OPEN meter

Open Public Extended Network metering

7TH FRAMEWORK PROGRAMME

Project overview and results achieved

OIML Seminar on smart meters

Brijuni, Croatia

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Agenda

1. OPEN meter project objectives
2. OPEN meter participants
3. OPEN meter fact sheet
4. Smart metering and standardisation
5. Work packages: objectives, deliverables, results
6. Summary

A project born under good constellation

- Sustainable energy supply and environment concerns, EU 3x20 target: energy efficiency, CO_2, renewables
- Europe to take the lead in smart metering & smart grids
- Directive 2006/32 on energy end-use efficiency and energy service puts better metering in focus
- Standardisation mandate M/441 from the EC to the ESOs March 2009
- Economic crisis is a risk and an opportunity

Why OPEN meter?

- Open:
  - based on open standards and non-proprietary solutions
  - result is a set of open standards
- Public:
  - results will 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

OPEN meter - objectives

- Develop a coherent set of open European standards for multi-utility smart metering / AMI, accepted by all stakeholders

This will contribute to:

- Removing barriers from large scale deployment of AMI
- Achieving EU 3 x 20 target
- Creating EU wide energy and energy services market
- Creating EU leadership in the field of smart metering / smart grids

- European collaborative project
- 7th Framework Programme
  - Topic Energy 2008 7.1.1
  - Project Number 226 369
- Estimated project duration 30 months: Jan 2009 - June 2011
- Project cost: € 4,2 Mio, EC funding: € 2,4 Mio
- Consortium with 19 participants
- Total effort committed: 339 man-months
- Project co-ordinator: Iberdrola /Spain
- Project Technical co-ordinator: KEMA / NL
- Website: openmeter.com

OPEN meter consortium






INDUSTRY

- Smart Meter Manufacturers
- Telecommunication industry
- Silicon design & manufacturing

USERS

- Energy operators (retailers)
- Network operators
- Metering operators



R&D, Technology centers

- Comm. protocols, data formats
- Integrated systems
- Compliance tests

POLICY MAKERS

- Regulatory bodies
- Standardization bodies









- CEN, European Committee for Standardization
- ERA, The Energy Retail Association (UK)
- ESMIG, The European Smart Metering Industry Group
- EUROGAS, The European Union of the Natural Gas Industry
- EUTC, European Utilities Telecom Council
- Other stakeholders - e.g. energy end-users' organisations - are in the process of joining the Panel

Smart metering – why standards?

