Smart metering –

Why, What and How

Győző Kmethy
- President, DLMS User Association
- Secretary, IEC TC 13
- Convenor, CENELEC TC 13 WG02
Presentation program

- Drivers for multi-energy smart metering systems
- European projects and harmonisation efforts
- Requirements, Use cases, Architectures, Technologies
- Data models, Protocols, Data security
- The role of the DLMS User Association
Drivers for smart metering

Political
- energy efficiency
- energy saving
- supply security / sustainability
- EU energy market
- EU services market
- establish new technology culture
- economy stimulus

Businesss
- operation of the energy market
- customer choice
- efficient energy network operation
- defer capacity investments
- cost reduction
- market players need new revenue streams

Technology
- static meters
- ICT – Information and communication technologies grow together
Relevant European Directives

- **2004/22/EC, Measuring Instruments Directive (MID)**
  - Specifies essential requirements for metrology
  - Harmonised standards (OJ pub) give presumption of conformity
- **2006/32/EC, Energy end-use efficiency and energy services**
  - Article 13: Metering and informative billing of energy consumption
- **2009/72/EC, Common rules for the internal market in electricity**
  - Economic assessment of implementing smart metering by Sept 2012
  - Where positive, at least 80% of consumers shall be equipped with intelligent metering systems by 2020
  - 200,000,000 metering points, 40,000,000,000 € market
- **2009/73/EC, Common rules for the internal market in natural gas**
  - Economic assessment of implementing smart metering by Sept 2012
  - Subject to that assessment, prepare a timetable for the implementation of intelligent metering systems
EU smart metering projects / 1

- **France, Linky project, E-metering**
  - Pilot of 300,000, S-FSK PLC / Euridis + DLMS/COSEM
  - Go / No Go mid 2011
  - 35 M rollout 2013-2017, OFDM PLC / Euridis + DLMS/COSEM
  - 4,000 M € investment 10 years return

- **Germany, difficult to make a business case**
  - „Mühleim zählt” pilot with 14,000 meters
  - Multi Utility Controller (MUC) concept, local standards
  - Open Metering System (OMS) specification, M-Bus based

- **Italy: Telegestore project, E-metering**
  - 35 M meters installed, FSK / BPSK PLC
  - 2,100 € investment, 5 years return
  - MORE specification is made public now
  - Gas metering is starting now
EU smart metering projects / 2

- The Netherlands: 7 M E-meters, 6.5 M Gas meters
  - NTA 8130, Dutch Smart Metering Req Spec 3.0 (Soon)
  - DLMS/COSEM on S-FSK PLC, GPRS, web services
  - Rollout held back due to security / privacy concerns

- Spain: Total market 26 M E-meters
  - IBERDROLA, 54%: Prime OFDM PLC with DLMS/COSEM
  - ENDESA / ENEL, 46 %: MORE (like in Italy)

- Scandinavia
  - Various technologies: DLMS/COSEM with S-FSK PLC, GPRS
  - Echelon, Zigbee (Gothenburg)

- UK: 47 M meters 2010 - 2020
  - Trials and technology evaluation
  - HAN: ZigBee, Z-Wave, proprietary Low Power radio
  - Backhaul: GSM / GPRS / ZigBee, TV transmitters...
European harmonisation efforts

- **OPEN meter collaborative research project**
  - FP7: Seventh Framework Programme for research and technological development
  - Objective: *specify a comprehensive set of open and public standards for AMI supporting multi commodities based on the agreement of the most relevant stakeholders*

- **M/441 smart metering standardization mandate**
  - Objective: *create European standards that will enable interoperability of utility meters (water, gas, electricity, heat)*
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
Work packages

