

Energy efficiency and smart grids

– A presentation for CIR smart grid 2010

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24 June 2010

Ref: 17288-244

Smart Grids & Cleanpower Conference

24/25 June 2010

<http://bit.ly/cleanpower>



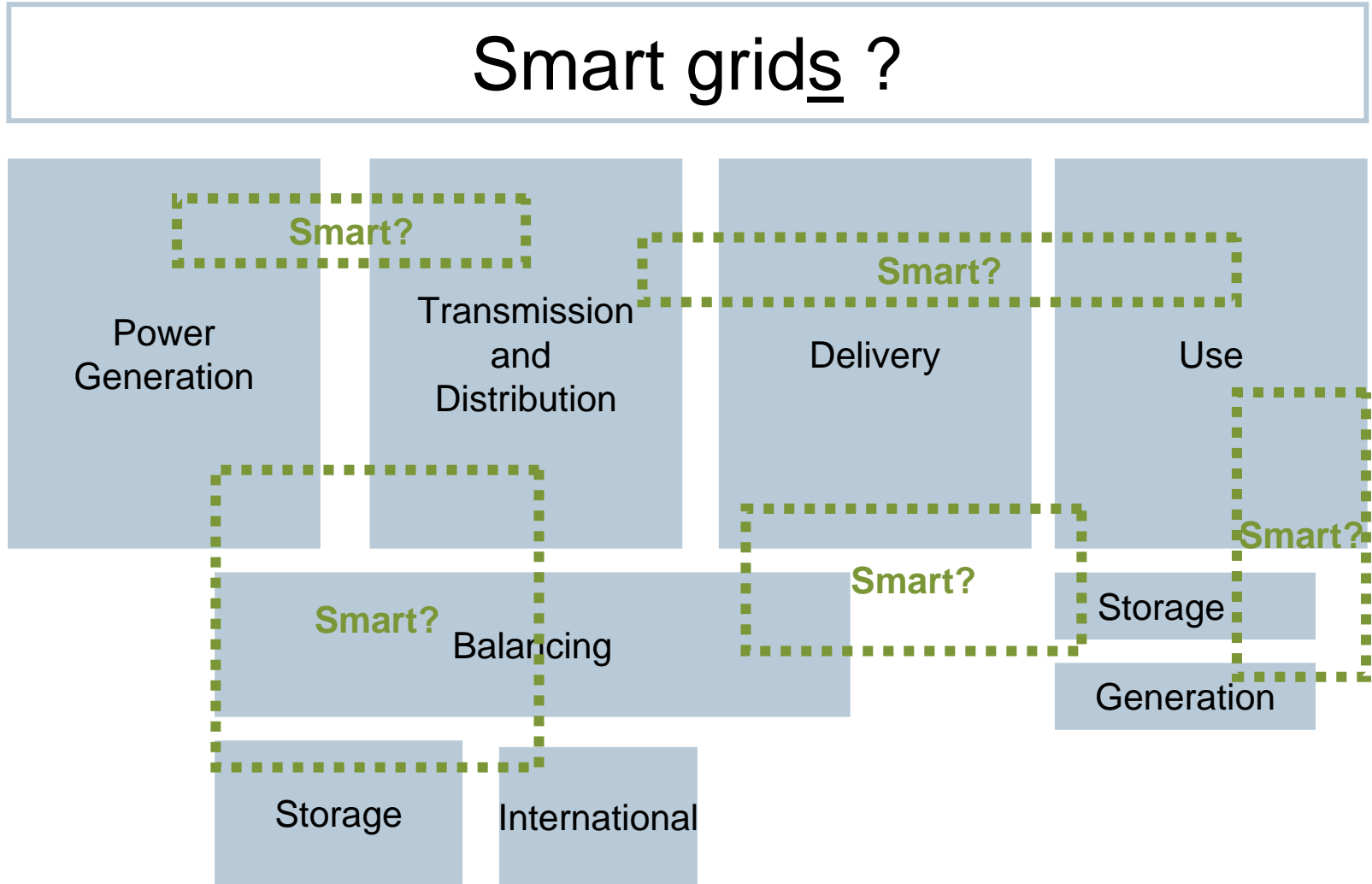
Summary

- 'Smart grid' relates to many concepts
- Investment case is difficult for some concepts, easier for others
- Smart energy services can drive energy usage efficiency
- Wall garden or open business models are possible
- Standards, guidelines and rules are necessary to help develop markets and competition



Honey. where are the matches?

