EXPERIENCES WITH SMART METERING IN ITALY

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Head of Electricity and Gas Smart Metering
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ERRA Training Course

Minsk, 15 September 2010
AGENDA

Smart metering
• Regulation in Italy
• Activities by European Energy Regulators
• Initiatives by the European Commission

Smart grids
• Regulation in Italy
• Activities by European Energy Regulators
• Initiatives by the European Commission
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THE ITALIAN REGULATORY AUTHORITY FOR ELECTRICITY AND GAS

- Founded in 1995
- Operating since 1997
- Functions:
  - Price control
  - Quality standards
  - Competition
  - Accounting and administrative unbundling
  - Monitoring and auditing
  - Complaints and appeals
  - Disputes
  - Information and transparency
  - Advice to Government on licensing and market structure
- Fully independent
- Accountable to the Parliament
LEGAL AND REGULATORY FRAMEWORK
Consultation and Decision Process

• The Autorità issues consultations papers containing guidelines and proposals

• Consultation papers are public (on the web site) and are send to all stakeholders involved:
  – companies
  – consumers’ associations
  – trade unions
  – environmental associations

• Formal hearings are organized with main actors

• Everybody can formulate questions, comments, proposals in written

• No decision is taken without a consultation round
SMART METERING REGULATION
The Autorità’s organisation

• Smart metering regulation is performed by a special Task Force established in 2006

• After a long discussion in 2005, it was decided to create a TF horizontal to all Directions (Markets, Tariffs, Quality and consumer affairs)

• In consequence of this choice two kinds of regulatory orders are issued:
  ➢ the TF identifies and determines minimum requirements (that’s meter and system capabilities)
  ➢ the Directions determine parametrization of meters and systems

• The regulation of smart meters tries to balance customer needs/rights, electricity/gas system needs and technical limitations of AMM systems
## SMART METER IMPLEMENTATION CURRENT SITUATION IN EUROPE

<table>
<thead>
<tr>
<th>Smart meters are already installed</th>
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<td>Germany</td>
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30 millions installed at mid-2009

*ERGEG Status review report on smart metering (2009)*
*available at [www.energy-regulators.eu](http://www.energy-regulators.eu)*
## ITALY: SMART METERING CHARACTERISTICS

### Electricity DSOs
- Enel D. 85%
- Acea Roma 5%
- A2A Milano-BS 3%
- Others middle-size* 3%
- Others small-size** 4%
  * each between 1 M and 100 k cust.
  ** each less than 100 k cust.

### Scale of LV market
- 35 Millions LV meters, of which:
  - 28.7 M household
  - 6.4 M small business
- 137 TWh energy distributed at LV, of which:
  - 90 TWh univers.supply (of which 60 TWh household)
  - 47 TWh free market (of which 2.5 TWh household)

### Summary

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<tr>
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<th>Gas</th>
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<tr>
<td><strong>Regime</strong></td>
<td>regulated</td>
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</tr>
<tr>
<td><strong>Operator responsible</strong></td>
<td>DSO</td>
<td>DSO (retailer until 2008 for meter reading only)</td>
</tr>
<tr>
<td><strong>Accounting separation</strong></td>
<td>From 2001</td>
<td>From 2001</td>
</tr>
<tr>
<td><strong>Tariff separation (from distrib.)</strong></td>
<td>From 2004</td>
<td>From 2009</td>
</tr>
<tr>
<td><strong>Minimum functional requirem.s</strong></td>
<td>From 2006*</td>
<td>From 2008**</td>
</tr>
</tbody>
</table>
  * (95% by 2011)
  ** (80% by 2016)

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* **Electricity**: Regulatory Orders 292/06 and 235/07 (*in English*: http://www.autorita.energia.it/docs/06/292-06allengnew.pdf)

**Gas**: Regulatory Order ARG/gas 155/08: (*in English*: http://www.autorita.energia.it/docs/08/155-08alleng.pdf)
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MAIN STEPS CARRIED OUT

- **February/May 2006**: made a formal request of information to Enel, Acea Rome and to major European manufacturers of smart meters (in practice smart metering systems were studied from the functional points of view)
- **July 2006**: published the consultation document n. 23/06
- **December 2006**: published the regulatory order 292/06, introduced:
  - replacement obligations
  - minimum functional requirements
- **September 2007**: introduced performance indicators for smart metering systems, for the time being only for monitoring purposes (regulatory order 235/07)
### SMART METERS FOR LV CUSTOMERS

