



Energy research Centre of the Netherlands



## Smart meters and smart grids, natural allies?

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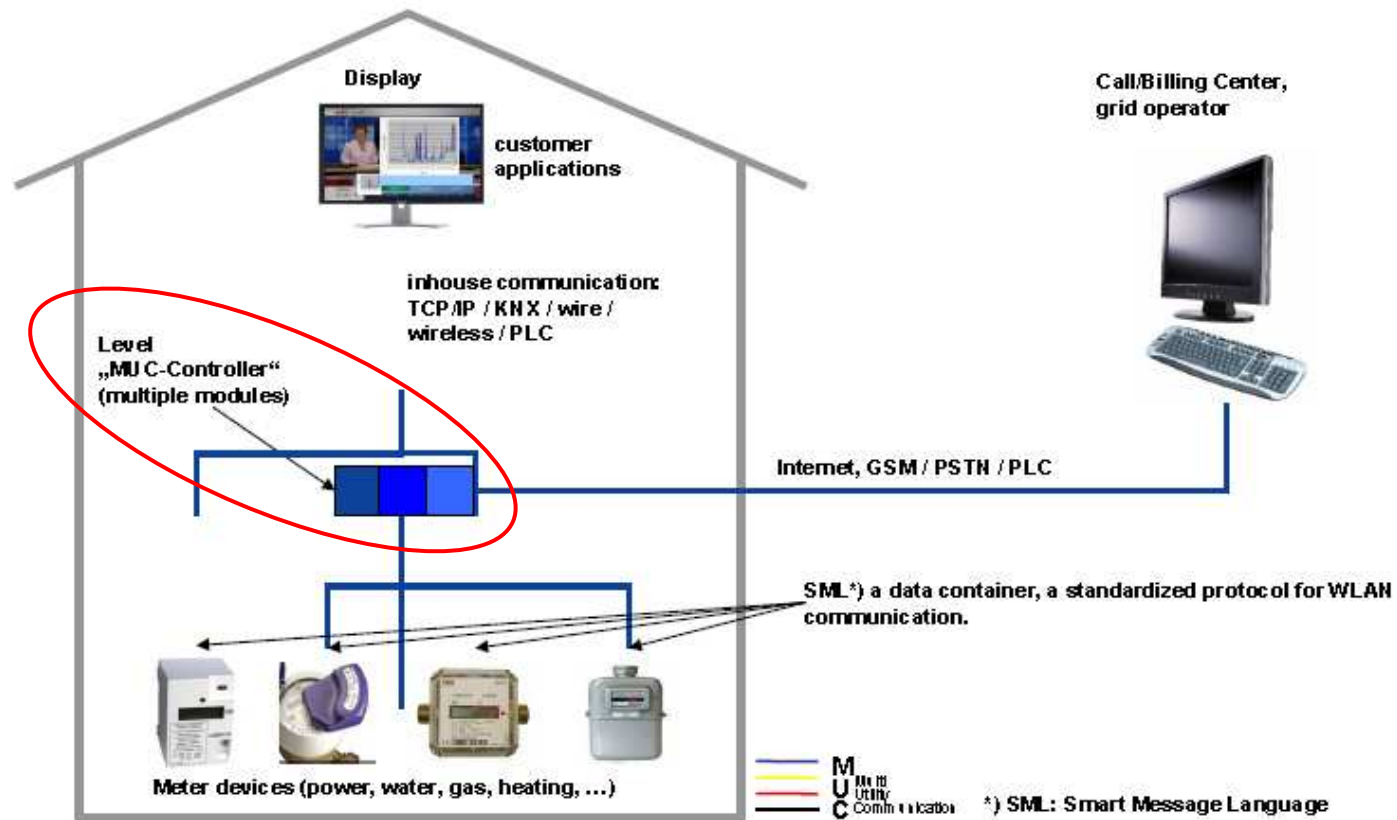
Smart meters and smart grids, natural allies?  
Petten, 29 October 2008

[www.ecn.nl](http://www.ecn.nl)