Not one definition, but many



Too many standards, or too few

General



NIST

Electricity



Telecommunication

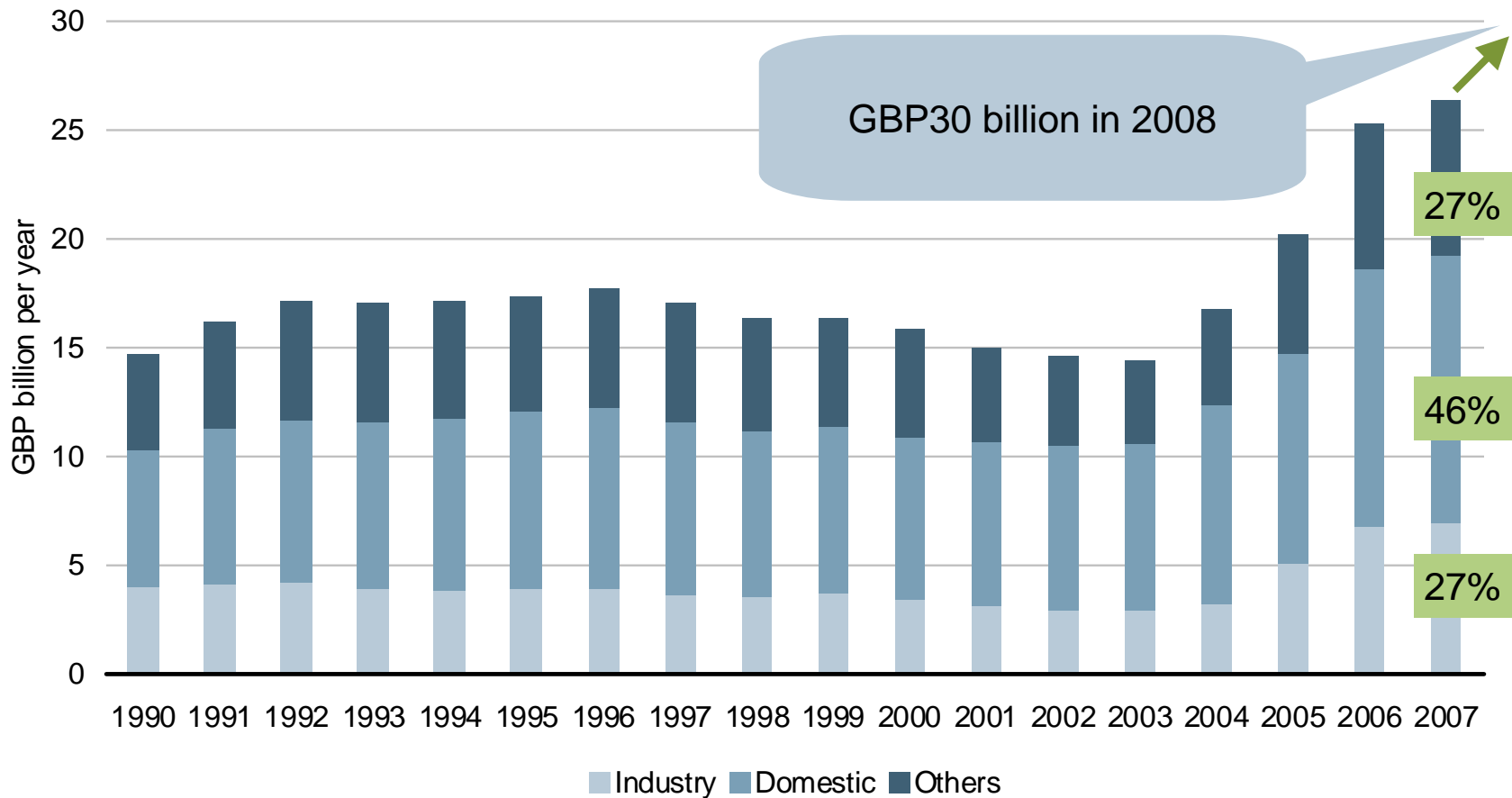


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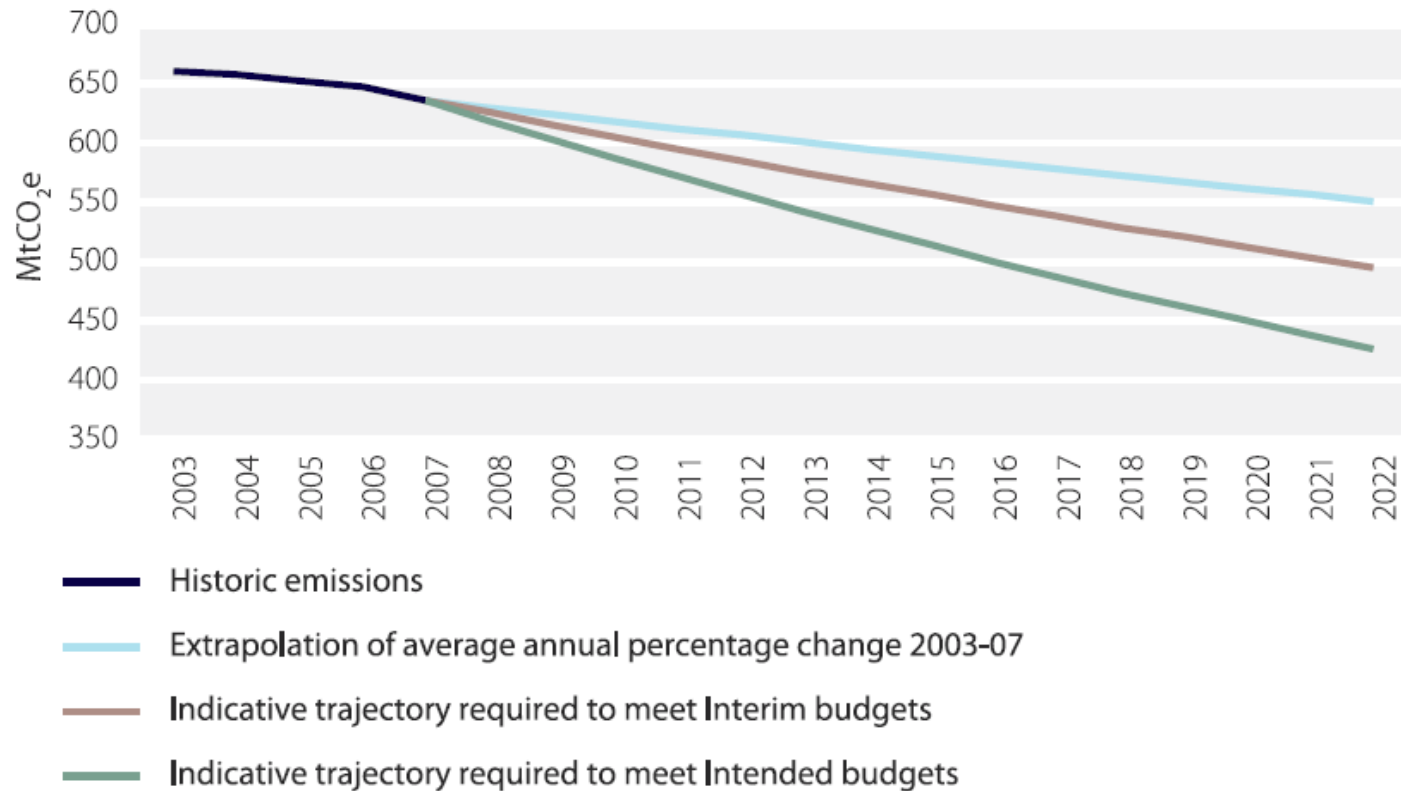
Electricity is more expensive

What the end-users pay for their electricity (UK statistics)