**Mandatory timetable (1/2)**

<table>
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<tr>
<th></th>
<th>Installation</th>
<th>Commissioning</th>
<th>Penalty (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household customers and non household customers with P&lt;=55kw</td>
<td>25%</td>
<td>31-Dec-08</td>
<td>30-Jun-09</td>
</tr>
<tr>
<td></td>
<td>65%</td>
<td>31-Dec-09</td>
<td>30-Jun-10</td>
</tr>
<tr>
<td></td>
<td>90%</td>
<td>31-Dec-10</td>
<td>30-Jun-11</td>
</tr>
<tr>
<td></td>
<td>95%</td>
<td>31-Dec-11</td>
<td>30-Jun-12</td>
</tr>
<tr>
<td>Customers with P&gt;55kw</td>
<td>100%</td>
<td>31-Dec-08</td>
<td>30-Jun-09</td>
</tr>
</tbody>
</table>

(*) Not recognized CAPEX for electromechanical meters not replaced
SMART METERS FOR LV CUSTOMERS
Mandatory timetable (2/2)

- Starting from 1 January 2008, for each low-voltage withdrawal point through which the injection of active electricity into the network is activated, DSOs shall install one single smart meter, single-phase for single-phase applications and three-phase for three phase applications.
Source: data submitted to the Autorità by DSOs

DSOs with more than 100,000 LV connection points

Smart meters for LV connection points

COMMISSIONING

STATUS OF INSTALLATIONS AND
INTERVAL METERS FOR HV AND MV CUSTOMERS

• HV customers and major MV customers have been equipped with interval meters (15min – 1 hour) since the second half of 80s

• In 2004 were introduced obligations for the installation of interval meters (1 hour) for all MV customers:
  - P>500kW by June 2004
  - P=201-500kW by December 2004
  - P=101-200kW by December 2005
  - P<=100kW by December 2006

• Currently all HV and MV customers are actually equipped with interval meters and treated on hourly base
REGULATORY DRIVERS IN 2006

- Completion of the liberalization of the electricity sector as from 1 July 2007
- High differentiation among DSOs (AMM systems vs. electromechanical) in the absence of any obligation to set up AMM systems
- Prevent DSOs from “free riding”, in light of a single national tariff
- Major role that AMM systems can play in the electricity market of today and tomorrow
- Comments received to a previous consultation document (7 March 2005) on the same matter suggested the Authority to characterize AMM systems from the functional and performance points of view
- European Directive 2006/32/EC (article 13)
OBJECTIVES

• To help ensure competitiveness in the supply of electricity to residential and non-residential customers

• To establish the functional and technological conditions to make it possible to extend hourly metering to low-voltage withdrawal points also

• To improve the quality of the electricity metering, supply and distribution services for LV consumers and ensure the same functional and performance levels both for customers in the free market and those in the universal service

• (Not included in the R.O.): to look further some specific requirements, in particular consumption awareness (remote display) and demand response issues (home and building automation)
WHY MINIMUM REQUIREMENTS

- In order to guarantee:
  - the pursuance of the objectives
  - the same options to all customers (household/non household; free/in the protection scheme)
  - interoperability and standardization

- They should fulfil the following criteria:
  - system oriented
  - such as to avoid raising of barriers or limits to technical/technological innovation
  - such as to prevent the rejection of new solutions/architectures
  - be independent from telecommunications systems
RATIONAL BEHIND MINIMUM FUNCTIONAL REQUIREMENTS

- They had to be common to at least 4-6 models of smart meters present in the market from different manufacturers. For this reason the formal request of information was sent to:
  - Enel distribuzione
  - Acea Roma
  - Landis + Gyr
  - Actaris
  - Iskra-Emeco
  - Echelon (didn’t reply)

- Minimum functional requirements contained in the R.O. 292/06 were/are common to at least five models from major world-wide manufacturers
MAIN MINIMUM FUNCTIONAL REQUIREMENTS-AMM

Specified for:

- Single phase mono-directional meters
- Single phase bi-directional meters
- Three-phase phase mono-directional meters
- Three-phase bi-directional meters

- TOU price scheme (weekly profile): up to four bands, up to five intervals per day (1 totalizer + 4 band registers)
- Interval metering (min. 1 hour, depth = 36 days)
- Remote transactions [consumption reading (registers and intervals), supply activation/deactivation, change of the subscribed power, change of the TOU tariff, power reduction]
- Security of data (inside meters, during the transmission to the control centre, status word with prompt transmission to the control centre in case of meter failure)
- Freezing of withdrawal data (billing, contractual changes, switching)
- Breaker on board of meters + demand control algorithm (alternative: registration of the peak power per TOU band)
- Meter display (current totalizer and activated TOU band registers, last freezing)
- Slow voltage variations (according to EN50160)
- Upgrade of the program software
PERFORMANCE REQUIREMENTS