WP1
FUNCTIONAL
REQUIREMENTS &
REGULATORY ISSUES

WP2
IDENTIFICATION OF
KNOWLEDGE &
TECHNOLOGY GAPS

WP3
PRE-NORMATIVE RESEARCH ACTIVITIES

WP4
TESTING

WP5
SPECIFICATION & PROPOSAL OF A STANDARD

WP6
DISSEMINATION

WP7
COORDINATION
Deliverables to date

- D 1.1 Requirements, use cases
- D 1.2 Regulatory requirements
- D 2.1 State-of-the art of technologies and protocols
- D 2.2 Assessment of technologies
- D 2.3 Identification of gaps
- D 3.1. System architecture

- Deliverables available at www.openmeter.com
Architecture

System components and interfaces

Electricity Meter / Communication hub

Local O&M device

Multi-utility meter

End Customer devices

Central System

Legacy systems (Supplier / Grid Company)

Local O&M device

Concentrator

External devices

Open Public Extended Network metering

OPEN meter

Open Public Extended Network metering
<table>
<thead>
<tr>
<th>System requirements / Processes (Minimum)</th>
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<tbody>
<tr>
<td>OM-SR1                  Meter registration</td>
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<td>OM-SR2                  Remote tariff programming</td>
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<td>OM-SR3                  Meter reading – on demand</td>
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<td>OM-SR4                  Meter reading – for billing</td>
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<td>OM-SR5                  Remote disconnection and reconnection</td>
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<td>OM-SR6                  Power control</td>
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<td>OM-SR7                  Clock synchronization</td>
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<td>OM-SR8                  Remote firmware update</td>
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<td>OM-SR9                  Alarm and event management</td>
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<td>OM-SR10                 Interruption information</td>
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<td>OM-SR11                 Fraud detection</td>
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<td>OM-SR12                 Remote concentrator access</td>
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<td>OM-SR13                 Load profile management</td>
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<td><strong>System requirements / Processes (Advanced)</strong></td>
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<td><strong>System requirements / Processes (Optional)</strong></td>
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IEC 62056 DLMS/COSEM selected as data model and application layer protocol

Media: S-FSK PLC, OFDM PLC, M-Bus, Euridis, GPRS / UMTS...
M/441 Mandate: Overview

- In view of the various Smart Metering projects there is an urgent need for harmonisation to avoid uncontrolled growth of specifications.

- Mandate M/441 of the EC from 12th March 2009:
  - Draft standardisation mandate to CEN, CENELEC and ETSI in the field of measuring instruments for the development of an open architecture for utility meters involving communication protocols enabling interoperability.

- Objectives:
  - To create European standards that will enable interoperability of utility meters (water, gas, electricity, heat), providing a means to raise customers’ awareness of actual consumption in order to allow timely adaptation to their demands (commonly referred to as “smart metering”).
M/441 Mandate: Tasks

- **Communication: 9 months**
  - Develop European standards for an open software und hardware architecture for utility meters that:
    - Support secure bi-directional communication
    - Allow advanced information, management and control systems
    - Scalable and adaptable for future needs
    - Provide secure interface to protected metrology block
- **Harmonised solutions for additional functions: 30 months**
  - Develop European standards for additional functions within an interoperable environment
- **Permit innovation**
- **Permit fully integrated modular and multi-part solutions**
- **Consider existing international, EN and national standards**
M/441 mandate org and responsibilities

European Commission
DG Enterprise and Industry
Mandate issued 3/09

Smart Metering standards
2011-2012

Mandate accepted 6/09
Approve reports
Publish standards

Smart Meter Coord. Group

CEN
CENELEC
ETSI
WELMEC
CEER / ERGEG
OPEN meter

EURELECTRIC
MARCOGAZ
ESMIG
FACO Gaz
Consumers Assn.
Installers Assn.

