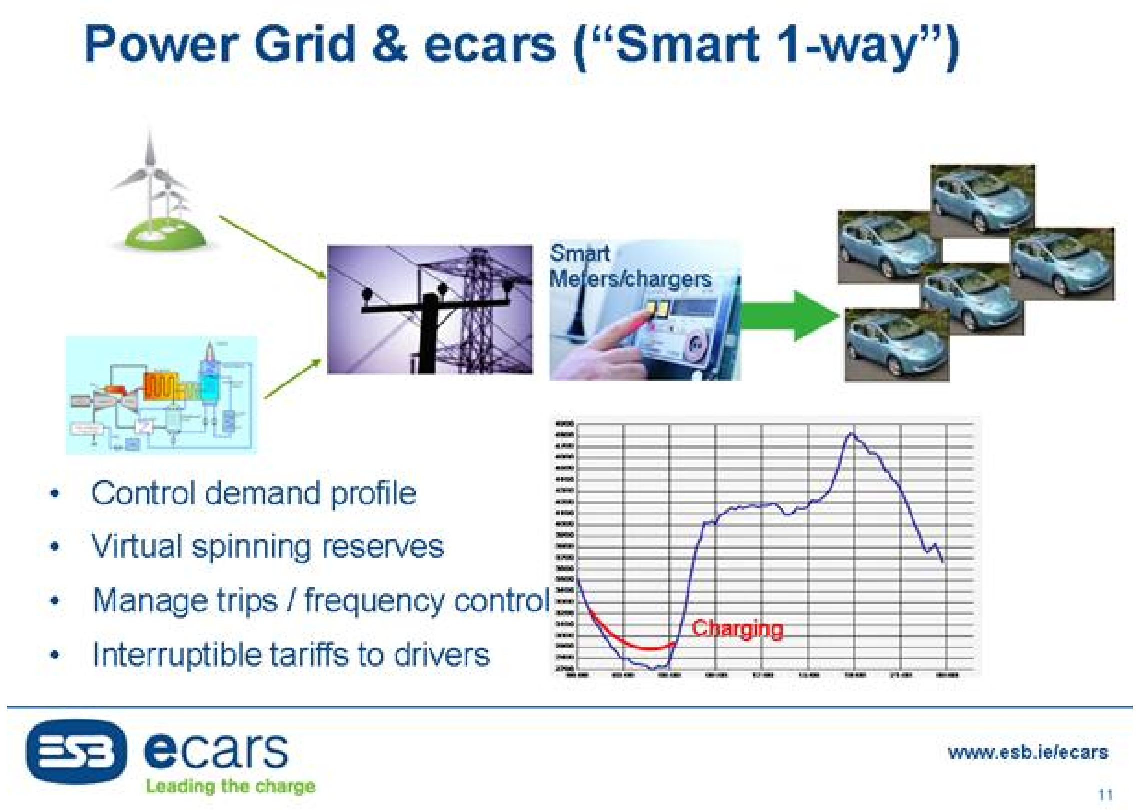


Figure 114: ESB – Power Grid & eCars

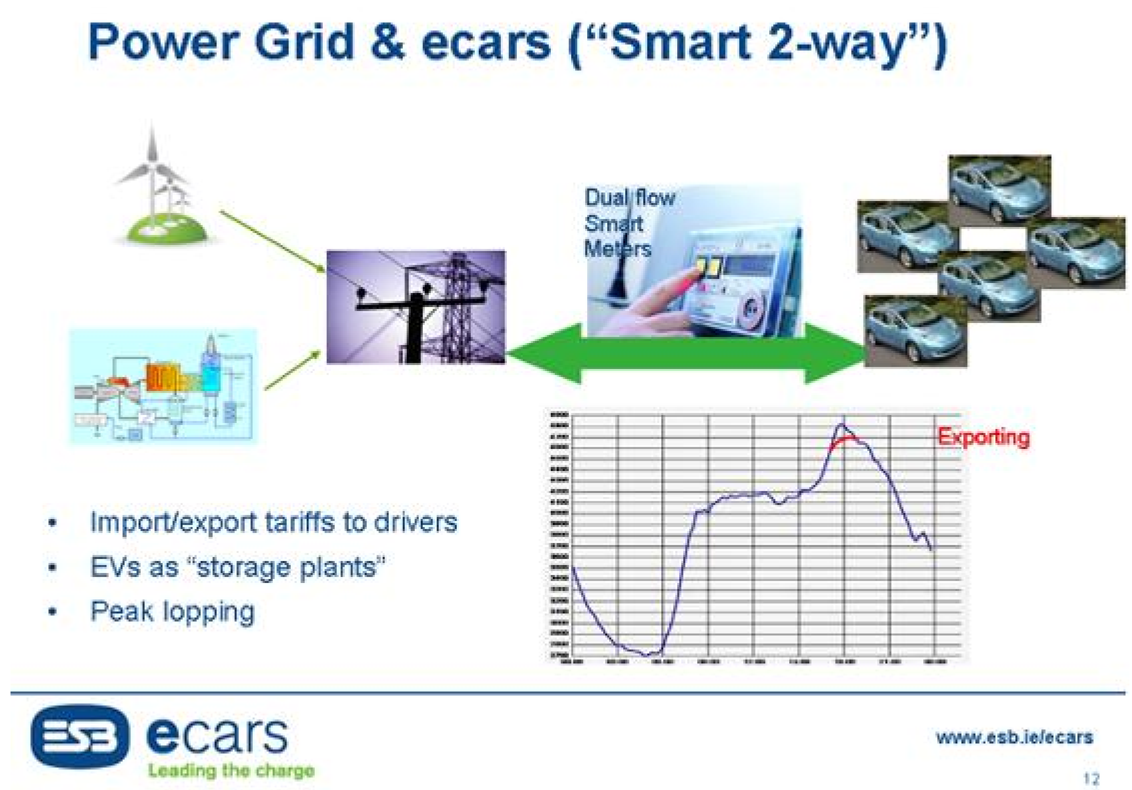


Figure 115: ESB – Smart 2-way

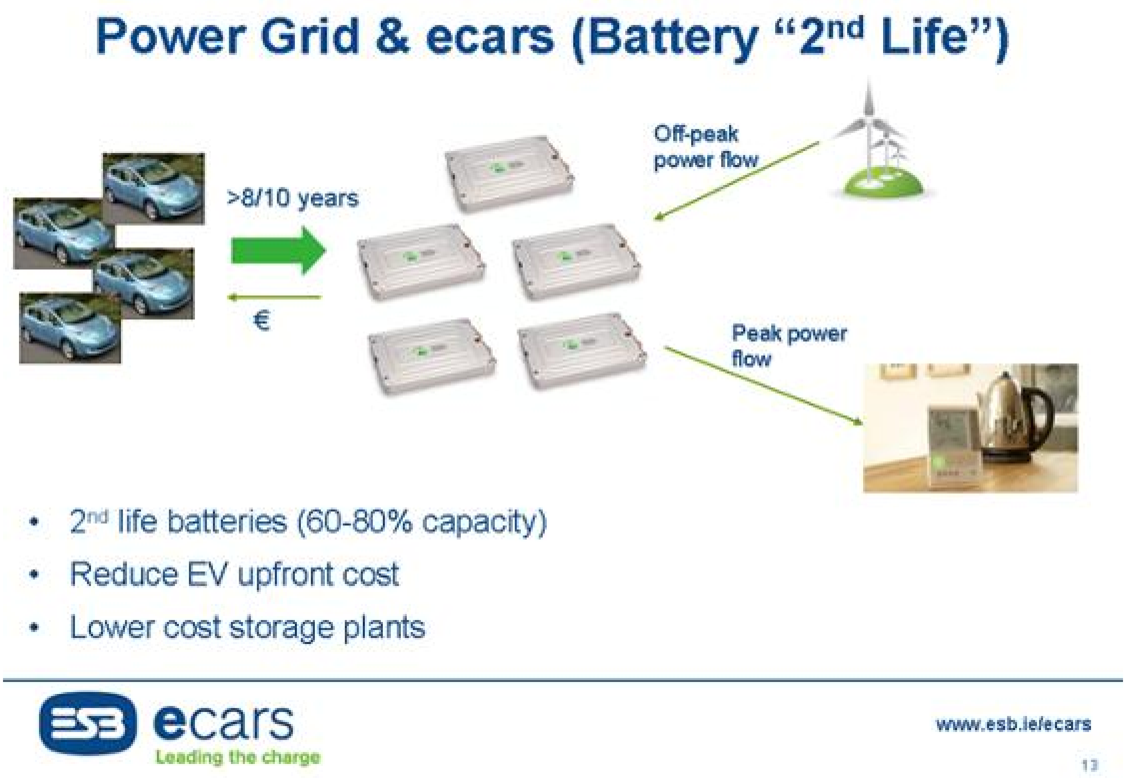


Figure 116: ESB – Battery 2nd Life

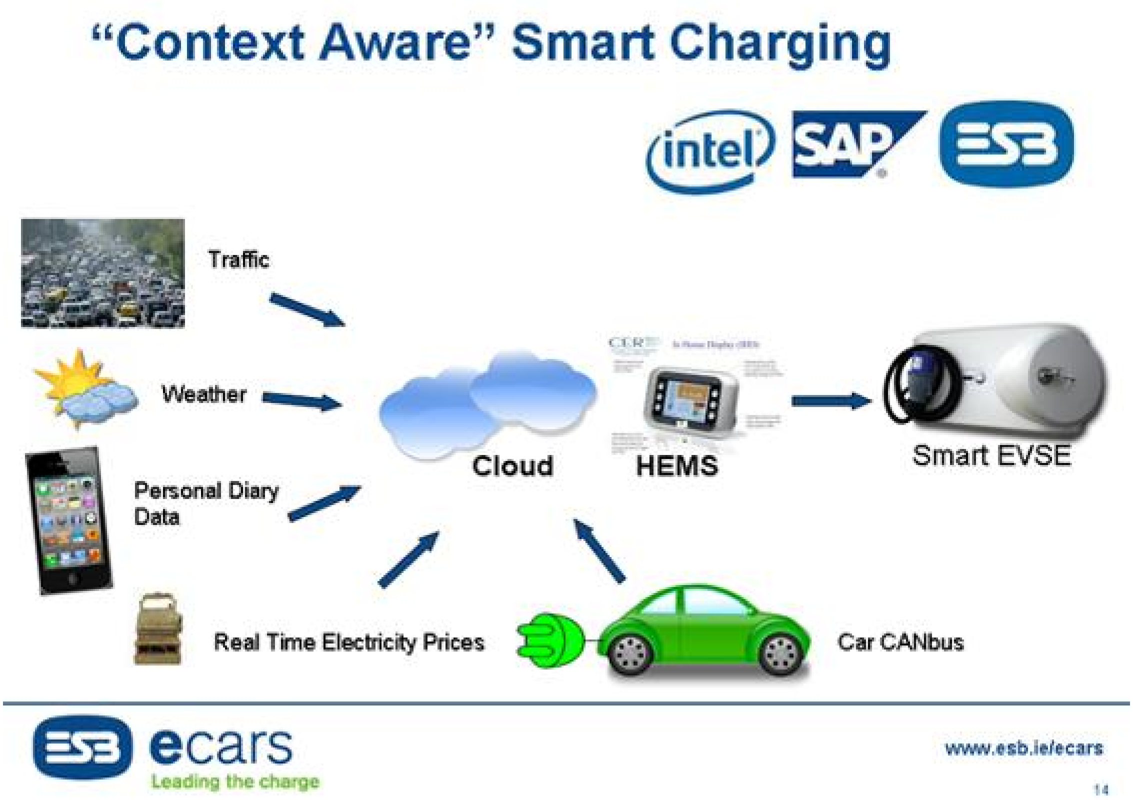