- After the introduction of minimum functional requirements, some performance indicators of AMM systems have been introduced (R.O. 235/07):
  - Annual percentage of successful remote transactions (activation/deactivation, change of the subscribed power, change of the price scheme, power reduction) within 24 hours and within 48 hours
  - Annul number of meters that at least once registered a failure reported to the control centre (through the status word)

<table>
<thead>
<tr>
<th>Reading frequency</th>
<th>Threshold S</th>
<th>No. of meters with no. of successful readings below threshold S</th>
<th>No. of meters with no. of successful readings below 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bimonthly</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-monthly or four-monthly</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six monthly</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>0</td>
<td><strong>Dark Gray</strong></td>
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</tr>
</tbody>
</table>
"DAILY" USE

Functions available today for around 30 Million customers

– Supply activation/deactivation
– Monthly/bimonthly readings (→ billings and other purposes))
– Change of the contractual power
– Reduction of the contractual power (bad payers)
– Disconnection/reconnection (bad payers)
– Switching
# ENEL DISTRIBUZIONE PERFORMANCE 2008

<table>
<thead>
<tr>
<th>ENEL DISTRIBUZIONE</th>
<th>Annual percentage of successful remote transactions (activation/deactivation, change of the subscribed power, change of the price scheme, power reduction) within 24 hours and within 48 hours</th>
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<td>Within 24 hours</td>
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<td>ENEL DISTRIBUZIONE</td>
<td>79%</td>
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Source: data submitted to the Autorità by Enel Distribuzione
**ENEL DISTRIBUTUZIONE PERFORMANCE 2008**

<table>
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<th>Meter reading frequency</th>
<th>Threshold S</th>
<th>% of meters with successful no. of annual readings below threshold S</th>
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<tr>
<td>Monthly</td>
<td>6</td>
<td>1.68%</td>
<td>0.59%</td>
</tr>
<tr>
<td>Bimonthly</td>
<td>3</td>
<td>1.73%</td>
<td>0.60%</td>
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Annual percentage of successful remote transactions (activation/deactivation, change of the subscribed power, change of the price scheme, power reduction) within 24 hours and within 48 hours

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<td>83%</td>
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Source: data submitted to the Autorità by Enel Distribuzione
MANAGEMENT OF BAD PAYERS

• First step: remote reduction of the 85% of the available power (that’s only 15% maximum of the available power is consumable by the customer)

• Second step: remote meter disconnection after 10 days from the reduction if the customers doesn’t pay

• Third step: remote meter re-connection with 100% of the available power within 1 day after payment
ITALY - average time (days) for activation and de-activation of supply

Source: data submitted to the Autorità by DSOs
USE OF SMART METERS AND AMM SYSTEMS FOR CONTINUITY OF SUPPLY

• Starting from 2008, gradually depending on the size of DSOs, the obligation to record the number and the list of the LV customers actually involved in each long unplanned interruption have/shall come into force

• This mandatory rule shall replace the current one in force based on the estimate of interrupted LV customers

• To this purpose DSOs are allowed to use information systems, characterized by minimum requirements determined by AEEG, or smart meters and AMM systems

• An incentive (to be paid in 2010 or 2011) is envisaged for DSOs that will use smart meters and AMM system to this purpose
USE OF SMART METERS AND AMM SYSTEMS FOR VOLTAGE QUALITY

- As from 2009 smart metering systems must be able to record and collect measurements relevant to slow voltage variations according to EN 50160

- A measurement campaigns (1 week in January 2010), based on samples of smart meters, has been required to Enel distribuzione and major DSOs. Data are under study.
DEMAND-RESPONSE
Energy or Power capacity?

- Retail markets (LV customers)
  - **Power:** household capacity limit: 3 kW (normally)
  - Power absorption limited with breaker on the meter
  - Strong tool for energy efficiency ⇒ no thermal electricity usage
- **Energy:** graduality in exploiting Smart Metering benefits:
  - From 2005: required interval metering (1 hour) for all MV cust.
  - From 2007: extended interval metering (1 hour) to all LV customers with power capacity > 55 kW
  - From 2009: required 3-band metering for all LV customers (to be completed by end-2011)
DEMAND RESPONSE (ELECTRICITY): OPPORTUNITY FROM SMART METERING

Household customers:

- Individual information about separated consumption per band (6 months per each customer, through the bill)
- Universal service 2-bands tariff (peak / midlevel+offpeak) progressively compulsory from mid-2010 (graduality regime)
- Cost-reflectivity for each LV customer
- Move contractual power capacity from 3 to 4.5 kW only during off-peak hours (automatically on board)

