PROJECT FINAL REPORT

GRANT AGREEMENT NUMBER: 226369

PROJECT ACRONYM: OPEN METER

PROJECT TITLE: OPEN PUBLIC EXTENDED NETWORK METERING

FUNDING SCHEME: COLLABORATIVE PROJECT

DATE OF LATEST VERSION OF ANNEX I: 2ND JUNE 2011

PERIOD COVERED: FROM 1ST JANUARY 2009 TO 30TH JUNE 2011

PROJECT COORDINATOR:

IBERDROLA DISTRIBUCIÓN ELÉCTRICA S.A.

NICOLÁS ARCAUZ (NICO.ARCAUZ@IBERDROLA.ES)

+34 944663331

www.openmeter.com

Document History

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Document Authors

Partners	Contributors
IBERDROLA	Nicolás Arcauz, Iñigo Berganza
KEMA	Jan Maarten Van der Valk, Maurice Adriansen
ENDESA	Robert Denda
CTI	Makus Bittner
IBERDROLA	Iñigo Berganza
LANDIS+GYR	Thomas Schaub
DLMS UA	Gyozo Kmethy

Document Approvers

Partners	Approvers
IBERDROLA	Nicolás Arcauz

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1 INTRODUCTION

The OPEN meter Grant Agreement defines the need to provide a final report at the end of the project.

This final report shall comprise three separate parts as described hereafter.

- a) A final publishable summary report covering results, conclusions and socio-economic impact of the project.
- b) A plan for use and dissemination of foreground.
- c) A report covering the wider societal implications of the project, in the form of a questionnaire, including where applicable gender equality actions, ethical issues, efforts to involve other actors and to spread awareness.

The present document constitutes par a) and part b) of the Final report, while part c) has been provided through the Commission facilities for reporting.

It has to be taken into account that this document is not a self-contained document, as it is a summary of the activities performed by the Consortium members during the project, but it does not give details and descriptions of the results and outputs obtained in this period. For a complete and detailed explanation of the results and outputs, please refer to the Deliverables mentioned along this report, which have been delivered to the Commission during this period and are available through the project website (www.openmeter.com).

2 EXECUTIVE SUMMARY

The OPEN meter project was launched the 1st of January of 2009. It was a project which was born aligned with the SET plan objectives and the 20-20-20 targets, as it has been an very relevant initiative in the area of smart metering (Smarter and more intelligent electricity networks are a key component in the SET plan and the achievement of the 20 20 20 targets).

The **main objective** of the OPEN meter project **has been to specify a comprehensive set of open and public standards for Advanced Metering Infrastructure (AMI) supporting multi commodities (Electricity, Gas, Water and Heat), based on the agreement of the most relevant stakeholders in the area**.

The OPEN meter acronym summarizes the project philosophy:

- OPEN: Project based on open standards and non-proprietary solutions, resulting is a set of open standards
- PUBLIC: results to be made freely available to all stakeholders
- EXTENDED: goes beyond utility metering and allows for providing new energy services
- NETWORK: metering devices become nodes of telecom networks

In order to achieve this main objective In order to achieve these objectives, the OPEN meter project has taken a holistic approach starting from analyzing the market requirements and regulatory issues, evaluating current and emerging technologies and standards, identifying and filling knowledge gaps, testing the solutions developed, and drafting and proposing the necessary standards to the relevant standardization bodies. The project has thereby enabled the relevant industries to agree, implement and embrace a new set of international standards that have been proposed.

There have been some significant factors during the project that have conditioned the work of the project. These have been the following:

- Publication of the Mandate M/441 by the EC in March 2009 (after the start of the project) to the standardization organizations. OPEN meter achieved to be mentioned in the mandate as a significant initiative to be considered in the framework of the mandate, which was at the end an important positioning of the project in order to meet the project objectives
- Different standardization initiatives started in the course of the last two and half years (during the project) which forced OPEN meter to accommodate them in the project work.

- The start of a new SM-CG and SG-CG in Brussels, in which the project achieved also to be significantly represented.

At the moment of delivering this report (August 2011), the OPEN meter project is officially finished. At this point, we can state that the OPEN meter project has fully achieved its objectives of specifying a comprehensive set of open and public standards for Advanced Metering Infrastructure (AMI) supporting multi commodities (Electricity, Gas, Water and Heat), and based on the agreement of the most relevant stakeholders in the area. These new standard suites have been provided, accepted and supported by all members of the consortium and they should constitute a major contribution for the removal of barriers in the large scale deployment of smart metering systems and building an Advanced Metering Infrastructure.

3 FINAL PUBLISHABLE SUMMARY REPORT

The OPEN meter project has finalized the last 30th of June. OPEN meter has been a European collaborative project within the 7th Framework program, aiming at developing a set of coherent, open standards for smart metering/AMI. Its objectives have been fully achieved. It has been a major European undertaking uniting 19 major players, utilities, meter manufacturers, research institutes, and standardization organizations.

The **factsheet** of the project can be summarized as follows:

- 7th Framework Programme
    - Topic Energy.2008.7.1.1.
    - Project Number 226369.
- Estimated project duration 30 months: Jan 2009 - June 2011
- Project budget: € 4,2 MM, EC funding: € 2,4 MM
- Consortium with 19 participants
- Total effort committed: 339 person-months
- Project co-ordinator: IBERDROLA
- Project Technical co-ordinator: KEMA
- Official website is http://www.openmeter.com

3.1 Project content and objectives

The project objectives as stated at the beginning of the project are as follows:

The **main objective** of the OPEN meter project **is to specify a comprehensive set of open and public standards for Advanced Metering Infrastructure (AMI) supporting multi commodities (Electricity, Gas, Water and Heat), based on the agreement of the most relevant stakeholders in the area**.

In order to achieve this main objective, the OPEN meter planned to carry out the necessary research activities resulting in filling the existing knowledge gaps, and thereby enable the relevant industries to agree, implement and embrace the new set of international standards that are specified.

The specific scientific and technical objectives of the OPEN meter project leading to the achievement of its main objective were the following:

- To provide a selection and a common understanding for the use of available open communication standards suited to support AMI.

- To propose recommendations for changes or extensions to existing data communication standards (suited for AMI) adopted by standardisation organisations. This should lead to a harmonised set of standards that cover AMI needs.

- To carry out the necessary research and development activities to fill the existing knowledge gaps in order to have definitions and specifications of new communication standards and technologies for those communication channels and/or new technologies where standards don't yet exist, or do not meet AMI needs.

- To propose conformance test procedures and test scenarios for implementations of new and existing data communication standards that support AMI, and test the first system implementations based on the project results.

- To promote awareness about the outcomes of this project among the stakeholders of AMI (namely utilities, distribution system operators, associations, standardization bodies, endusers, public national and EU administrations, regulators, developers, suppliers and testers).

- To initiate and support the official standardization process of the new selected and specified set of standards for AMI.

In order to achieve these objectives, the OPEN meter project has taken a holistic approach starting from analyzing the market requirements and regulatory issues, evaluating current and emerging technologies and standards, identifying and filling knowledge gaps, testing the solutions developed, and drafting and proposing the necessary standards to the relevant standardization bodies.

There have been some significant factors during the project that have conditioned the work of the project. These have been the following:

- Publication of the Mandate M/441 by the EC in March 2009 (after the start of the project) to the standardization organizations. OPEN meter achieved to be mentioned in the mandate as a significant initiative to be considered in the framework of the mandate, which was at the end an important positioning of the project in order to meet the project objectives

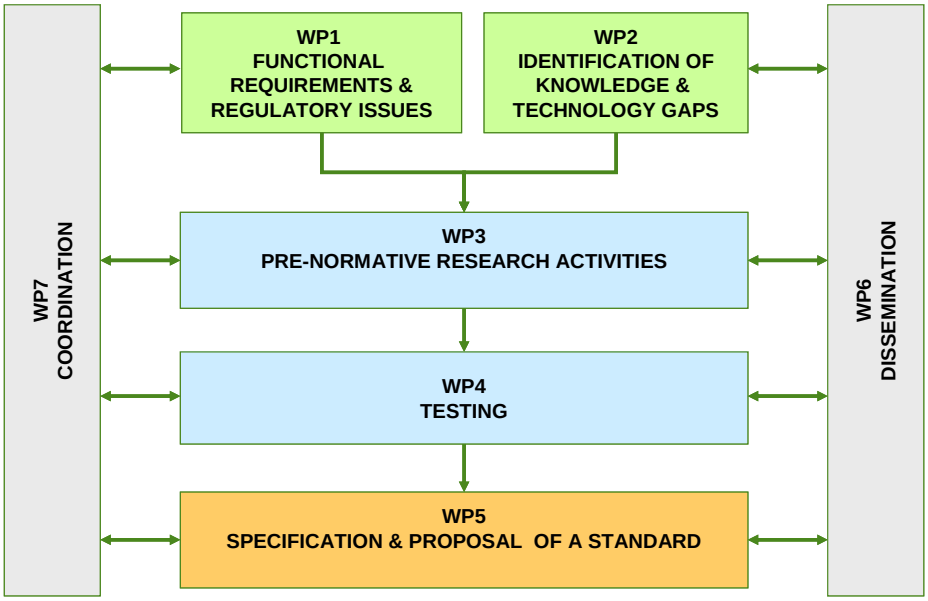
- Different standardization initiatives started in the course of the last two and half years (during the project) which forced OPEN meter to accommodate them in the project work.

