

# Smart meters in our future

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New Generation Energy

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# + Topics

Smart meters....

1. What are they and what do they need
2. Their role in the industry
3. Implications for now and the future



## + Part 1 – What is it all about?

What is a smart meter, what does it need, what can it do, who is doing it?



# The visible

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## Features of the Smart Meter

Smart meters measure and record how much electricity is used at different times of the day, and use a communications network to transmit the half hour meter readings to Jemena six times a day.

There are registers on the smart meter you can access to read information displayed on the screen.

The Power Usage light indicates that power is being consumed at the metered premises. The faster the light flashes, the more power is being used.

The Scroll button allows you to navigate through register items on the display panel.

The terminal cover contains a seal to prevent tampering and protect the integrity of your consumption data. It is an offence to remove seals or interfere with metering equipment.

A sticker is attached here to provide meter reading instructions for the local electricity network.

Use the Scroll button to display the following registers:

0204 12  
01

**Register 1**  
Displays the current date in a day, month and year format.

083302  
02

**Register 2**  
Displays Australian Eastern Standard time in a 24 hour format, including hours, minutes and seconds.

078 124  
03

**Register 3**  
Displays the total electricity consumption at the main circuit of the premises in kilowatt hours from the date of meter activation.

00 1308  
13

**Register 13**  
Displays export electricity if your meter is configured for renewable energy, such as solar.



## HOW TO READ YOUR METER

Single phase 410 AMI (Advanced Metering Infrastructure) Meter

To record the energy generated from the grid of your solar system, the existing smart meter installed has been re-programmed to record exported energy. This re-program will allow the meter to record net usage, which records the premises' total electricity consumption that has been offset by electricity generated by your solar system. This includes the excess energy that is exported back into the SP AusNet electricity distribution network. AMI meters feature a scroll button. Pressing the scroll button very lightly prompts the device to commence scrolling through a list - as follows:

Scroll Time 5 Seconds	Display List
88	Display Test
1	Time
2	Date
3	kWh Imported Total Energy
4	kWh Imported Peak Energy
5	kWh Imported Off Peak Energy
6	kWh Total Exported Energy
13	kWh Exported Peak Energy
16	kWh Exported Off Peak Energy

The kilowatt hours (kWh) number displayed on the meter is cumulative. To determine actual consumption for a particular period, you must take a reading at the start and end of the required period and then subtract the initial kWhs reading from the final kWhs.

Please Note: The energy generated by your solar system will be consumed first by your installation. Any surplus generation will flow back through the meter where it will be measured as it is exported to the grid. The meter will only record exported kWhs if the electricity generation exceeds consumption during a particular time interval.

### Display

Automatically displays total accumulated energy consumption.



### Scroll Button

Lets you scroll through display options to view:

- test pattern
- date
- time
- total accumulated energy consumption (instead of waiting for auto display)

### Boost Button

Activates a boost for electricity hot water systems if you have this function.

## Your Smart Meter

Display panel

Power usage light

Button 2

Service port

Terminal cover

Button 1

This button activates the smart meter display waiting to be connected, and operates hot water boost for premises with off peak water heating - see back of this card.

Terminal cover

This cover contains a seal to prevent tampering and protect the integrity of your consumption data. It is an offence to remove seals or interfere with metering equipment.







# The invisible

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## ■ A Smart Meter is:

- Broad spectrum electronic metering & monitoring
- ⊙ Switching and control options
- ⊙ Communications hub (HAN)

## ■ A Smart Meter needs:

- Meter Data Management systems
- Connectivity
- Industry processes and rules (national and State)
- Modernised deployment methods and tools

## ■ A Smart Meter exposes:

- Legacy data quality
- Legacy installation quality, tariff correctness
- Consumer ignorance (fair and unfair) and vulnerability
- ⊙ What is known and unknown



**\$2 billion+  
Smart meter  
program**

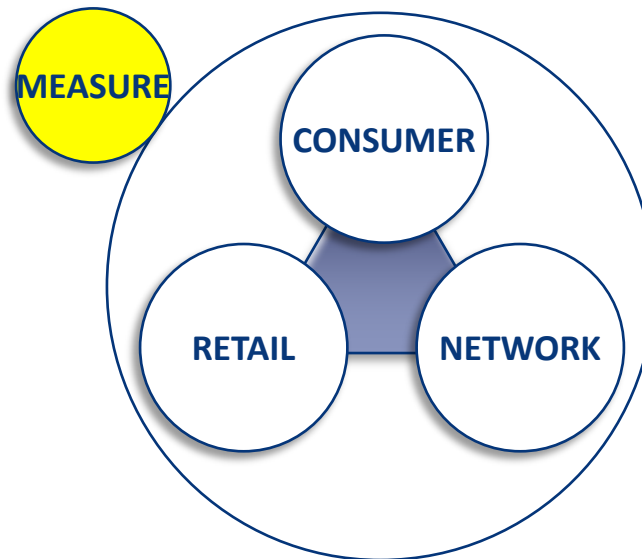
- Generally successful
- Notable issues incurred or continuing
- ⊙ Yet to be tested, trialed, or used