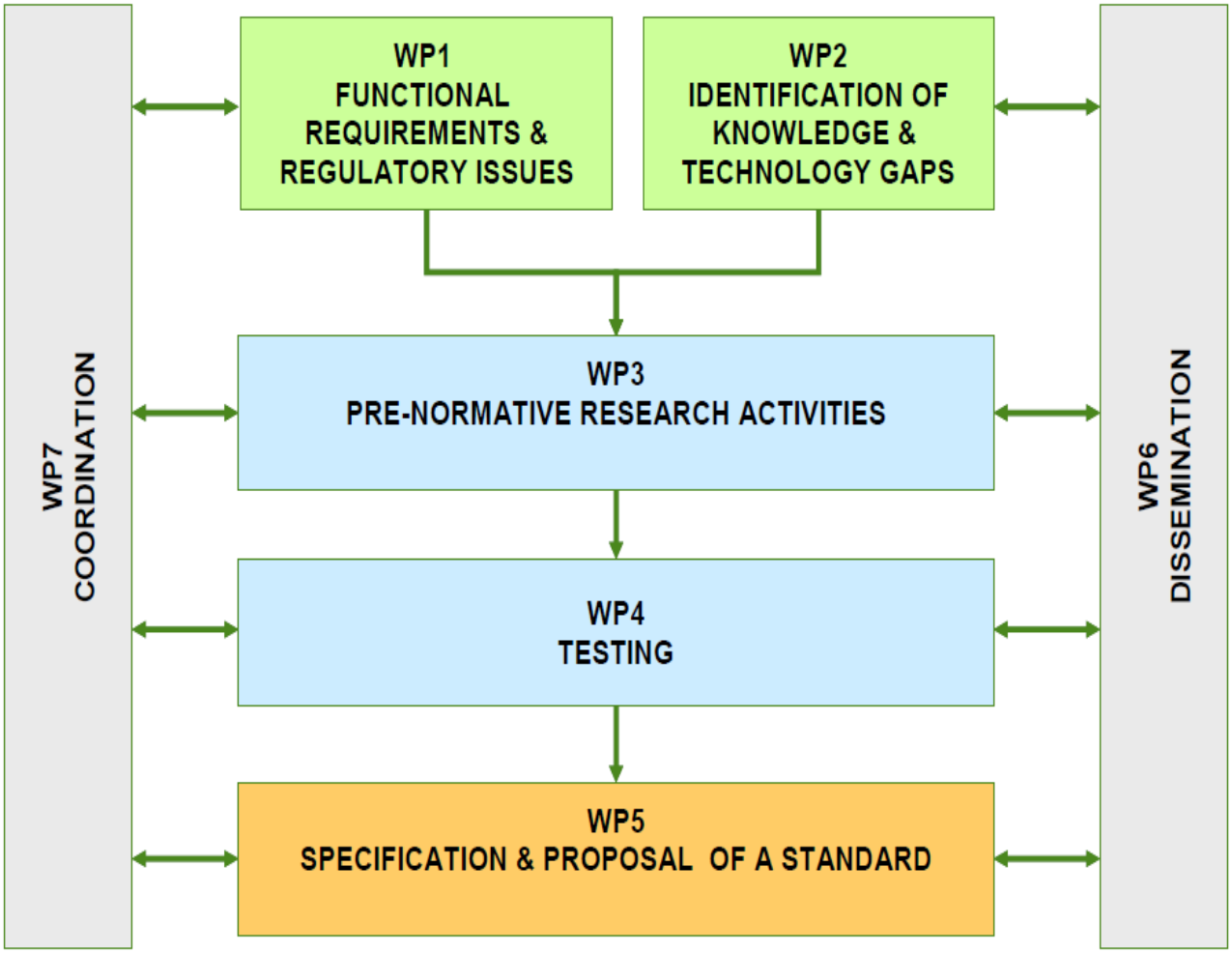
- For large-scale smart metering roll-outs, multi-lateral co-operation
  - purchasers
  - equipment suppliers
  - telecommunication providers
  - system integrators
- Standards
  - create a common language and understanding to formulate requirements, to provide solutions, to define tests
  - create spirit of co-operation
  - create level playing field for providers
  - ensure that systems are future proof
- EU wide market not possible if not based on open standards

- Issued 12th March 2009 to ESOs
- Background and justification
  - standards accelerate innovation
  - standards can be used for presumption of conformity with Essential Requirements of Directives
  - 2004/32/EC Measuring Instruments Directive
  - 2006/32/EC Energy end-use efficiency
  - avoid that competing technologies and standards fragment the market
- Tasks:
  - develop open architecture for two-way data exchange
  - standardise additional functions for smart metering
- OPEN meter is an invited partner
  - project objectives are fully in line with the mandate

EU definition of Open standards (Used in the OPEN meter project)

- The standard is adopted and will be maintained by a not-for-profit organization (e.g. ISO/IEC, CEN/CENELEC, ITU, …) and its ongoing development occurs on the basis of an open decision-making procedure available to all interested parties (consensus or majority decision etc.).
- The standard has been published and the standard specification document is available either freely or at a nominal charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee.
- Quality and level of detail – sufficient to permit the development of a variety of competing implementations of interoperable products or services. Standardized interfaces are not hidden, or controlled other than by the standard definition organisation promulgating the standard.
- The intellectual property - i.e. patents possibly present - of (parts of) the standard is made irrevocably available on a royalty-free basis.
- There are no constraints on the re-use of the standard.