- The start of a new SM-CG and SG-CG in Brussels, in which the project achieved also to be significantly represented.

Despite all these situations, at the end of the project we can state that the OPEN meter project has fully achieved its objectives of specifying a comprehensive set of open and public standards for Advanced Metering Infrastructure (AMI) supporting multi commodities (Electricity, Gas, Water and Heat), based on the agreement of the most relevant stakeholders in the area. These new standard suites have been provided, accepted and supported by all members and they should constitute a major contribution for the removal of barriers in the large scale deployment of smart metering systems and building an Advanced Metering Infrastructure.

Project organization:

For the accomplishment of the objective of the project, the project has been organized into 6 different working packages as shown next:



WP1 Functional requirements and regulatory issues: It addressed the regulatory issues concerning AMI/smart metering is the various European countries and it identified the requirements of the various stakeholders, taking into account the conditions prevailing in the various countries of the EU.

WP2 Identification of knowledge and technology gaps reviewed the state of the art of the different technologies available, including protocols for wired, PLC and wireless communication media, as well as application data models and system architectures. The technologies most suitable for the purposes of AMI have been selected. WP2 also identified research needs to fill the knowledge gaps.

WP3 Pre normative research activities built on the results of WP1 and WP2, carrying out the necessary research and development activities, to ensure that the requirements of AMI/smart metering were met in a cost effective manner.

WP4 testing developed test approaches and procedures for laboratory, compliance and field tests, and actual tests were carried out on newly developed system elements.

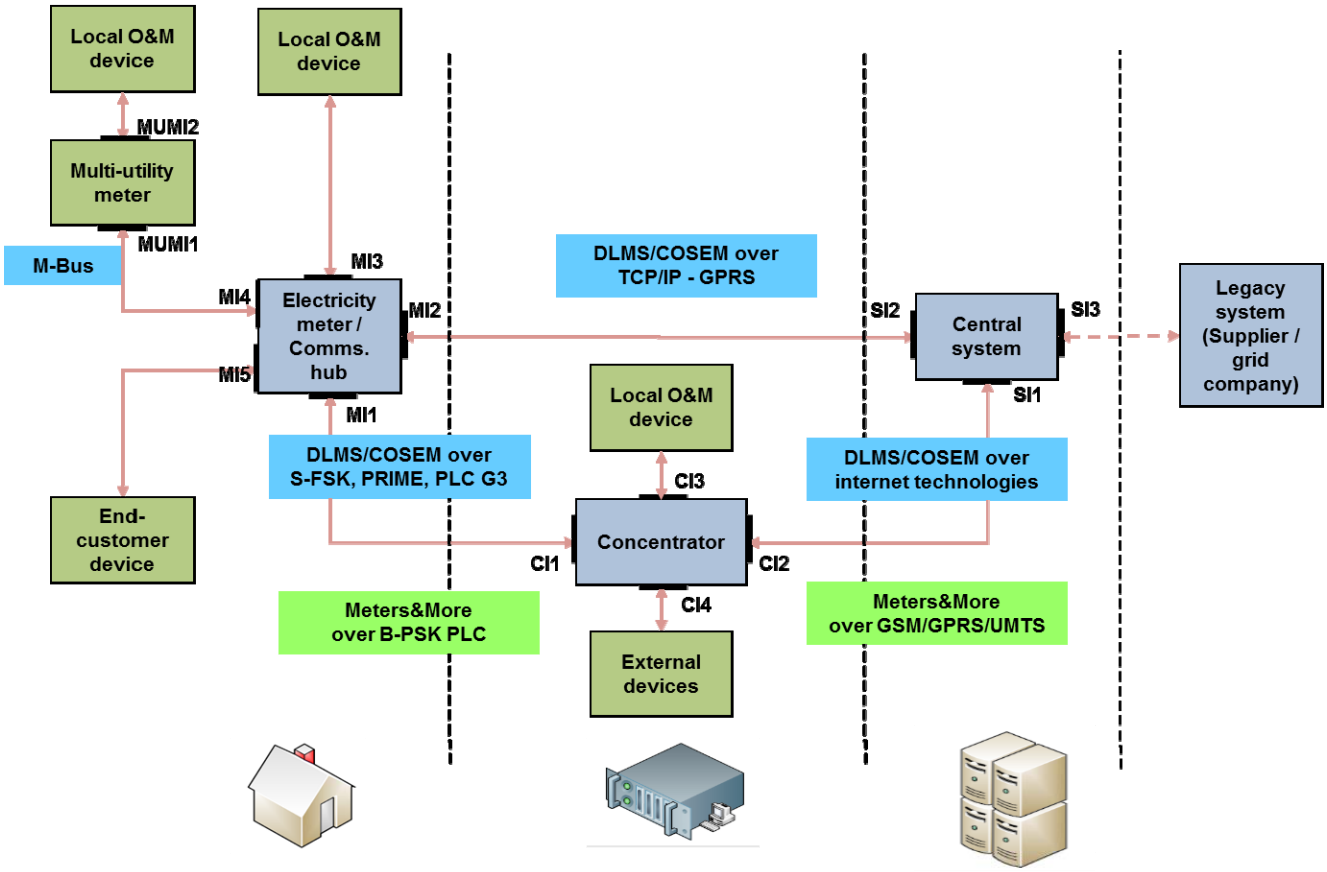
WP5 Specification and proposal of a standard consolidated the results of the previous WPs and provided a formal specification of the final OPEN meter proposals of standards. These results have been submitted to the relevant European and International Standardization Organizations (CEN/CENELEC and ETSI).

WP6 dissemination carried out different activities aimed at achieving the highest possible project impact.

3.2 Main S & T results/foregrounds

3.2.1 OVERALL RESULTS

The following figure summarizes the overall rsults of teh project; It shows the system architecture and teh finally selected technologies (agreed upon teh OPEN meter consortium and proposed to teh standardization organizations):



As shown in the figure above, for each of the interfaces considered in OPEN meter, different technologies have been selected and proposed fort standardization in the framework of the mandate M/441.

3.2.2 WP RESULTS:

3.2.2.1 WP1 – REQUIREMENTS AND REGULATION

WP1 addressed the regulatory issues concerning AMI/smart metering in the various European countries and it identified the requirements of the various stakeholders, taking into account the conditions prevailing in the various countries of the EU.

At the end of the project the work of WP1 has reflected in two deliverables:

- D1.1: Report on the identification and specification of functional, technical, economical and general requirements of advanced multi-metering infrastructure, including security requirements - published on 01.07.09
- D1.2: Report on regulatory requirements- published on 17.07.09

For both deliverables the final version, approved by the OPEN meter's Technical Committee, is available on the project website

Conclusions of the WP work:

- The requirements and use-cases provided in WP1 results cover business, regulatory and technical needs of an advanced multi-metering infrastructure.
- Homogeneous requirements provided to cover the national regulations of the different member states.
- Quality of specifications is assured by the know-how of a representative set of
  - European utility companies
  - major European equipment manufacturers.
- Requirements have led to the development and testing of real prototypes and products within the Open Meter project

- The classification into minimum, advanced and optional requirements allows the development of a modular, scalable and cost-efficient solution for utilities of different sizes and countries.

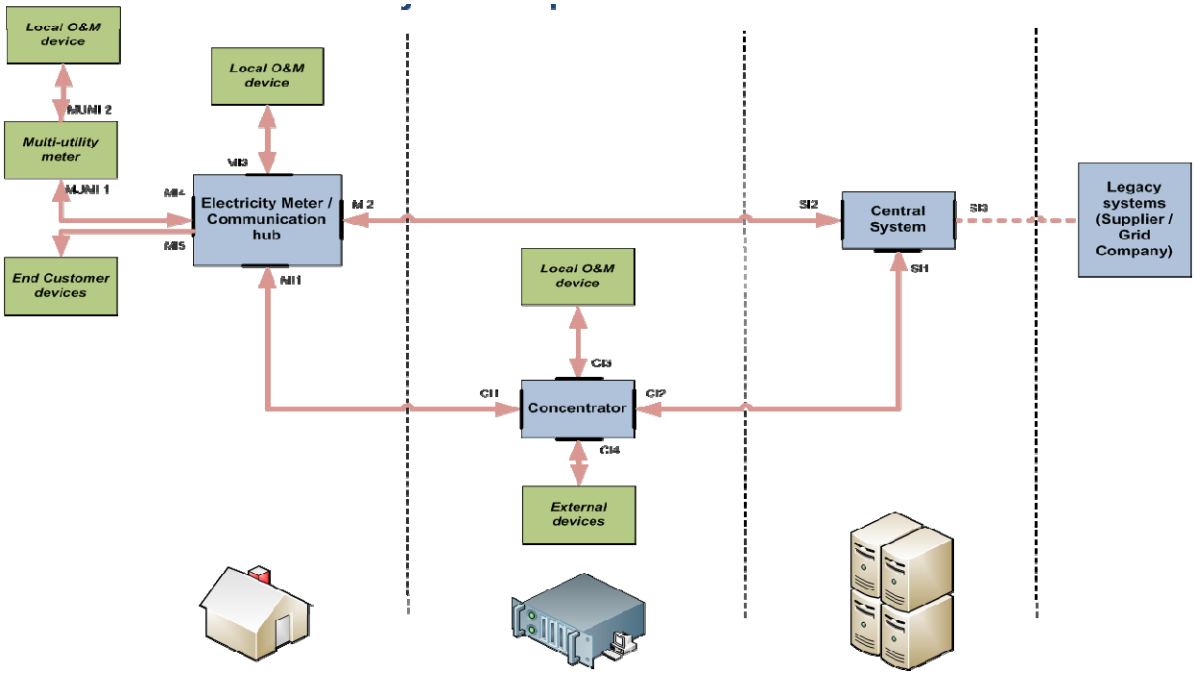
- A first reference architecture for a standardized European smart metering solution has been defined.