# Old meter

Electro-mechanical cumulative reading  
of consumption

- Quarterly read
- Extra reads for churn (30%)
- Estimations common

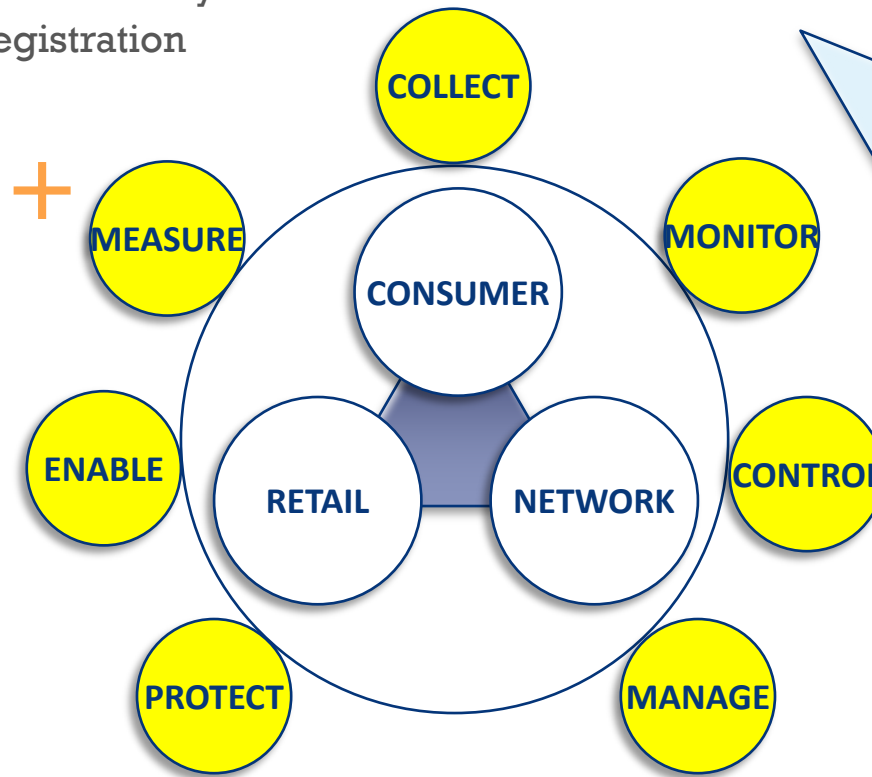


# + New meter – a computer

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## Multi-function device

- 30min interval + read remotely
- Supply and event registration
- Remote control
- Remote updates
- Device support HAN
- Tamper protection