OPEN meter Work packages



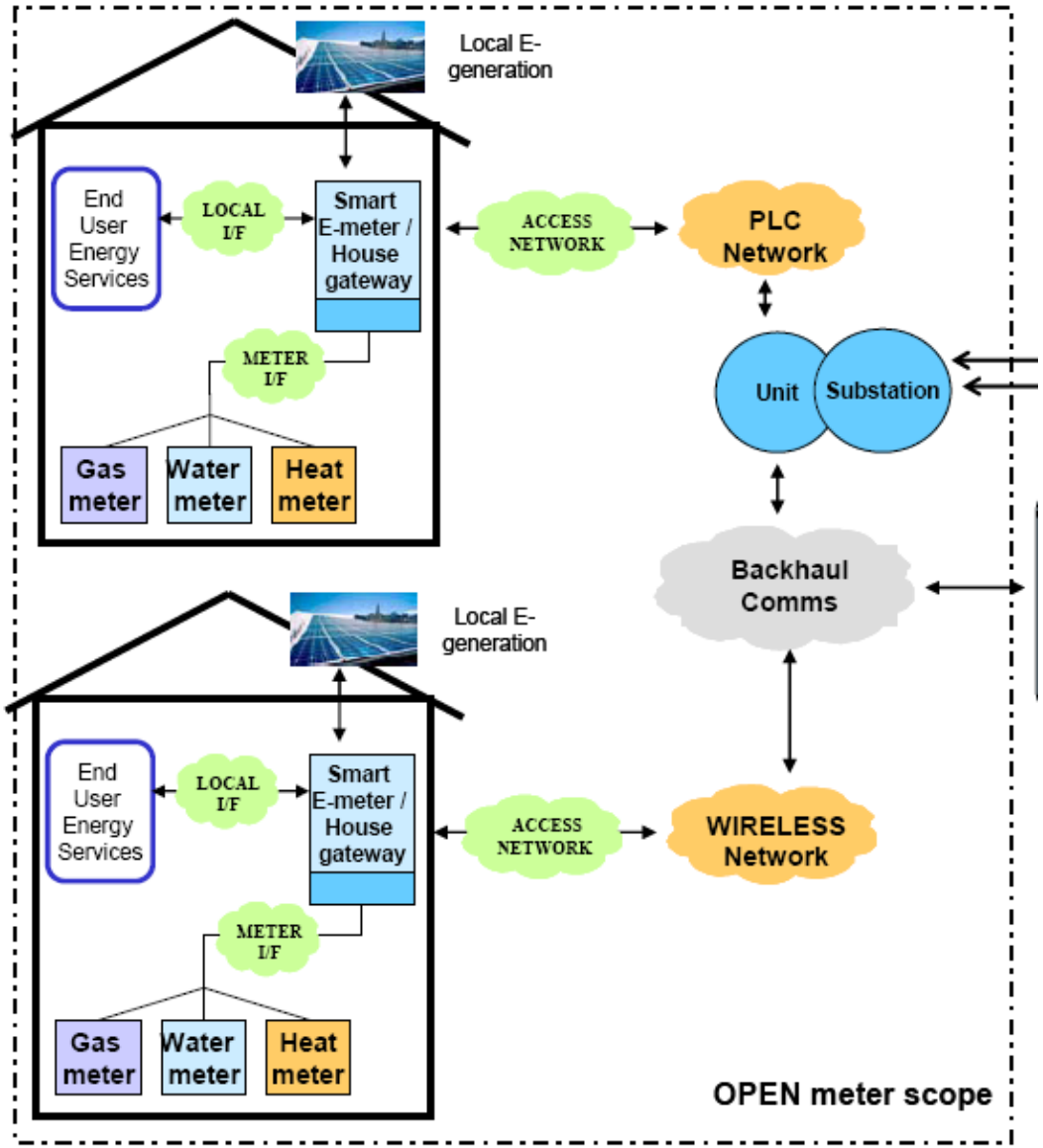
From requirements to standardisation: a holistic approach

Project schedule

We are here:

Jan 2009 - June 2011	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
WP1										
Requirements										
WP2										
Knowledge & technology gaps										
WP 3										
Pre-normative research										
WP 4										
Testing										
WP5										
Proposal of standard										
WP 6										
Dissemination										

