Regulatory implications of networks in decline

RPI Conference
Merton College, Oxford
8 September 2015

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Introduction

Four points:

1. What is a network in decline, and why are some networks in decline?
2. Some examples
3. Is it a policy issue? Should we be concerned?
4. What are the implications for regulation, and what are some of ways of addressing the challenges posed by declining networks?

What is a network ‘in decline’?

- A network characterised by **sustained**, **non-temporary, reductions in demand** resulting in excess capacity on **large parts** of a network **most of the time**

Factors associated with the decline

- No single driver can be observed, some common across all network sectors and countries, others are sector or jurisdiction specific.

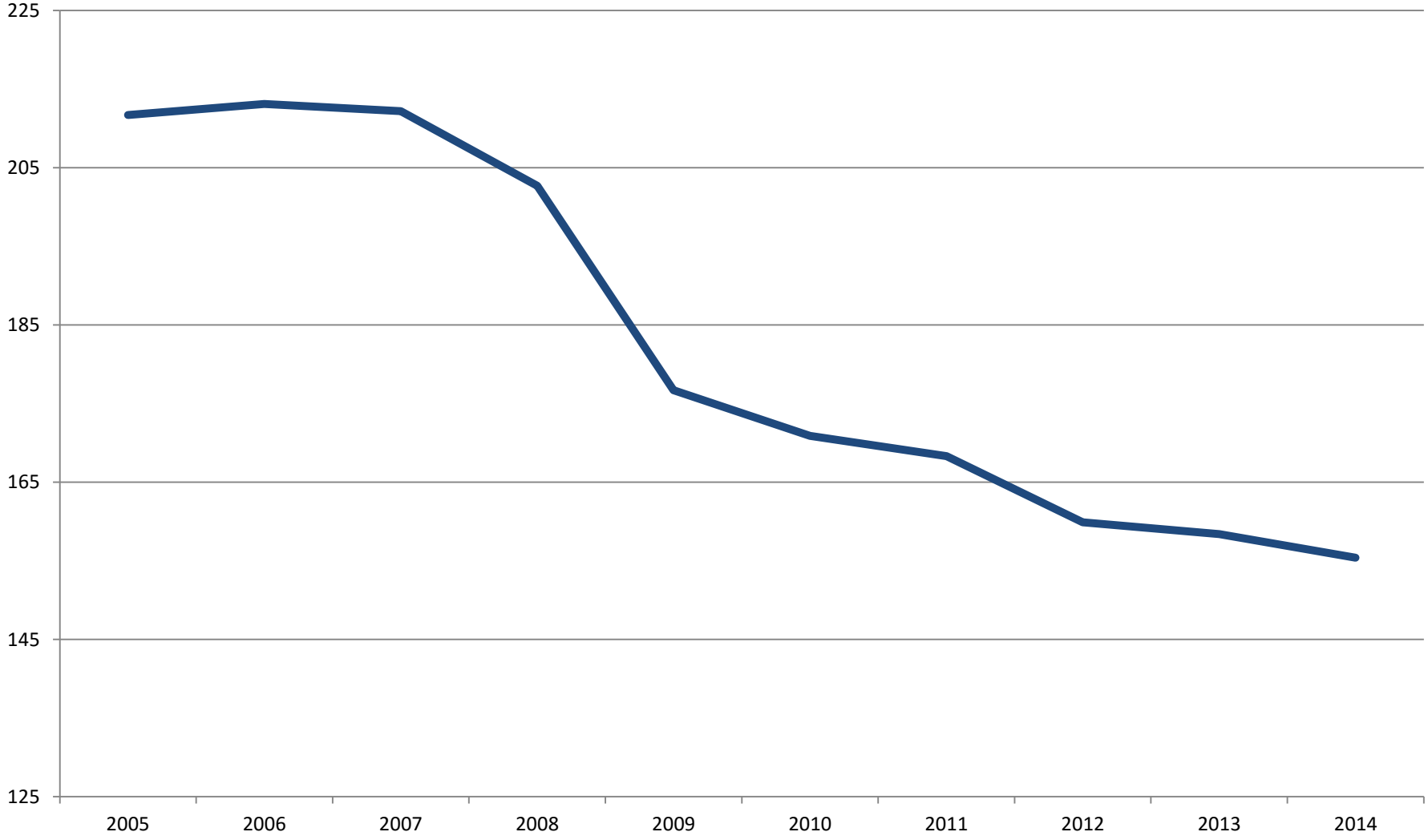
Among the factors:

- Technological change and accompanying product/service innovation
- Public policy
- Depleting resources
- Demand reductions
- New entry at different stages of the value chain
- Changes in consumer preferences

Postal services networks

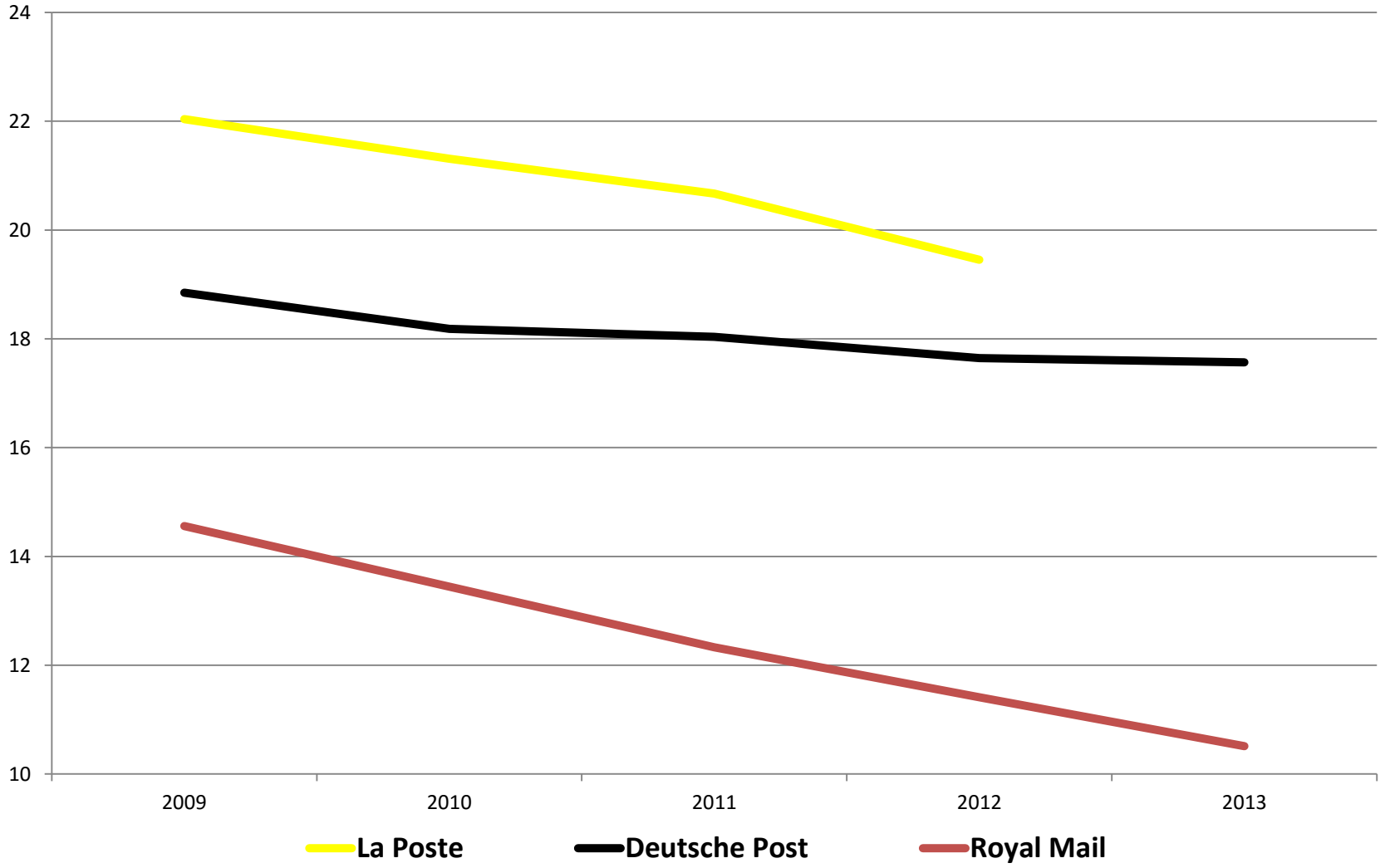
- Drivers: competition, technology and changes in consumer preferences
- Entry by new suppliers at different stages of the production chain, and by new digital products and services.
- A global phenomenon

USPS total mail volume (Billions)



Source: United States Postal Service '*Postal Facts – A Decade of Facts and Figures*'

Selected European countries - total mail items (billions)



Source: Post NL '*European Postal Markets: 2015 An Overview*'