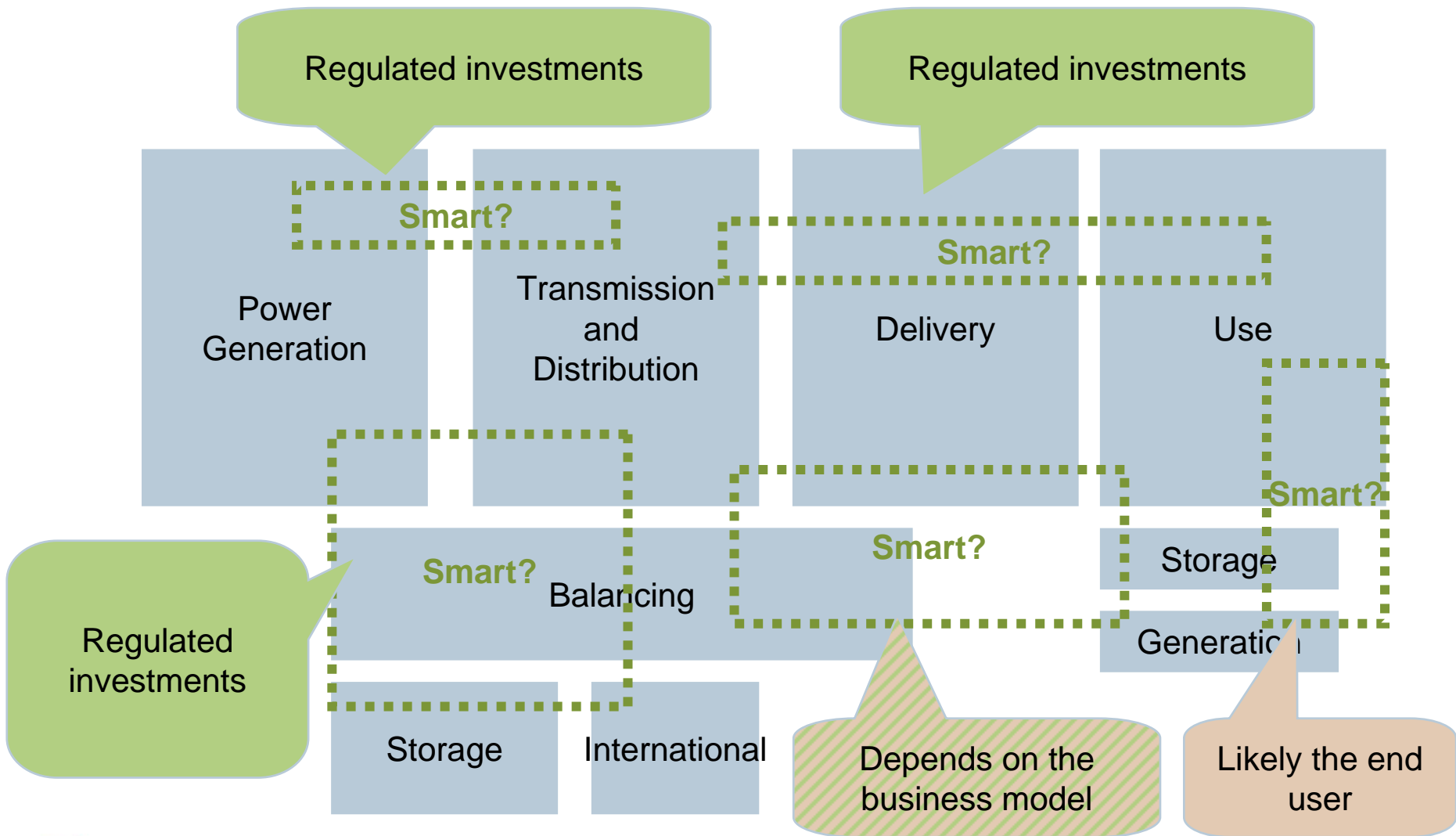
Carbon emissions difficult to curb

Figure 1 Recent UK GHG emissions and indicative reductions required to meet legislated carbon budgets

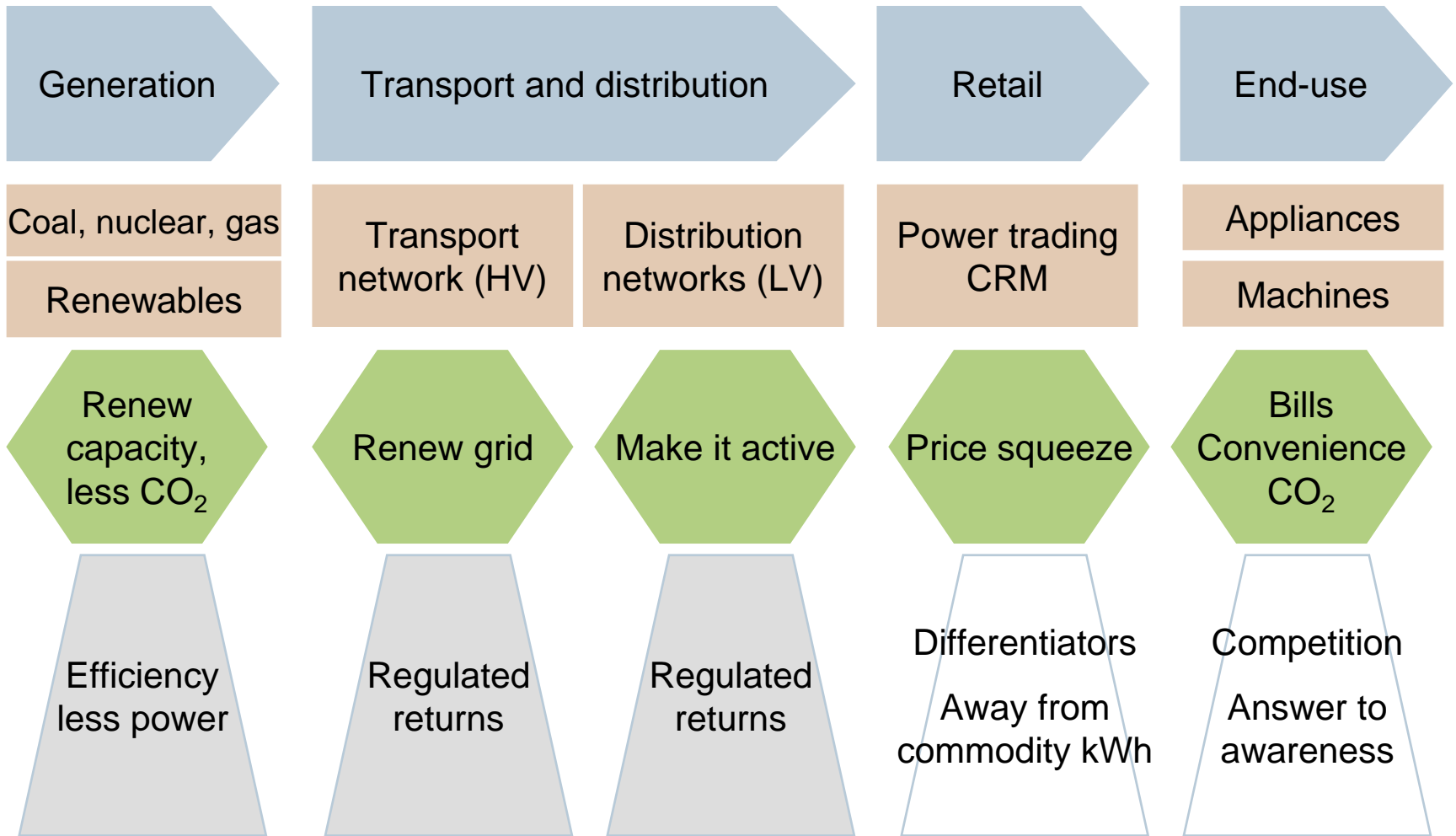


Source: NAEI (2009); CCC Modelling.