## Content

- What is Smart Metering?
- What are SmartGrids?
- Why combine Smart Metering and SmartGrids?
- Current developments
- ESMA project
- Conclusions

# Smart Metering



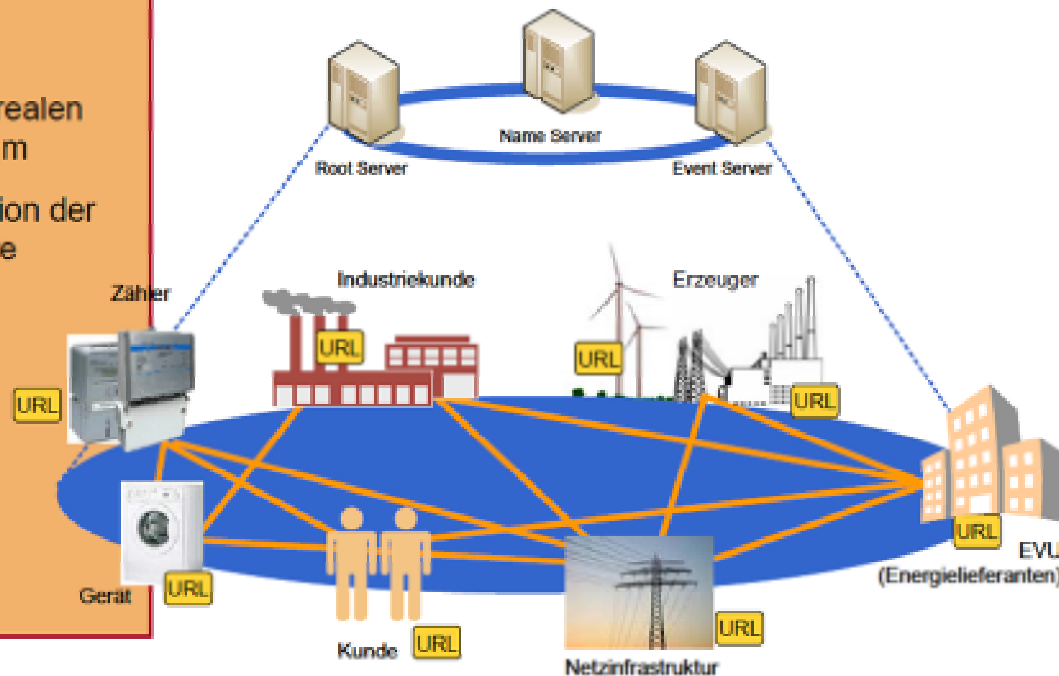
Metering Europe 2007, Prof. Dr. Michael Laskowski, RWE Energy AG, Germany

[www.m-u-c.org](http://www.m-u-c.org)

## Das Internet der Energie

### Merkmale und Eigenschaften

- Virtuelles Abbild der realen Welt im Energiesystem
- Eindeutige Identifikation der Elemente und Akteure
- Datensicherheit- und Datenschutzkonzept
- Neutraler Betrieb
- Universelle, flexible Kommunikation