OPEN meter architecture



Meters and smart meters

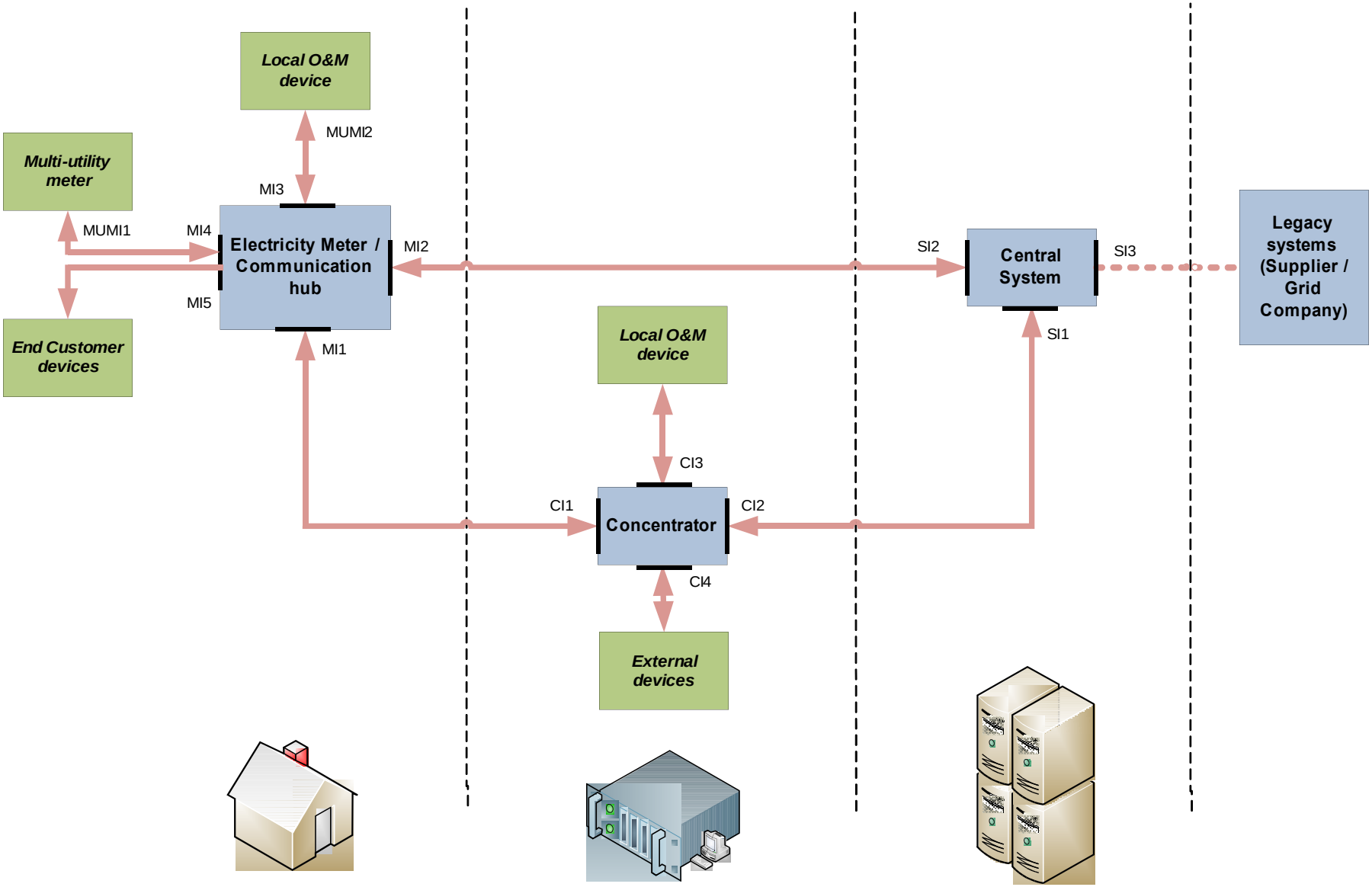
- A meter measures energy and displays the result locally
  - multiple tariffs, load profiles, load control, remote data exchange are present or not
- A smart meter
  - may support measurement of local electricity generation
    - bi-directional electrical energy measurement
  - must provide detailed info on energy use
    - clock, multiple tariffs, load profiles must be available
  - must support network monitoring
    - PQ measurement features must be present
  - must support load monitoring and control
    - load control, limitation, connect / disconnect must be present
  - must support bi-directional data exchange
  - must support evolving requirements, mass application
    - remote programming, firmware upgrade must be available