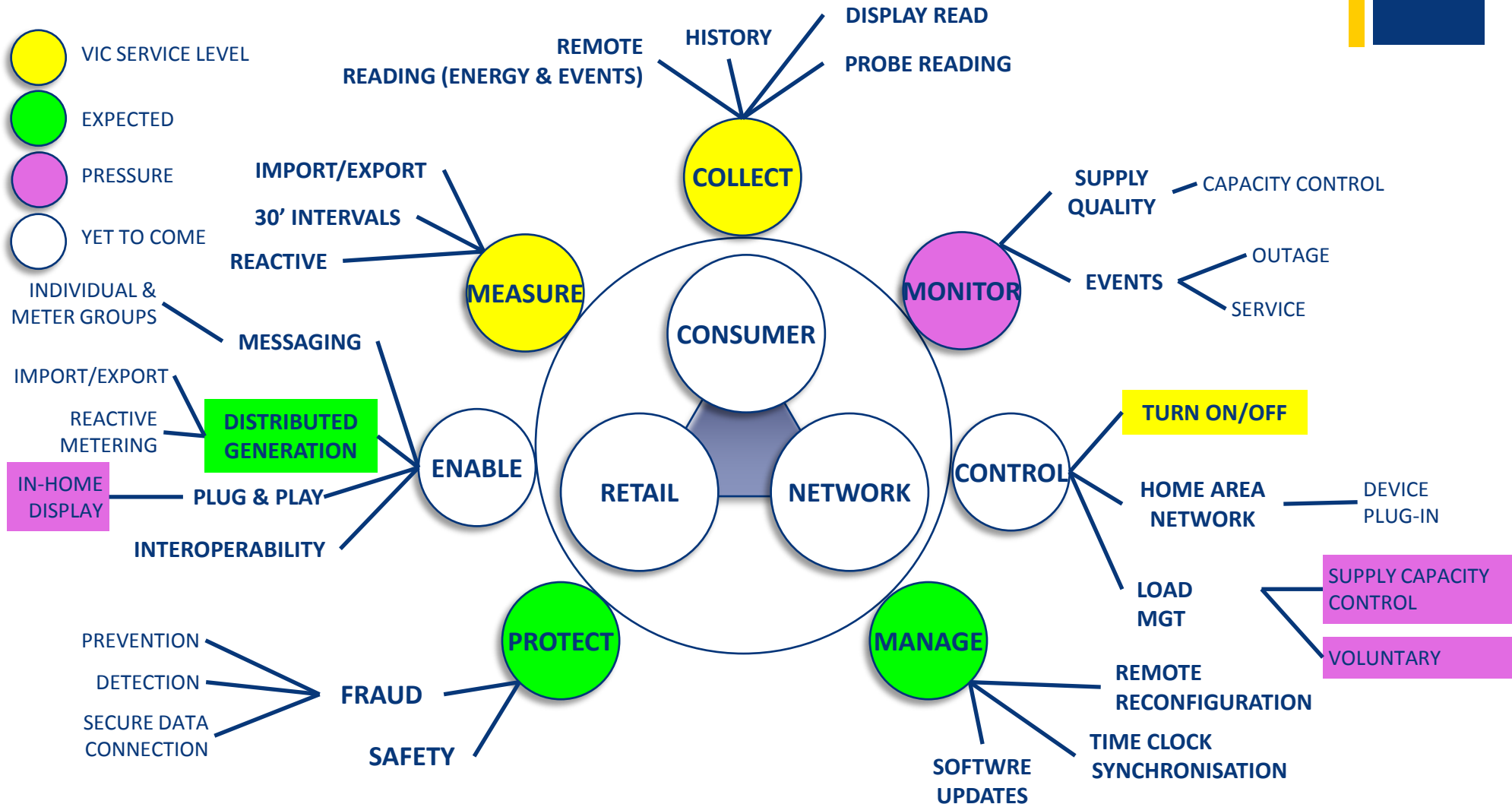


- History recorded
- Profile now by meter
- Charges calculated daily
- Estimated bills (all but) redundant
- Proactive action feasible e.g. faults, quality
- Faster reaction
- Local and remote connection
- Data to market daily (95% by 6am)
- Metering groups
- Remote turn on/off (when safe)
- Remote load management (DB &/or customer)
- Device control

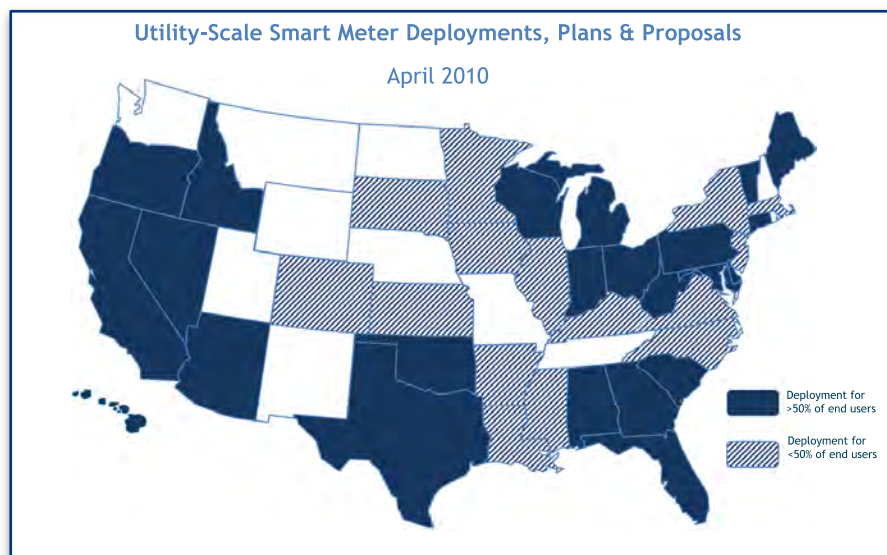


# Functionality (of the meter)

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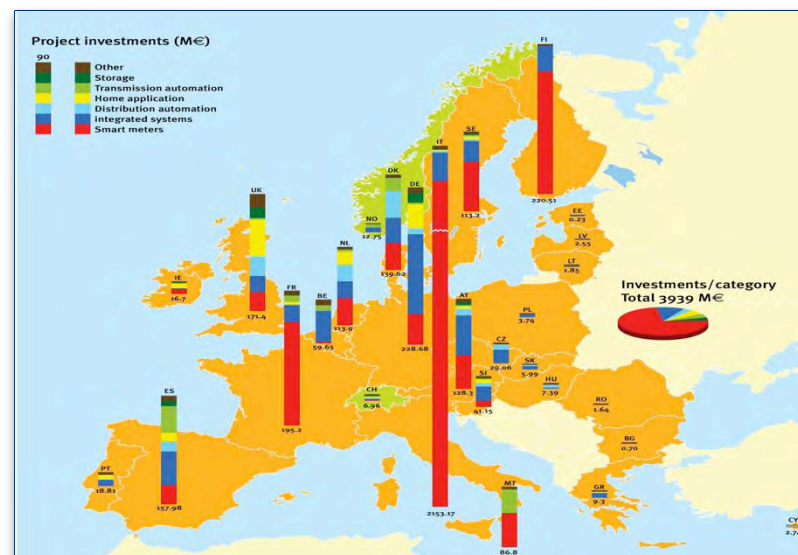






## ■ USA

- 140 power companies started installing smart meters
- considered the Smart Grid interface with the home
- 65 million meters expected by 2020
- consumer backlash is slowing \$29 billion effort to upgrade networks
- job creation occurring, stronger smart grid returns (on a legacy that had a low level of smarts)