Figure 117: ESB – Smart charging

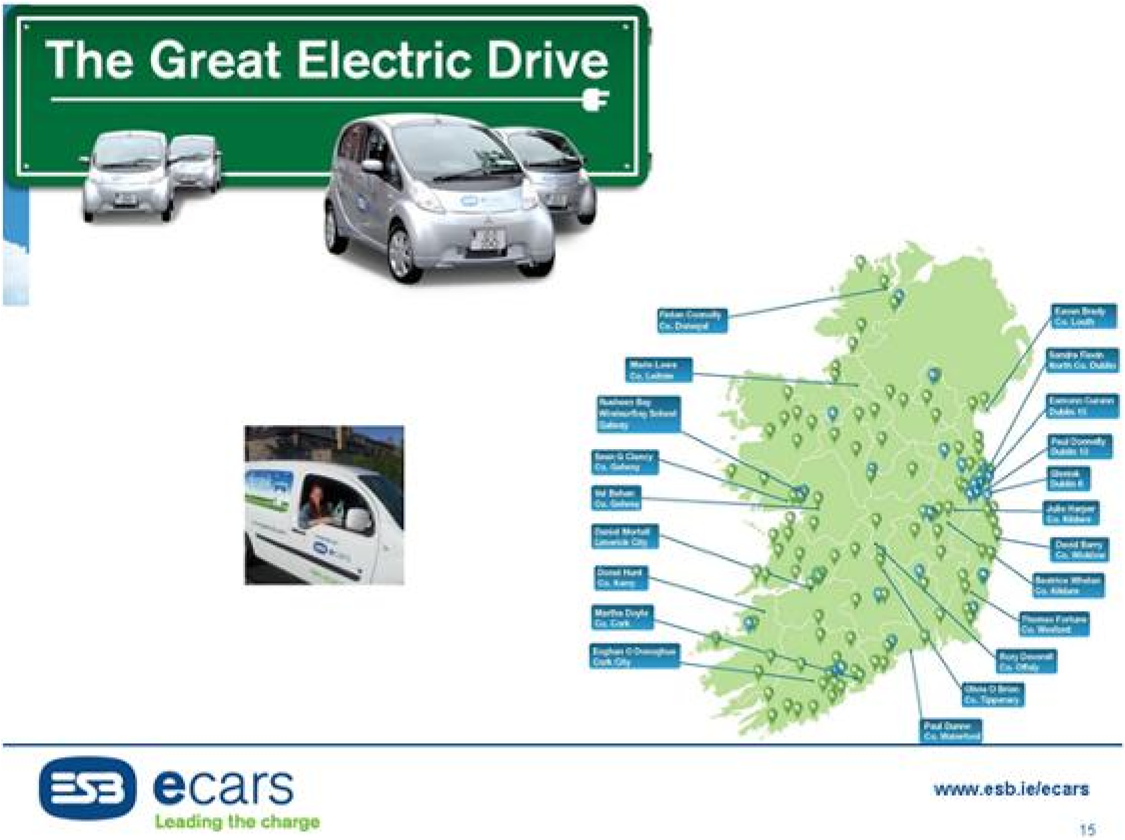
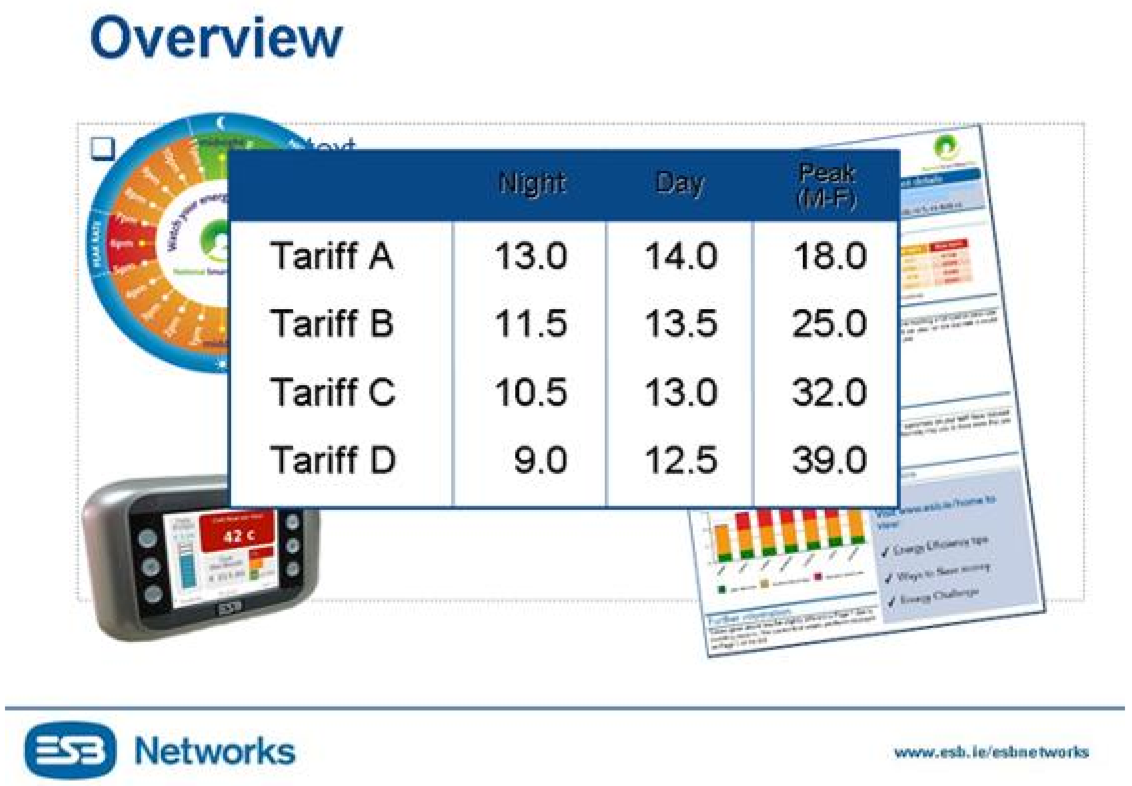


Figure 118: ESB – Electric Drive

Figure 119: ESB – Smart Meter Trial



	Night	Day	Peak (M-F)
Tariff A	13.0	14.0	18.0
Tariff B	11.5	13.5	25.0
Tariff C	10.5	13.0	32.0
Tariff D	9.0	12.5	39.0