Who wants a smart grid?



Incentives for energy efficiency



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Services to address different goals

Key requirements and goals

Energy industry	End users	Governments (and regulators)
<ul style="list-style-type: none"> ▶ Accurate energy demand forecast SMART ▶ Demand management SMART ▶ Renewable power generation SMART ▶ Energy portfolio optimisation ▶ Lower costs SMART ▶ Better administration 	<ul style="list-style-type: none"> ▶ Lower retail prices SMART ▶ Micro generation capability SMART ▶ Better information and understanding of costs SMART ▶ Reporting of use and emissions SMART ▶ Ease to switch supplier ▶ Demand management ▶ Renewable power access 	<ul style="list-style-type: none"> ▶ Lower carbon emissions SMART ▶ Security of supply ▶ Lower retail prices SMART ▶ Increased competition ▶ Infrastructure deployment SMART ▶ Harmonisation (EU)

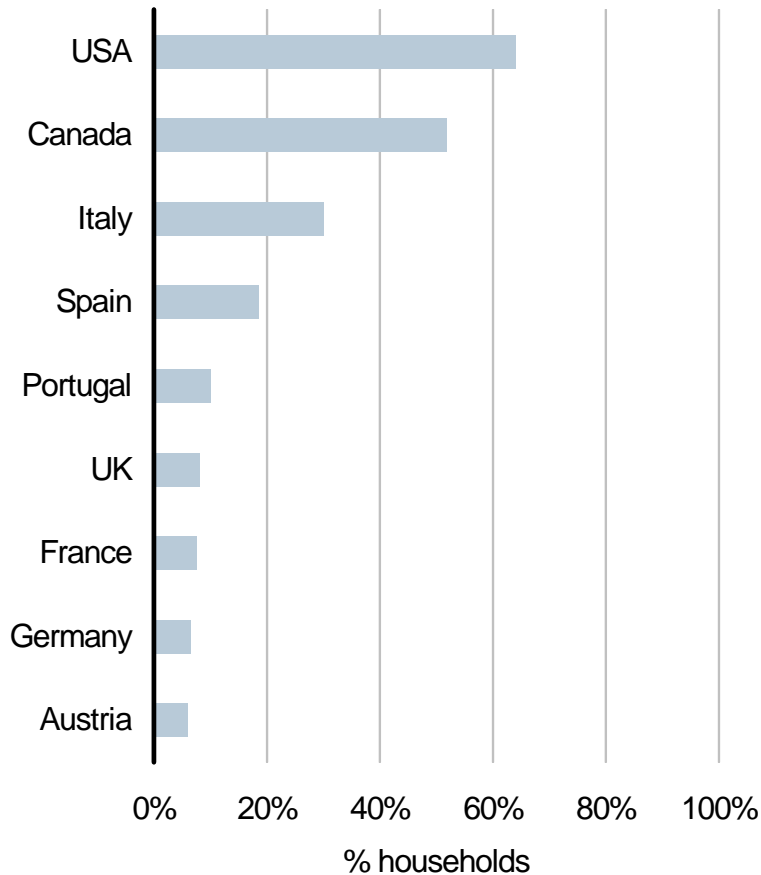
SMART Requirements that can be met (at least in part) by the rollout of smart meters

Different services for end-users

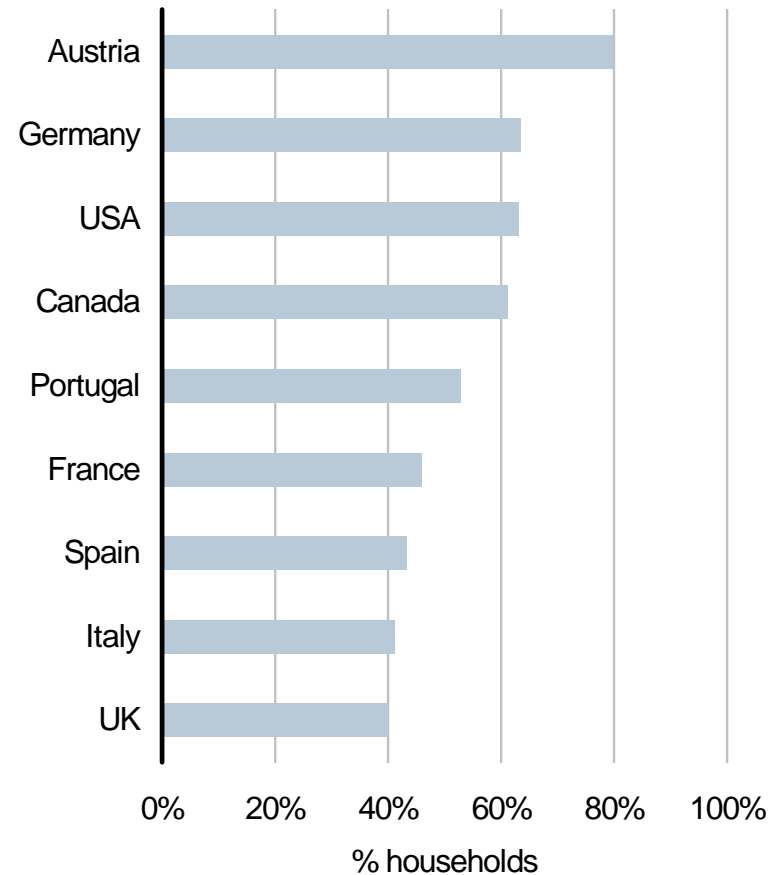
	Households	Enterprises
Characteristics	<ul style="list-style-type: none"> • Large number (around 30m) • Cost efficiency • Lower revenue potential 	<ul style="list-style-type: none"> • Significant number (around 1m) • Resilience • Additional revenue potential
Possible solutions	<ul style="list-style-type: none"> • Few features • Use of existing infrastructures • Reduced control possible • Little or no impact on bills 	<ul style="list-style-type: none"> • Additional features possible • Larger range of infrastructure possibilities (driven by features) • Looking at reduced energy costs • Possible value-add services (additional revenues)

Air conditioner and dish washer

Air conditioner penetration (2009)



Dish washer penetration (2009)



Independent service providers



Description

Web based application to monitor usage using a wireless monitoring device – provided by the utility service provider or sold separately
 A free SDK is provided to allow utility provider or data aggregators to display energy consumption data

Web based application based on Microsoft Azure’s cloud-based OS. It does not require an energy meter, but can work with one if installed
 Microsoft has also signed an agreement with Ford to install Hohm on Ford Focus Electric
 The website provides loads of tips to reduce consumption

How it works?