WP1: Requirements

- WP leader / effort: Endesa (ES), 17,5 person-month
- Objectives
  - Identify needs of all stakeholders and specify requirements.
  - Review Regulatory requirements
- Deliverables
  - D 1.1: Identification and specification of requirements
  - D 1.2: Regulatory requirements

WP1: System components and interfaces

System components and interfaces



WP1: Requirements overview

Overall requirements

- System functions
- General req's
- Economic req's

Field component requirements

- Functional
- Technical

Communication requirements

- Per component and per interface

Requirements / use cases are strongly based on Dutch NTA 8130 / DSMR

WP1, Overall requirements – System functions

- Meter registration (auto install)
- Remote tariff programming
- Clock synchronization
- Meter reading on demand / billing
- Load profile management
- Activation / deactivation of limits
- Remote connect / disconnect
- Prepayment

- Remote FW update
- Alarm and event management
- Interruption information
- Fraud detection
- Customer information
- Adaptation to grid changes
- Meter availability control
- Energy balance

Minimum, advanced, optional

WP1: Overall requirements

General requirements

- Management
- Security
  - access and use control
  - integrity
  - confidentiality
  - resource availability
  - physical protection
- Interoperability
- Robustness
- Scalability, Flexibility, Upgradability
- Maintenance
- Perfomance: QoS, GoS, SLA

Economic requirements – CAPEX

- Component costs
- Installation costs
- System integration costs

Economic requirements – OPEX

- Communication cost
- Customer management
- Disconnection / reconnection
- Maintenance
- Remote programming / FW update
- Loss reduction (tech / non-tech)
- Eenergy balace
- Tamper
- Power consumption

WP1: Field component requirements (1)

Functional requirements

- Robustness
- Multi-utility meter reading
  E – G - W - H
- Meter configuration / operational parameters
- Concentrator configuration / operational parameters
- Functional requirements supporting system requirements

Installation and maintenance

- Receive and register equipment
- Adjust configuration
- Update firmware
- On-site maintenance
- Self-check
  - accuracy (vendor spec.)
  - memory
  - battery
  - connection
- Retrieve state
- Un-install meter
- Re-set meter

WP1: Field component requirements (2)

Network & CAS requirements

- Install concentrator
- Configure concentrator
- Physical install
- Self-check
- Retrieve state
- Verify communication channels
- Determine hosted equipment
- Provide required data to support functional requirements
- Un-install

Distributed Energy generation requirements (electricity)

- Inform about generation state

WP1: Technical requirements

Technical requirements

- Metrology (MID)
- Time keeping
- Influence of power supply
- Overcurrent
- EMC requirements
- Strong permanent magnetic fields
- Power consumption (network and battery)

Technical requirements cont'd

- Recovery from power and communication failure
- Backup power supply
- Breaker performance
- Display
- Reliability, expected lifetime
- Safety
- Interoperability
- Access & Security
- Performance

WP1: Communication requirements

- Interfaces
- Performance
- Auto reconnection to network
- Repeating, routing (media specific)
- Interoperability
- Diagnostic information
- Line quality information
- Integrity and security
- Safety of connection to telecom networks
- Obsolescence management
- Co-existence of technologies

WP2: Knowledge and technology gaps

- WP leader / effort: Current (CH), 28,5 person-month
- Objective: Establish state-of-the-art, assess technologies and standards, identify technology gaps and R&D needs
- Deliverables
  - D 2.1: State-of-the-art: data models, wired, wireless, PLC protocols
  - D 2.2: Assessment of potentially adequate technologies & standards
  - D 2.3: Identification of gaps and resurrect needs

- A host of technologies and standards reviewed
  - local, in-house, access / LAN and backhaul / WAN
  - data models
  - in-house: wired and wireless
  - access / LAN: PLC, narrow band and wide band, LP radio
  - backhaul / WAN: PSTN, GSM, GPRS, Internet
- This is followed by
  - specifying evaluation criteria and assessment
  - selection of potentially suitable technologies and standards
  - identification of gaps and determination of R&D needs

WP3: Pre-normative research

- WP leader / effort: Iberdrola (ES), 119 person-month
  - largest work package
- Objective: research and develop elements identified in WP2 to fill knowledge gap
- Deliverables
  - D 3.1: Design of system architecture
  - D 3.2: Specification of lower layers
  - D 3.3: Specification of upper layers
  - D 3.4: Specification of interfaces