## ■ Europe

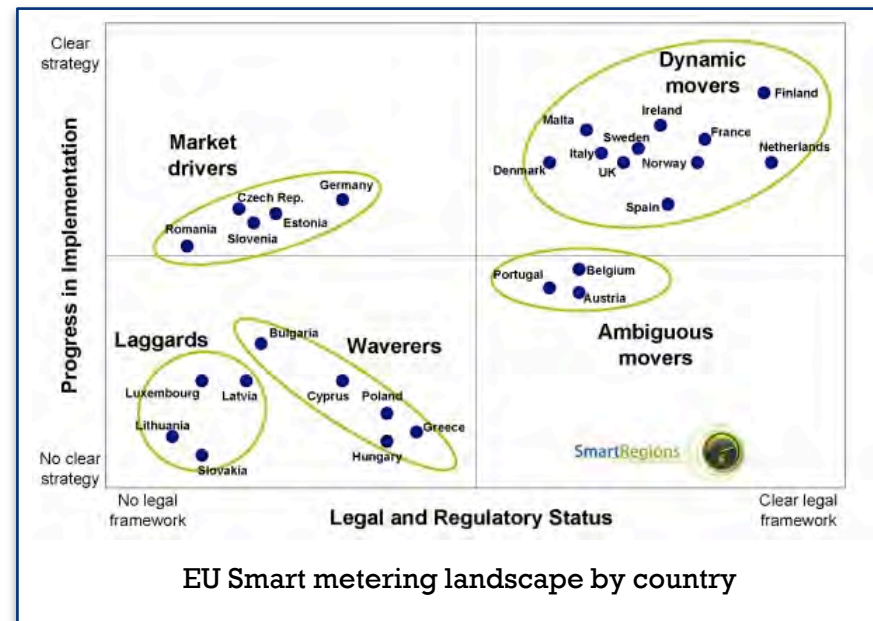
- Strong community consultation
- In-home display a key focus
- UK commencing roll-out, Italy done (low spec), most members started or about to start
- EU standards – comprehensive and thoroughly considered
- Single shared communications network/system
- Dual fuel meters



# Comparative observations

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- Consumer consultation and participation
  - EU greater focus, USA mixed, AUS limited
- Data protection value proposition
  - EU huge focus, USA integrated business, AUS very low consideration
- Easier site work in Aus and USA than EU
  - EU 6 installs per day, AU 15+, USA > 20
- Hands off approach
  - AUS highly structured physical deployment and co-ordination (given network leadership), UK independent given industry fragmentation
  - MCE – NSW QLD to proceed though time to be confirmed
  - EU road map guidance – member State discretion
- Asset managers role
  - Leap of faith for other than the vertically integrated businesses (as their network benefits are more significant)
  - Governments have stepped in to foster progress
- Control
  - Strategic next step and everyone in experiment stage – what is/is not worth doing



AUS “You want pensioners dying in their homes from switching off the air-conditioner during a 40 degree day?”

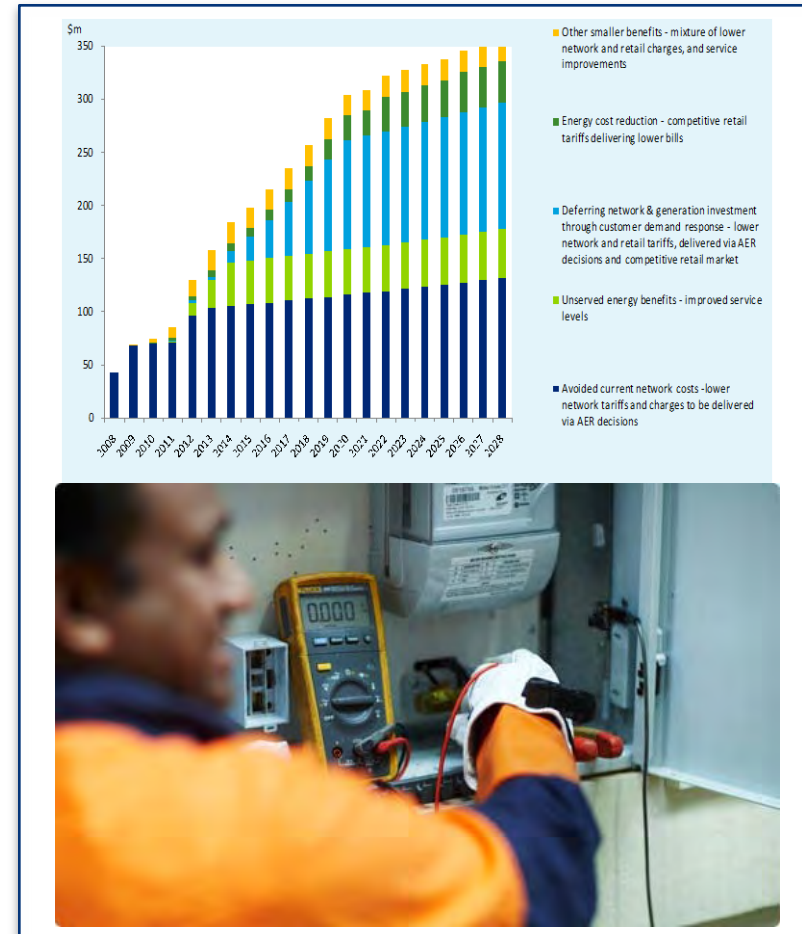
EU “....update the readings frequent enough to use energy saving schemes”