The software collects information from a device (sold separately in the UK for GBP49) installed at home, tracks energy consumption, and sends data to a customer’s iGoogle personalised homepage (subscription of GBP1.99 per month)

It uses advanced algorithms licensed from the Lawrence Berkeley National Laboratory and the Department of Energy to calculate energy usage. These calculations are based on the average energy consumption in a particular post code, which is adjusted to consumers parameters, such as home size and size of household

Partners



Industry alliances



Goal

Association of Home Appliance Manufacturers (AHAM) is a U.S.-based trade association of the home appliance manufacturing industry

It provides appliance standards and certification programmes

Standards & licensing

25 standards to measure specific product characteristics and performance features

Provides certification for air cleaners, air conditioners and dehumidifiers

35 members



A non-for-profit organisation that publishes a suite of standards for connecting heterogeneous devices wirelessly

A number of device profiles are defined, indicating the domain of applications such as home, smart energy, commercial building, telecommunication, hospital, car and toys

Protocols for secure and energy efficient communications

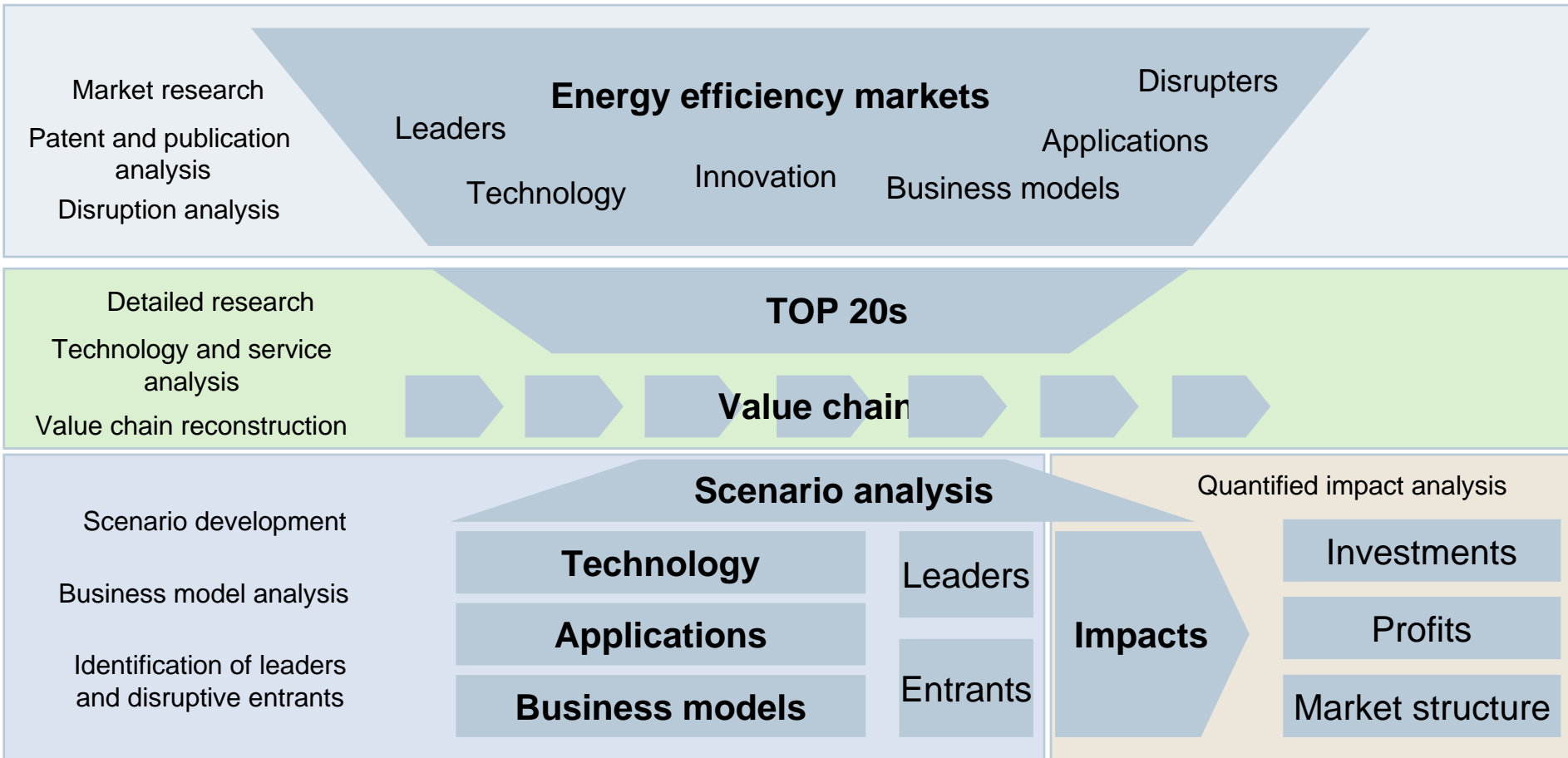
Free licence for non-commercial purposes; paid members are provided with access to the as-yet unpublished specifications and are given permission to create products for market using the specifications