- System architecture overview
- Description of system components
- Description of system interfaces
- Protocol architecture on each interaface
  - protocol stack
  - application model
  - security
  - management

WP4: Testing

- WP leader / effort: KEMA (NL), 96 person-month
- Objective: develop test approach and procedures, perform tests, make recommendations
- Deliverables
  - D 4.1: Test approach and procedures
  - D 4.2: Prototypes
  - D 4.3: Test facilities
  - D 4.4: Report on test results, recommendations

WP5: Proposal of standard

- WP leader / effort: Landis+Gyr (CH) 34,5 person-month
- Objective: Draft standards for submission to ESOs
- Deliverables: Formal specifications of
  - D 5.1: Services
  - D 5.2: Architectures
  - D 5.3: PLC technologies & protocols
  - D 5.4: Wireless technologies & protocols
  - D 5.5: Other technologies
  - D 5.6: Workshop with stakeholders: first WS 8th July 2009, Brussels
  - D 5.7 – D 5.8: Report on status of standardisation
  - D 5.9: CENELEC Workshop Agreement

WP6: Dissemination

- WP leader / effort: DLMS UA (CH), 24,5 person-month
- Objective: To provide all stakeholders with information of the progress and results of the project
- Deliverables
  - D 6.1: Presentation of the project
  - D 6.2: Dissemination plan
  - D 6.3: Project website
  - D 6.4. Dissemination material

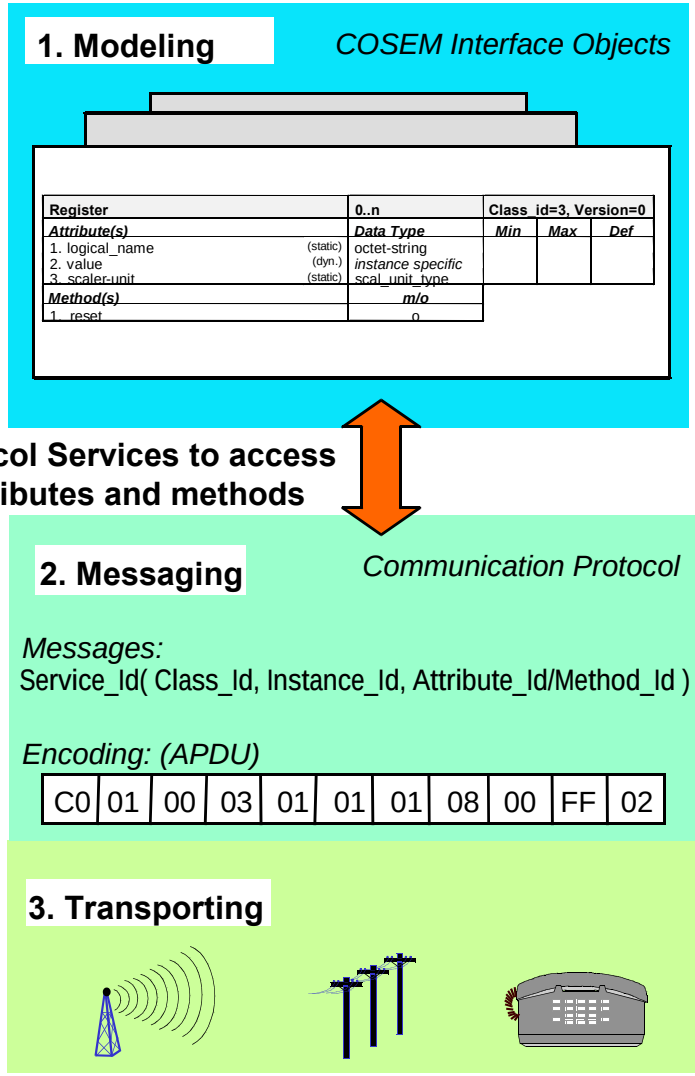
- Delivered:
  - project presentation
  - dissemination plan
    - audience and dissemination channels identified
  - project website
    - public info and consortium work area