<table>
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<tr>
<th>M</th>
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<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
<th>S</th>
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<tr>
<td>off-peak</td>
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<td>peak</td>
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<td>mid-level</td>
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### 30 June 2010

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<td>No. of LV non</td>
<td>1.5 millions</td>
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Regulated market – average consumption per capita (kWh) for household consumers with TOU tariff vs. average consumption per capita (kWh) for household consumers with non TOU tariff

Source: Enel Servizio Elettrico
Regulated market – distribution of consumptions for a sample of 2,800 household consumers with voluntary TOU tariff as from January 2008 (until December 2007 they were consumers with non TOU tariff)

The same distribution of consumptions is observed for all the 0.2 millions of household consumers with TOU tariffs

Source: Enel Servizio Elettrico
Regulated market – monthly consumption per capita (kWh) for a sample of 2,800 household consumers with voluntary TOU tariff as from January 2008 (until December 2007 they were consumers with non TOU tariff)

Source: Enel Servizio Elettrico
Source: local supplier in North Italy, 50 TOU consumers

Source: Enel Servizio Elettrico

Autorità per l'energia elettrica e il gas
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TOU TARIFF FOR ALL CONSUMERS IN THE REGULATED MARKET: A RECENT DECISION (1/2)

• Introduced the mandatory TOU tariff for all household consumers in the regulated market as from July 2010 (the application of the TOU tariff for LV non household consumers in the regulated market started in 2008)

• Prices differentiated per bands (peak vs. mid-level + off-peak)

• The application of the TOU tariff will be conditioned by the following aspects:
  – the consumer must have a commissioned smart meter, re-parametrised according to the peak, mid-level and off-peak bands
  – the consumer has received specific information and at least three bills (one bill every two months) reporting the distribution of his consumptions with respects to the peak, mid-level and off-peak bands

• Expected 4.5 millions consumers with TOU tariffs in July 2010, 11 millions in August 2010, around 20 millions in December 2010
TOU TARIFF FOR ALL CONSUMERS IN THE REGULATED MARKET: A RECENT DECISION (2/2)

- The behaviour of consumers in shifting potentially their consumptions and the potential consequences on the LV network have been assessed by the Autorità and will be monitored in detail for a selected panel of consumers for 18 months (1 domestic customer every 1,000 between July 2010 and December 2011)

- Economical consequences for consumers - the equilibrium in the cost of the bill with respect to the non TOU regime is:
  - 1/3 of consumptions in the peak band
  - 2/3 of consumptions in the mid-level + off-peak bands

- If the consumer will be able to concentrate less than 1/3 of his consumptions in the peak band, he will pay less with respect to the non TOU regime, for the same consumption

- Until the end of 2011 an interim period, where the difference of the two prices (energy components) is limited to 10%, is envisaged

- The energy component prices will be differentiated also per season starting from 2012 (high season vs. low season)
DEMAND-RESPONSE

• Today: weak requirements (breaker and demand control algorithm on board, remote reduction of the available power until disconnection, display on board) strengthened by interval metering (> 55kW) and TOU (peak/off-peak/mid-level for <= 55kW)

• Tomorrow: to be developed.
  – Made a study in 2008 aimed at verifying what could be the role of smart meters in the future (remote display and home/building automation): a smart node in a smart network?
  – Made a survey in 2010 (through CATI methodology) on the interest of LV consumers and their willingness to pay to have a remote (in house) display in the house and suitable information to implement demand-response
DEMAND-RESPONSE

In the 2010 survey (carried out by “Istituto Piepoli S.p.a.”) the following interests of LV consumers, inter alias, have been surveyed:

- The preferred information by consumers to be displayed on the in house display
- The frequency this in house display would be checked by the consumer
DEMAND-RESPONSE

The preferred information by LV consumers to be displayed on the in house display:

(\textit{DEGREE OF INTEREST = \% of A lot + Enough})

<table>
<thead>
<tr>
<th>Consumption in Euro</th>
<th>Advance notice for planned interruptions</th>
<th>Instantaneous consumption</th>
<th>Values of the current consumption registers</th>
<th>Consumption peak</th>
<th>Current tariff in force</th>
<th>Value of the frozen consumption registers</th>
<th>Consumption profile</th>
<th>Information on interruptions of supply</th>
<th>Information on voltage quality (rms)</th>
<th>Green telephone number</th>
<th>Display of commercial messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>48%</td>
<td>50%</td>
<td>44%</td>
<td>43%</td>
<td>39%</td>
<td>40%</td>
<td>44%</td>
<td>41%</td>
<td>44%</td>
<td>26%</td>
<td>24%</td>
<td>31%</td>
</tr>
<tr>
<td>39%</td>
<td>37%</td>
<td>33%</td>
<td>32%</td>
<td>33%</td>
<td>29%</td>
<td>29%</td>
<td>29%</td>
<td>26%</td>
<td>26%</td>
<td>23%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Source: 2010 Istituto Piepoli survey
DEMAND-RESPONSE

