



Regulating energy networks for the future: Innovation in action

Smart Grid – Smart Meter – Smart Home
Synergy

Peter Boait
Institute of Energy & Sustainable Development
De Montfort University



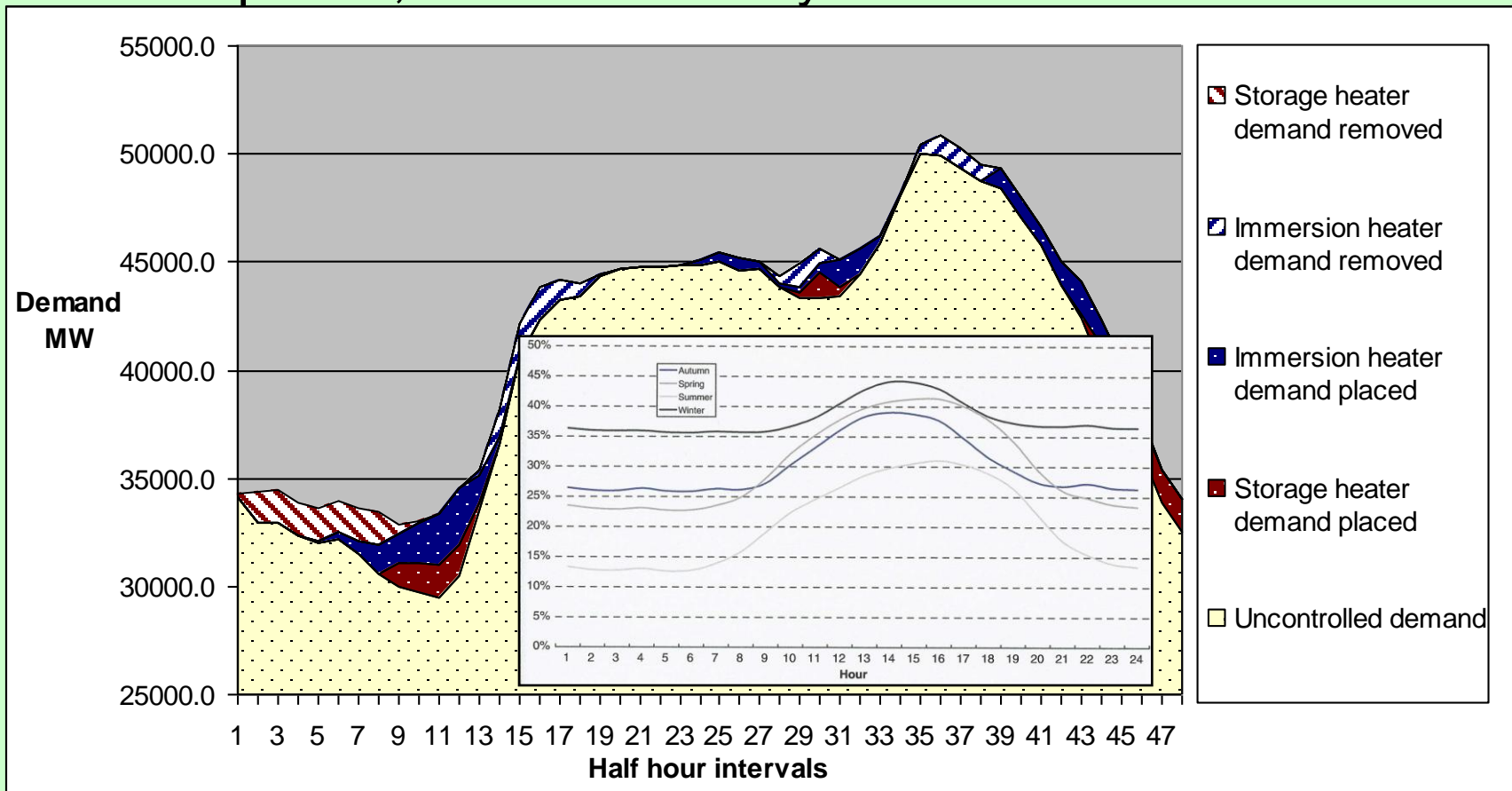
Smart grid-smart meter-smart home synergy: driving out the benefits of smart metering

- Demand side management
 - at national scale flattening the demand curve & matching it to renewables
 - at local scale avoiding reinforcement and over-voltage as distributed generation increases
 - electric cars: a challenge and an opportunity
- Behaviour change – improving efficiency without it
- Energy services – selling comfort, not kWh