Figure 120: ESB – Overview

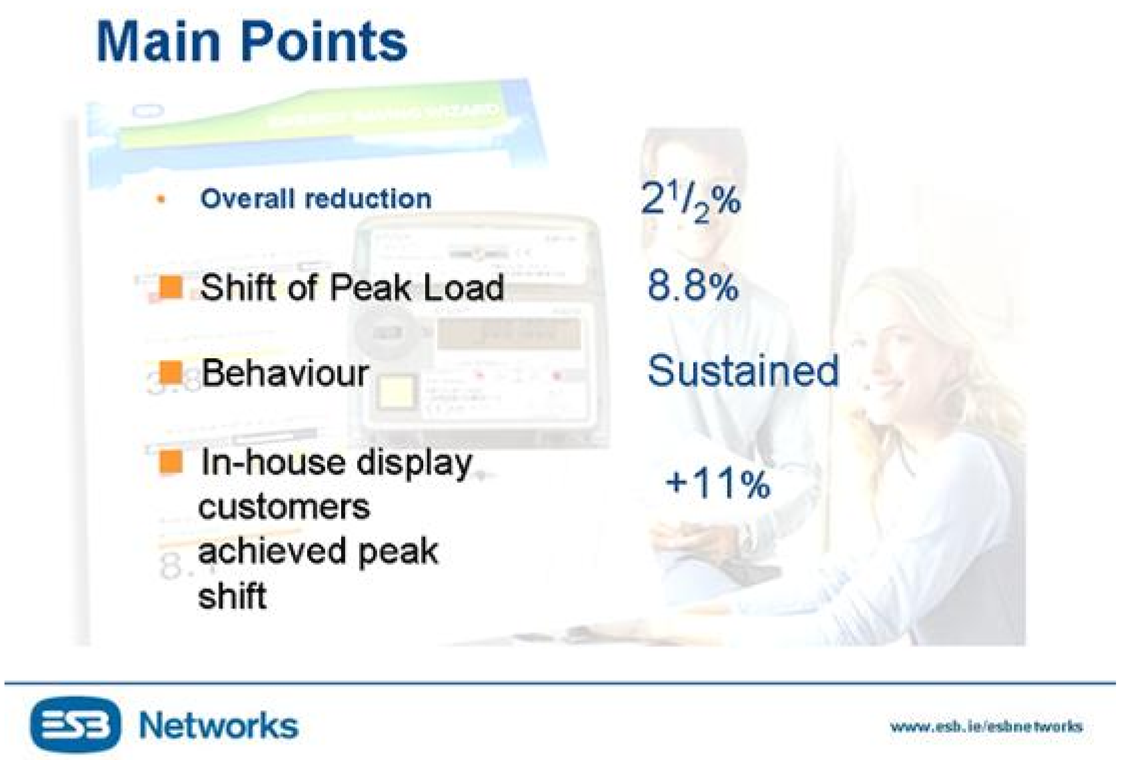


Figure 121: ESB – Smart Meter Trial main Points