Prepares reports
Assigns responsibilities /
Coordinates work programs

CEN TC 294
CLC TC 13
CLC TC 205
ETSI M2M

Develops Glossary
Develops Use cases
Develops architecture
M/441 Mandate: Application

- Only MID has essential requirements
  - Smart metering standards will not be „harmonised” by publishing them in the OJ – no presumption of conformity

- Solutions of member states may differ
  - Standardization in the context of the mandate does not necessarily mean completely identical solutions in the member states

- Standards must cover all solutions
  - As a target smart meter solutions of the member states must be covered by suitable standards

- Country solutions to be standards based
  - The member states can set their own priorities and treat the various consumption types differently, but the selected solution must be taken from the one and only smart meter standard pool

- Back office systems and industrial metering are out of scope
  - Industry solutions or back office solutions will not be regulated by the mandate, knowing that there will be a significant impact on these areas
M/441 mandate: ESO TC responsibilities
M/441 Mandate: High level additional functions

Additional function is what goes beyond the MID

- F1. Meter reading for billing, export / import
- F.2 Two-way comms for PQ, tamper, firmware update, customer info
- F.3 Prepayment, TOU
- F.4 Remote disablement / enablement / limitation of supply
- F.5 Communication with in-home devices: load control, customer info, HA
- F.6 Provide info via web portal / gateway
M/441 Mandate: technologies/standards

IEC 62056-62 / IEC 62056-61/ EN 13757-1
COSEM / OBIS model

IEC 62056-53
DLMS/COSEM Application layer

IEC 61334-4-32
LLC layer

IEC 62056-46
HDLC

IEC 62056-42
Phy layer

IP support layers e.g. GPRS, ADSL, Ethernet,
OFDM PLC Phy+MAC

IP SSAL

IEC XXXX
S-FSK PLC Phy+MAC

SSAL

IEC 62056-31
Euridis transport

IEC 62056-31
Euridis support mgr.

M-Bus Application layer
EN 13757-3

M-Bus
EN 13757-2
M-Bus
Phy + Link

EN 13757-4
w-less M-Bus
Phy + Link

NextGen
w-less
Phy + Link

Public WAN

Acces LAN

ETSI M2M

CLC TC 13

CEN TC 294

12th May 2010
Metering Asia
Kuala Lumpur, 11-12 May 2010
CLC TC 13 WG02 Road map

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12th May 2010

Metering Asia
Kuala Lumpur, 11-12 May 2010
IEC – CLC TC 13 co-operation

- CLC TC 13 develops technical reports, describing how to use existing standards for smart metering
- Identifies need for new standards – these will be developed by IEC TC 13
- IEC standards become EN standards through parallel voting
A few words on data security

• Data security and privacy are major concerns
  – May fail a project

• DLMS/COSEM provides tools for:
  – role based access
  – peer authentication
  – message confidentiality
  – message integrity /authenticity

• It is up to the project to use them properly

• Guidance:
  – Customer should own data and
  – Make available for the purposes of the services required
DLMS User Association Update

- Formed in 1997
- 171 members (May 2010)
- 5 continents - 40 countries
- from all branches of the industry
- 142 Product Certificates
DLMS UA in smart metering standardization

M / 441
EC Smart Metering
Standardization Mandate

TC 57, Power systems management
• IEC 61334 PLC

TC 13, Metering
• WG 14 - IEC 62056

TC 13, Metering
• WG02, Smart metering

TC 294,
Communication systems for meters – EN 13757-1

ETSI
• TC M2M

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Metering Asia
Kuala Lumpur, 11-12 May 2010
### Status of the DLMS/COSEM specification

<table>
<thead>
<tr>
<th>Blue Book Ed. 10</th>
<th>Green Book Ed. 7</th>
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<tr>
<td>• energy&amp;demand</td>
<td>• 3-layer HDLC</td>
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<td>• instantaneous, PQ</td>
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<td>• data security</td>
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Summary

• Many national smart metering projects
• Standards are seen as key to interoperability
• EU pushes for harmonised standards
  – OPEN meter project
  – M/441 standardisation mandate
• IEC 62056 / EN 13757-1 DLMS/COSEM is core standard
  – Data model for all energies
  – Advanced security
  – GPRS, Internet, PLC ... Media
• DLMS UA works with all TCs involved

Smart meters have new talents: how do we benefit?
Many thanks for your kind attention!

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