Fixed line telecoms

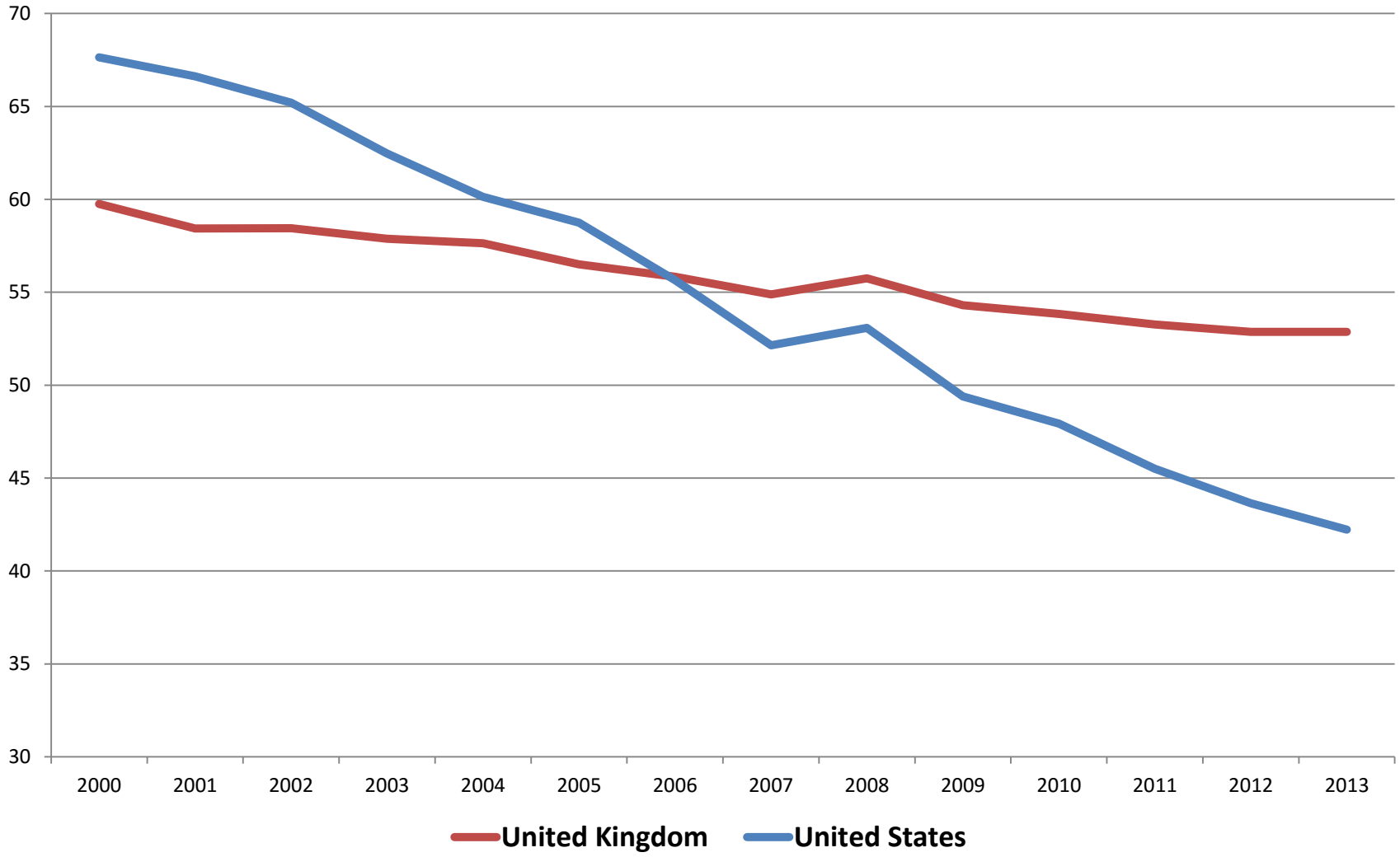
- Underutilization is a feature of large of parts of networks in some jurisdctions, particularly for the local-loop component (which is not used to transmit mobile services) (See Briglauer and Vogelsang (2011))

- Drivers: again, competition, technology and changes in consumer preferences.

- Competition from cable, mobile telephony and more recently OTT services (VoIP).

- Also wider consumer preference shift towards other forms of instant communications (SMS etc).