The frequency the in house display would be checked by the LV consumer:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Non Domestic</th>
<th>Domestic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day or almost</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Once/more than once a week</td>
<td>12%</td>
<td>16%</td>
</tr>
<tr>
<td>Around once every two weeks</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>Around once a month</td>
<td>18%</td>
<td>19%</td>
</tr>
<tr>
<td>More rarely</td>
<td>39%</td>
<td>29%</td>
</tr>
<tr>
<td>Doesn’t know</td>
<td>17%</td>
<td>21%</td>
</tr>
</tbody>
</table>

BASE: TOTALE CAMPIONE

Source: 2010 Istituto Piepoli survey
DEMAND-RESPONSE

Internet vs. the in house display for LV non domestic consumers: the preferred interface

- **Non Domestic**
  - In house display: 36%
  - Internet, through specific web site: 64%

This percentage explains why non domestic consumers are less interested in the in house display

Source: 2010 Istituto Piepoli survey
THE METERING TARIFF

- **2004**: separated the metering tariff from the distribution tariff
- **2004-2007**: the “extra-charge” for each household customer due to smart meters has been less than 2 Euros per year
- **2008-2013**:
  - the X factor will be 5% for metering activities (vs 1.9% of distribution activities)
  - the metering tariff is/will be adjusted every year
- An equalization mechanism is envisaged in order to recognize higher costs to smaller DSOs
**INTEGRATED DEMAND-RESPONSE**
Envisaged evolution of architecture/interoperability

Reg.Order 292/06

- **Electricity smart meter**
- **Traditional gas meter**
- **Control center**

(*) Function not required by the minimum requirements set by AEEG but already available via PLC

*Autorità per l'energia elettrica e il gas*
INTEGRATED DEMAND-RESPONSE
Envisaged evolution of architecture/interoperability

(*) Function not required by the minimum requirements set by AEEG but already available via PLC

Autorità per l'energia elettrica e il gas
INTEGRATED DEMAND-RESPONSE
Envisaged evolution of architecture/interoperability

Reg.Order 292/06
+Mandate M-441

Reg.Order. ARG/gas 155/08

Electricity
smart meter

Gas
smart meter

Control center

Home display (*)
and automation

2nd generation

(*) Function not required by the minimum requirements set by AEEG but already available via PLC

Autorità per l'energia elettrica e il gas

Additional physical or logical communication gate (regulatory framework to be developed, but already envisaged by Reg.Order n. ARG/gas 155/08)
AGENDA

Smart metering
• Regulation in Italy
• Activities by European Energy Regulators
• Initiatives by the European Commission

Smart grids
• Regulation in Italy
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• Initiatives by the European Commission
RECENT ERGEG WORKS ON SMART METERING

- In 2009 ERGEG published a Status Review (Status Review on Regulatory Aspects of Smart Metering (Electricity and Gas) as of May 2009 - Ref. E09-RMF-17-03 19 October 2009)

- In June 2010 ERGEG published a consultation paper on smart metering (An ERGEG Public Consultation Paper on Draft Guidelines of Good Practice on Regulatory Aspects of Smart Metering for Electricity and Gas - Ref: E10-RMF-23-03 10 June 2010)

- The conclusion paper is expected for end 2010/beginning 2011

All documents are freely available on the web site of European Energy regulators: http://www.energy-regulators.eu/portal/page/portal/EER_HOME
FINDINGS: MAIN POLICY DRIVERS FOR A ROLL-OUT OF SMART METERING

• Main drivers:
  1. Energy efficiency
  2. More frequent meter readings
  3. Peak load management

• Key regulatory tools:
  1. Legal obligation
  2. Minimum functional requirements
  3. Financial incentives
  4. Standardisation

Source: 2009 ERGEG Status review on s.m.
FINDINGS: STATUS OF LARGE SCALE ROLL-OUT IN EUROPE

• Achieved
  – in electricity in 2 countries: Italy and Sweden (more than 90% of population equipped)
  – In gas in 0 countries

• Decided
  – In electricity in 3 countries: Finland, Greece and Spain
  – In gas in 2 countries: Italy and Spain