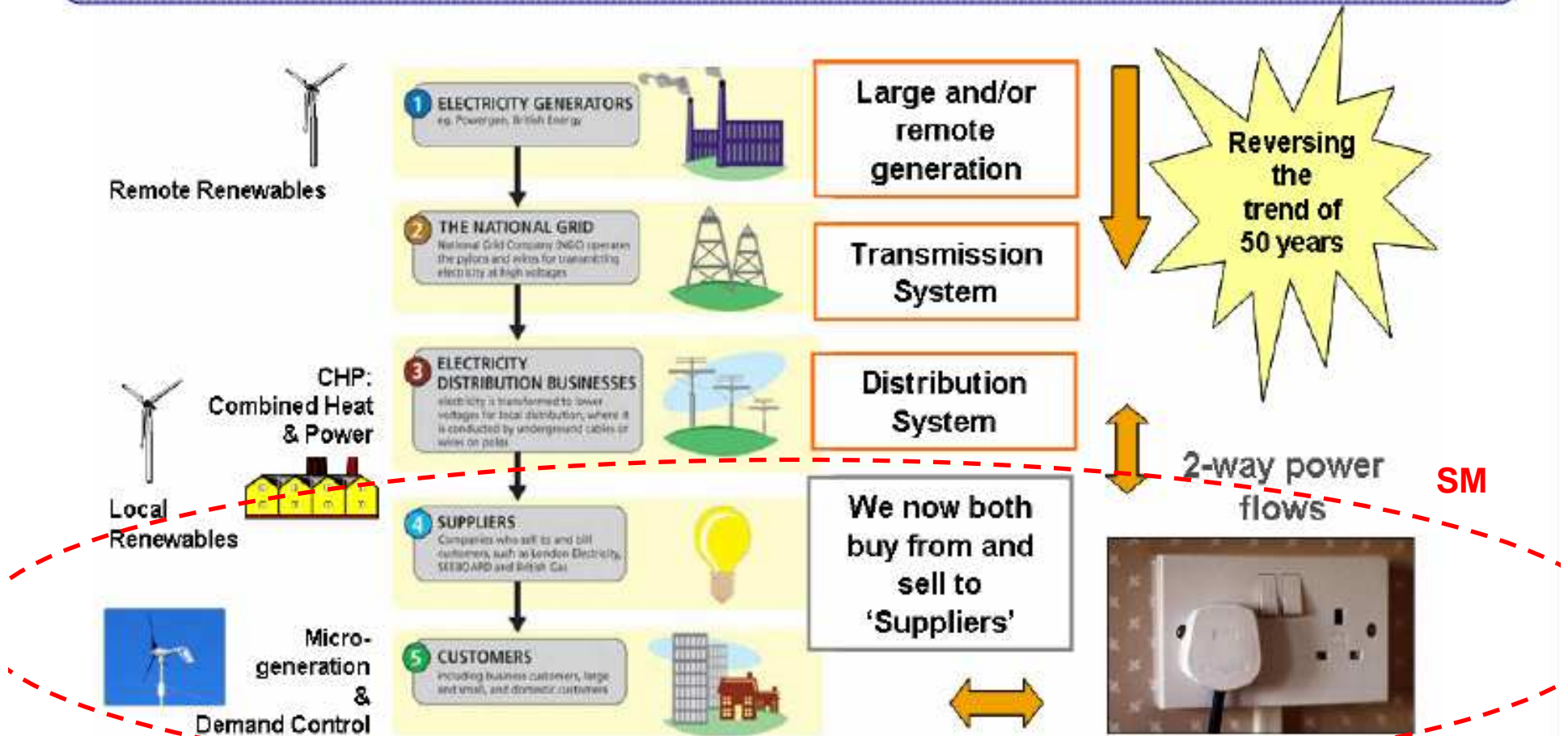
© Trianel European Energy Trading GmbH  
22.04.2008



Folie 23

# Your future home may help power others

*Any house can become an electricity generator and distributor  
Consumers become providers. Customers become suppliers*



Metering, Copenhagen 11th October 2006 – Maher Chebbo, VP Utilities EMEA SAP AG, EU Smart Grids vision 2020 and SRA  
12

