



THE OXFORD
INSTITUTE
FOR ENERGY
STUDIES

A RECOGNIZED INDEPENDENT CENTRE OF THE UNIVERSITY OF OXFORD



Energy demand and energy security

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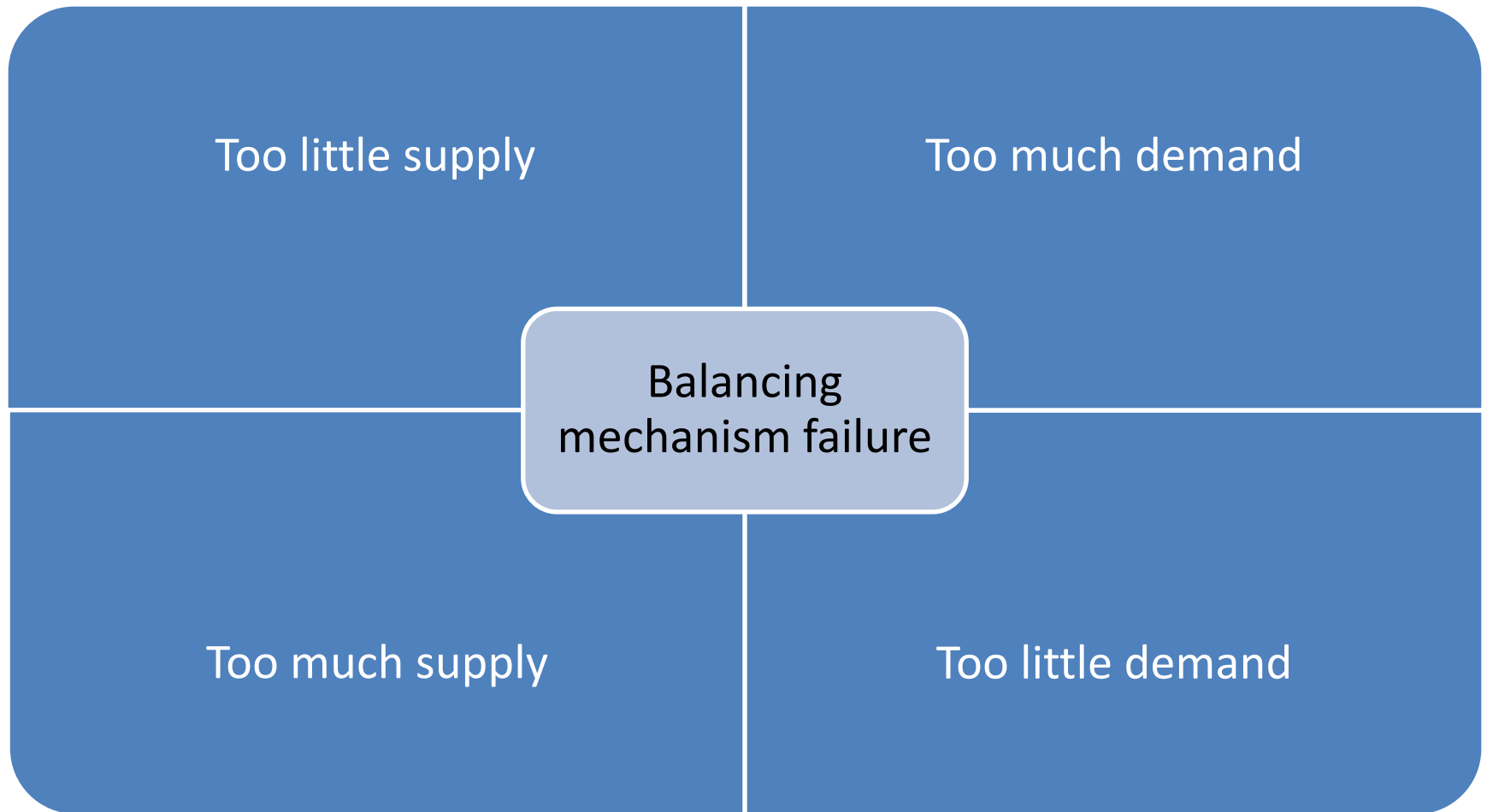
Two big questions

- 1 Why the focus on **supply** security?
- 2 How does **energy efficiency** fit in?

Security is about the balance of supply and demand



Mismatches are symmetrical - causes



Potential responses are also symmetrical

Balance can be restored:

- By increasing supply/reducing demand
- By reducing supply/increasing demand
- By fixing the balancing mechanism (markets, delivery infrastructure etc)



So why the focus on supply?