- The reference architecture and list of requirements are publicly available and can be freely used.

Main achievements of the WP:

A) D1.1 System components and interfaces, covering the needs of EU member countries:

The following figure shows the definition of AMI system components and interfaces adopted by OPEN meter:



B) Classification of requirements: Three complementary categories have been defined:

1. Minimum: Requirements that are absolutely necessary to reach the aimed benefits

2. Advanced: Requirements that are of high value but might not be strictly required at all deployments.

3. Optional: Requirements that include add-on functions that provide future value-added services toward smart grids or country-specific requirements.

According to these, the OPEN meter solution will be valid for a whole range of scenarios (small vs. large utilities, strict national regulation vs. lose regulatory requirements, traditional vs. highly innovative, etc.). OPEN meter technology will be modular and scalable to offer the correct and most cost-effective choice for all scenarios. The OPEN meter solution will consist of various communication protocols and physical modulations and allow optional interfaces at the system component level.

C) Requirements related to the overall system – system functions

- Meter Registration
- Remote Tariff Programming
- Meter reading (On demand)
- Meter reading (for billing)
- Remote Disconnection and Reconnection
- Power Control
- Clock Synchronization
- Remote Firmware Update
- Alarm and event Management
- Interruption information
- Fraud Detection
- Remote Concentrator access
- Load Profile Management

MINIMUM

- Automatic adaptation to grid changes
- Meter Availability Control

ADVANCED

-Energy Balances
-Load Shedding Management
-Costumer device management
-Power Quality Management
-Prepayment

OPTIONAL

D) Requirements related to the overall system – general requirements:

These have been classified as requirements related to: Management, security, interoperability, robustness, scalability, maintenance, performance.

E) Requirements related to the overall system – economic requirements (examples):

- Minimise price (cost) of field components
- Minimise cost of installation
- Minimise cost of system integration

CAPEX

- Minimise cost of operation
- Loss Protection

OPEX

F) Requirements related to the field components:

- General functional requirements
- Business use cases for installation and O&M
- Performance requirements in use cases
- Concentrator Functional description
- Requirements for Distributed Generation

- Common Requirements
- Electricity Meter Requirements
- Gas Meter Requirements
- Heat Meter Requirements
- Water Meter Requirements
- Concentrator Requirements
- Communication Equipment Requirements

G) Requirements related to communications (examples):

- PLC or Wireless Interface
- At least 3.000 end point addresses per concentrator
- The minimum speed for PLC: 2.4 kbps
- Automatic meter detection and adaptation to topology changes
- Phase-detection
- Repeater functionality
- Coexistence

MINIMUM

- Bidirectional connection to other multi-utility meters

ADVANCED

- Posibility of a faster PLC interface
- Use of PLC modem of a meter device to communicate with other nearby meters
- Self-healing and auto-configured repeating mechanism for wireless
- One-directional interface to the end customer

OPTIONAL

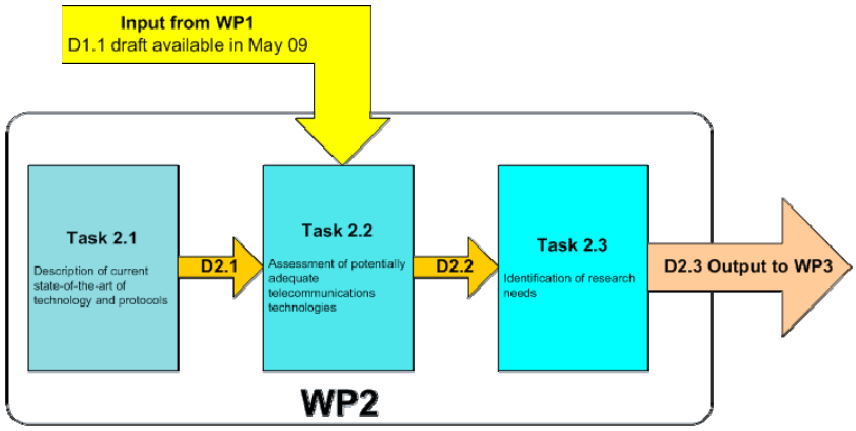
3.2.2.2 WP2: ASSESSMENT OF TECHNOLOGIES

Conclusions of the WP work:

- All WP2 tasks have been successfully completed.
- The WP2 deliverables have been provided to WP3 for further consideration.

Main achievements of the WP:

The WP work is summarized in the following diagram:

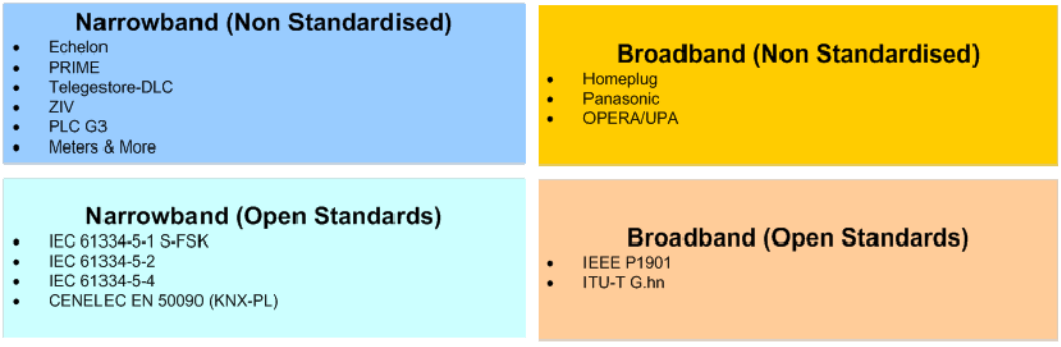


The main achievements of the WP are related to D2.1, D2.2 and D2.3.

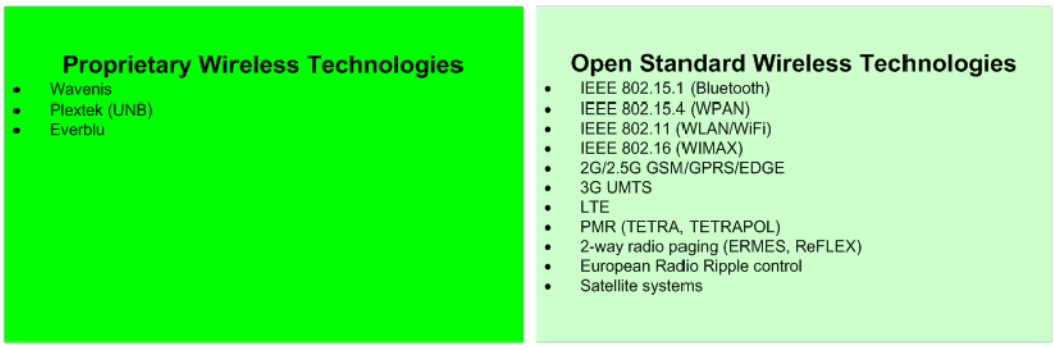
D2.1 DESCRIPTION OF CURRENT STATE-OF-THE-ART OF TECHNOLOGY AND PROTOCOLS; Achievements:

The following State-of-the-Art technologies and protocols have been identified as potential candidates for OPEN-Meter baseline technologies and protocols

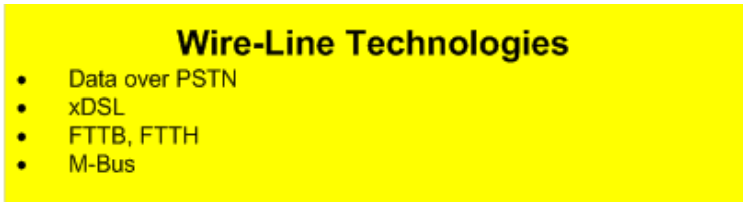
- 15 identified potential PLC technology candidates:



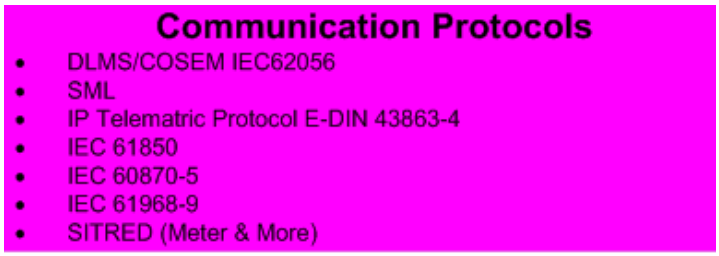
- 14 identified potential Wireless technology candidates:



- 4 identified potential Wired technology candidates



- 7 identified potential protocol candidates:



D2.2 ASSESSMENT OF POTENTIALLY ADEQUATE TELECOMMUNICATIONS TECHNOLOGIES -GENERAL REQUIREMENTS AND ASSESSMENT OF TECHNOLOGIES; Achievements:

- Assessment categories have been defined
- Requirements from WP1 have been mapped to the defined assessment categories
- An assessment-tool has been implemented and state of the art technologies have been selected for further investigation in D2.3

According to this, the finally Selected Technology Candidates have been the following:

- PLC for Interface MI1 – CI1
  - PRIME
  - S-FSK (IEC 61334-5-1)
  - Meters & More
  - PLC G3
- Wireless for Interface MUMI1 – MI4
  - WPAN (IEEE 802.15.4-2006)
  - KNX-PL
- PLC for Interface CI1 – SI1
  - Broadband PLC over MV

D2.3 IDENTIFICATION OF RESEARCH NEEDS FROM BOTTOM-UP APPROACH - KNOWLEDGE GAPS: Achievements:

The following technology gaps have been identified for the selected technologies

- PRIME
  - Standarisation / Openess / Interoperability
  - Robustness
  - Unknown performance
  - Unknown power consumption
  - Unknown whether all functional requirements can be put into practice
- PLC G3
  - Present standard does not specify test modes and conditions
  - Unknown data throughput in a real world scenario
  - Unknown whether one of the modulation schemes is superior and thus should be preferred while being automatically adapted

- The mesh network approach is designed for wireless networks. No information is available how reliable this technology works taking into account the specific properties of the power line channel.

- Meters & More
  - specification regarding how to support multi-metering

- S-FSK IEC 61334-5-1
  - Building up and maintaining the S-FSK PLC network
  - Interoperability / Coexistence of PRIME and IEC 61334-5-1
  - Data throughput

3.2.2.3 WP3 PRE-NORMATIVE RESEARCH ACTIVITIES

Conclusions of the WP work:

- OPEN meter profiles (protocol architecture) fully defined
- Fair amount of research and improvements
- Checked that spec documents complied to OPEN meter functionalities and requirements
- Proposed technologies for testing (WP4) and standardization (WP5)

Main achievements of the WP:

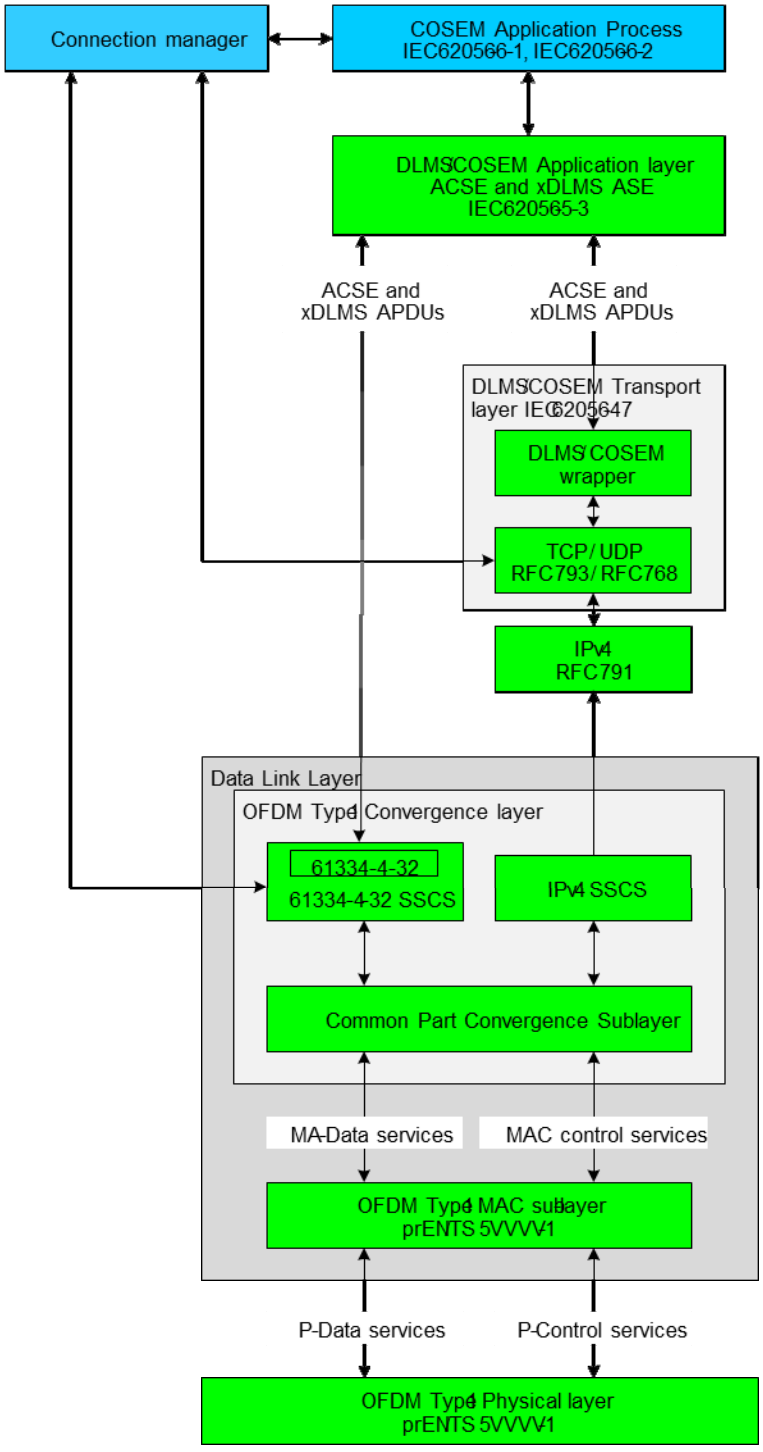
The main achievements of the WP are related to D3.1, D3.2:

DELIVERABLE D3.1: DESIGN OF THE OVERALL SYSTEM ARCHITECTURE: Achievements

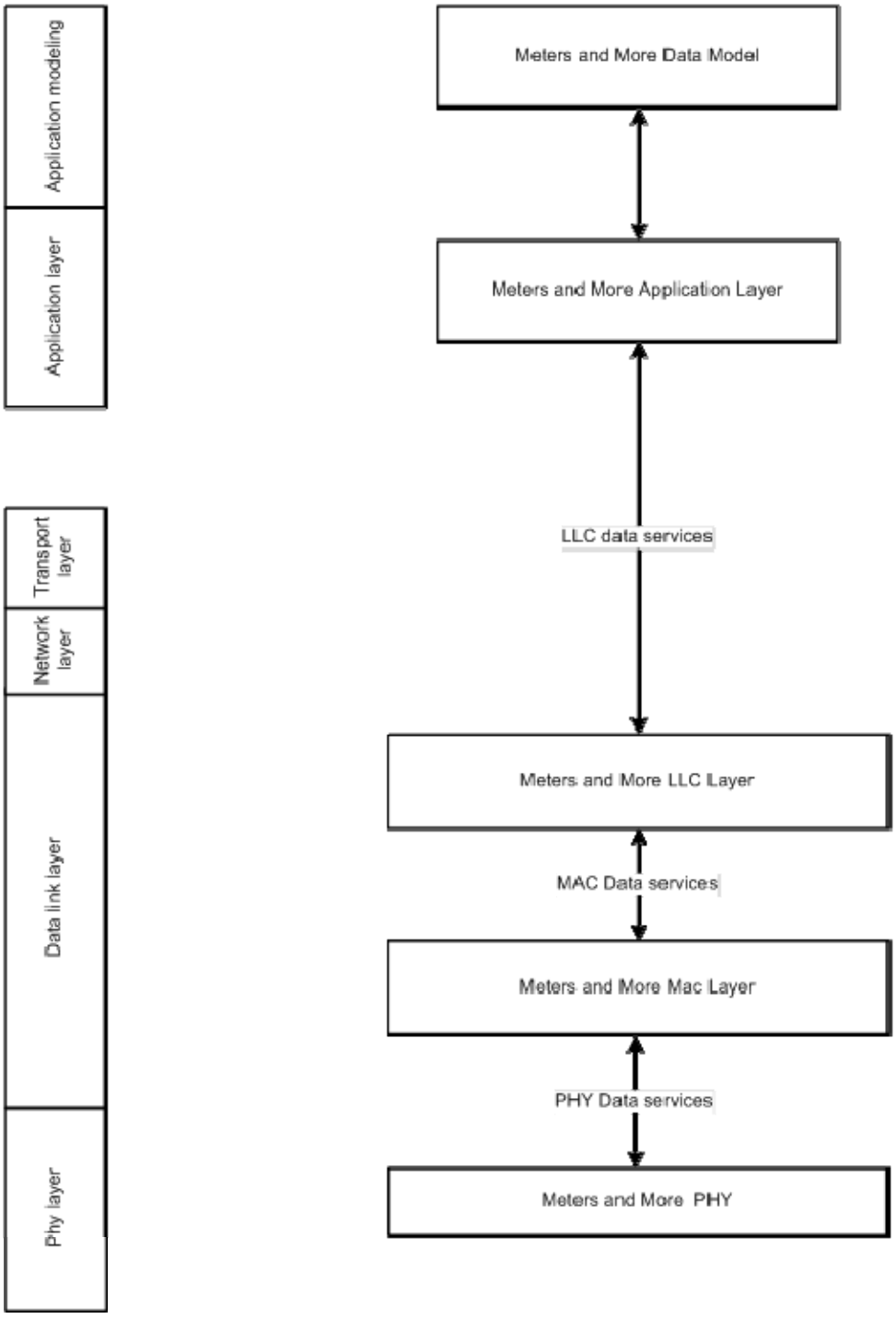
- Selection of specific technology solutions for the Protocol Architecture of each of the interfaces.
- Each interface has been analyzed following the OSI layer model. These communications stacks are usually called Functional Profiles (the “function” being here the service of the interface), Communication Profiles or just “profiles”.