## Why combine Smart Metering and SmartGrids?

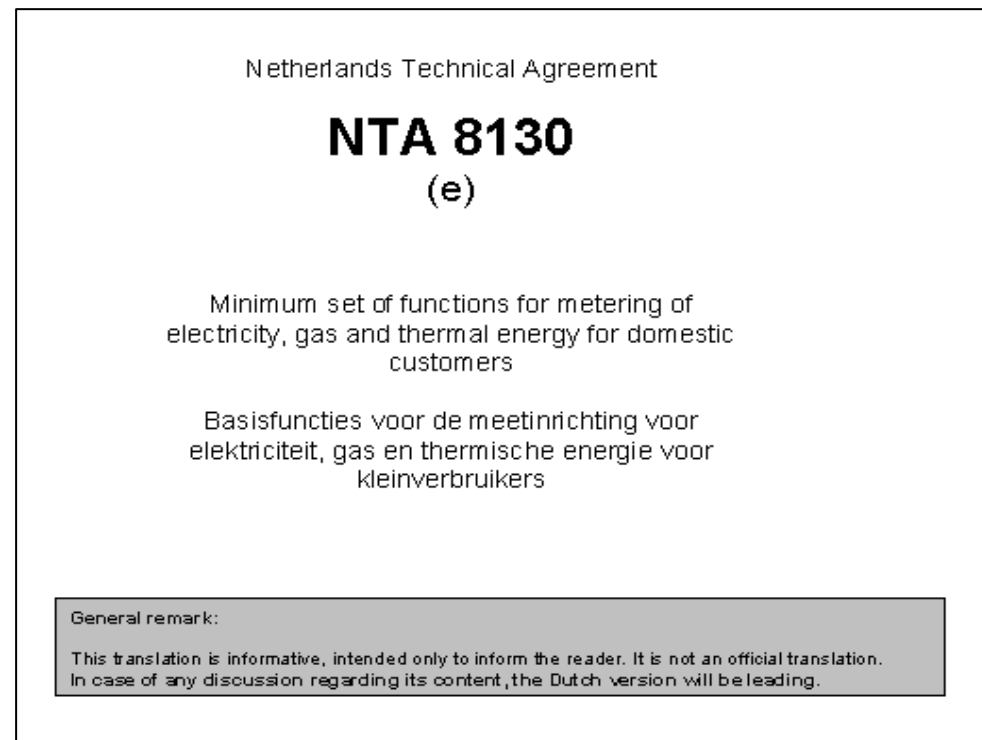
- Smart Metering is about interaction between utility and customers supported by IT
- SmartGrids is about interaction between power grid and customers supported by IT
- IT requirements for SmartGrids include:
  - bidirectional communication with customers and their appliances
  - comtable measurement of time dependent tariffs
  - comtable measurements for distributed generators and storage
  - distributed control
  - PQ measurements
- IT requirements for Smart Metering are similar

## Why NOT combine Smart Metering and SmartGrids?

- IT requirements for Smart Metering may be downscaled
- Smart Metering is already being implemented in several countries
- Timing, business case and requirements for SmartGrids are still being discussed
- Smart Metering requires high investment
- SmartGrids makes investment even higher

## Netherlands

### NTA 8130:2007 Minimum set of functions, August 2007



## Europe

### FP7: Open-access Standard for Smart Multi-Metering Services

- **Widely accepted open standards**
- **capable to guarantee interoperability**
- **of systems and devices of different manufacturers**

#### Goal

- **open up market of smart multi-metering system**
- **enable active customer participation to energy markets**
- **allow EU-industry to take world leadership**

*Topic ENERGY.2008.7.1.1: Open-access Standard for Smart Multi-Metering Services*

*Contentscope:* The large scale adoption of Smart Multi-Metering equipment, potentially covering electricity, gas and any other network service and commodity, is today hampered by the lack of widely accepted open-standards, capable to guarantee the interoperability of systems and devices produced by different manufacturers.

The main objective of this topic is to fill the knowledge gaps necessary to enable the relevant industries to agree on the required standards.

(Pre-normative) Research activities should cover formal definition of protocols, data formats and all the necessary modules of integrated open-access Integrated Automatic Meter Management Systems. Among the functions covered will be automatic meter reading, remote (re)connection, flexible tariff management, demand side management and demand response to market and network signals, and integration of Distributed Generation.

*Funding scheme:* Collaborative Project.

*Expected impact:* Adoption of these standards will open up the market of smart multi-metering system, enabling active customer participation to energy markets, and at the same time allowing EU-industry to take world leadership.

*Other information:* The typical consortium should be a well balanced partnership between network industries, equipment suppliers, research centres and regulatory and standardisation bodies. A maximum of one project will be funded under this topic.