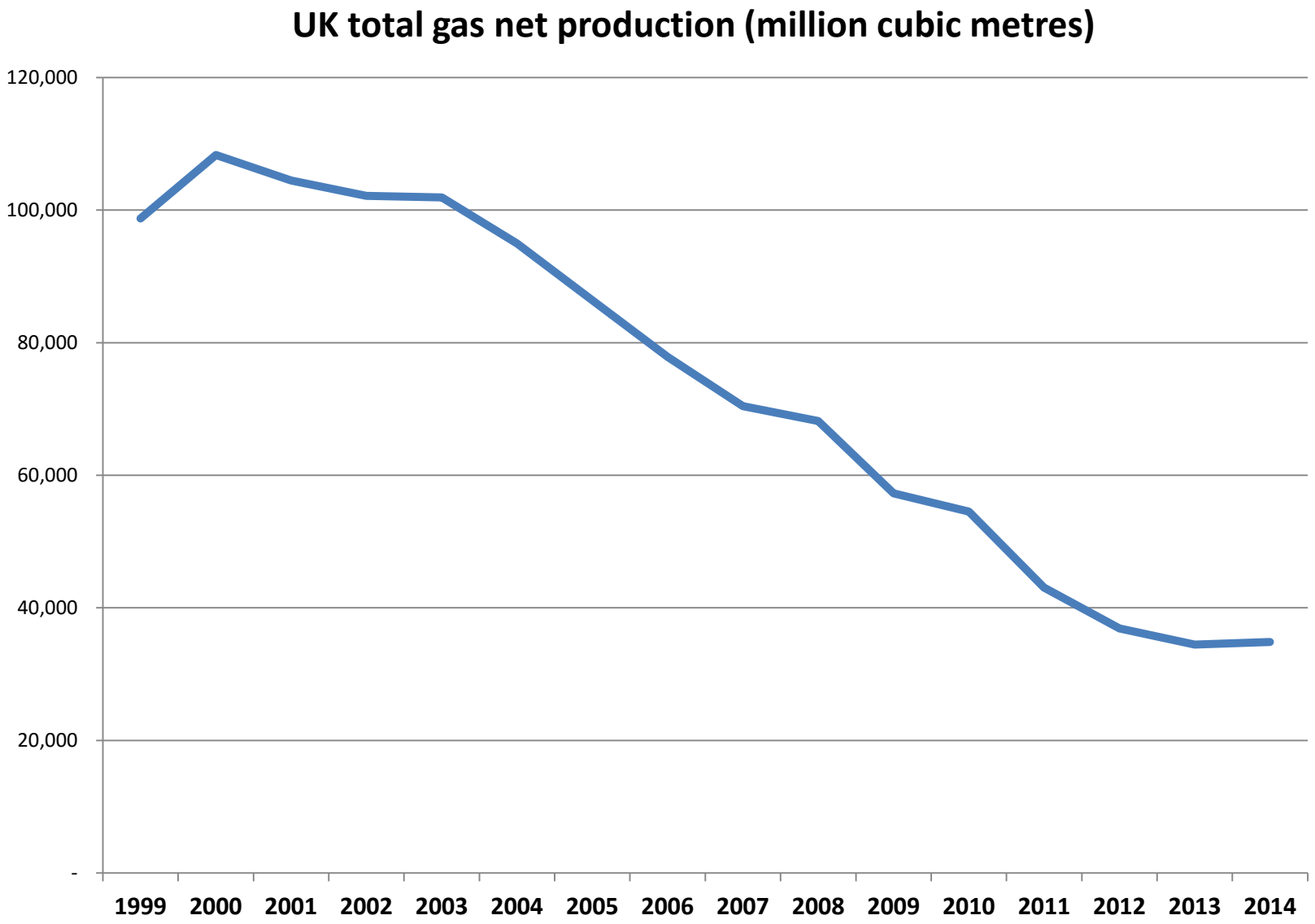
Fixed-telephone subscriptions per 100 inhabitants



Source: ITU, statistics 2014.

Gas networks

- Drivers: depleting *conventional* gas reserves
- EU expectations that gas demand has slowed and some projections suggest that it will peak in the next 10 to 20 years
- UK: significant reductions in total gas production over past 10-15 years



Source: DECC, *F.2 Gas Production*

Electricity networks

- Some jurisdictions, notably USA, but also parts of Australia and Canada, showing decreasing rate of growth of demand for electricity consumption
- Growing uptake of distributed generation facilities, particularly onsite generation facilities (solar PV and small scale wind)