The resulting profiles for the technologies selected in WP2 have been the following:

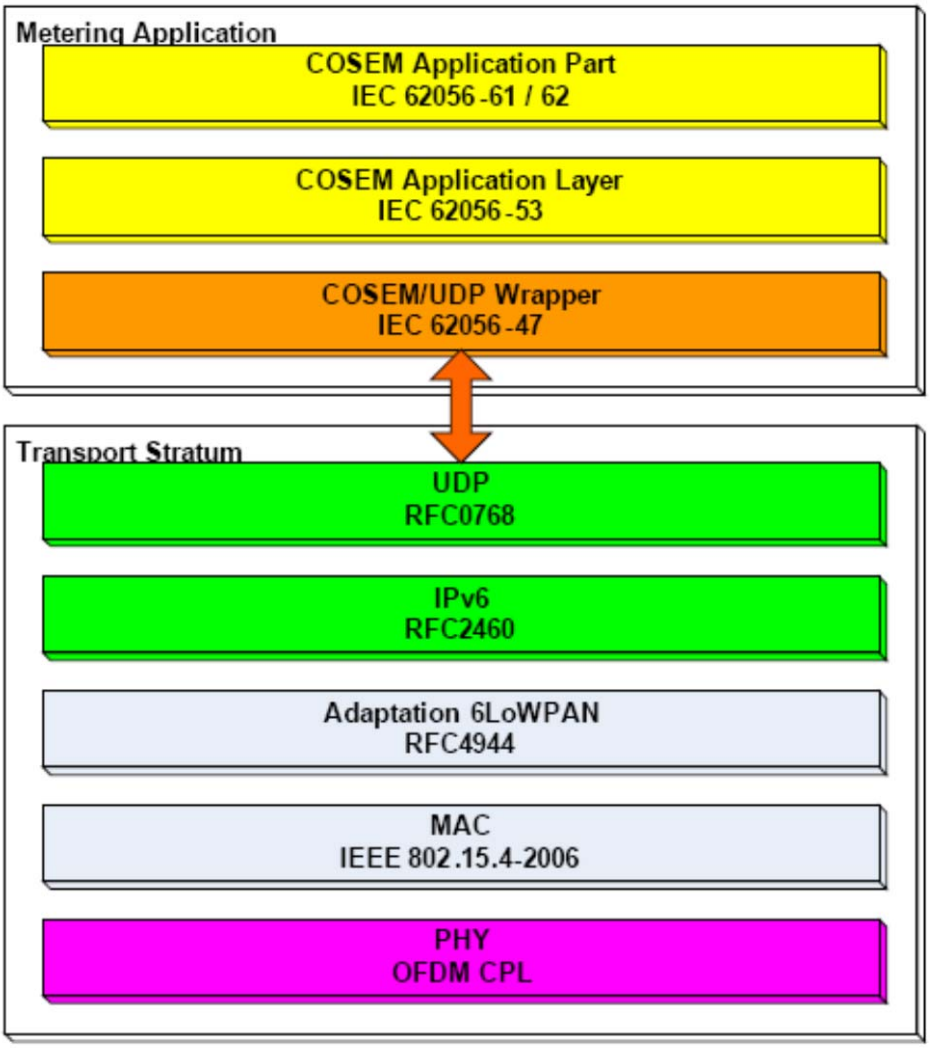
PRIME profile:



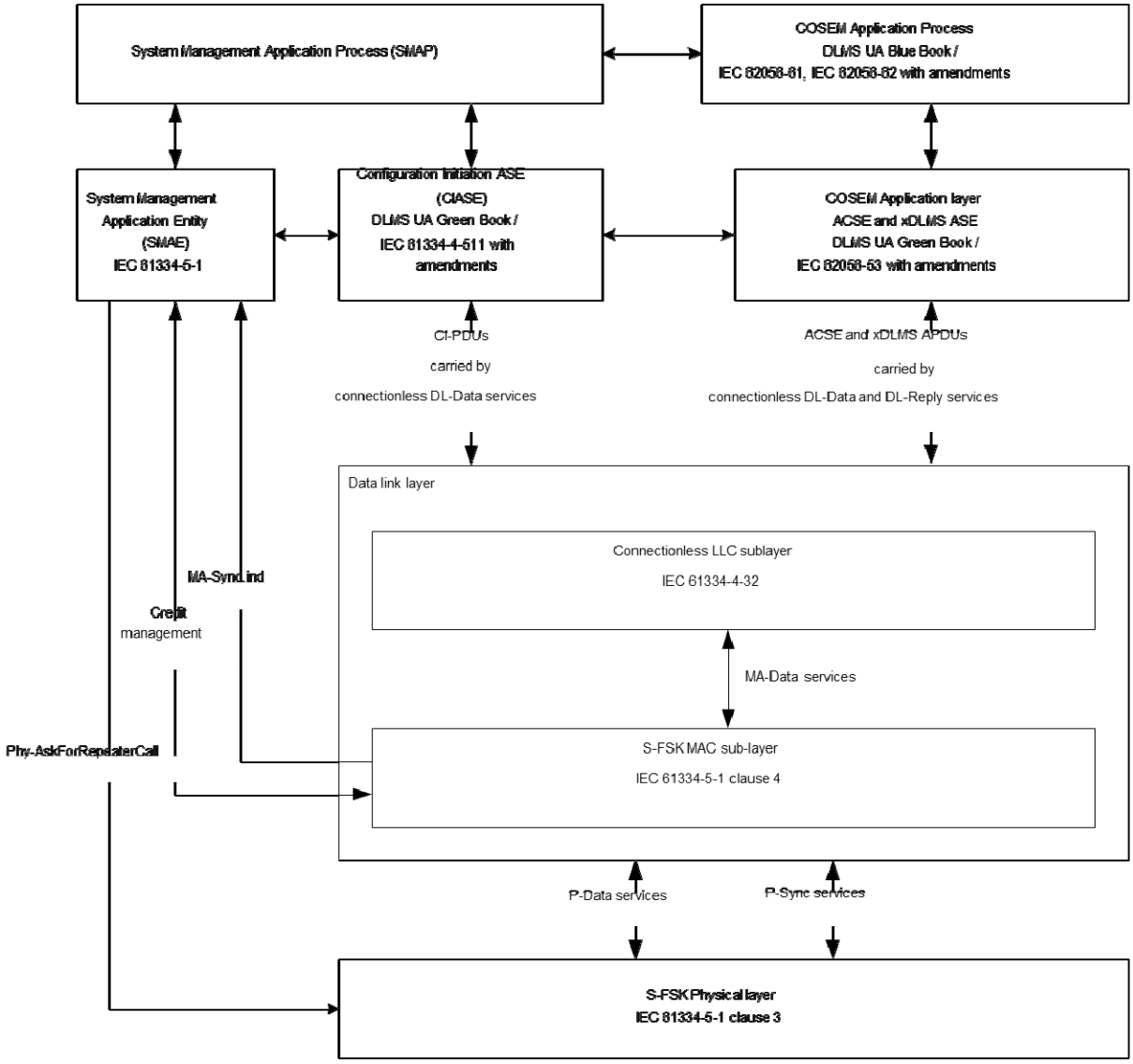
Meters & More profile:



PLC G3 profile:

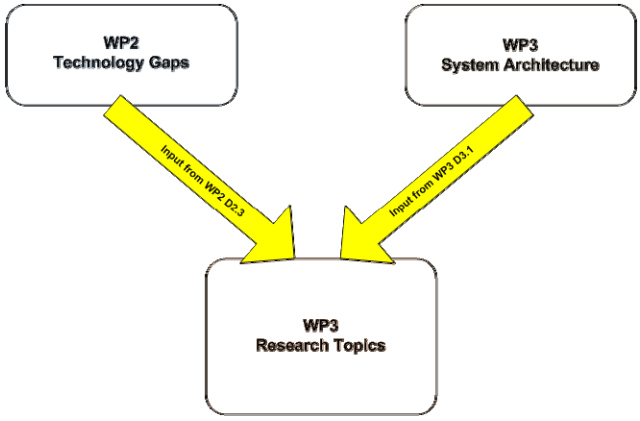


S-FSK IEC 61334-5-1 profile:



*DELIVERABLE **D3.2**: SPECIFICATION OF OPEN METER OSI LAYERS AND MULTI-METERING NETWORKING INTERFACES: Achievements*

The work within this deliverable has been organized as follows:



The main achievements within this deliverable consist on the work developed for each technology and interface, which is summarized next:

- MI1-CI1
    - Extending the currently available frequency range specified in EN 50065-1
    - Assignment of frequency bands to user groups
    - Coexistence with radio controlled clocks
    - EMC
    - Coexistence of PLC technologies (PRIME, Meters&More)
    - Conformance test modes and conditions (PRIME, PLC G3, Meters&More)
    - Feasibility of in-system communication performance tests
    - Remote interrogation of PHY diagnostics data
    - Error control overlay to improve robustness in impulsive noise conditions
    - Identification of possibly unreliable communication links and corresponding parameters
    - Verification of adaptive modulation scheme (PRIME, PLC G3)
    - Network addressing and routing

- Alternative Route-path to reach each node
- Verification of meshed network approach (PRIME, PLC G3)
- Building up and maintaining the S-FSK PLC network

- MI2-SI2
  - Gaps for UMTS
  - Gaps for GPRS
- CI2-SI1
  - Support for smart metering use cases
- MUMI1-MI4
  - Gaps for IEEE 802.15.4
  - Gaps for M-Bus
  - Gaps for Euridis
  - Gaps for ZigBee
- DLMS/COSEM:
  - PRIME/PLC G3 and IPv6 setup classes
- Security:
  - Study on security needs, analysis for DLMS/COSEM and Meters&More
- Specific gaps on PLC G3:
  - Data throughput in real-world communication scenarios
- Specific gaps on Meters&More:
  - Power consumption, support of multicast and broadcast transmission mode, multi utility metering, repeater function

3.2.2.4 WP4: TESTING

The WP work dealt with the testing of the technologies selected by OPEN meter. Its objective being to make the validation of the proposed OPEN meter architecture by testing the solution proposed in laboratory tests and field trials, and to get insight in the compliance and interoperability of components of the OPEN meter Advanced Metering Infrastructure.

Conclusions:

The selected standards/technologies tested in OPEN Meter cover the requirements defined by the OPEN Meter project and thus:

- METERS AND MORE
- SFSK
- PRIME and
- PLC G3

will be prepared as proposal for International Standardization

Main achievements:

The main achievements of the WP are related to D4.1, D4.2,D4.3 and D4.4:

D4.1: REPORT ON TEST APPROACH AND – PROCEDURES

The deliverable provides the definition of test procedures:

1. Inventory and evaluation of existing test procedures
2. Identification of requirements to be tested (based on the WP1 requirements)
3. Definition of the scope of testing
4. Matching the existing test procedures with test requirements and scope
5. Identify per test case the test category (Conformance, Interoperability, Functional and Performance)

D4.2: SET OF PROTOTYPES AND TEST FACILITIES & D4.3: REPORT ON PHYSICAL PROTOTYPES AND TEST FACILITIES

The deliverable provided prototypes and test facility implementation & report:

- **Prototypes & devices:**
  - Current (PRIME/DLMS)
  - Elster (PRIME/DLMS)
  - ITRON (S-FSK/DLMS & PRIME/DLMS)
  - Landis & Gyr (S-FSK/DLMS & PRIME/DLMS)
  - ZIV (PRIME/DLMS)
  - ENEL (Meters & More)
  - SAGEMCOM (G3)

- **Test facilities:**
  - ERS (Meters & More)
  - KEMA (PRIME / DLMS)
  - Iberdrola (PRIME / DLMS)
  - ENDESA (Meters & More)
  - EDF (S-FSK/DLMS & G3/DLMS

Some examples:

D4.4: REPORT ON FINAL TEST RESULTS AND RECOMMENDATIONS

Prototypes and devices developed in task 4.2 have been tested in a laboratory and field environment. Test cases have been used by all test partners and audits have been organized as extra level of independence at each test location for each technology

So, D4.4 describes the final test results and recommendations. Recommendations and observations for further improvement of the standards are provided to the applicable organizations

3.2.2.5 WP5: STANDARDIZATION

WP5 dealt with the proposal of the OPEN meter selected technologies for the path to standardization

Conclusions:

WP5 has fully achieved its goal by the proposal of 10 draft specifications to CENELEC in the framework of the M441 mandate.

The objective was me in June 2011, when Cenelec made the Circulation of the OM proposals as draft Technical Specifications for commenting. Now, teh next steps will be the following:

- Sept 2011: Revi
  ew of the comments in Cenelec WG02
- Feb 2012: Offici
  al Cenelec Technical Specifications within M/441

Now that the specifications have been submitted, it is time to go from Technical Specifications to Standards. For this to happen, the following has to be met:

- No conflicting standards
- no conflicts between IEC and Cenelec

Therefore:

- It is needed to DECIDE between the different options described in the Technical Specifications
- Standardise in IEC and re-label the IEC standards for CENELEC

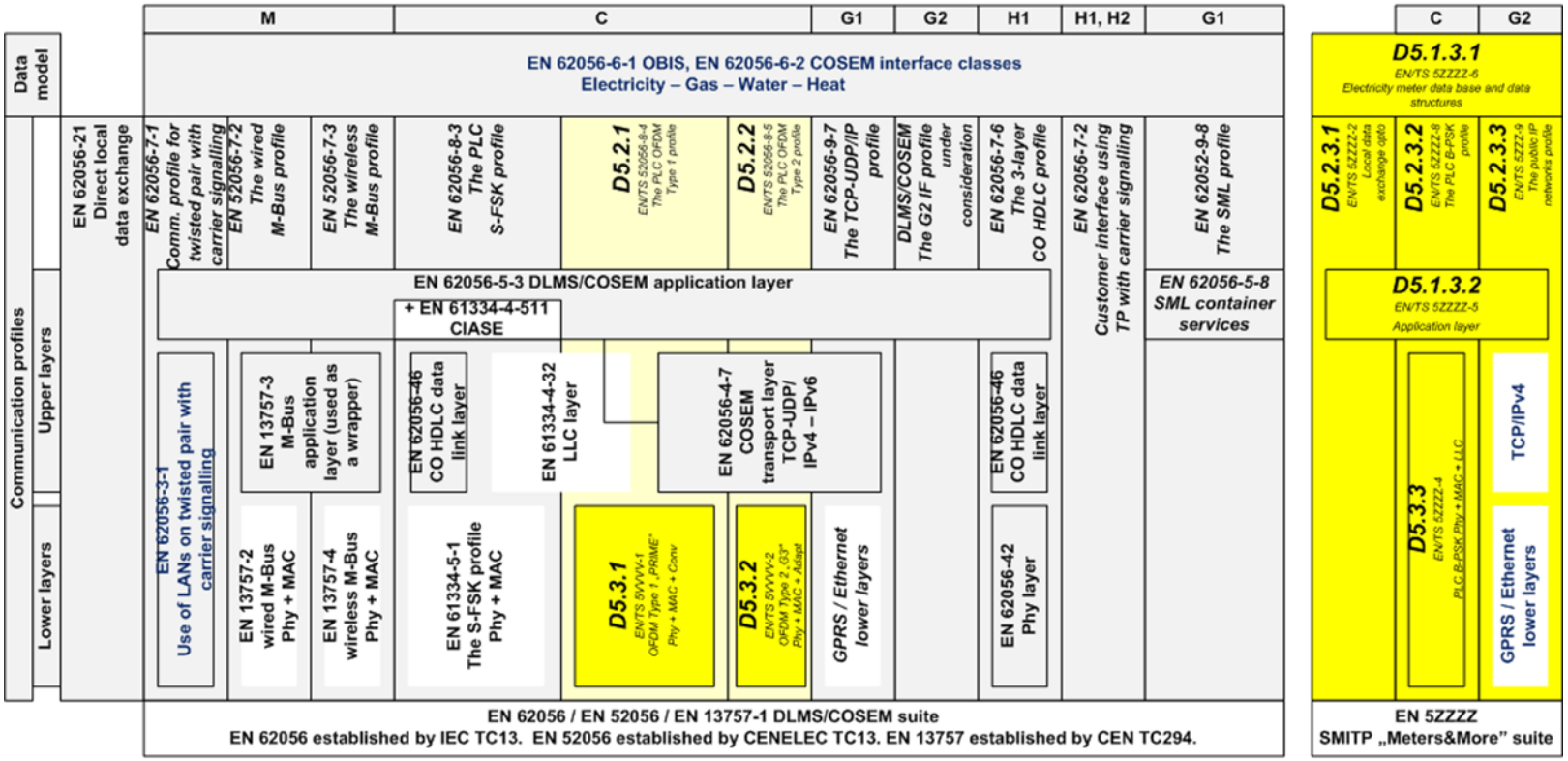
These steps are to happen outside the OPEN meter project (already finished), but the OPEN meter members will be participating in the process.

Main achievements:

The main achievements of WP5 are summarized in the diagram in the next page, where the 10 specification drafts provided by OPEN meter to CENELEC are identified in yellow color.