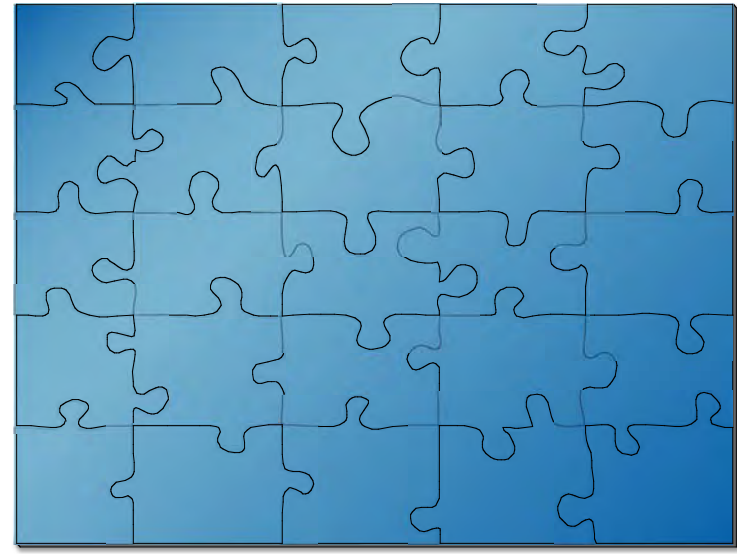
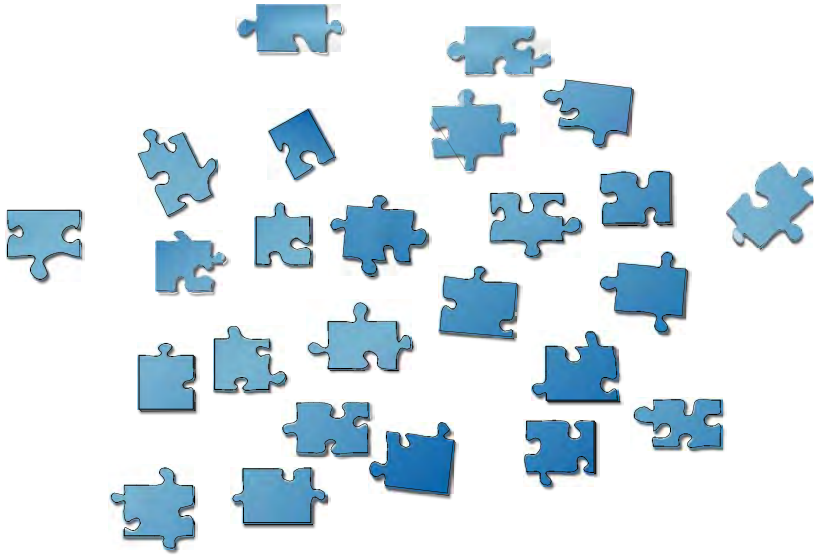
# Consequences

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- 'Hard' benefits - \$350m (20 year horizon)
  - Tariff competition – lower bill
  - Deferred infrastructure – customer demand response
  - Unserved energy – improved service
  - Avoided infrastructure
- Real impacts (unintended)
  - Billing clean up (correct tariffs)
  - Defect identification and resolution
  - Life support register
- 'Experience benefits'
  - Control
  - Plug and play – I can do my solar
  - Modernised – iPad / iPhone / PC
- A lot of work and waiting to do to enable all benefits



Advanced metering infrastructure cost benefit analysis 2011



## + Part 2 – their role in the industry

What is the role of smart meters in the industry solution jigsaw, and what picture will the pieces make?

# + Scenarios

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1. Support solar
  - different infrastructure costs
  - plug and play expectation
2. Support differential tariffs
  - winners (mostly) and losers
  - impact on load profile
3. Support load control
  - customer choice and forced
4. Support user (device) control
  - device pairing
  - HAN (meter) + GPRS + WI-FI
  - smart devices
5. EV (Iven - next)
6. ...

No one is sure what the medium-term future is really going to be



# The meter provides the data

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- Energy data

- Import
- Export
- Time

- Supply data

- Quality
- Events

- Profile data

- Solar
- Device type and profile
- Connection profile e.g. phase



- Potential value is high

- Barrier 1: Analytical maturity

- Industry has a relatively low analytical maturity

- Barrier 2: Audience expectation

- Little history of using detailed analytics

- Barrier 3: Regulatory framework

- Network trained with the stick
- Lack of agreed requirement for the future (just that it is different and difficult)