350 members

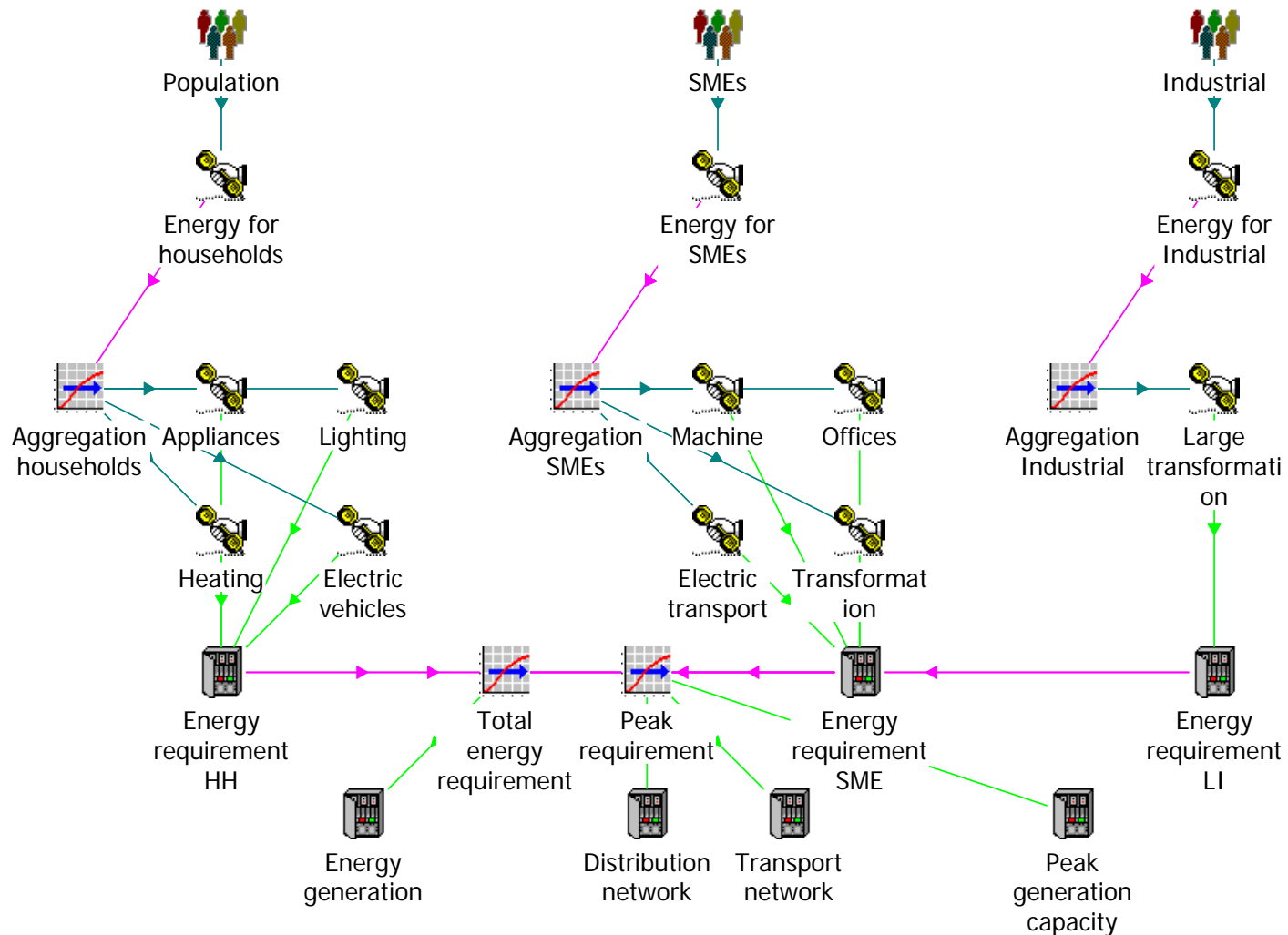


The need for clarity

Analysys Mason research programme



Model: usage, expenditure, network

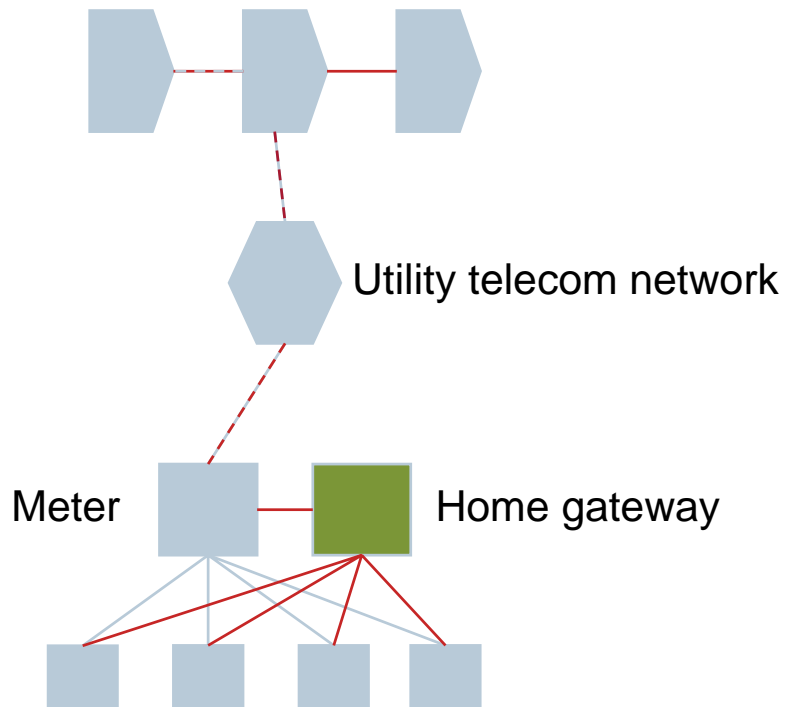


Summary

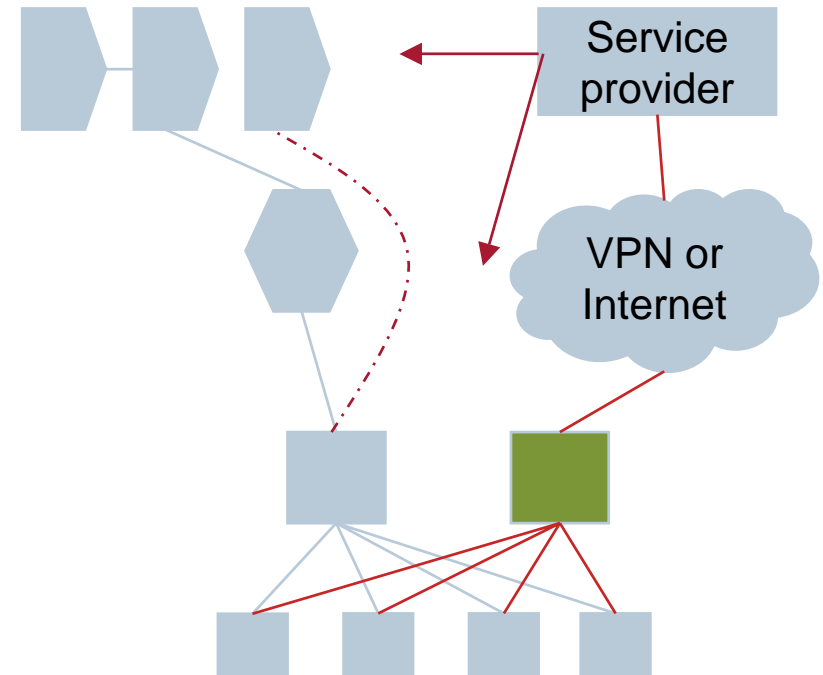
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SEEs – two business models [1/2]