• Under discussion
  – in electricity in 12 countries: Austria, Czech Republic, Denmark, France, Germany, Great Britain, Ireland, Netherlands, Norway, Poland, Portugal, Slovak Republic
  – In gas in 4 countries: France, Great Britain, Netherlands and Slovenia

Source: 2009 ERGEG Status review on s.m.
FINDINGS: COST/BENEFIT ANALYSIS

- Have been conducted
  - for electricity in 7 countries: Czech Republic, Finland, France, Netherlands, Portugal, Spain and Sweden
  - for gas in 3 countries: Italy, Netherlands and Spain

- Are in progress
  - for electricity in 5 countries: Austria, Belgium, Denmark, Germany and Poland
  - for gas in 8 countries: Austria, Belgium, France, Germany, Great Britain, Ireland, Poland and Slovenia

Source: 2009 ERGEG Status review on s.m.
FINDINGS: FUNCTIONAL AND TECHNICAL ASPECTS

- Countries who have regulated or discussed (some kind of) minimum requirements:
  
- **In electricity 16 countries:** Germany, Austria, Cyprus, Estonia, Finland, France, Hungary, Iceland, Italy, Lithuania, the Netherlands, Norway, Poland, Portugal, Spain and Sweden

- **In gas 4 countries:** France, Italy, Poland and the Netherlands

- But: Not all these countries have included all the functions mentioned in the review

Source: 2009 ERGEG Status review on s.m.
CONTENTS OF THE 2010 CONSULTATION PAPER

For both electricity and gas, recommendations on:
- Customer services (minimum and optional)

Correspondence with the additional functionalities in development under the mandate M/441

- Costs and benefits
- Roll-out

Source: 2010 ERGEG Consultation paper on s.m.
## CUSTOMER SERVICES

<table>
<thead>
<tr>
<th>ELECTRICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum customer services</strong></td>
</tr>
<tr>
<td>1. Information on actual consumption, on a monthly basis</td>
</tr>
<tr>
<td>2. Accurate metering data to relevant market actors when switching supplier or moving</td>
</tr>
<tr>
<td>3. Bills based on actual consumption</td>
</tr>
<tr>
<td>4. Offers reflecting actual consumption patterns</td>
</tr>
<tr>
<td>5. Power capacity reduction/increase</td>
</tr>
<tr>
<td>6. Activation and de-activation of supply</td>
</tr>
<tr>
<td>7. Only one meter for those that both generate and consume electricity</td>
</tr>
<tr>
<td>8. Access on customer demand to information on consumption data</td>
</tr>
<tr>
<td><strong>Optional services</strong></td>
</tr>
<tr>
<td>9. Alert in case of an non-notified interruption</td>
</tr>
<tr>
<td>10. Alert in case of high energy consumption</td>
</tr>
<tr>
<td>11. Interface with the home</td>
</tr>
<tr>
<td>12. Information on voltage quality</td>
</tr>
<tr>
<td>13. Information on continuity of supply</td>
</tr>
</tbody>
</table>

**Source:** 2010 ERGEG Consultation paper on s.m.
## Costs and Benefits / Roll-out

<table>
<thead>
<tr>
<th>ELECTRICITY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs and benefits</td>
<td>14. When making a cost benefit analysis, an extensive value chain should be used</td>
</tr>
<tr>
<td>Roll-out</td>
<td>15. All customers should benefit from smart metering</td>
</tr>
<tr>
<td></td>
<td>16. No discrimination when rolling out smart meters</td>
</tr>
</tbody>
</table>

Costs and benefits: example of assessment of the term “positively” in the 3rd energy package, based on:

- Calculation of the net present value considering a temporal horizon for the analysis;
- Actual ROI (the ratio of money gained or lost on an investment relative to the amount of money invested); or
- Expected impact on customer charges.

Costs and benefits: assessed further potential benefits:

- 8 for customers
- 2 for network owners/controllers
- 11 for network operators
- 1 for society as a whole

Source: 2010 ERGEG Consultation paper on s.m.
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INITIATIVES ON SMART METERING BY THE EUROPEAN COMMISSION

- Directive 2004/22/EC (MID)
- Directive 2006/32/CE (ESD), in particular article 13
- Standardization mandate M/441 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 (12 March 2009)

- Launch of the collaborative project “OPEN meter” funded under the Seventh Framework Programme FP7 (Grant Agreement 226369 of 4 December 2008)

- 3rd energy package
MANDATE M/441 - Objectives

- The general objective of this mandate is to create European standards that will enable interoperability of utility meters (water, gas, electricity heat) which can then improve the electricity, heat), means by which customers’ awareness of actual consumption can be raised in order to allow timely adaptation to their demands.
MANDATE M/441 – Execution of the mandate