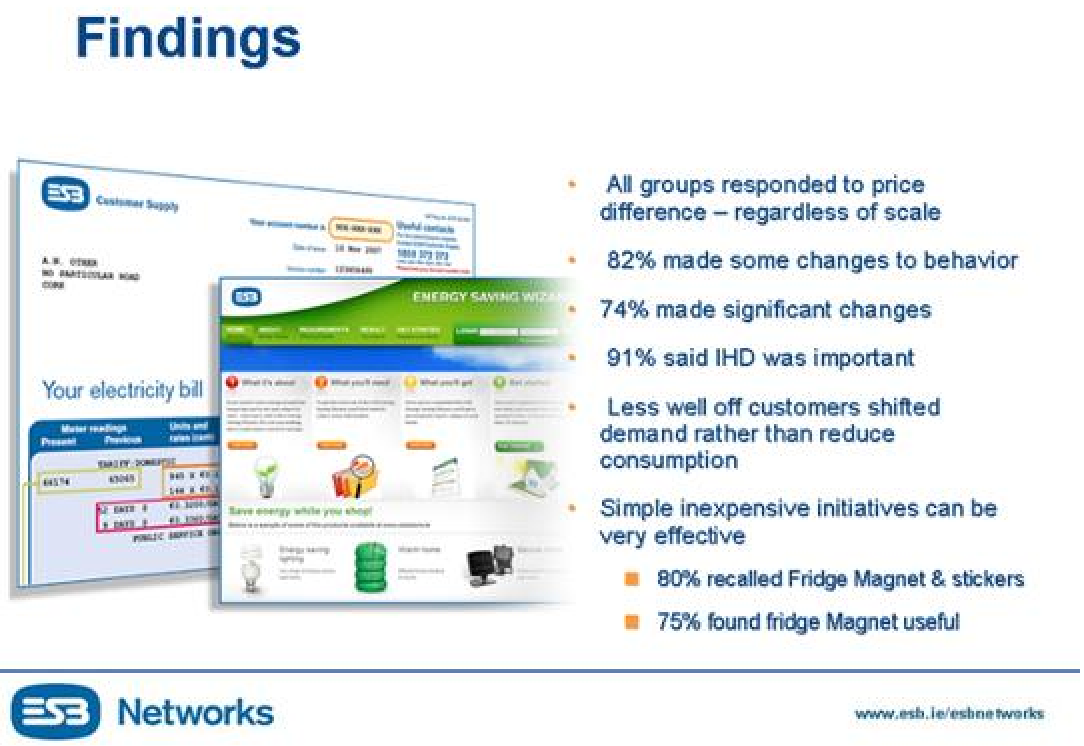


Figure 122: ESB – Findings

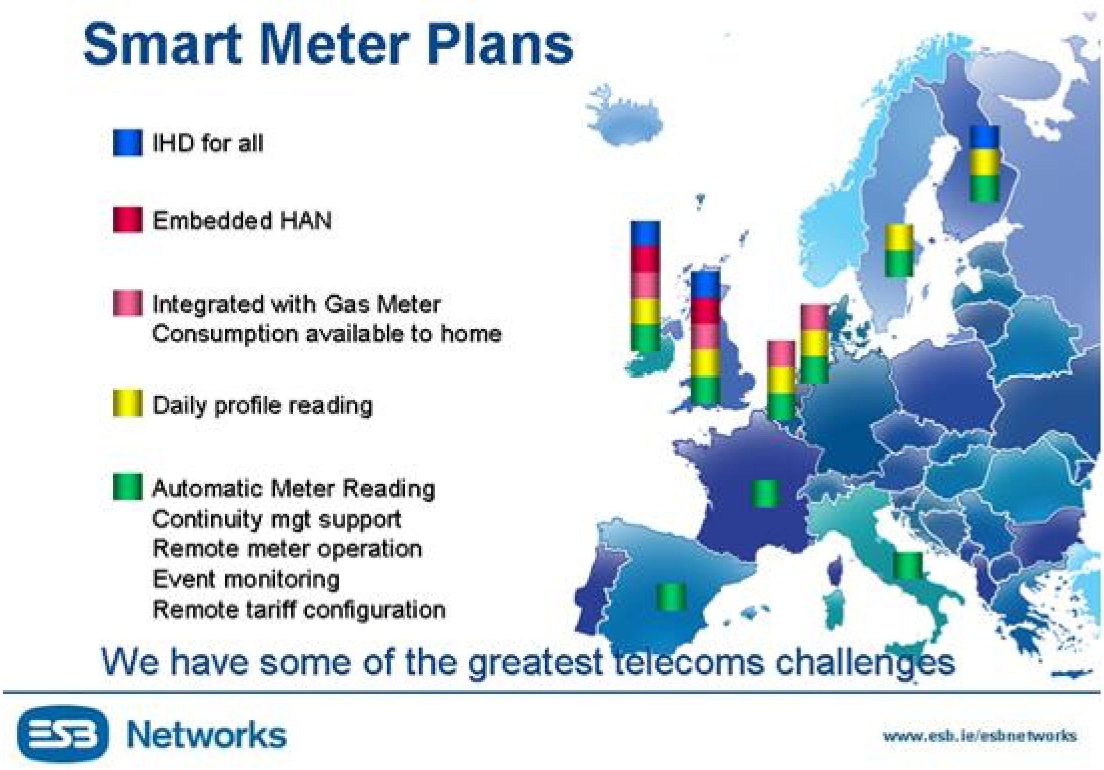
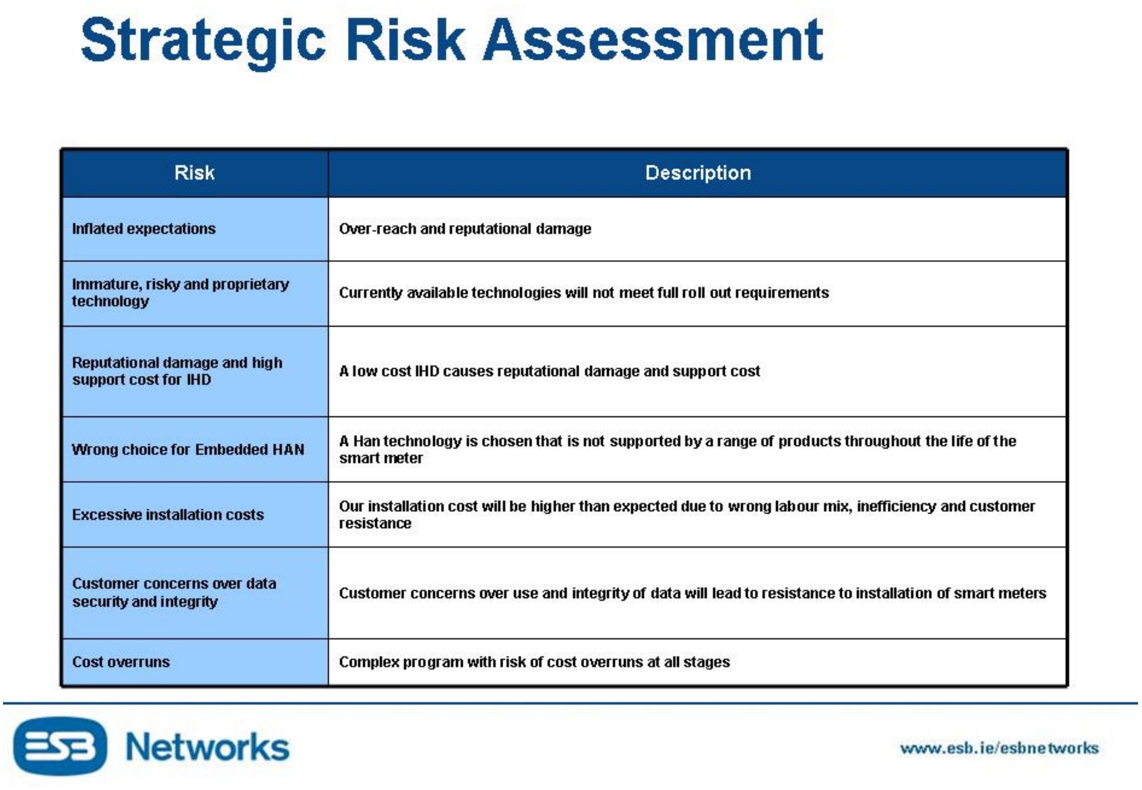