Each of the OPEN meter contributions is identified with one concrete deliverable

OPENmeter Deliverables into the Cenelc M/441 standards framework



D5.1.3.1	Data Base and Data Structures for the Meter&More suite
D5.1.3.2	Application layer for the Meter&More suite
D5.2.1	Communication Profile: PLC based on PRIME OFDM
D5.2.2	Communication Profile: PLC based on G3 OFDM PLC
D5.2.3.1	Communication Profile: Local data exchange for the Meter&More suite
D5.2.3.2	Communication Profile: PLC based on B-PSK for the Meter&More suite
D5.2.3.3	Communication Profile: IP for the Meter&More suite
D5.3.1	PLC lower layers based on PRIME
D5.3.2	PLC lower layers based on G3
D5.3.3	PLC lower layers on B-PSK for the Meter&More suite

3.3 DESCRIPTION OF POTENTIAL IMPACTS

The OPEN meter coordination team believes that the impact of the OPEN meter project has been (and will be) extremely relevant, as it is explained in the following paragrhps:

Potential impact 1: Contribution of OPEN meter to the 20 20 20 targets:

Smarter and more intelligent electricity networks (SMART GRIDS) are a key component in the SET plan and the achievement of the 20 20 20 targets.

Additionally, interoperability and standardisation of technologies are a recognized key success factor for smartgrids. This is why the OPEN meter results will be key in supporting the deployment of Smart Grids and thus in contributing to the achievement of the 20-20-20 targets.

Potential Impact 2: Adoption of the proposed standards will contribute to open up the market of smart multi-metering system

The main objective of the OPEN meter project was to define a comprehensive set of open and public standards for Advanced Metering Infrastructure (AMI) supporting multi commodities, based on the agreement of all the relevant European stakeholders in the area.

This objective has been fully accomplished and the direct impact of achieving such an ambitious objective will set up the basis for opening up the market of smart multi-metering systems in Europe with a European standard.

This is an achievable and realistic impact because the OPEN project has tackled the main identified barrier for a wide deployment of smart multi-metering systems in Europe, which is the lack of a set of standards that guarantee:

- The filling of the existing technology gaps.
- The interoperability of systems and devices produced by different manufacturers.

The overall expertise of the participants in the project (among the most relevant worldwide expertise in the several areas covered) ensures the capability of the project results to drive adequately the necessary standardization efforts ending with the definition and proposal of an adequate set of standards valid for the actual and future needs of Smart multi metering. The OPEN meter team is

Moreover, in order for this technological and standardisation effort to be effective it is evident that it is not enough to define a set of standards, but these must be widely accepted accordingly by all the relevant stakeholders. The strong and comprehensive Consortium of the OPEN meter Project ensures this extent, and the prove of this is that the OPEN meter results, actually offered for standardizatio to CENCELEC have been agreed upon a strongly relevant group of entitites:

- Main European Utilities that act as energy distribution operators, network operators and retailers: IBERDROLA DISTRIBUCIÓN, EDF, ENDESA, ENEL, DUTCH UTILITIES AND RWE.

- The European meter manufacturing industry, telecommunication solution providers and silicon solution providers: ITRON, ADVANCED DIGITAL DESIGN, CURRENT TECHNOLOGIES INT., ELSTER, LANDIS+GYR, ST MICROELECTRONICS, USYSCOM AND ZIV MEDIDA.

- Leading edge specialized research and technological centres and universities: CESI RICERCA, DLMS USER ASSOCIATION, KEMA AND UNIVERSITY OF KARLSRUHE.

- The European Committee for Electrotechnical Standardization (CENELEC), officially responsible for standardization in the electrotechnical field.

Besides from CENELEC, the results have also been supported by the members of the OPEN meter Panel of Users and stakeholders which includes the main standardisation and regulatory bodies: CEER, ERA, EURELECTRIC, EUROGAS, ESMIG and IEC.

Due to the high EU-wide involvement of relevant stakeholders in this Consortium, **it is expected that this project will act as a door opener for all the European utilities (not involved in OPEN meter) to accept the suite of smart metering standards proposed by OPEN meter,** which will ease interoperability between different manufacturers, support their current and their future smart metering needs, and furthermore, will guarantee the opening up of the smart multi metering market.

Potential impact 3: Enabling active customer participation to energy markets

As stated in the SmartGrids ETP Strategic Research Agenda (SRA), “Electronic meters and Automated Meter Management Systems (AMM) [...] represent the enabling advanced technologies to enable customer choice in the energy field of the future.”

Indeed, smart multi-metering systems are the key technology to enable active customer participation in energy markets. The OPEN meter project believes that thanks to technologies proposed by the project, the project is already a very relevant milestone in the development and deployment of smart multi-metering systems. All the activities carried out in this project (study of regulatory issues, identification of technological gaps, pre-normative research activities, testing and proposal of a standard by a Consortium made up by the main European stakeholders in the field) have been important contributions towards achieving such an impact, which is now closer than what it was before the completion of the project.

Potential impact 4: Allowing EU-industry to take world leadership in Smart Metering

The Consortium of the OPEN meter project has an international dimension, both from the technical point of view – as the expertise of the participants is among the most relevant worldwide – as from the industrial/commercialisation point of view.

Indeed, the Utilities participating in the project operate worldwide: ENEL, IBERDROLA and ENDESA are key market players in America as well as in Europe. Furthermore, the industrial partners sell also worldwide: LANDIS+GYR is the world's largest electricity meter manufacturer, ST Microelectronics is the largest European semiconductor manufacturer (and 5th largest in the world), ITRON and CURRENT technologies Int. are global companies, etc.

The work carried out by such a strong Consortium ensures that the results of the OPEN meter project have a global impact and that will allow the major EU-industry players to take world leadership.

This has already been the case in other EU defined standards, such as GSM for example, that are the living proof that initiatives such as the OPEN meter project may have an impact boosting European technology industry and stepping forward beyond competitors.

3.4 DISSEMINATION

The dissemination tasks have been addressed right from the very beginning of the. The dissemination activities have focused on dissemination activities directed to 2 main groups of actors:

- Public administrations/governments, regulators, European and National Standard organisations.

- Research community, industry, utilities, distribution system operators, and end users in the form associations. These bodies have been given all the information generated on the new developed technologies to heighten awareness of the new standard.

In the OPEN meter project, dissemination has been of capital importance to achieve the desired project impact. For the outcome set of open and public standards to become widely accepted and used standard, the results of the OPEN meter project needed to be effectively communicated to all relevant AMI stakeholders.

Such an ambitious and vast dissemination goal has been possible to meet due to the relevance of the different members of the Consortium, who through WP6 will develop a pro-active set of dissemination activities. Each partner used its own dissemination networks to further publicise the project and thus ensure maximum impact on a regional, national and European level. The different interests of the Consortium partners (Utilities, Research centres, Industry) and end-users (i.e. consumers) have been considered in order to focus the dissemination activities in an effective way:

- Utilities in the Consortium operate worldwide. Therefore, the adoption of the AMI standards derived from OPEN meter by these companies will have a worldwide projection, as their communication channels have also a worldwide dimension.

- The industry partners are leaders at global level. They already commercialize metering devices and related systems worldwide. The dissemination activities of OPEn meter

have taken advantage of this circumstance to communicate the results of the OPEN meter project to the main AMI end-users worldwide. These partners have included references to OPEN meter project in their commercial and technical presentations and workshops, technical papers, exhibitions, trade fairs and websites These partners also made use of their connections in National and European related Technology Platforms of Electricity Networks (SmartGrids, Futured, etc) to disseminate project activities and results.

As the ultimate goal of the OPEN meter project was to create a new AMI set of standards, the project activities and results needed to be coordinated with the main standardisation and regulatory bodies and associations (CENELEC; IEC, CEER, ERA, EURELECTRIC, EUROGAS, ESMIG…). This has been achieved through the direct involvement of CENELEC in the project, and also through the contributions of the other associations, standardization and regulatory bodies to the advisory panel of the project.

Dissemination of the project has taken place through different activities:

Project website:

A dedicated Project Website was set up from the beginning of the OPEN meter project. The website includes an overall description of the project (objectives, structure, innovations, Consortium…), the complete set of deliverables, as well as planned events and articles carried out by the partners of the project.

Special care was taken to inform about the different results and reports collected in the website, and it has been the main channel for the dissemination of the OPEN meter results (including all the project deliverables).

The project website had two sections, a public section accessible to all visitors, and a restricted section available only for the Consortium members and the project officer in the EC. The restricted section was used by the Consortium partners as a channel for information and documents interchange. IBERDROLA Distribución, as project coordinator, has been in charge of the creation, updating and maintenance of the project website.

The project coordinator has taken the responsibility for the development and maintenance of the project Webpage for the duration of the project and will take the same responsibility for the period of one year after its completion to ensure maximum presence for the project, its concept, results and conclusions to as wide an audience as possible.

RTD Dissemination

Each RTD partner has contributed to this activity through their regular dissemination wires such as attendance to scientific congresses, publication in specialist magazines, conferences. This has certainly helped to achieve a better dissemination degree in the research community. Some of the concrete dissemination activities carried out by the RTD partners are:

- ERS
  E disseminated results of the project both at international, European and national level, participating to conferences like CIRED, CIGRE. The entity will promote technology transfer and best practices to Italian distribution utilities, as well as possible solutions to decision makers.

- KEM
  A provided presentations at international conferences such as Metering International, DistribuTECH / Autovation, European Utilities Intelligent Metering, PowerGrid and national conferences in the participation countries focussing on SmartGrids and/or Smart metering.