• CEN, CENELEC and ETSI shall present a work programme to the EC within 3 months of the acceptance of the mandate

• “The European standards for communication shall be presented within 9 months of the acceptance of the mandate”

• “The harmonised solutions for additional functions (European standards) shall be completed within 30 months of the acceptance of the mandate”
MANDATE M/441 – The interoperable architecture (concept)
MANDATE M/441 – Additional functionalities

1. Remote reading of metrological register(s) and provision to designated market organisation(s)
2. Two-way communication between the metering system and designated market organisation(s)
3. Meter supporting advanced tariffing and payment systems
4. Meter allowing remote disablement and enablement of supply
5. Communicating with (and where appropriate directly controlling) individual devices within the home/building
6. Meter providing information via portal / gateway to an in-home/building display or auxiliary equipment
THE OPEN METER PROJECT

Collaborative project “OPEN meter” funded under the Seventh Framework Programme FP7 (Grant Agreement 226369 of 4 December 2008)

Objective:

- The main objective of the OPEN meter project is to specify a comprehensive set of open and public standards for AMI, supporting electricity, gas, water and heat metering, based on the agreement of all the relevant stakeholders in this area, and taking into account the real conditions of the utility networks so as to allow for full implementation

Duration of the project:

- The project officially started on the 1st of January 2009 and it will be accomplished in 30 months, by 30th June 2011
3rd ENERGY PACKAGE - Electricity Dir. 2009/72/EC of 13 July 2009

For smart metering (Item 2 of Annex 1):

- Member States shall ensure the implementation of intelligent metering systems that shall assist the active participation of consumers in the electricity supply market. The implementation of those metering systems may be subject to an economic assessment ...

- Such assessment shall take place by 3 September 2012.

- Subject to that assessment, Member States ... shall prepare a timetable with a target of up to 10 years for the implementation of intelligent metering systems.

- Where roll-out of smart meters is assessed positively, at least 80 % of consumers shall be equipped with intelligent metering systems by 2020.

- The Member States ... shall ensure the interoperability of those metering systems to be implemented within their territories and shall have due regard to the use of appropriate standards and best practice and the importance of the development of the internal market in electricity.
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Smart grids
- Regulation in Italy
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1. Incentive scheme for demonstration projects on smart grids

Launched a selection process for demonstration projects of smart grid, focused on “active MV networks” with at least 1% of the time in a year the power flows from MV to HV at the HV/MV transformer.

The selection process will be based on a comparative assessment of different proposals to be presented by DSOs (by end-September 2010), according to a key-performance indicator scheme, and will conclude with a list of demonstration projects admitted to a special tariff incentive: increased WACC for distribution investments in smart grids from 7% to 9% for 12 years.
2. Technical rules and economic conditions for connections (1/2)

Available harmonised technical rules for connections, both for users and producers, to distribution networks.

Approved a “standard technical rule” for connections to MV and HV networks conceived with the cooperation of the Italian electric standardisation body (CEI) in order to be applied at Country level (in Italy there are 160 DSOs).

Currently, a “standard technical rule” is under public inquiry also for connections to LV (for instance for small PV plants).
SMART GRID REGULATION IN ITALY

2. Technical rules and economic conditions for connections (2/2)

As for economic conditions for connections, a special regime has been introduced from January 1\textsuperscript{st} 2009 with the introduction of shallow connection fee for distributed generation plants to be connected at MV or LV networks moreover, for RES (renewable energy sources) distributed generation plants, special reduced fees (50\%) apply (the difference of the cost being socialised among all customers). Timeframes for connections are set in the same regulatory order, and automatic compensations are envisaged when time deadlines are not respected by the distribution companies due to their responsibility.
SMART GRID REGULATION IN ITALY

3. Smart metering and TOU prices for all LV consumers

See the first part of this presentation.
4. Demand response

See the first part of this presentation.

Furthermore, a proceeding finalized to take initiatives on demand response issues with particular reference to the availability of consumption data to consumers through the use of smart meters, according to the dispositions provided by the article 13 the Directive 2006/32/EC, thus assessing the possibility to increase the effectiveness of the information and of the price signal to consumers, was launched in 2009.
5. Renewable generation incentivization

Special attention for promoting the RES (renewable energy sources) distributed generation plants.