Figure 123: ESB – Smart Meter Plans



Strategic Risk Assessment

Risk	Description
Inflated expectations	Over-reach and reputational damage
Immature, risky and proprietary technology	Currently available technologies will not meet full roll out requirements
Reputational damage and high support cost for IHD	A low cost IHD causes reputational damage and support cost
Wrong choice for Embedded HAN	A Han technology is chosen that is not supported by a range of products throughout the life of the smart meter
Excessive installation costs	Our installation cost will be higher than expected due to wrong labour mix, inefficiency and customer resistance
Customer concerns over data security and integrity	Customer concerns over use and integrity of data will lead to resistance to installation of smart meters
Cost overruns	Complex program with risk of cost overruns at all stages

Networks
www.esb.ie/esbnetworks

Figure 124: ESB – Risk Assessment

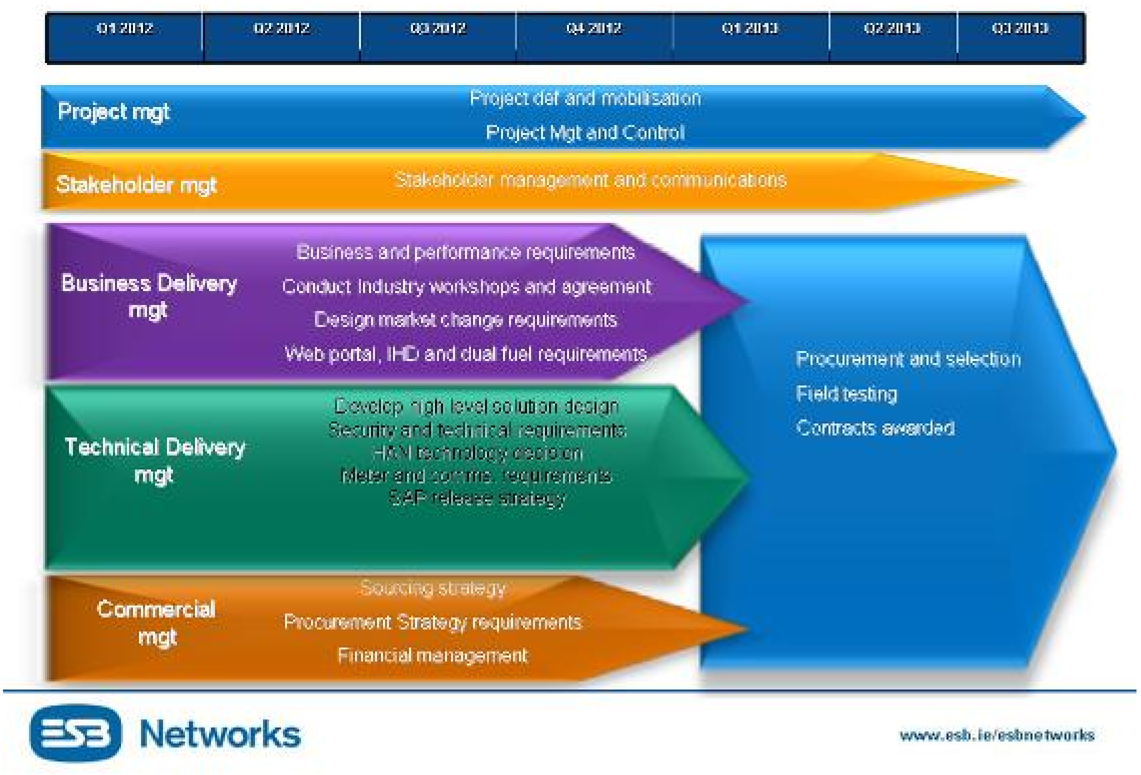


Figure 125: ESB – Mgt Plan

Figure 126: ESB – eCar Trial

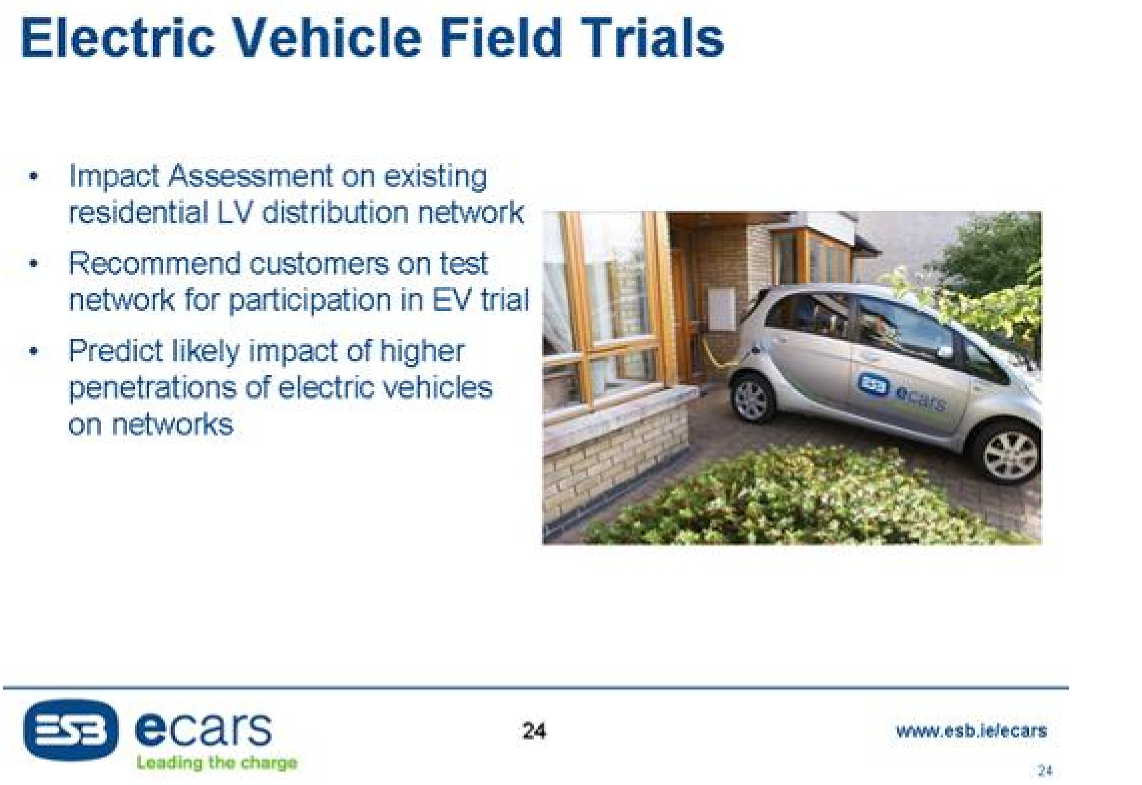


Figure 127: ESB – eCar Trial Field Vehicles