Strengths to **exploit**



Weaknesses **exposed**



Opportunities **introduced**



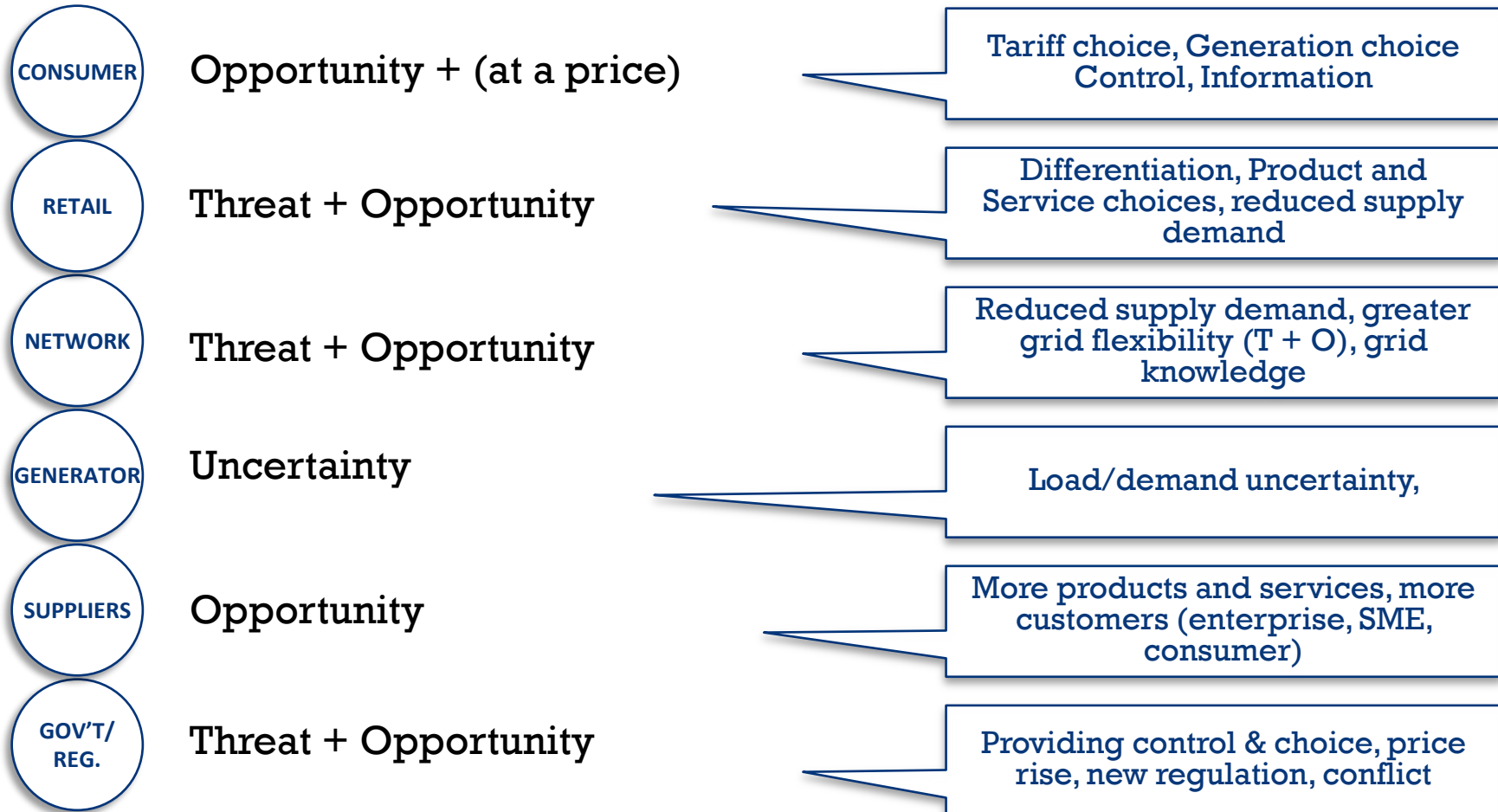
Threats **promoted**

## + Part 3 – Implications

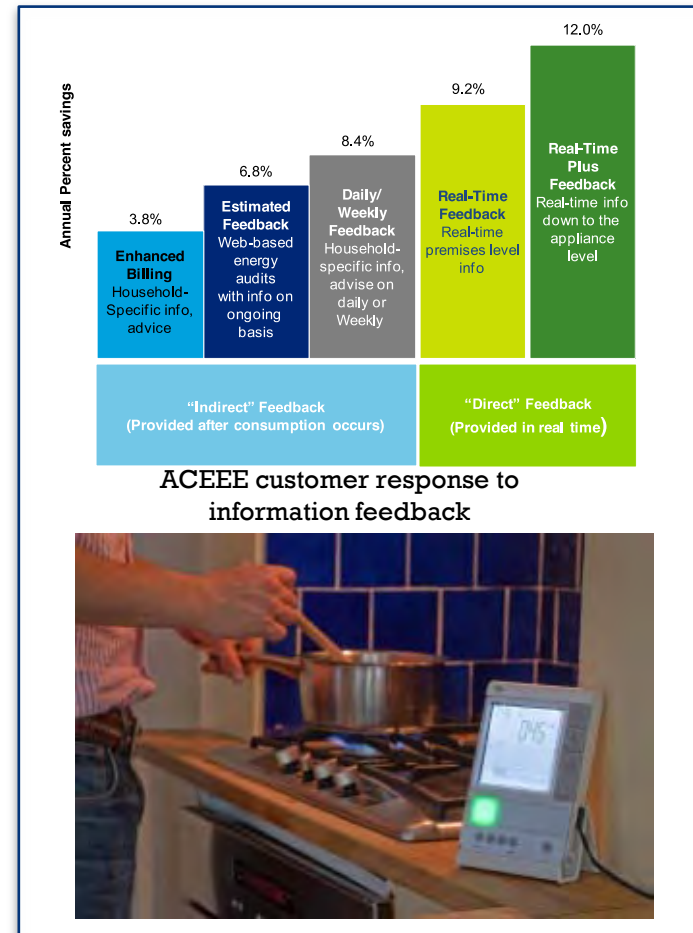


# Implications

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- Significant latent demand exists
  - Dynamic load, pricing options, etc.
- Enabling cost control – in-home display, online display
  - Cost projections – savings from IHD, % that will stick
  - Peak load management
  - Behaviour awareness
- Change management hurdle to be overcome –
  - value of ‘consumer control’ yet to be provided and proven
    - Peripheral technology still to be developed
    - Consumer confidence yet to be achieved
    - Lack of differential tariffs
    - Lack of feedback (in-home displays)
  - Overflow from consumer electronics