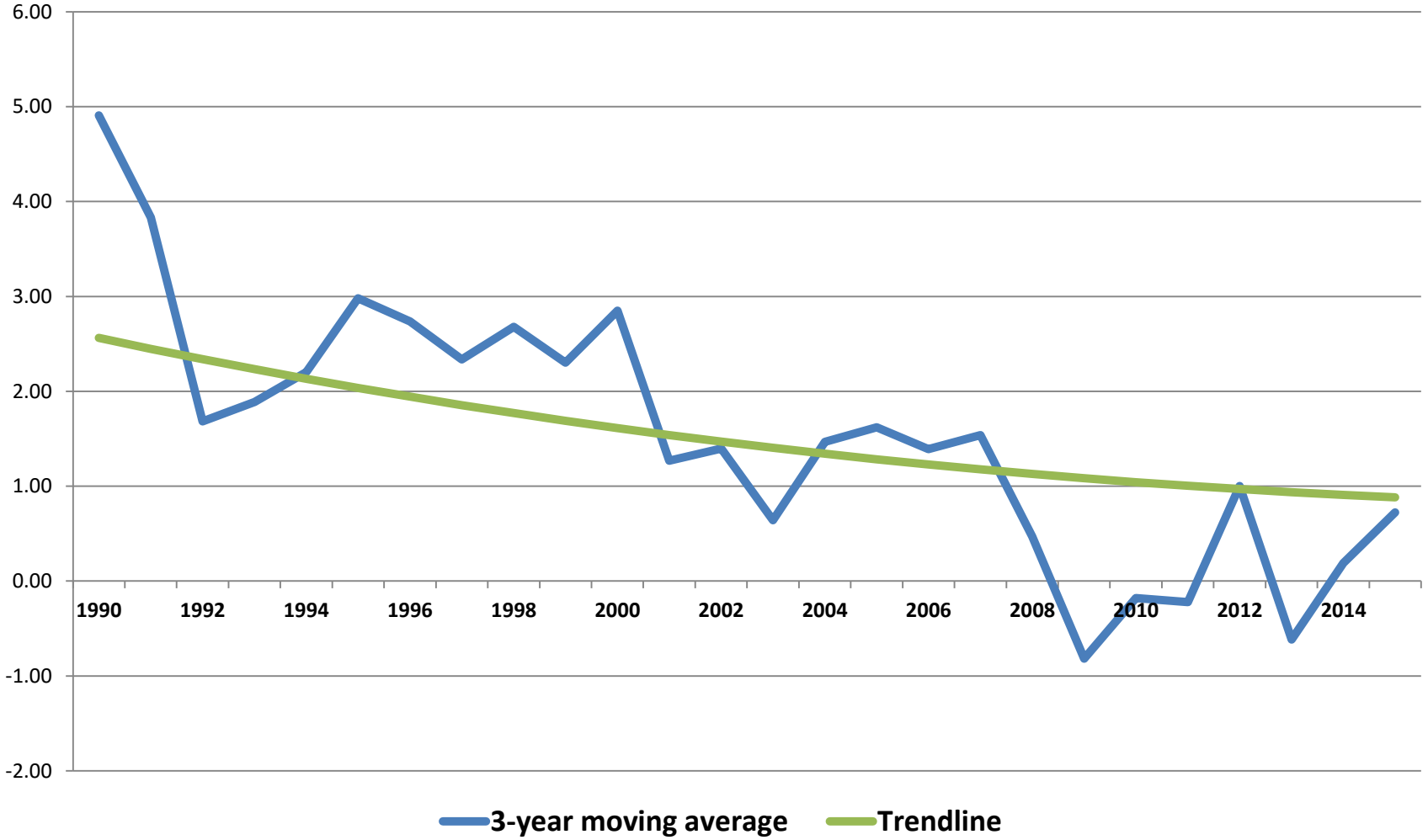
U.S.

- 'Massive growth' in the adoption of solar PV technology at the residential level (i.e.: behind the meter)
- Residential distributed solar market grew by 50% annually in 2012, 2013 and 2014. (See NC Clean Energy Technology Center (2015)

U.K.