- Top left part of matrix (supply < demand) has been main focus of concern (eg statutory security “of supply” document).
- Mainly due to supply side bias – demand side treated as a given (consumers must have access to “the services they need”); security therefore taken as ensuring enough supply to meet that demand.
- Balancing mechanisms often ignored (though they are the usual suspect in a crisis).



But there are some asymmetries

Disruptions have been more common on supply side (they can happen on demand side but have been constrained or predictable).

Some further (recursive*) **asymmetries**:

- Most of our information relates to supply side
- Value of lost load (VOLL) much higher than cost of supply

(*both are effect as well as cause)

Asymmetries 2: responses

- Supply side has large scale response mechanisms
- Responses on demand-side (diversity, storage, redundancy) may be (regarded as) trickier to mobilise

But:

- Governments have a legal responsibility to have the capacity to reduce oil demand by 10% (IEP)
- In practice, this has often been achieved or exceeded (IEA 2011b)

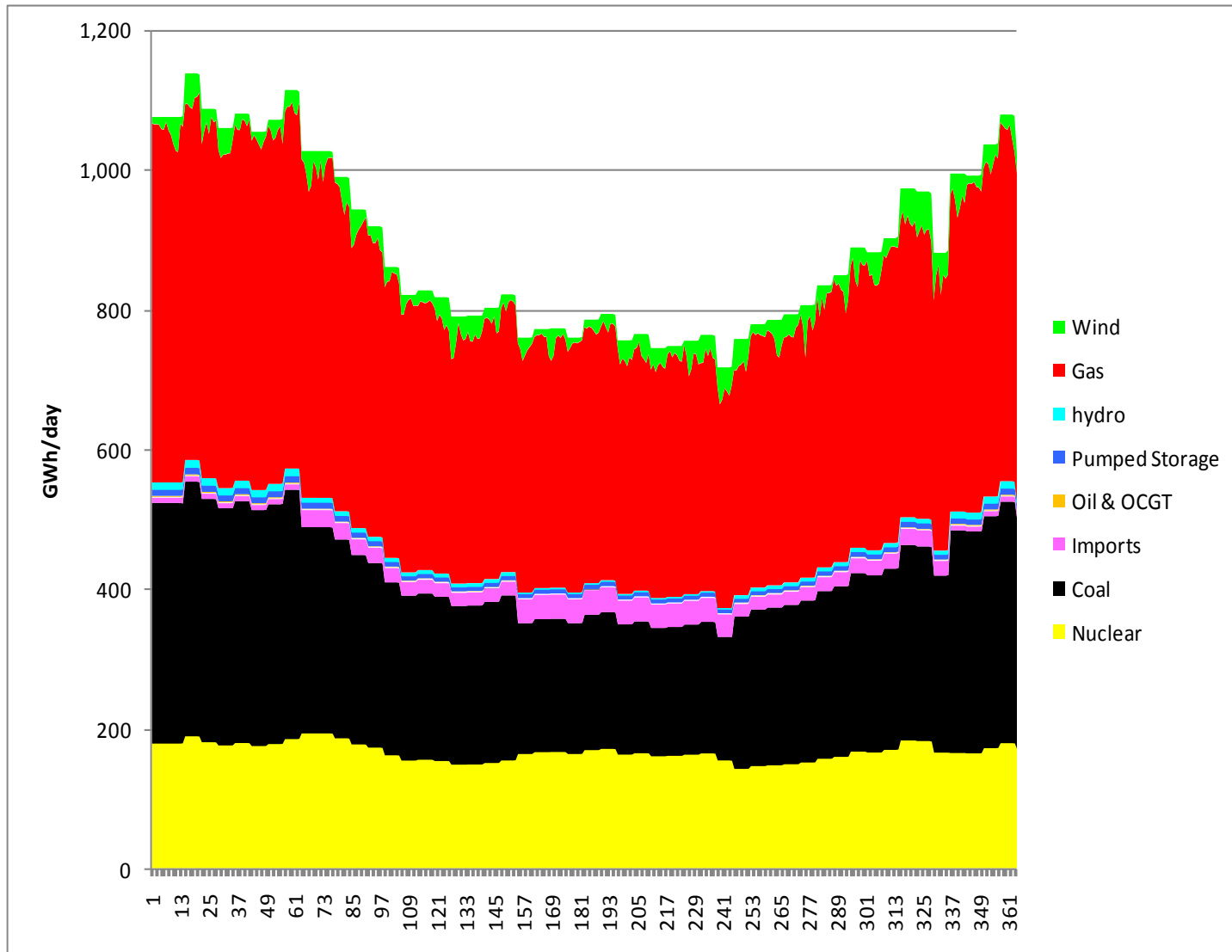


In any event, the future balance will be different

- Growing supply side inflexibility (non-dispatchable and capital intensive low carbon plant; gas imports)
- Growing demand side flexibility (smart grids, smart meters etc)
- Growing demand side complexity (uncertain trend of demand; new demands – EVs and dg; policy driven demands; gas/power interactions)
- Rising cost of energy (greater incentives for demand side – VOLL relatively lower)

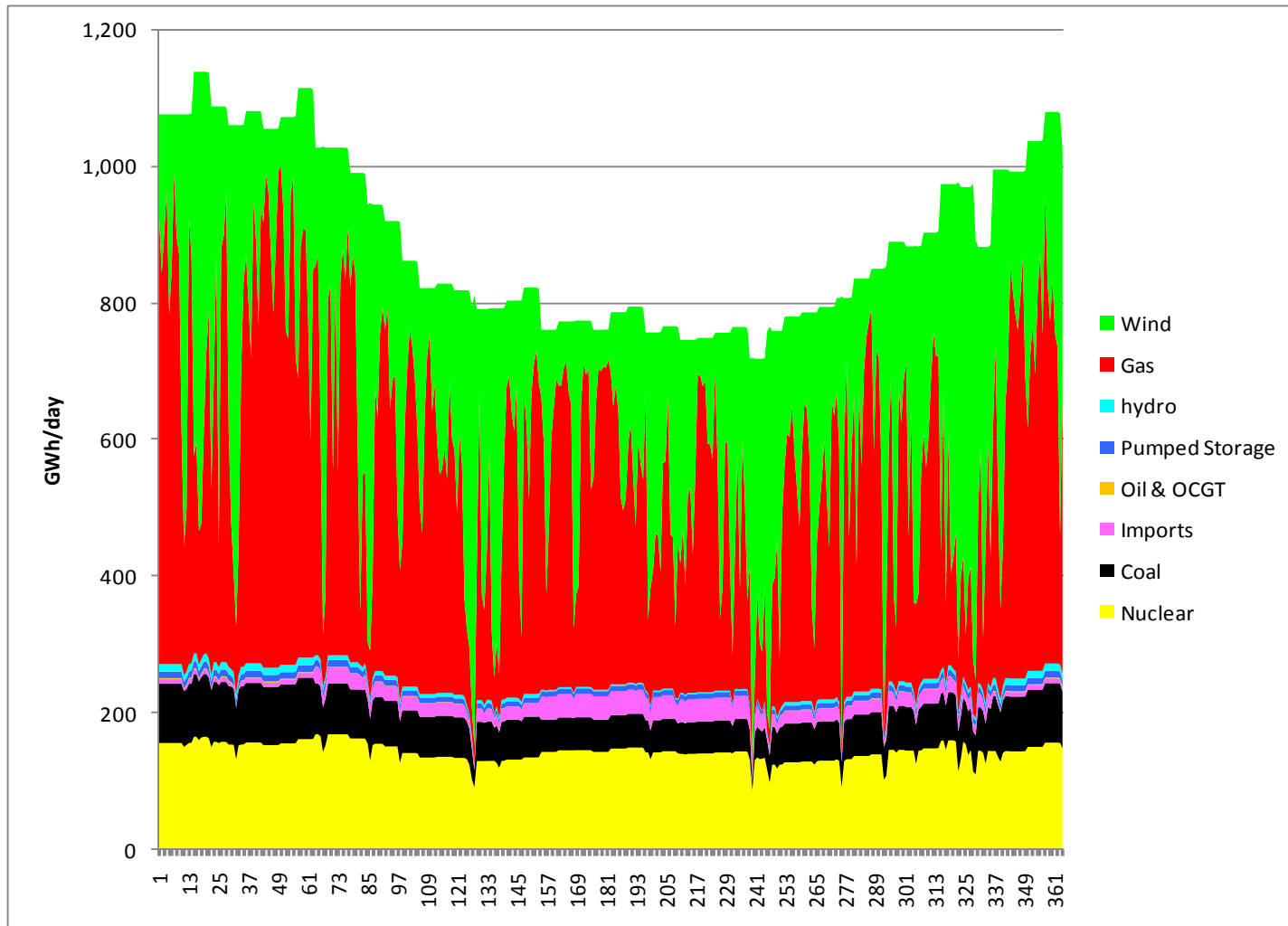


UK Sources of Power Generation 2009 – Daily (3.8 GW Wind Capacity)