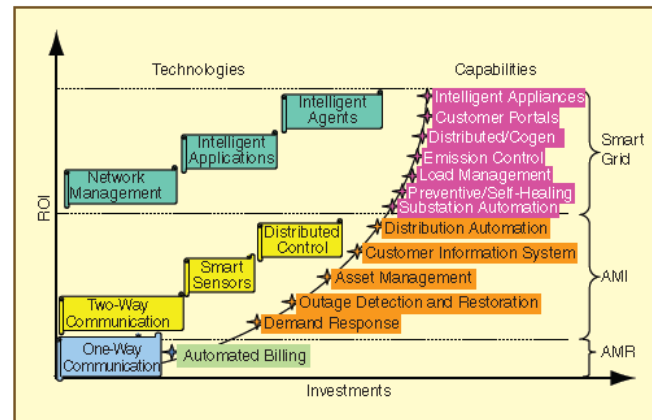


# Networks – catalyst for smart grid II

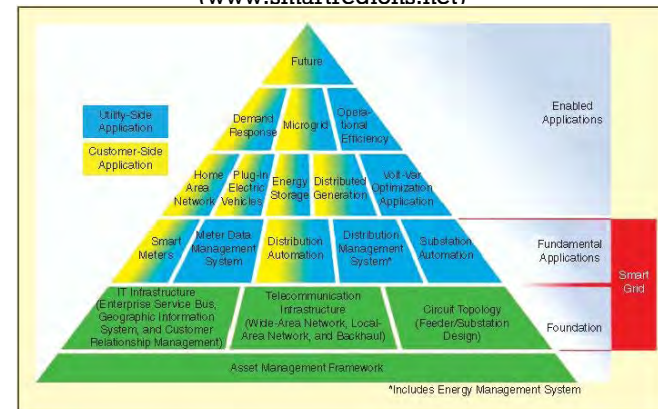
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- A key cornerstone of Smart Grid
  - Australia was already reasonably advanced in SCADA control
- Meters are now an asset to be managed rather than forgotten
  - Now know the last leg
  - Responsibility
- Reliability and fault management
  - Rapid data provision

The use of data to inform network planning, optimisation, regulatory decision making, service evaluation will become ubiquitous



Smart Grid return on investment  
([www.smartregions.net](http://www.smartregions.net))



European roadmap



# Conclusion

- The information age is enabled through smart meters
- Decision frameworks need to be established
- Consumer choice will pressure the industry
- Significant spend will continue to enable the industry of the future
- It is going to be exciting and fun again!

# Questions and contact details

*Will be announcing shortly the Utility of the future....*

## Greenfield Utility

*Providing smart utilities for communities of the future*

## Community Transition

*Changing existing buildings to lower cost, high performing assets*



## Data Services

*Give the insight to enable smarter consumer and industry choice*

## Utility Hub

*Provides the one-stop-shop for smarter industry solutions*

## ■ Contacts

### ■ Dr. Iain Jennings

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Iain is a leader of change in the electricity and broader utility industry in both UK and Australia. Recently he lead the transformation of Citipower and Powercor to enable 'Smart' metering and is a founder of a soon to be announced multi function utility company.

## ■ References

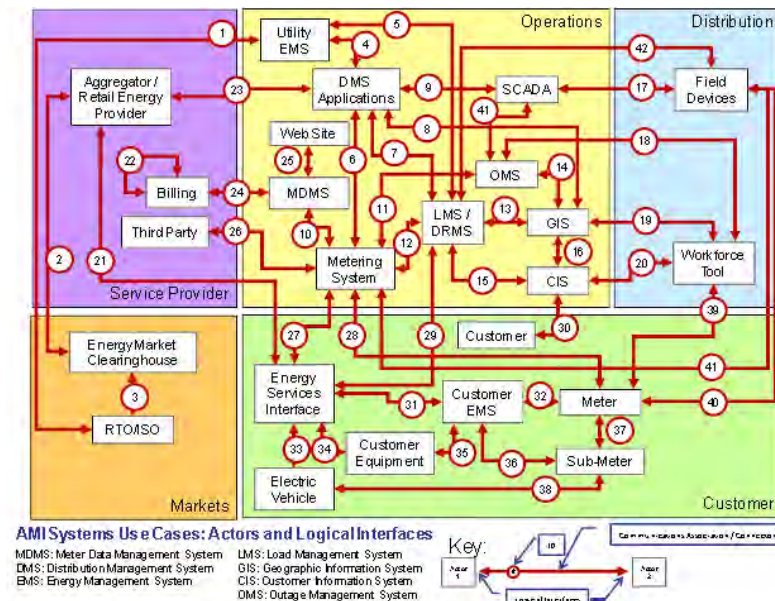
- The American Council for an Energy Efficient Economy (ACEEE) Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity Saving Opportunities, June 2010
- EU Smart metering landscape by country  
[www.smartregions.net](http://www.smartregions.net)  
<http://ses.jrc.ec.europa.eu/ses/node/43>
- Full report, Vic Dept. of Treasury and Finance, Advanced metering infrastructure cost benefit analysis 2 August 2011  
<http://www.dpi.vic.gov.au/smart-meters>
- Smart grid simulation  
<http://ses.jrc.ec.europa.eu/smart-grid-interactive-tool>





# Reference: Information & system solution

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Wide area situational awareness applications communications summary  
([www.smartregions.net](http://www.smartregions.net))

AMI systems application summary communication  
([www.smartregions.net](http://www.smartregions.net))

# Reference: Smart home – RWE Germany

## What is the SmartHome market about?

A market for convenience and efficiency-controls already exists  
Massmarket products are missing



### DIY systems



- Low-cost devices
- Limited standard functionality
- Poor usability – at least for non-technical users
- Poor design
- Do-it-yourself

€ ~ 50 – 1,000

### Gap

Existing market for convenience and efficiency services; missing mass market products