*Open in call: FP7-ENERGY-2008-1*

## Europe

### FP7: Open-access Standard for Smart Multi-Metering Services

Functions including:

- **Automatic Meter Reading**
- **Remote (re)connection**
- **Flexible tariff management**
- **Demand Side Management and Demand Response to market and network signals**
- **integration of Distributed Generation**

*Topic ENERGY.2008.7.1.1: Open-access Standard for Smart Multi-Metering Services*

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# ESMA (www.esma-home.eu)



**ESMA explores:**

- ... how final energy customers can improve their energy efficiency with the help of energy use feedback**
- ... what are the requirements for smart meters to support this**
- ... how utilities / ESCOs / service providers can provide this**

# ESMA Guide

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## Rules of thumb for effective feedback

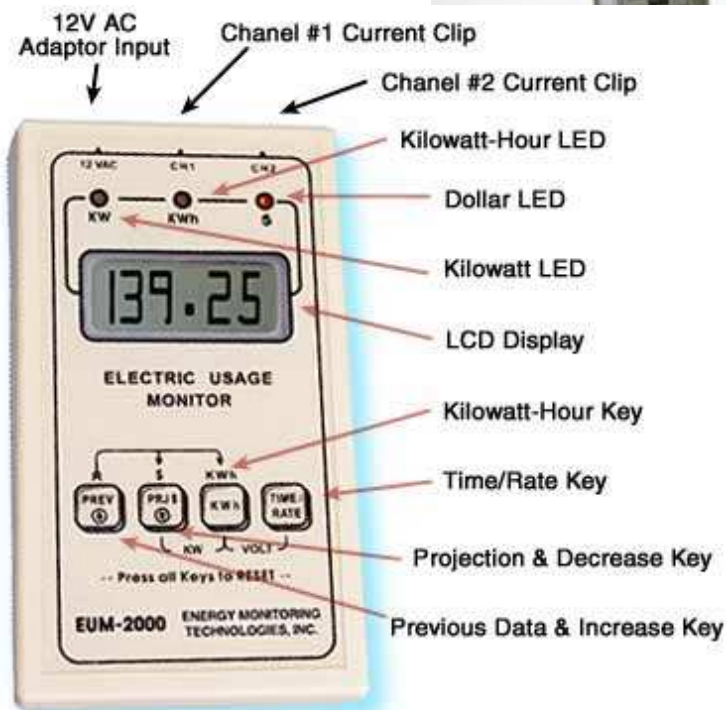
1. **Time** between behaviour and feedback is crucial:
  - direct feedback -> consumption behaviour
  - indirect feedback -> investment behaviour
2. Feedback is likely to be more effective in combination with **goal setting**
3. **Historic benchmarking** is likely to be more effective than comparative or normative feedback
4. For direct feedback **displays** more suitable than internet

# Feedback Displays: some samples

## Australia



## USA



# Feedback Displays: some samples

UK



Netherlands



## Recommendations for Smart Metering

- Common minimum requirements for Smart Metering
  - interoperability, services
- Preferably on a European level
  - no market barriers
- Take into account SmartGrids developments within the next 10-15 years.

## Conclusions

- Smart Metering is about interaction between utility and customers, supported by IT
- SmartGrids is about interaction between power grid and customers (demand, supply, storage), supported by IT
- IT requirements for SmartGrids include:
  - bidirectional communication with customers and their appliances
  - comtable measurement of time dependent tariffs
  - comtable measurements for distributed generators and storage
  - distributed control
  - PQ measurements
- IT requirements for Smart Metering are similar, but may be downscaled

## Conclusions (2)

- Interest in SmartGrids is rapidly growing
- Timing, business case and requirements are still being discussed
- Smart Metering is being implemented in several countries
- Main driver in Europe: Energy Efficiency
- Common minimum requirements for Smart Metering are necessary
  - Preferably on a European level
  - Taking into account SmartGrids developments (in next 10-15 years)

## Smart Meters and Smart Grids: Natural Allies?

**NO**

**Smart Meters**

**CAN BE**

**FIRST STEP**

**towards Smart Grids**



QUOTE

*'Slimme meters vragen om een slimme minister'*

*EZ-topambtenaar **Mark Frequin** bij de in ontvangstdname van het actieplan decentrale infrastructuur*