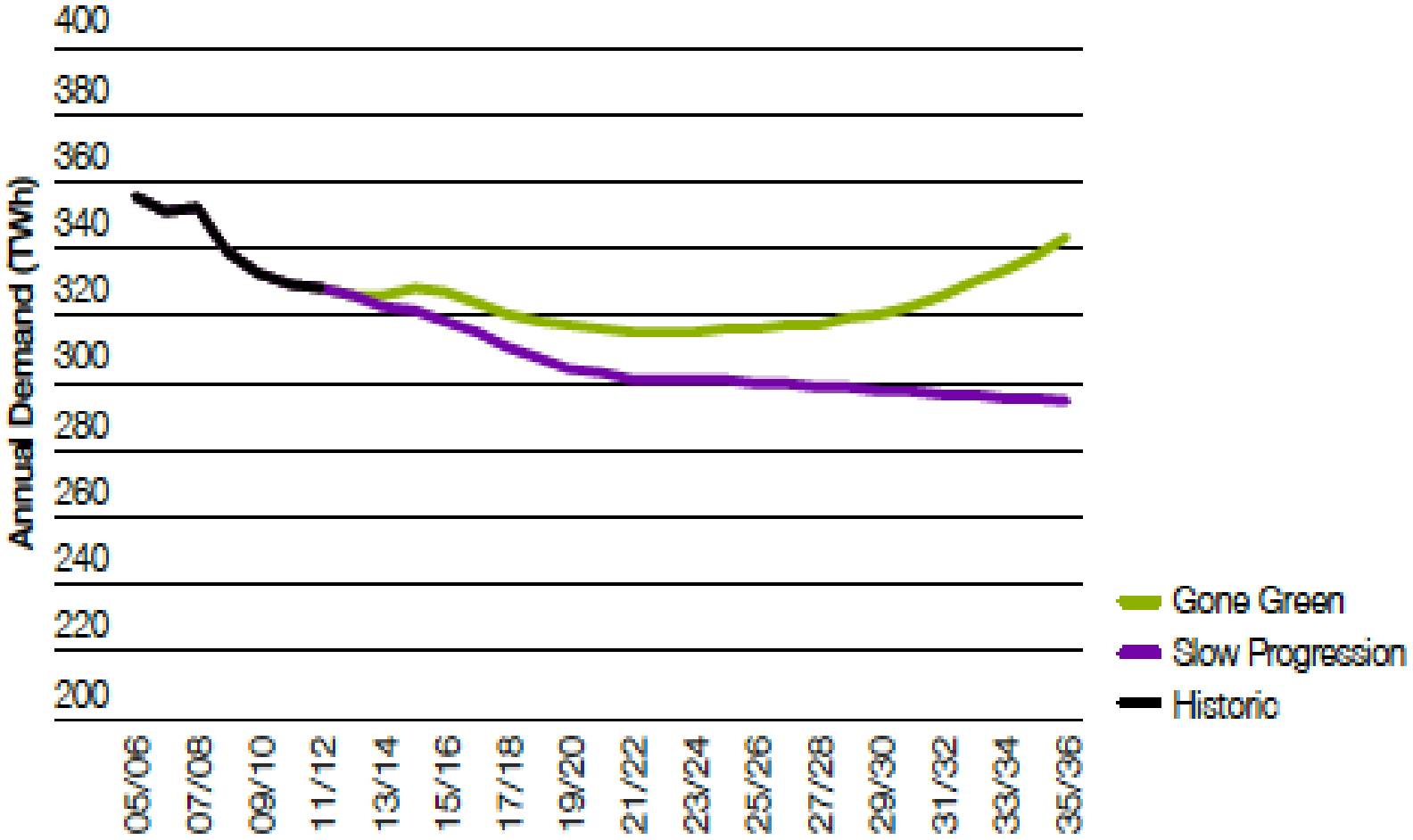
- Some projections of decreasing total demand over period to 2036
- Also some expectations of significant growth in installed micro-generation capacity , particularly solar PV over period to 2035

U.S. electricity demand growth, 1990 - 2015 (percent, 3-year moving average)