Wall garden



















Open model



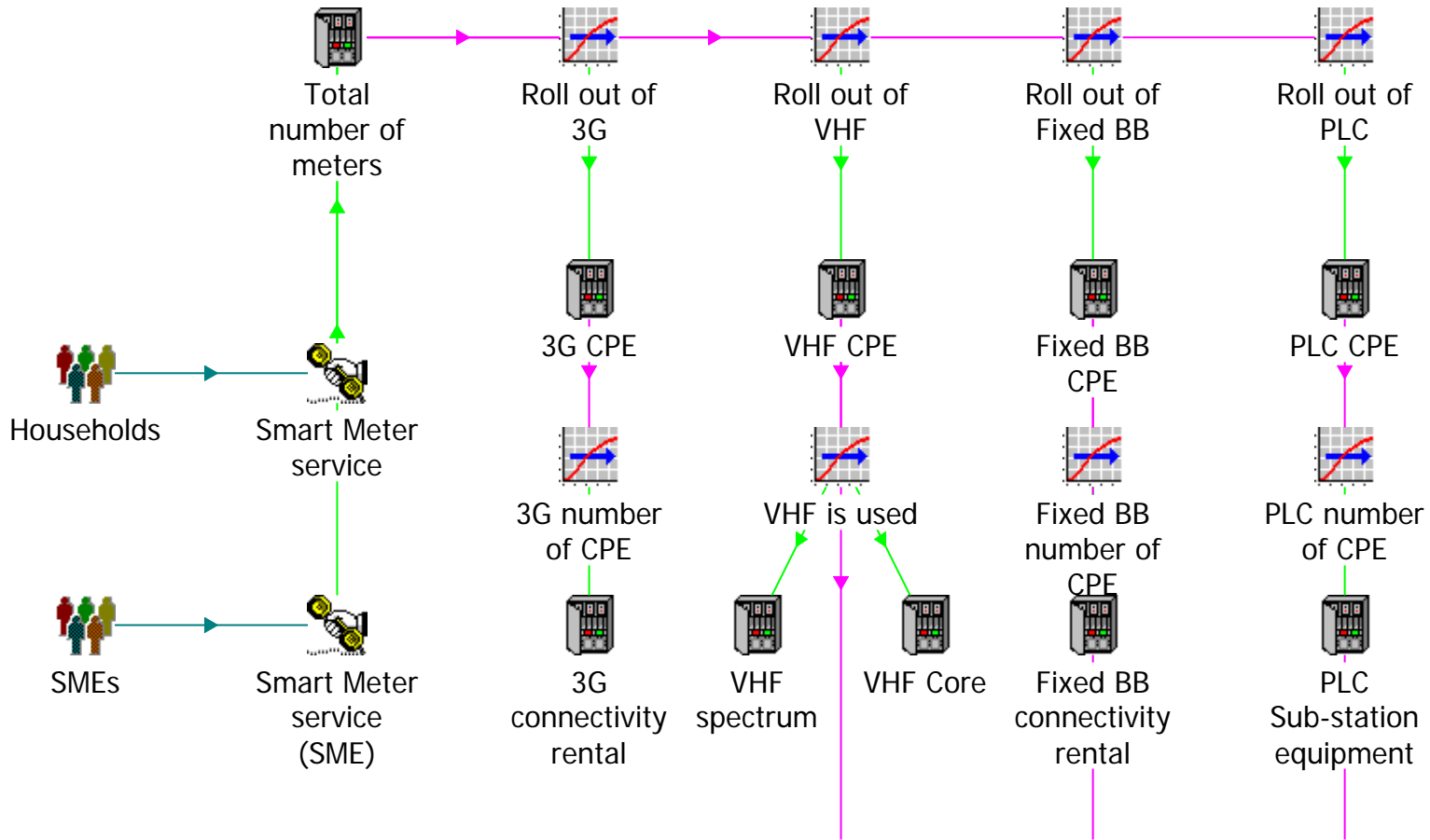
SEEs – two business models [2/2]

Wall garden	Open model
<p>Secure</p> <p>Private</p> <p>Required for tariff innovation</p> <p>May enable demand-response systems</p> <p>Handles micro-generation</p>	<p>Opens market to wide range of players</p> <p>Promotes competition and innovation</p> <p>Large source of R&D and funding</p>
<p>May limit innovation</p> <p>Requires change of meter</p> <p>Expected to be slow roll out</p> <p>Low R&D until now (IFI, LCNF)</p>	<p>Security and privacy issues</p> <p>Wall garden model may be still required for key services</p>

Different access technologies

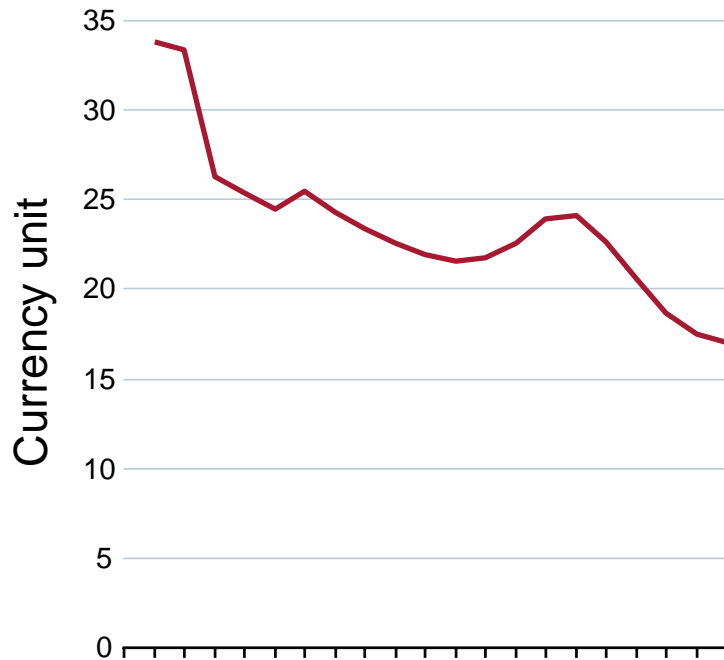
Situation			Solutions (telecom infrastructure)			
Area	Existing coverage (2G/3G)	Existing coverage (fixed broadband)	2G/3G	PLC	Broadband	VHF
Urban (dwelling with outside meter)	Yes	Yes	 (re-use infrastructure)	 (requires new infrastructure)	 (requires sharing a modem)	 (requires new infrastructure)
Urban (flats with meters in the basement)	No (indoor)	Yes	 (may need relay)	 (requires new infrastructure)	 (need to link the meter to the modem)	 (requires new infrastructure)
Rural	Yes	No (out-of-range)	 (best with low frequencies)	 (requires new infrastructure)	 (likely to require large investments)	 (requires new infrastructure)
Rural (remote)	No (indoor or out-of-range)	No (out-of-range)	 (need many new base stations)*	 (likely to require investments)	 (likely to be out of reach*)	 (good coverage, but new infrastructure)