QUOTE

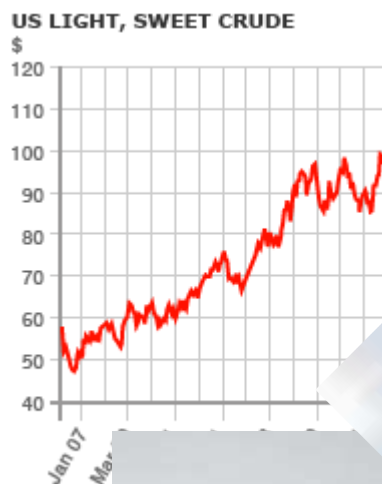
*'Smart Meters require a smart minister'*

***Mark Frequin** (Director General at ministry of Economic Affairs)  
when receiving the Action Plan Decentral Infrastructure*

## Bonus Material

# New requirements for the energy supply

**Oil price 'may hit \$200 a**



World Primary Energy Demand by Region  
in the Reference Scenario



Bloomberg  
IEA – WEO 2006  
WWF  
GWEC  
Tesla  
MS Clipart

## What is happening?

- **Customers**
  - live , travel, recreate, consume
  - worried about energy costs
  - some: worried about money, environment, energy security
  
- **Governments**
  - economy, environment, energy security
  - purchasing power, prevention of fuel poverty
  - targets: energy efficiency, CO<sub>2</sub> emissions, renewables
  
- **Companies**
  - market opportunities
  - some: sustainable development
  
- **Energy suppliers, ESCOs, service providers**
  - energy services
  - energy advice

## What is happening?

opportunities for  
energy efficiency  
services

- **Customers**
  - live , travel, recreate, consume
  - worried about **energy costs**
  - some: worried about **environment, energy security**
- **Governments**
  - **economy, environment, energy security**
  - **purchasing power, prevention of fuel poverty**
  - targets: **energy efficiency, CO<sub>2</sub> emissions, renewables**
- **Companies**
  - **market opportunities**
  - some: **sustainable development**
- **Energy suppliers, ESCOs, service providers**
  - **energy services**
  - **energy advice**

## PowerPlayer- Concept features

- Real time and historical energy, cost and carbon data for electricity and gas
- Instantaneous and cumulative
- Intelligent goal setting program ('learning by gaming')
- Estimates monthly and annual cost savings
- Focus on efficient behaviour instead of changing behaviour

## Summary

- How can I use Smart Metering to help my customers increase their Energy Efficiency?
  - ▶ **Combine feedback with targeted advice and incentives**
- What is the efficiency improvement my customers can achieve?
  - ▶ **Indirect feedback: 0 – 10%**
  - ▶ **Direct feedback: 5 – 15%**
- What type of feedback is most effective?
  - ▶ **Direct feedback in combination with advice and incentives**
- What can I learn from experiences throughout Europe and the world?
  - ▶ **See also European Smart Metering Guide 2008**

## Energy feedback: Basic concepts

- Direct feedback (real time, separate display etc.)
- Indirect feedback  
(logging on to a website for interval data, TV, SMS, billing)
- Part of pre payment program (direct feedback)
- Part of time related pricing structures (less common in EU)
- Utility controlled feedback: demand response, peak load control/ management (less common in EU).

## ESMA Project Participants



## ESMA privileges for Alliance Members

- Alliance members' Web site (<http://www.esma-home.eu>)
- Best practices for energy efficiency regarding:
  - Regulation and market conditions
  - National barriers and drivers
  - Methodologies for estimating energy savings
  - Consumer feedback mechanisms
- Annual reports about progress of smart metering in Europe and elsewhere
- 'ESMA Guide': quick introduction (getting started)

## 7 rules to consolidate your investment

1. **Imagine** possible future environments and business models
2. **Imagine** future services
3. **Design** using open standards (international, intersectoral)
4. **Design** the system in a modular way
5. **Design** for growth and (partial) replacement
6. **Test** extensively before large scale implementation  
(including a customer interaction test)
7. **Communicate with all (future) stakeholders**

## What is most effective feedback?

In home tools based on a mix of:

- Degree of instantaneous and continuous information
- Type, quality and quantity of data
- Level of interaction and control by consumer
- Use of rate program / pricing structure