TC 13 standards

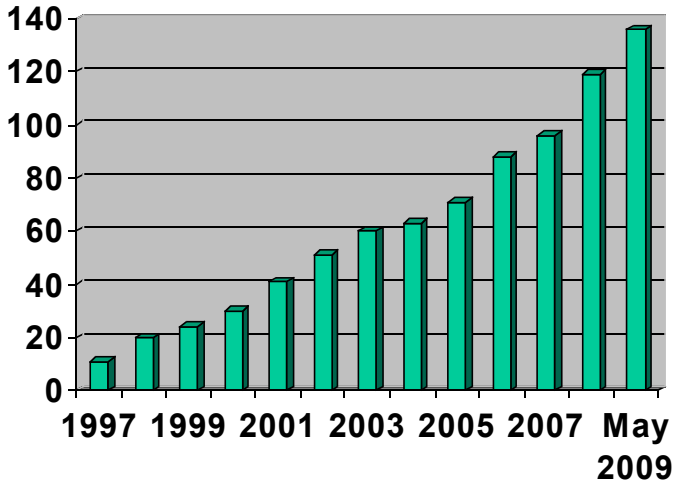
- Metrology: Active, reactive, export/import
  - IEC/EN 62052, IEC/EN 62053, EN 50470 (MID)
- Tariff and Load control: Time switch & Ripple control
  - IEC/EN 62052, IEC/EN 62054
- Payment metering: Functions, processes, type testing
  - IEC/EN 62055
- Data exchange (in liaision with the DLMS User Association)
  - Application model: IEC/EN 62056-62 COSEM objects, 6-62 OBIS
  - DLMS protocols: local port, local bus (Euridis), PSTN/GSM, GPRS/Internet: IEC/EN 62056-21, 6-31, 6-42, 6-46, 6-47, 6-53
  - Adopted by CEN TC 294 EN 13757-1: with energy type specific data identifiers + M-Bus protocol