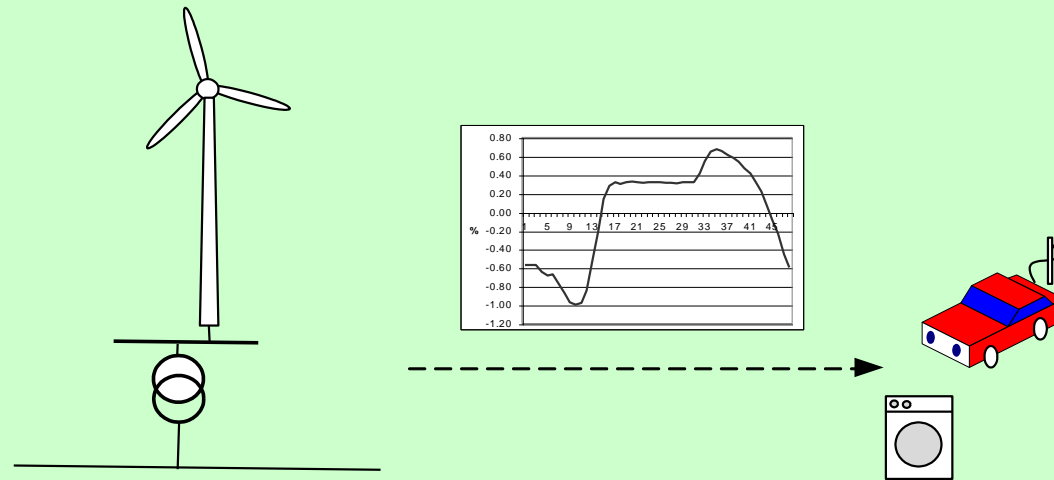
Demand management

Flattening demand, and responding to intermittency of wind power, will save money and carbon:





Demand management



The grid needs to send a signal indicating when electrical loads with time flexibility should draw their demand. Looks like a “price” signal, but should preferably reflect local network costs & constraints as well as retail supplier costs.

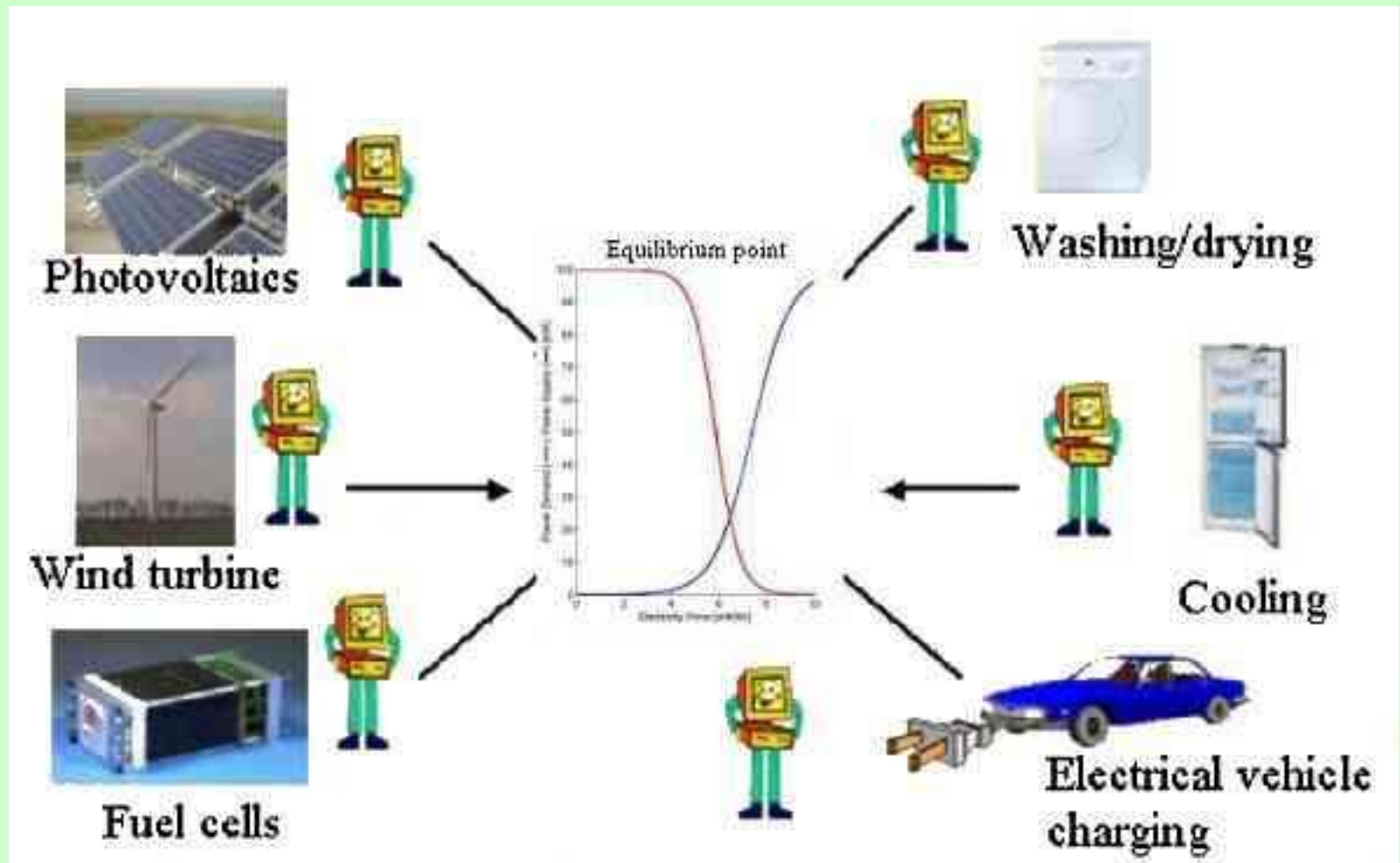


Demand side management innovations - all require smart (i.e. half-hour) metering for consumer to benefit