Modelling the smart business

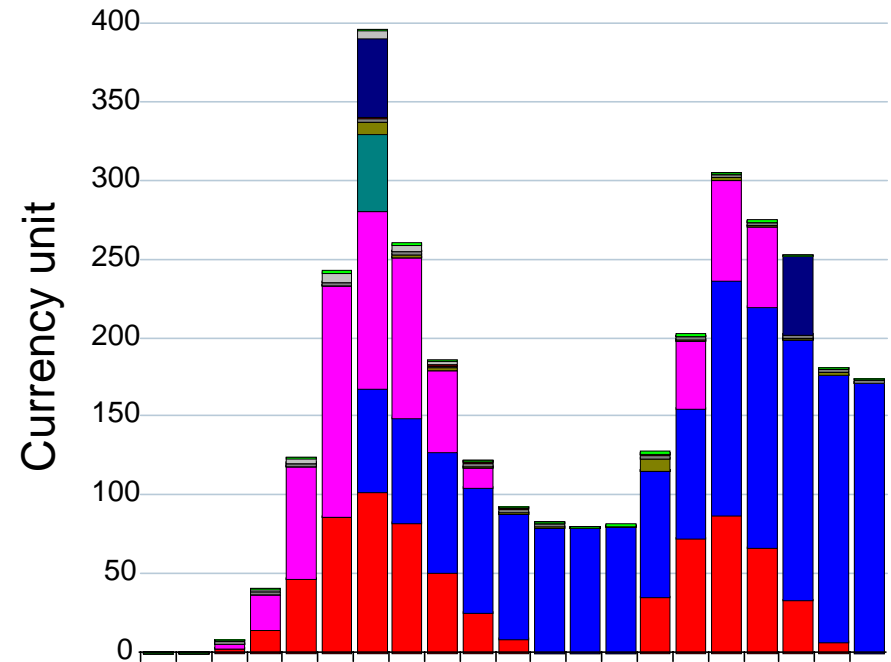


The need to finance smart services

**Total cost by connection per year
(includes opex and capex charges)**



Total network capex

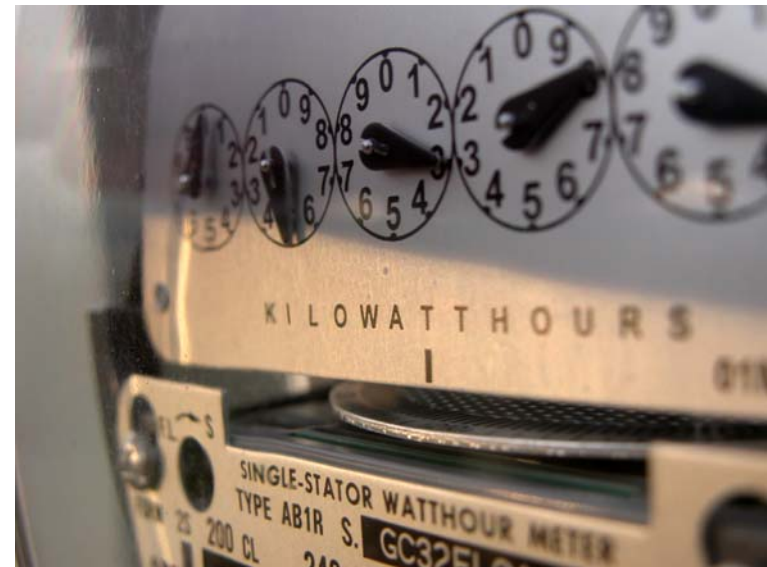


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Some market rules are necessary

- What is deployed?
- Who pays for what?
- Security, privacy
- Innovation and competition
- Standards (telecoms, devices, services, energy quality)
- Long term vision
- Business models and clarity on capex, opex, returns

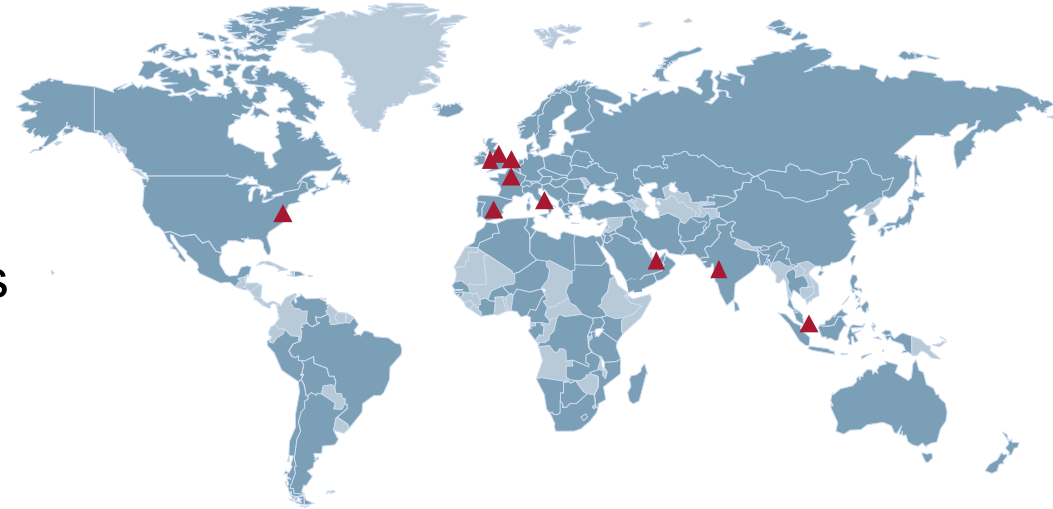


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