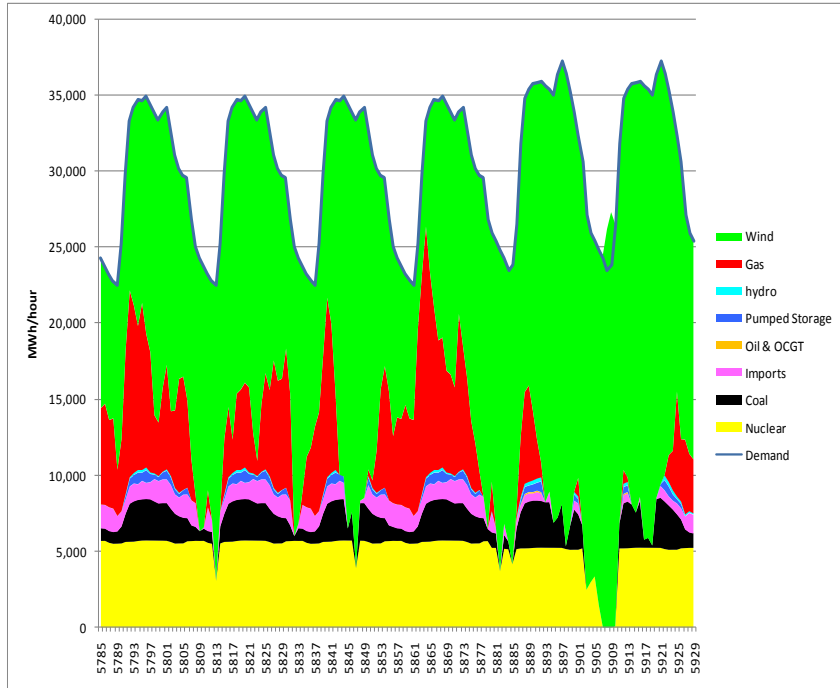
UK Sources of Power Generation 2025 Daily