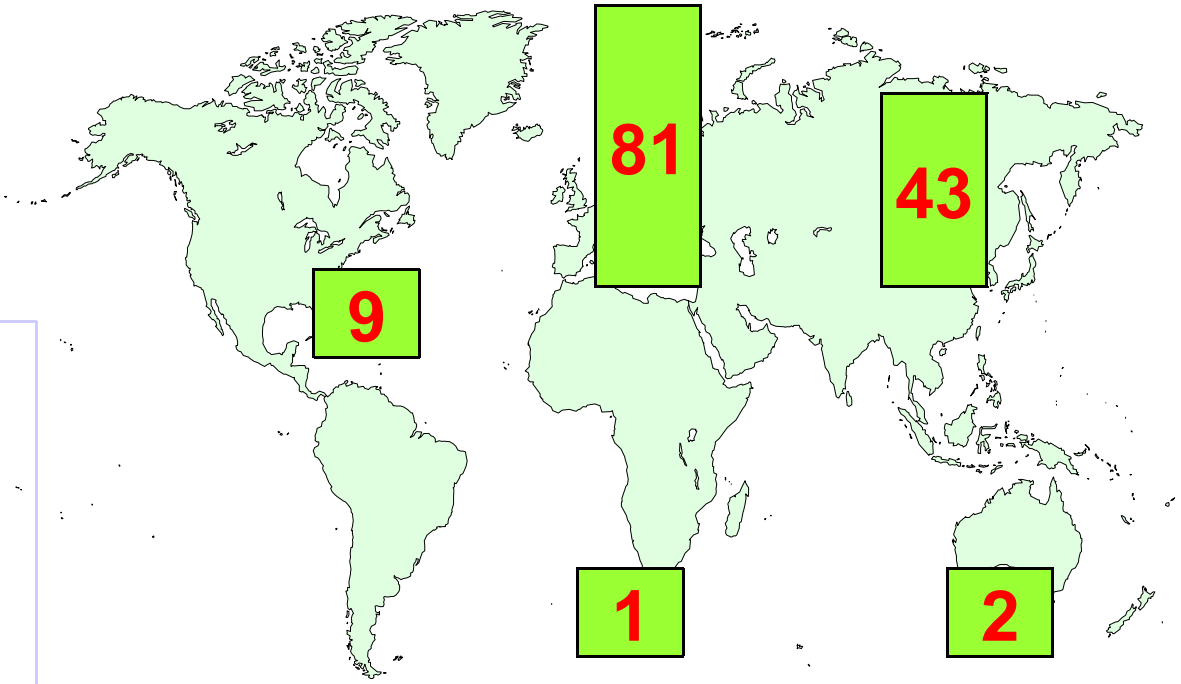
DLMS/COSEM in a nutshell

- Application data model
  - COSEM objects + OBIS
  - All energy types
  - Communication method independent
- Messaging
  - DLMS APDUs - most compact
  - Future: XML?
- Transportation
  - ISO / IEC / RFC / NIST based communication protocols
- Open international standard IEC / CEN
- Conformance testing
- Globally accepted in all segments
- User support by the DLMS UA
- Stable - an important asset



DLMS UA fact sheet





- Formed in 1997
- 136 members (May 2009)
- 5 continents - 51 countries
- from all branches of the industry
- 110 Certificates (May 2009)

The DLMS/COSEM standards

COSEM interface object model
OBIS identification system

Class name		Cardinality
Attribute(s)		***Data Type***
1. logical_name	(static)	octet-string
2. …..	(..)	…..
3. ……	(..)	…..
Specific Method(s) (if required)		***m/o***
1. …..		…..
2. …..		…..

Data

Tariff functions

Access control

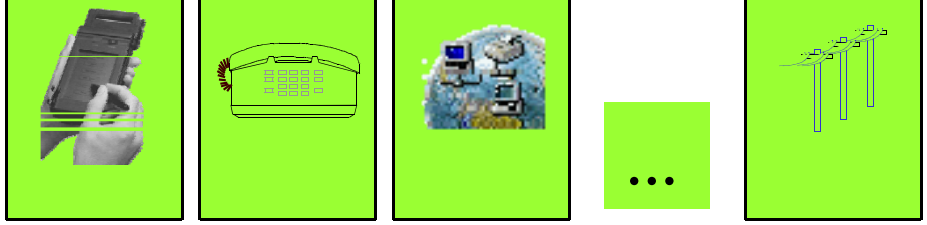
Comm. setup

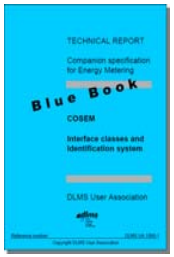
PROTOCOL

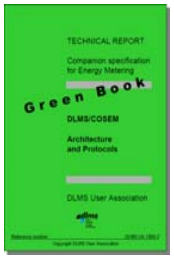
COSEM application layer

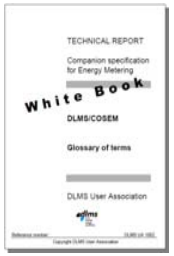
Connection

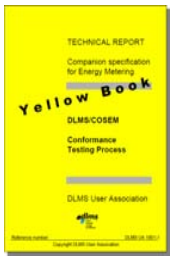
DLMS Messaging











IEC 62056 -61 -62

-42 -46 -47 -53

IEC 62051-1

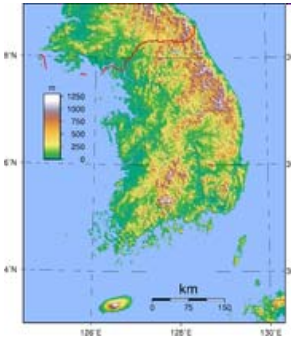
EN 13757 Part 1

Recent market developments

- DLMS UA is participant of the EU OPEN Meter project
- IEC 62056 DLMS/COSEM is a core standard in the project

- IEC 62056 DLMS/COSEM selected for the APDRP project
- Companion specification being developed

- Companion specification being developed to meet UNI/TS 11291 requirements for gas metering



- IEC 62056 DLMS/COSEM, adopted as a Korean standard, will be the basis of a nationwide smart metering project

Summary – Towards a better energy future

- The OPEN meter project responds to actual needs of many stakeholders
- Strong fundaments to build on
- Strong skills united by the project
- Significant breakthrough is expected: *coherent, market relevant, open standard, based on innovative technologies*
- Buy-in is ensured by participation of future users and good communication

Many thanks for your attention!