- UNIKA provided participation in events such as ISPLC, GLOBECOM, ICC, INFOCOM, IASTED, Metering, Billing/CRM Europe.

OPEN meter Conferences and workshops

During the project, the project Consortium has organised a Final Conference for the presentation of the OPEN meter standard. Different organizations from the most appropriate organisations and legislative bodies have taken part in these events, which have gathered the main stakeholders among the two dissemination groups identified above.

3.5 EXPLOITATION

The OPEN meter project results represent enormous exploitation possibilities, which differ depending on the type of partner to exploit them. All different types of industrial stakeholders (utilities, meter manufacturers, telecom firms, silicon designers and manufacturers) are represented in the Consortium with European worldwide operating leader companies. This fact ensures that within the Consortium most partners do have a direct commercial interest to exploit the results. Moreover, the objective accomplished has been to produce a set of open and public standards that will allow other industrial partners to join later on in the use of such a European led standard for AMIs.

The specific exploitation preliminary plans for the different types of industrial companies are described below.

1. Meter manufacturers, telecom firms, silicon designers and manufacturers

It is expected that the success of this project will have a huge influence on middle- and long-term business strategy and revenue perspectives of SmartGrid solutions providers. It will also have a considerable impact on the technology and products to be developed.

The open standards proposed by OPEN meter will remove the most important barrier for the adoption of AMI, which is that of not having a widely accepted industry standard with multiple technology suppliers. The project will hence accelerate the deployment of AMI system across Europe and beyond. This will create huge business opportunities.

The standards for multi-metering services for Electricity, Gas, Water will enable to better serve all such utilities that have a “multi-utility” business model.

The results of this project already offers the utilities an attractive alternative to defining their own products, by providing common standards which bears enough flexibility so that applications can be optimised according to the local requirements.

The open technologies offered by the project avoid individual solutions for individual customers. This will significantly reduce the time and cost to the market. System and equipment providers will largely benefit from the open standard as they will have choice between multiple chip suppliers. A high-speed future-proof communication standard will make it easier to offer truly SmartGrid solutions that not only include AMR but also DA, AM, DSM, DR and other new services.

Harmonised smart metering standards will boost the investment into smart metering. A standard solution – based on latest technology and supported by several manufacturers – is the best insurance against stranded investment.

2. Utilities

Business cases for the individual applications of AMI are difficult to justify on their own. As it can be seen from the experience with AMR (Automatic Meter Reading) systems in the past, investments were hard to justify, as savings from replacing manual meter reads by remote reading were too limited. It is the combination of various AMI applications (such as demand side management, distribution automation, outage management, reduction of energy usage, efficient customer switching, decrease of network losses, local balancing by load and generation control) that helps to build a solid business case.

But is also this combination of applications that requires a standards-based AMI so that all these applications can make use of the same infrastructure and seamlessly integrate, so the OPEN meter outcomes will clearly contribute to overcome this barrier. This will lead European worldwide operating utilities to deploy AMI systems, boosting the European sector ahead of other worldwide competitors, being the first to incorporate advanced SmartGrids technologies.

In fact, during the project execution, all the utilities involved in the project have started with the first smart metering roll outs (not massive yet) which are being carried out according tot eh OPEN meter specifications.

4 USE AND DISSEMINATION OF FOREGROUND

The main objective of the OPEN meter project was to specify a comprehensive set of Open and Public standards for Advanced Metering Infrastructure (AMI) supporting multi commodities (Electricity, Gas, Water and Heat), based on the agreement of the most relevant stakeholders in the area.

As previously explained, the objective has been fully achieved by the submission to CENELEC of 10 draft specifications of different technologies which is the OPEN meter proposal for standardization.

The OPEN meter flagship has always been the OPENNESS and the PUBLIC nature of the solutions proposed, and this is why the plan for the use and dissemination of the OPEN meter foreground is very simple:

All the results generated by OPEN meter are Open and Public and therefore are available to any interested party.

The dissemination channel for these results is the OPEN meter website (www.openmeter.com) in which all the project deliverables have been published.

As stated in the previous section, the OPEN meter partnership will continue to disseminate the results of the project in their own benefit, and they will as well exploit the results generated according to their interests. Additionally, any potential partner willing to make the exploitation of the OPEN meter results is allowed to do so.

4.1 LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

TEMPLATE A1: LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[1] (if available)	Is/Will open access[2] provided to this publication?
1	Intelligentes Verbrauchsverhalten dank Smart Metering	T. Schaub	E& I Elektrotechnik&Informationstechnik	Volume 126/10	Springer Verlag	Vienna	2009	365-366	http://www.springerlink.com/content/v71238n5g1kt8436/	Yes
2	SHAPING THE FUTUREOF SMART METERING:THE EUROPEANOPEN METERPROJECT	N. Arcauz	Metering International	Issue 3, 2009	Spintelligent	South Africa	2009	62-63	http://www.metering.com/node/15383	No
3	*SHAPING THE FUTURE OF SMART METERING – OPEN METER PROJECT UPDATE.*	*G. Kmethy*	*Metering International*	*Issue 3, 2010*	Spintelligent	*South Africa*	*2010*	*pp. 136-138*	http://www.metering.com/node/15383	*No*

[1] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).
[2] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

4.2 LIST OF DISSEMINATION ACTIVITIES

TEMPLATE A2: LIST OF DISSEMINATION ACTIVITIES

NO.	Type of activities[3]	Main leader	Title	Date	Place	Type of audience[4]	Size of audience	Countries addressed
1	*OIML Seminar on Smart metering*	*G. Kmethy*	*OPEN meter - Project overview andresults achieved*	*2-5 June 2009*	*Brijuni*	*Policy makers, Industry*	*75*	*Europe*
2	*Conference Metering Europe*	*N. Arcauz*	*The OPEN meter European project*	*6-8th October 2009*	*Barcelona*	*Policy makers, Industry*	*2000+*	*Global*
3	*Conference European Energy Efficiency Strategies*	*N. Arcauz*	*The OPEN meter project*	*19-20th October*	*Brussels*	*Policy makers, Industry*	*N.A.*	*Europe*
4	*European Utility Telecom Conference*	*T.*	*OPEN meter: Smart Standards for Smart*	*6th*	*Budapest*	*Policy makers, Industry*	*100*	*Hungary*

[3] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[4] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias ('multiple choices' is possible.

		Schaub	*Meters*	*November 2009*				
5	*Conference EGETICA*	*N. Arcauz*	*N.A.*	*25-27th November 2009*	*Valencia*	*Industry*	*N.A*	*Spain*
6	*Workshop ERGEG-CEER*	*N. Arcauz*	*The OPEN meter project*	*14th December 2009*	*Brussels*	*Policy makers*	*N.A.*	*Europe*
7	*Conference ICT4EE*	*N. Arcauz*	*The European OPEN meter project*	*23rd February 2010*	*Brussels*	*Industry, Policy makers*	*N.A.*	*European Community*
8	*Conference Metering Asia 2010*	*G. Kmethy*	*Smart metering – Why, What and How*	*12th May 2010*	*Kuala Lumpur*	*Industry, Policy makers*	*300*	*Asia*
9	*Workshop IEEE p1901.1*	*Liu Weilin*	*N.A.*	*17-20th May 2010*	*Paris*	*Industry*	*N.A.*	*Global*
10	*IEC Smart Grid Workshop for TC officers*	*B. Schulz*	*TC 13 Activities in the field of Smart Grids*	*2nd July 2010*	*Geneva*	*Industry*	*50+*	*Global*
11	*Conference Metering Europe*	*G.Widder shoven*	*The EU OPEN meter project……and European smart metering standardization*	*21-23 September 2010*	*Vienna*	*Industry* *Policy makers*	*3000 +*	*Global*
12	*Conference INOVENTA 6th European Utilities Smart Grid & Metering*	*G.Widder shoven*	*One European Standard – The OPEN meter project*	*20-21 October*	*Stockholm*	*Industry*	*150-200*	*European*

				2010				
13	*Conference CIGRÉ*	*Elena Henríquez Suárez*	*Un primer paso hacia las redes del futuro. /The first steps towards the future grids).*	*1-2nd December 2010*	*Madrid*	*Industry*	*N.A.*	*European*
14	*·Conference of The Institution of Engineering and Technology: Smart Metering – Engineering the Smart World, the road to 2020.*	*G. Kmethy*	*Smart metering – European standardization*	*8-9th March 2011*	*London*	*Industry*	*80-100*	*UK*
15	*Conference IEEE ISPLC*	*Alessandro Moscatelli,*	*Standardization process in IEC.*	*3- 6th April 2011*	*Udine*	*Industry*	*N.A.*	*Global*
16	*Conference Metering Asia*	*G. Kmethy*	*Smart metering - standardization*	*11-12th May 2011*	*Bali*	*Industry, Policy makers*	*300-400*	*Asia*
17	*Conference Smart Grid*	*Gaizka Alberdi*	*The OPEN meter project*	*24th May 2011*	*Paris*	*Industry*	*200*	*French, European*
18	*Conference Metering Europe*	*G. Kmethy*	*Standardisation – how to handle differenttechnologies of PLC?*	*4-6th October 2010*	*Amsterdam*	*Industry, Policy makers*	*4000+*	*Global*