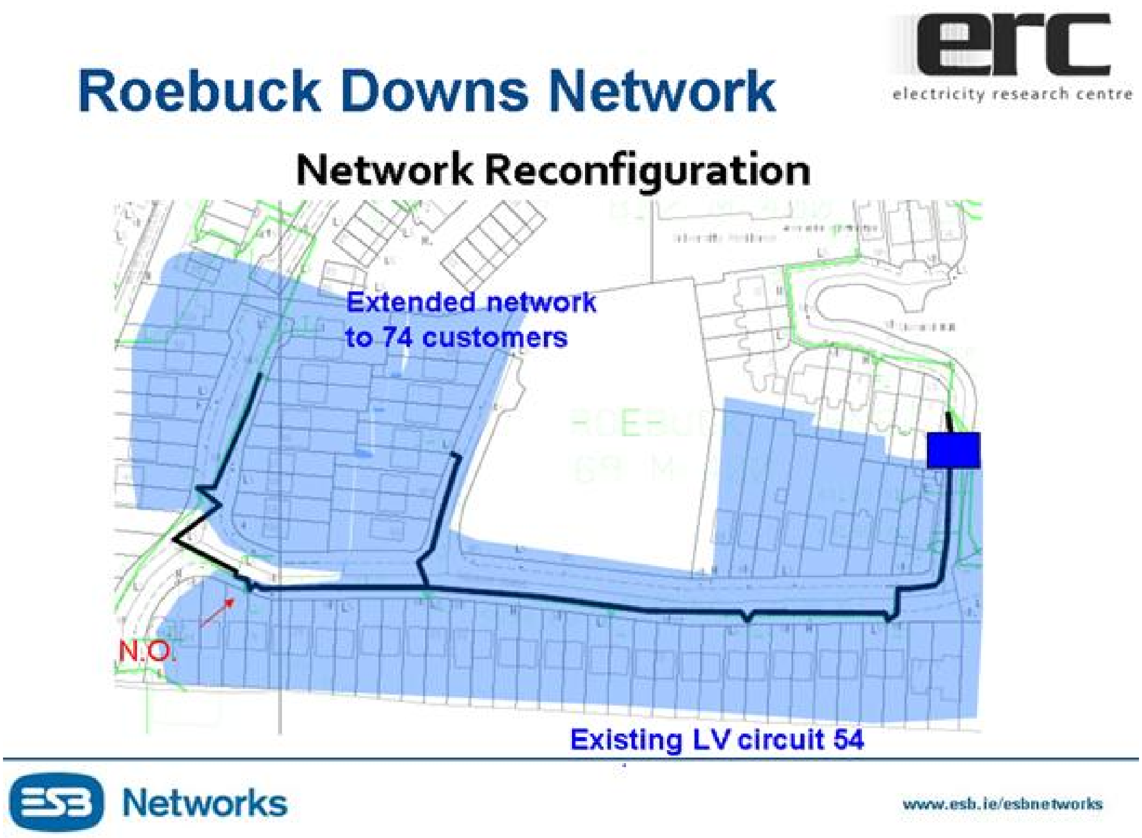


Figure 128: ESB – Networks

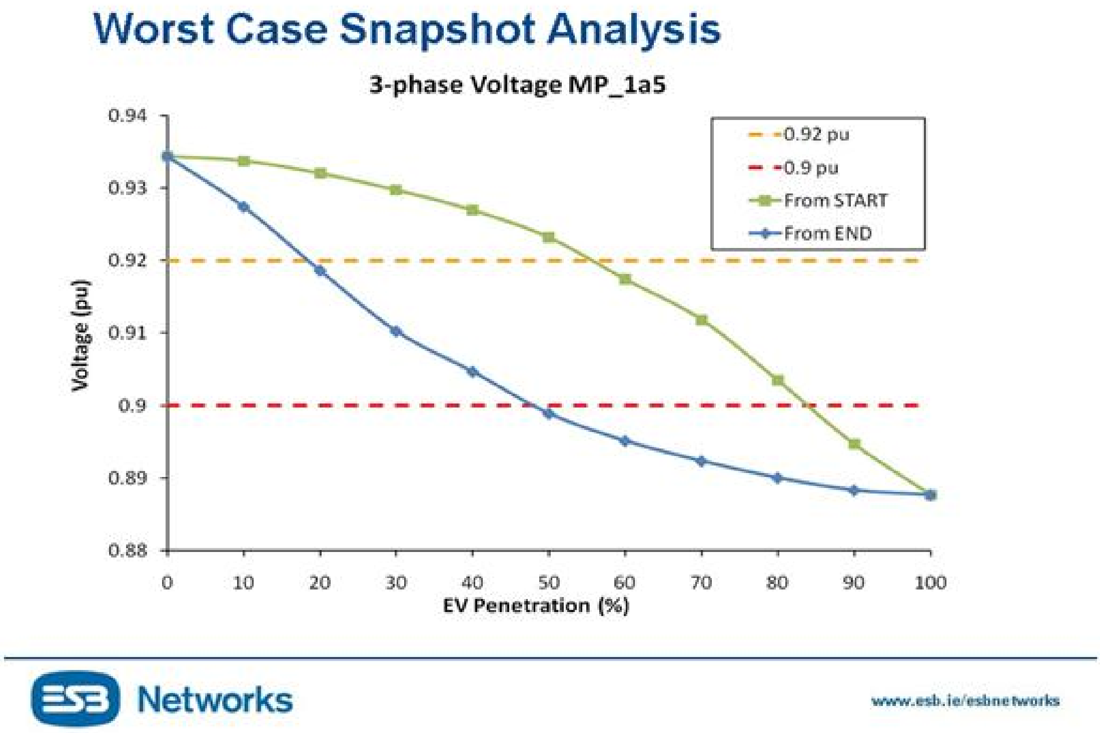


Figure 129: ESB – Worst Case Snapshot

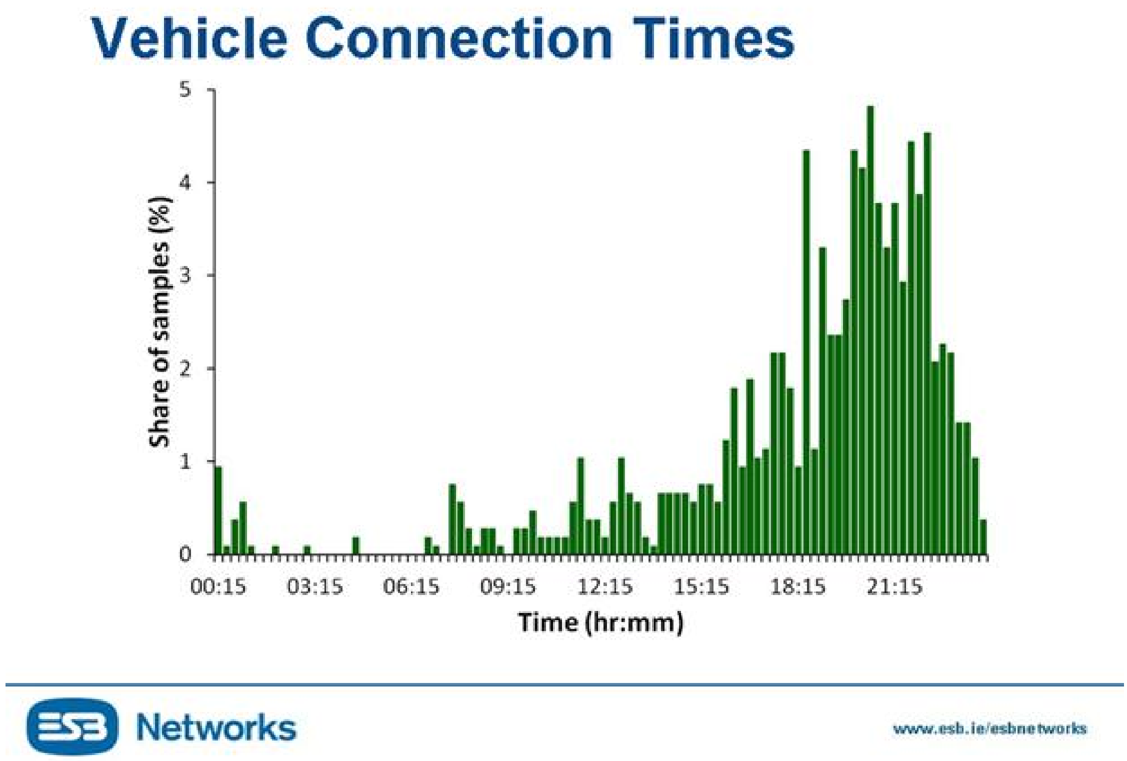


Figure 130: ESB – Connection Time

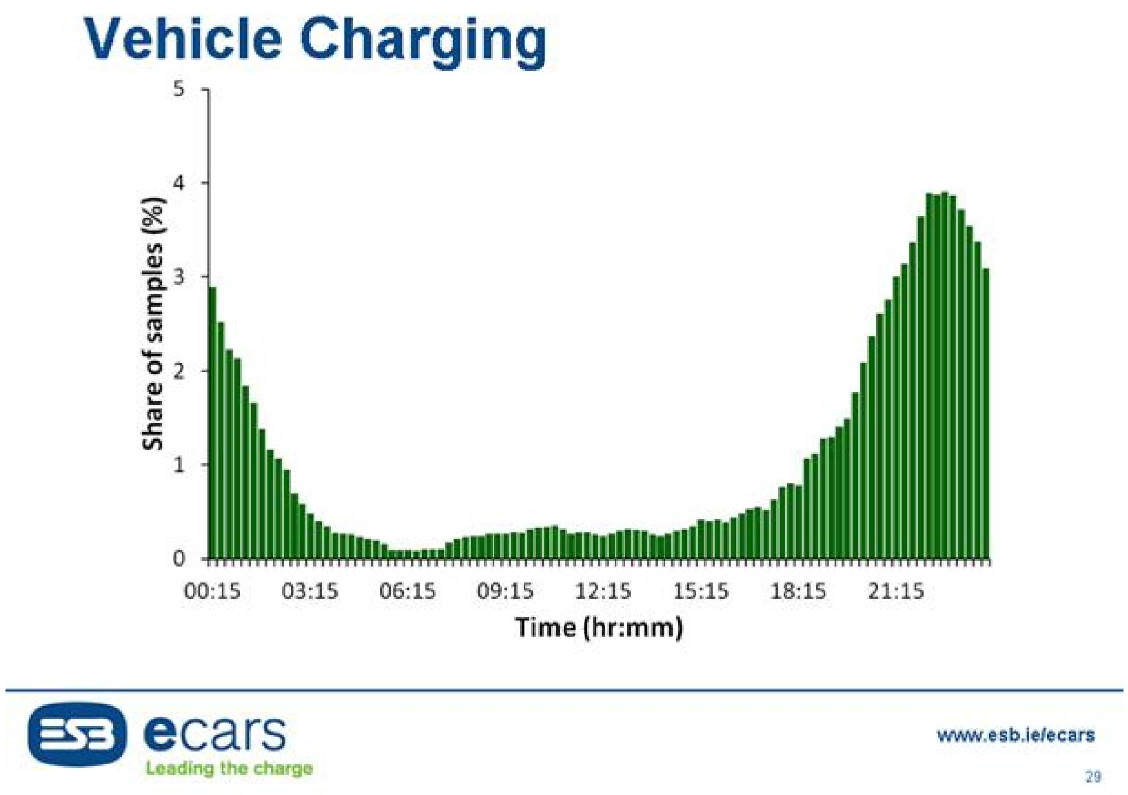


Figure 131: ESB – Charging Time

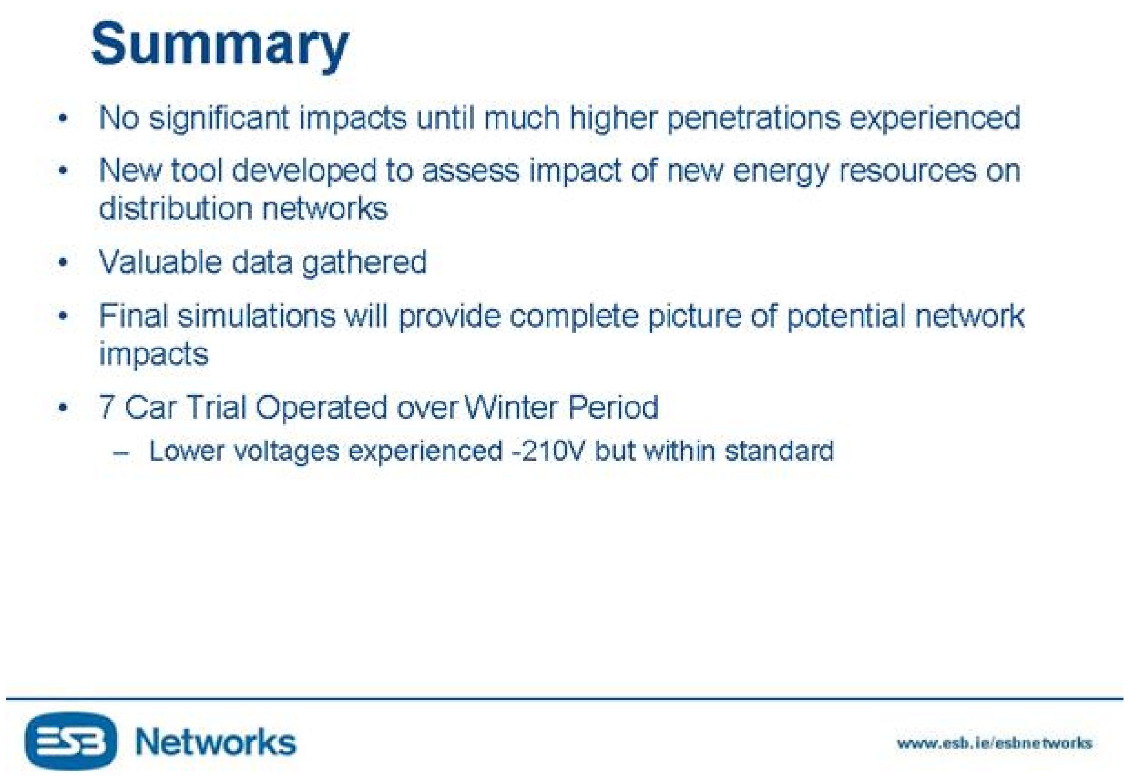


Figure 132: ESB – Summary

2.11 Open time-slot for presentations of SGSG members & AOB

In the open time slot for SGSG members George Huitema presented shortly two upcoming research opportunities in which he is involved.