- “on-spot trading”, especially suited for PV plants (but applicable for any RES plant up to 200 kW and for high-efficiency CHP plants); through this mechanism, the energy produced but not directly consumed is assumed to be “stored” by the network and can be exchanged “in site” at its actual value (valuated with a three-band system)

- due to the dramatic increase of wind generation plants, the relevant regulation recently evolved in order to ensure a higher level of integration of wind generation plants with the energy market. An incentive has been introduced to foster wind plants to give their better forecasts of production, in order to help the system dispatcher to reduce balancing costs.
SMART GRID REGULATION IN ITALY

6. Electric vehicles

Recently removed one of the barrier to the diffusion of EVs, envisaging that a single household customer can be connected with two points of delivery, in order to separate normal household supply from supply dedicated to EVs “household” recharge (same rule apply for heat pumps).

Now under assessment new rules for energy dispatching in order to adjust the customer freedom of choice for energy supply with the EVs recharge system that in a first phase could be owned by the DSOs under the condition that the customer that is also EV’s owner can freely choose his/her own energy supplier at the EV recharge point.
7. Continuity of supply regulation (1/2)


As from 2000 the continuity regulation scheme has focused on the duration of long unplanned interruptions (SAIDI) due to DSOs responsibilities and originated on MV and LV networks. Main effects of this regulation are:

- highly automation level of the MV network: all MV feeders are equipped with protection relays with real time communication with the Control Center; around 1/3 of the MV/LV substations are real time remotely controlled by the Control Center;

- in consequence of that, the reliability CAIDI index (Customer Average Interruption Duration Index) is the lowest in Europe, around 25 minutes, with lower values for interruptions originated on MV networks.
7. **Continuity of supply regulation (2/2)**

As from 2008 the continuity regulation scheme has focused also on the number of long and short interruptions (SAIFI + MAIFI; SAIFI=System Average Interruption Frequency Index, MAIFI=Momentary Average Interruption Frequency Index); due to DSOs responsibilities and originated on MV and LV networks.

As from 2006 guaranteed standards (with automatic compensations) on the maximum annual number of long interruptions for MV customers have been in force.

As from 2009 guaranteed standards (with automatic compensations) on the maximum duration of interruptions have been in force for LV and MV customers.
8. Voltage quality

The perspective of smart grids (increased DG connected to MV and LV networks) leads to a new scenario: in the future, it will be of keen importance to avoid any deterioration of voltage quality, keeping into account the presence of new agents (DG units, often connected to the grid by means of static converters). Hence the need for monitoring voltage quality levels along distribution networks.

Voltage quality on Italian MV networks is currently monitored by means of a research initiative displaced by CESI Ricerca (now RSE) driven by AEEG. In particular, about 400 main MV busbars of as many HV/MV transformer, representing about 10% of MV networks are monitored by means of a local VQ Monitor. The relevant data are collected by a central system, and are freely available on the web (http://queen.ricercadisistema.it, available also in English). This system has been in place since 2006.
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ACTIVITIES BY EUROPEAN ENERGY REGULATORS

• Prepared the “Position Paper on Smart Grids” which was available for public consultation on 17 December 2009 (E09-EQS-30-04), and the “Position Paper on Smart Grids - ERGEG conclusion paper” on 10 June 2010 (E10-EQS-38-05).

• This position paper identified three priorities for regulators:
  i. identify the effects and benefits of smart grids and concentrate on the output performance of regulated companies by the potential use of performance indicators;
  ii. facilitate ‘smart grids’ discussions, definition of common views, and cooperation among all stakeholders with a special focus on standardisation activities and interoperability of “smart” technologies;
  iii. find ways of encouraging innovation and supporting the transition process from research and development to demonstration and to full deployment.
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INITIATIVES BY THE EUROPEAN COMMISSION
DG ENER

Launched by the European Commission DG ENER (formerly DG TREN) in October 2009 a Task Force for the implementation of Smart Grids in the internal energy market. The mission of the “Task Force Smart Grids” is to advice the Commission on policy and regulatory directions at European level and to coordinate the first steps towards the implementation of smart grids under the provision of the Third Energy Package. Expert Groups are currently working on:

1. Functionalities of Smart Grid and Smart Meters;
2. Regulatory recommendations for data safety, data handling and data protection;
3. Roles and responsibilities of actors involved in the Smart Grids deployment.
INITIATIVES BY THE EUROPEAN COMMISSION
DG RESEARCH

European Electricity Grid Initiative (EEGI, officially launched on 3 June 2010) which is one of the European industrial initiatives for private-public partnerships in the framework of the Strategic Energy Technology Plan. The objective of EEGI is to implement a 9-year plan for research, development and demonstration about electricity grids, with planned current investments around 2 billion Euros.
Thank you for your attention!

For further information:
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This presentation is not an official document of the “Autorità per l’energia elettrica e il gas”