43.2 GW Wind Capacity (OIES)

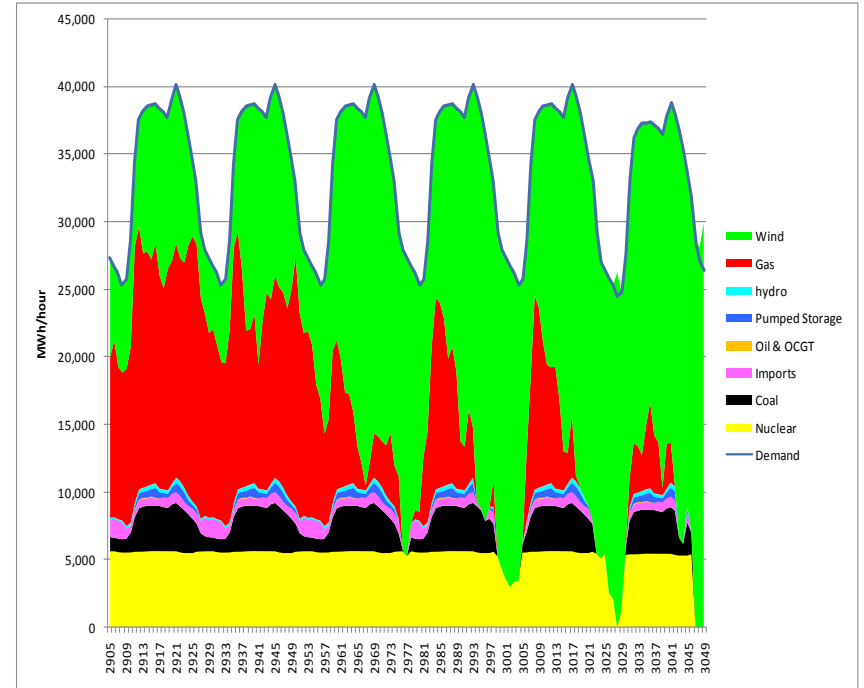


2025 Hourly Analysis (OIES)

Days 121 – 127

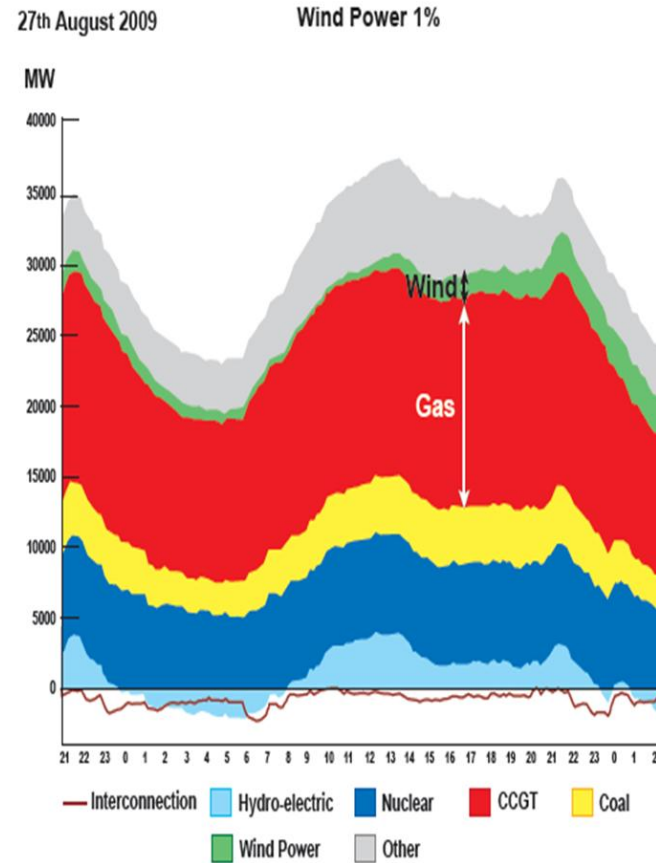
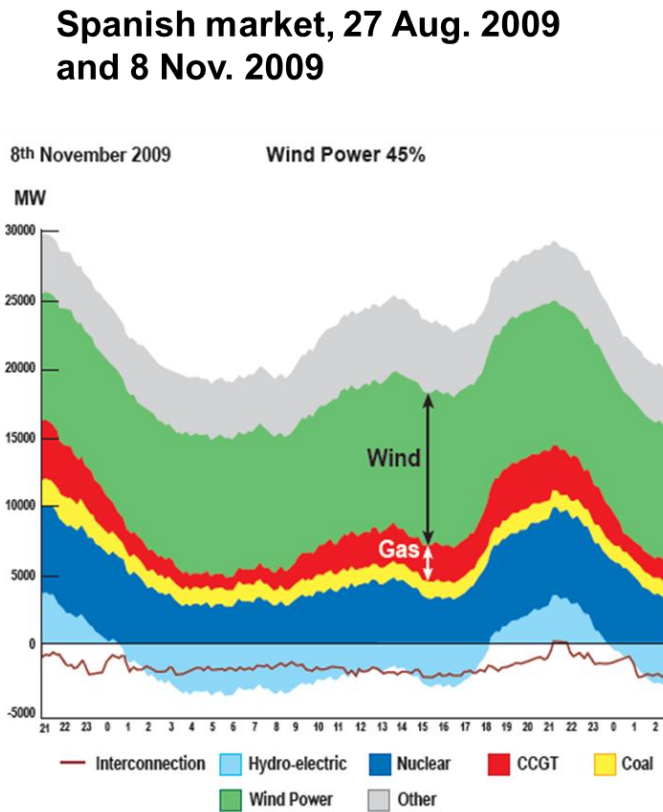


Days 241 – 247



Balancing in Spain

Two
days
in
Spain



Source: Presentation at Platts 4th Annual European Gas Storage, 10 February 2010, Luis I. Parada