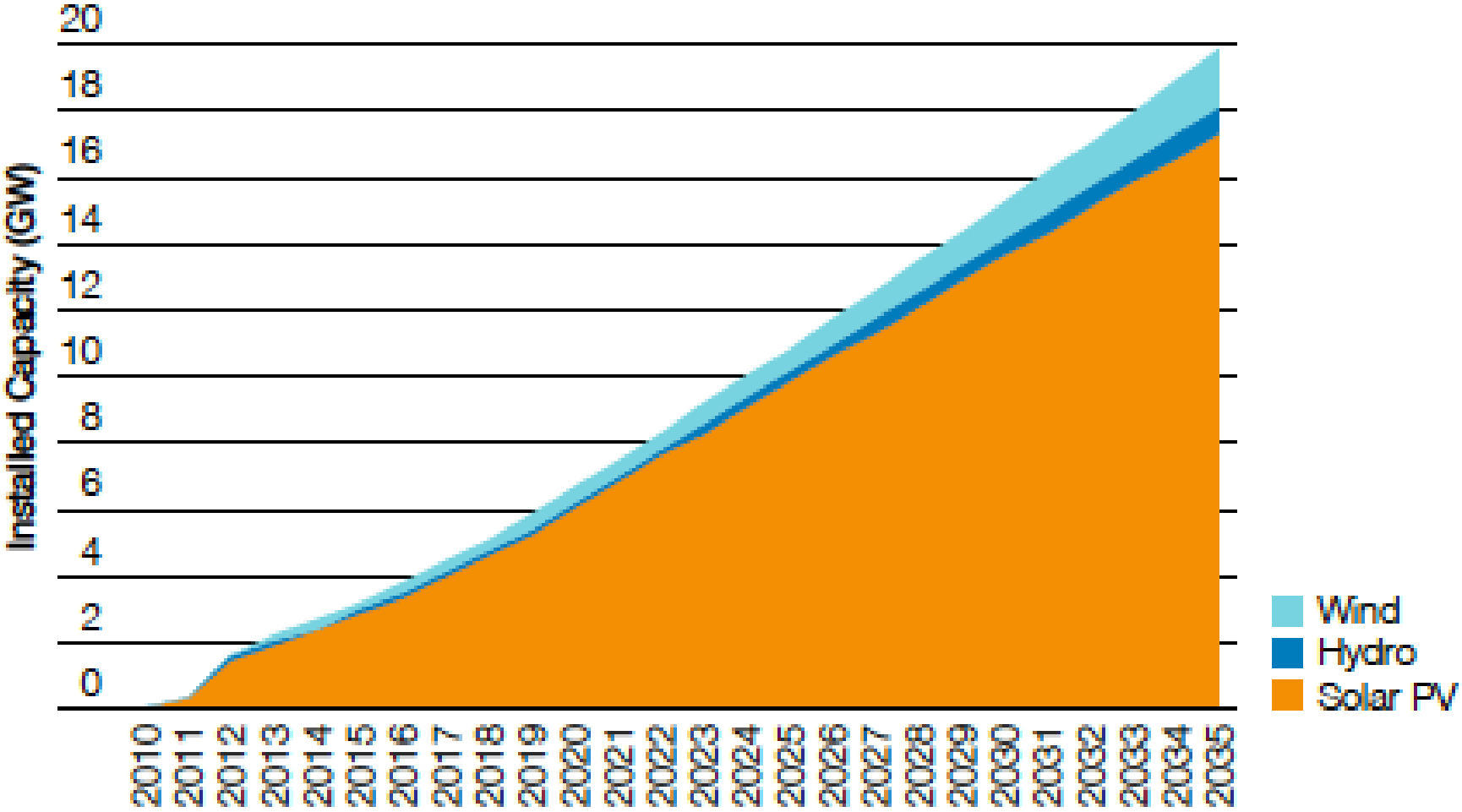
Source: Adapted from U.S Energy Information Administration U.S. Electricity Demand Growth, Figure 75.

Total Annual Electricity Demand - GB



Source: Reproduced from National Grid, UK Future Energy Scenarios, July 2013. Figure 32

Microgeneration installed capacity in Gone Green Scenario



Source: Reproduced from National Grid, UK Future Energy Scenarios, July 2013. Figure 37

Electricity networks

- Plus potential impact of small-scale, affordable storage

- Germany already has over 4000 residential storage systems, some estimates of PV + storage of up to 1000,000 by 2018.

Power to the people in energy revolution

Eco-batteries will slash household bills

James Dean
Technology Correspondent

Household batteries that will save consumers hundreds of pounds a year by collecting solar power and cheap off-peak electricity are to become as common as washing machines after a scientific breakthrough, experts have predicted.

The device, unveiled yesterday in the United States, was hailed as the start of a new era of cheaper electricity and home-generated renewable energy.

The wall-mounted battery stores energy collected by roof-mounted solar panels and garden wind turbines. It can also suck cheap electricity from the grid in the middle of the night for use in peak daytime hours.

As many as eight of the units, called Powerwall and manufactured by the American company Tesla, can be linked together to provide extra storage capacity for homes with high electricity demands.

Sam Wilkinson, research manager for energy storage at IHS Technology and a leading expert, described the decision to manufacture the Powerwall as "like lighting the fuse for the industry".

"This is the future," he said, with household batteries to become "far more common" in homes across the world. The price of Tesla's batteries was "significantly below what we've seen in the market", which would bring competition among other suppliers and push prices down, he said.

The energy storage industry is expected to grow from $200 million in 2012 to $19 billion in 2017. The price of rechargeable home batteries is expected to drop by half in the next two to three years.