- “Dynamic demand” from fridges and freezers by responding to mains frequency
- Update radio teleswitch – a neglected innovation of the 1980s – to engage any suitable appliance (or electric car) and also micro CHP
- European wholesale cost signalling schemes allowing an “aggregator” to create a “virtual power plant”
- Netherlands “Power Matcher” micro scale market – clearing auction system.



Powermatcher (www.powermatcher.net)





Behaviour change - improving efficiency without it

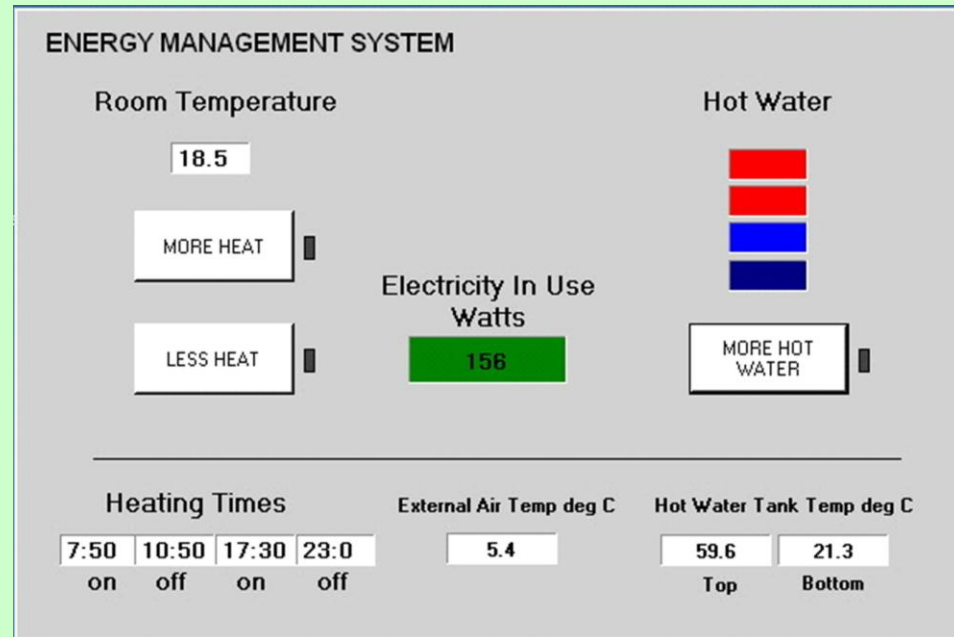
Giving consumers real-time feedback on their energy consumption will lead to 3%-15% savings, but:

- will those savings be sustained over the long run?
- what about the people who are not able / can't be bothered to respond to feedback?
- some efficient decisions require complex calculation

Use innovation to take the tedium out of energy saving



Automation of domestic energy management using the smart meter platform



- Uses electrical load measurements from smart meter to determine behaviour patterns, and sets room temperature “intelligently”
- Optimises use of dual fuels & local energy (e.g. solar hot water)
- Needs smart meter “owner” to accept add-on software applications



Energy services – removing market barriers with technical (and regulatory) innovation

Barriers to energy service contracts for domestic consumers:

- Risk to supplier of unreasonable consumer behaviour¹
- High transaction cost due to complexity of relationship between service provider and consumer²
- Allowing the consumer to switch service contracts as easily as supply contracts will result in stranded assets²

1. <http://news.bbc.co.uk/1/hi/business/3634976.stm>

2. Sorrell, S, 2007. The economics of energy service contracts. Energy Policy 35, 507-521.



Technical innovations to promote energy services (1)

- Manage behavioural risk with automated systems – could include “trips”
- Reduce transaction cost by making smart meter a “trusted agent” that ensures equality and adequacy of information to both parties covering:
 - building thermal properties
 - heating/cooling appliance type & efficiency
 - energy consumption
 - consumer behaviour e.g. occupancy pattern
 - achievement of contracted comfort levels



Technical innovations to promote energy services (2)

Allow consumer to switch service contracts through web based quotation system:

- Consumer holding service contract with ESCo A asks smart meter to request quotations from ESCOs B and C.
- Meter sends summary of data to B and C.
- B and C return quotation based on automated “due diligence”.
- Consumer accepts quote from C and contract transfers. C pays A a regulated buyout price for the residual value of the assets.



Summary of possible issues for regulation

- How do DNOs bring local network constraints to bear on demand if the “price” signalled to the smart meter is determined by the energy supplier?
- How can a market for “apps” on the smart meter be created (c.f. Apple iPhone)?
- Can a wholly new role be created in the regulatory framework for ESCOs?