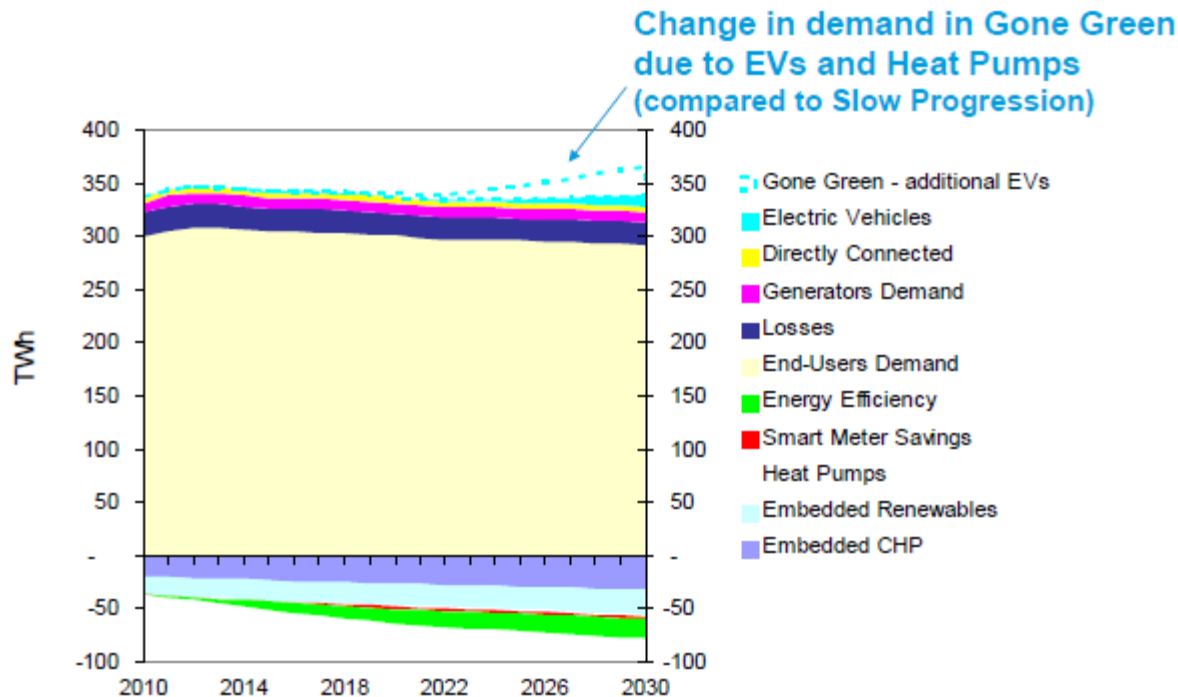
Electricity demand may well have peaked last decade (as may oil, gas etc).....

- Extended recession – lost decade(s) for Europe
- Energy efficiency (government policies plus AEEI)
- Higher electricity prices (global fossil prices plus cost of decarbonisation)
- “Negative demand” (small scale solar, CHP etc)



Demand: composition more significant than level - but dependent on policy (National Grid scenarios)

2011 Annual Electricity Consumption



The policy discussion revolves around energy efficiency

“Energy efficiency is the most cost effective way to reduce emissions [and] improve energy security [It] can be seen as Europe's biggest energy resource”

(Commission – Energy 2020)

“Energy efficiency must be the starting point [for increased energy security]” (Malcolm Wicks]

Energy efficiency is one of the “six pillars” in the Government’s latest security of supply document



But energy efficiency is about reducing inputs, not service outputs

- Energy efficiency means less energy for same amount of services
- Doesn't reduce dependence on energy services - except where non-energy services substituted (eg cycling)
- Dependence **not** represented by GDP share of energy or energy imports as in many policy documents
- Greater efficiency = higher value energy (ie the pain of loss is greater; VOLL is higher)



Efficient A vs inefficient B

- **A** and **B** use the same amount of energy services. **A** is more efficient and spends 3% of GDP; **B** 5%.
- With a given %age supply reduction, both lose the same %age energy services
- With a given quantity reduction **A** loses more services
- **B** likely to be able to reduce demand more quickly and cheaply in an emergency **because of** inefficiency
- **B** also more likely to have greater diversity of supply and infrastructure because of higher energy flows



On the other hand

- **B** pays more for energy and suffers more from higher prices (but always did)
- **B** has a bigger gap to fill in an emergency (so ...?)
- **A may** have better “buffers” (like insulation)
- **A may** have greater consumer awareness and responsiveness
- **A may** be less exposed to imports and fossil fuels in general



Role of energy efficiency

- Effects complex – no straightforward link with security
- Efficiency should not be considered in isolation or in an undifferentiated fashion; it's the system effects of particular forms of efficiency that count
- Need wider strategy for informing and empowering consumers



Conclusions

- Demand has received too little attention in relation to security in the past, though demand reduction has been important
- Energy efficiency has been treated too simplistically
- In future, the demand side will take on a much greater potential role as energy markets decarbonise
- Governments will need to develop a coherent and integrated strategy to harness this potential effectively and need to pay attention to the balancing mechanisms that link demand and supply