Furthermore, Kolja Eger presented feedback of FINSENY to the recommendations of the last SGSG meeting. Further details are provided in the next section.

3. Recommendations from the 6th SGSG

This section briefly outlines how FINSENY has taken the recommendations from the last SGSG meeting into account. The following recommendations have been derived during the 6th SGSG meeting:

Recommendations from break-out session Security

- Privacy as important topic in Smart Grid needs a wider scope within the ICT requirements of FINSENY

Recommendations for break-out session SLA (Service Level Agreement)

- Provide a clear definition of SLA able to take into account possible differences that are expected between countries, between B2B and B2C, between each party point of view (consumers, producers, regulators, …)

- Define a list of Classes of Services with each class defined as a list of parameters and expected parameter values (e.g. delay < 20 ms, 99.9% of time) and each class related to a specific use case. Compare such a list with QoS used and requested by top runners in the world. Socialize such a list with SGSG members before the next meeting and have then a discussion

Recommendations from break-out session Interoperability & Auto-Configuration

- Interoperability at service layer is most challenging and a preferred topic for further detailed studies

- Interface CEMS<->Aggregator is very important in many Smart Grid use cases but not clear defined. FINSENY could study this domain interface between Smart Grid and Smart Home in more detail.

3.1 Feedback on recommendations

FINSENY has taken the recommendations by the SGSG into account. They are already addressed in the newest or upcoming deliverables. In detail the feedback is

R1: Privacy

On the basis of the different data-privacy legal frameworks examined in detail in D1.10 (Europe, Germany, UK), it is obvious that data-privacy protection in smart grids cannot be achieved by a single measure only, but with a catalog of organizational and technical measures.

On the one hand, organizational measures include, for example, the comprehensive information of data subjects (e.g. customers) about the use of their personal data, their qualified agreement to the processing, procedures to respond to personal data copy requests, to rectify and erase data and to block data processing, the obligation to data secrecy for any person in contact with personal data (e.g. staff), privacy awareness training for staff, or blinded installation.

On the other hand, technical measures comprise not only standard IT security measures like, e.g., user authentication, authorization, access control, and encryption methods, but also specific privacy protection methods like, for instance, de-identification, transparency measures (e.g. visualization of personal data processed), and functionalities to erase data reliably or to stop data processing if desired by the customer.

These measures will be described in further detail in D1.11. In this process, the approach of “privacy by design” will be favored.

R2: SLAs

WP5 addresses this topic in general as well as in particular for the E-Mobility scenario. Further information is available in SGSG Infobase on

- SLA Definition
- SLA Contents and related terms
- SLA Management
- Service Levels and Telco metrics
- SLA focus in FINSENY
- SLA Requirements in FINSENY

A presentation can be found in the Infobase of the Smart Grid Stakeholder Group (https://overseer1.erlm.siemens.de/repository/Document/downloadWithName/FINSENY_FeedbackOnRecommendations_SLAs.pptx?reqCode=downloadWithName&id=6566714).

R3: Classes of Service

WP3 proposed a first version of Classes of Services for the Microgrid/VPP scenario on communication over WANs:

Service class	Name	Type	Parameter	Value/range	Examples for use cases which need the service
Service Class 1	Safety critical	Control Loop	Priority Latency Data occurrence Bandwidth / Data volume *) Communication Redundancy	highest < 10 -100 ms spontaneous (on failure in energy system) <1500 Byte Unicast/multicast needed for communication	Fault Location Isolation and Service Recovery, Intelligent load shedding
Service Class 2A	Operational critical	Control	Priority Latency Data occurrence Bandwidth / Data volume *) Communication Redundancy	medium < 1s spontaneous (on request of operator or action from SCADA) <1500 Byte Unicast redundancy in energy system (multiple devices can provide a similar service)	Control reserve, Volt/Var Control
Service Class 2B	Operational critical	Monitoring	Priority Latency Data occurrence Bandwidth / Data volume *) Communication Redundancy	medium < 1s periodically < 100kbps unicast redundancy in energy system (multiple devices can provide a similar service)	
Service Class 3	Synchronisation	Management	Priority Latency Data occurrence Bandwidth / Data volume *) Communication Redundancy	high < 100ms spontaneous and periodically < 100kbps Unicast/multicast needed for communication	Time synchronization
Service Class 4	Background traffic	Management	Priority Latency Data occurrence Bandwidth / Data volume *) Communication Redundancy	low best effort spontaneous and periodically best effort unicast no	Day-ahead price signals, Logging, Configuration, Post event analysis

*) Note on BW/Data volume: for spontaneous communications data volume is defined, for periodic bandwidth

The results from different other projects was taken into account

- SG-CG RAWG 1.0 (Annex J)
- IEC 61850-5
- EU project OpenNode
- NASPInet
- EPRI
- PSERC

Furthermore, the work was aligned with other FINSENY scenarios (esp. distribution networks).
Deliverable D3.3 “Microgrid Functional Architecture Description” will provide detailed information.

R4: Interoperability at Service layer

FINSENY follows the SGAM framework by SG-CG. This layered approach studies interoperability on all dimensions including dedicated function/service layer on top of the Smart Grid Plane. Interim results on functional architecture for FINSENY’s scenarios presented today show also results on service layer. Final deliverable on functional architecture will provide further details and will be publicly available.
Additionally, the FI-WARE platform also addresses service ecosystem in a dedicated chapter, see FI-WARE Applications/Services Ecosystem and Delivery Framework.

R5: Interface CEMS←→ Aggregator

FINSENY has provided use cases to the SG-CG Sustainable Processes WG, especially about the involvement of customers and integration of DERs. Interface between CEMS and Aggregator is addressed in all FINSENY scenarios. FINSENY studies information models and data flows in Task x.3 (Use Cases Functional Architectures) and will report results in Dx.3 (Use Cases Functional architecture description deliverables).

4. Conclusion

The 7th SGSG meeting presented the current status of different Smart Grid activities in Europe including OpenNode, activities by ESB and the newest results from FINSENY. Moreover, a demo was shown by the RegModHarz project. Also, a slot open for further contributions from the SGSG was available where upcoming research opportunities where presented.

The workshop provided interesting insight into different projects, several discussions during and after the presentations as well as in the breaks and a platform for information exchange on new collaboration opportunities, e.g. for Phase 2 in the FI-PPP.

The next SGSG meeting will be planned for spring/summer next year. As possible topics the final results of FINSENY could be presented and the new projects of Phase 2 in the FI-PPP could be introduced.

Last but not least, we like to thank all speakers and participants of the SGSG meeting for joining as well as all people who have supported the preparation of the meeting. Looking forward to the next SGSG meeting!