150- 2.000 €\*<sup>1</sup>

### Luxury home automation solutions



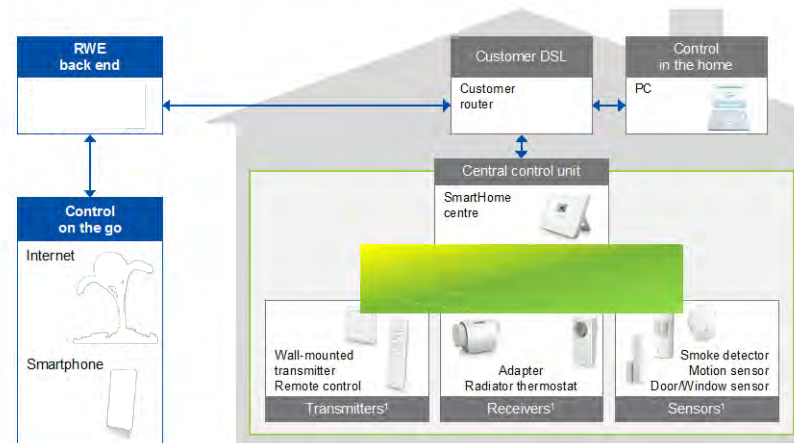
- "All-is-possible" fully custom individual ne
- Expensive
- Professional service prov installation /

€ 10,000 or more



RWE Effizienz GmbH

## How does RWE SmartHome communicate?



Information / control via cable (LAN)

Wireless information / control (CoSIP)

<sup>1</sup> Further devices to follow

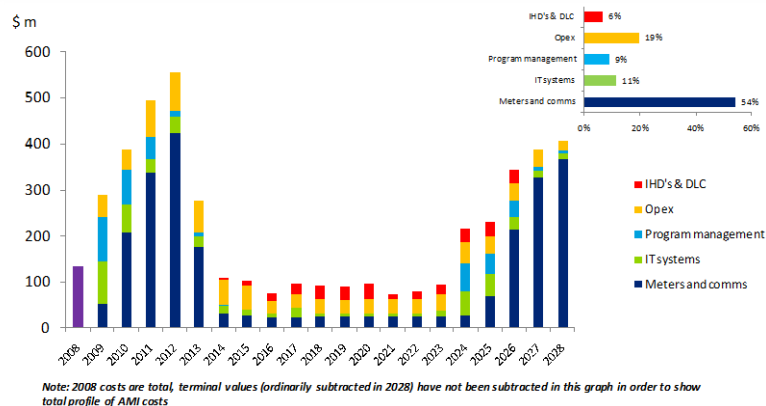




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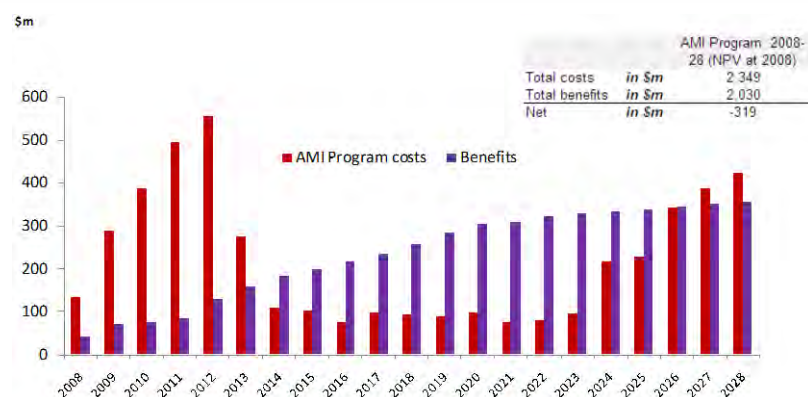
## Victoria: smart meters & tariffs

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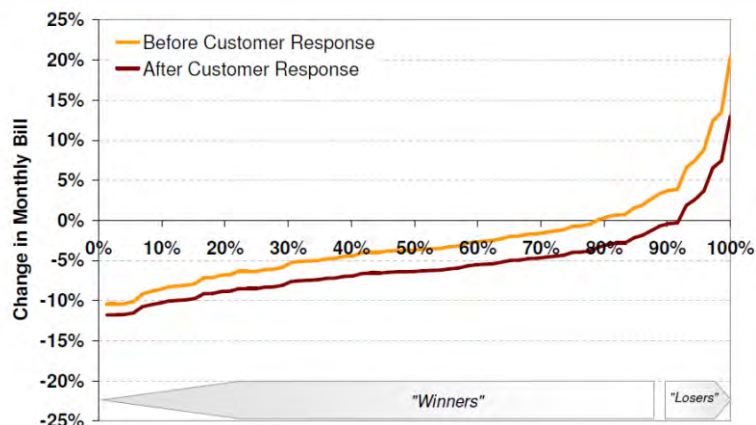


**Total AMI Program Costs over 2008-28 (\$2011)**

Full report, Vic Dept. of Treasury and Finance, Advanced metering infrastructure cost benefit analysis 2008



**Total costs and benefits of the AMI Program over 2008-28**



Distribution of dynamic pricing bill impacts for low income customers  
Most low income customers will be better off under dynamic pricing due to their flat load profiles

Drivers of change in consumption are:

- **Primary**
  - *Rate, technology, and pilot design are only part of the puzzle.*
- **Secondary factors :**
  - *Price signal;*
  - *Central-air conditioning (CAC) saturation*
  - *Other appliance saturation;*
  - *Type of enabling technology;*
  - *Weather;*
  - *Socio-demographic factors; and Marketing/incentives/education.*

Flexible pricing of electricity for residential and small business customers , DPI February 2012