Two versions of the Powerwall will be made available in Britain by the end of the year. One, a "daily cycle" battery that can store up to 7 kilowatt hours (kWh) of electricity, which is for day-to-day use, will cost $3,000 (£1,960) when it goes on sale in the US this summer. Another, a 10kWh "back-up" battery, which is intended to provide emergency power in the event of a blackout, will cost $3,500 (£2,290).

A single use of a washing machine consumes approximately 2.3kWh of electricity, Tesla estimates. A refrigerator uses 0.2kWh a day and a flat-screen television 0.1kWh a day.

The case for using a household battery in Britain is strong, Mr Wilkinson suggests, because energy tariffs in the UK fall heavily in favour of households that generate and use their own electricity.

Karl Brauer, a senior analyst at Kelley Blue Book, who has followed the

Continued on page 7, col 5

Household batteries to cut power bills

Continued from page 1

development of Tesla's electric car, said: "As solar panels get cheaper and easier to install the only thing keeping consumers tied to the energy grid is a need for electricity when the sun isn't shining. There's a universal application for portable energy and storable energy. It's really just a matter of getting the business model together."

A spokeswoman for Ofgem, the energy regulator, said: "Clearly, there is scope for energy storage, both at domestic and grid level, to help shift towards smarter consumption and a lower-carbon energy supply."

Elon Musk, the billionaire technology entrepreneur and chief executive of Tesla, said that affordable home battery packs were the "missing pieces" that had stopped families switching from fossil fuels to renewable energy.

"Our goal here is to fundamentally change the way the world uses energy at the extreme scale," Mr Musk said at a launch event near Los Angeles yesterday, which was powered by solar energy stored in Tesla batteries. This is a feasible thing. It's very important to appreciate that."

A number of smaller companies are making household battery packs. Ecotricity, the British green energy company based in Stroud, Gloucestershire, is experimenting with its "Black Box" battery unit. It will test the technology in 100 homes this year.

Most solar energy is generated in the middle of the day when the sun is at its hottest, but household power demand is highest in mornings and evenings. Battery storage overcomes this.

The same concept applies to the industrial Powerpack battery, also unveiled by Tesla yesterday, which is intended for utility companies that generate renewable energy. The units can also be used to store energy from renewable and non-renewable sources for release into the grid as demand rises.

The industrial Powerpack battery can store up to 100kWh of electricity and can be linked with others to provide capacity of more than 10MWh. Mr Musk said yesterday that two billion Powerpacks could hold enough energy to meet the entire world's electricity needs of 20 trillion kWh annually, the equivalent of powering a single family home for 1.8 billion years.

The Times, 2 May 2015, page 1

Is it a policy issue? Should we be concerned?

- Many of these changes bring with them considerable consumer benefits in terms of new products and services offering greater functionality, speed, quality, and sometimes at lower cost.

- Not all bad for network operators as well: some adaptations are occuring across industries
  - Mail: parcels substituting for traditional mail deliveries
  - Gas: non-conventional (shale) gas substituting for conventional gas
  - Telecoms: VoIP and broadband substituting for fixed-line calls
  - Electricity: some companies transforming into 'integrated energy managers' and forging partnerships with new localised providers

Is it a policy issue? Should we be concerned?

However, given the regualtory arrangements in many places, declining networks can raise some challenging, foundational questions:

- First, does it mean that competition ‘has arrived’ and these network operators no longer have (significant) market power? If so, what is the continuing rationale for regulation?

- Second, how do you address the different impacts which can arise among different types of consumer?

- Third, how do you deal with the impact on the owners/shareholders of networks? Specifically, what do we do with sunk costs?

Specific implications for the regulatory framework

1. Scope and funding of the 'essential services' provided by these networks
   - What is the 'essential' part of the service provided by the network operator? (lifeline services, guaranteed connection to power, commitments in terms of collection/delivery etc.)

2. Revenue and cost recovery
   - Should a network operator be able to recover all its costs, particularly sunk costs, given declining demand? What are the implications for efficiency?

3. The structure of charges and distributional impacts
   - If prices are based on average costs, will fully captive customers end up bearing a disproportionate burden of the (largely fixed) costs? Is this equitable?

Specific implications for the regulatory framework

4. The development of an asymmetric regulatory approach
   - A decline in one network activity is genrally accompanied by an increase in demand for another, often less-regulated, activity. Is this further facilitating the decline? Should they be regulated in a similar way?

5. The continuing relevance of capacity allocation methods such as auctions
   - If there is excess capacity at all points on network (no capacity constraints) there is no scarcity value, and any auction price will be zero or reserve price