

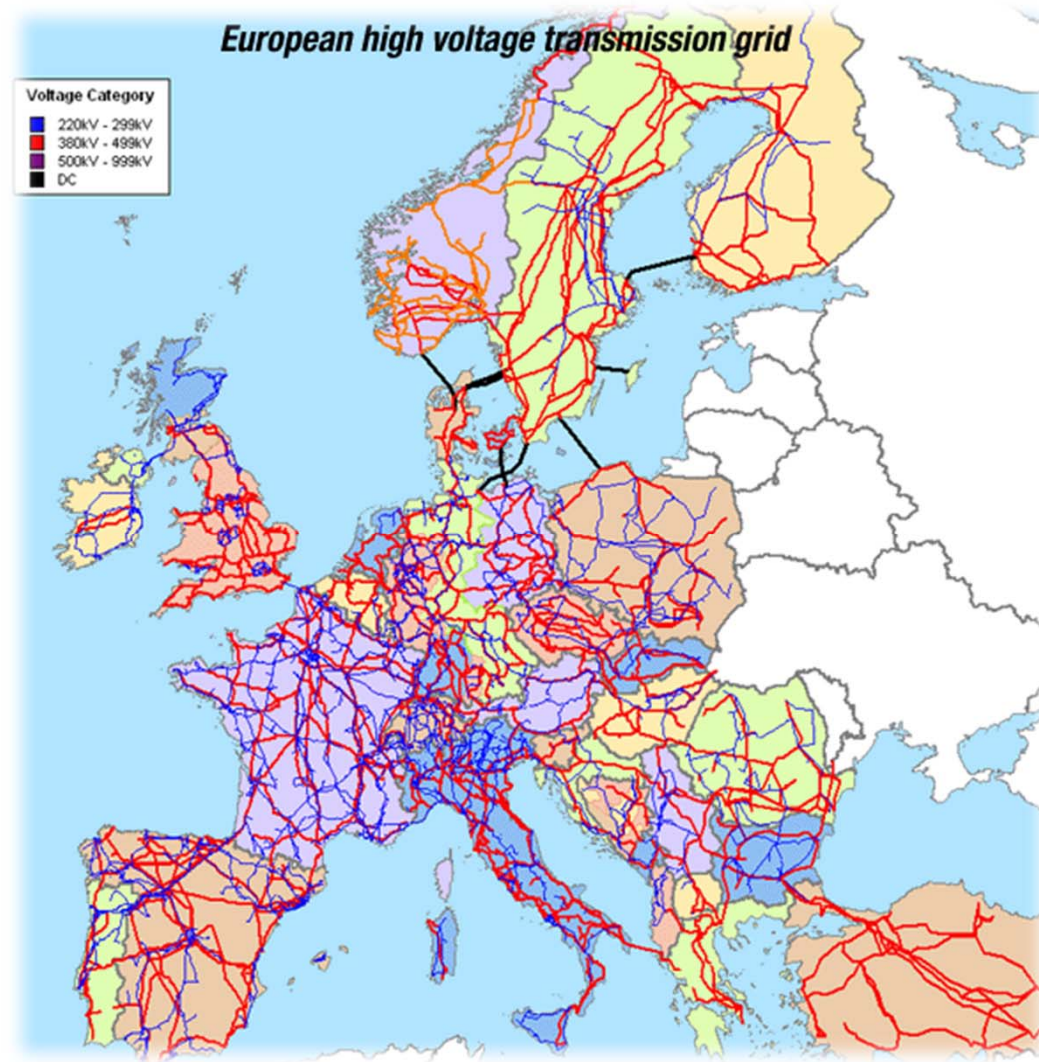
Smart Grids or Smart Systems?

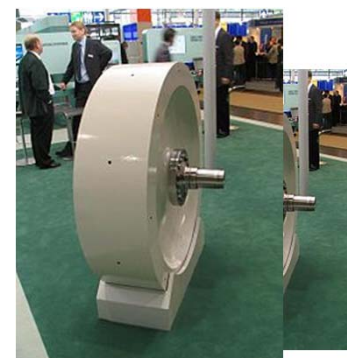
*'Recreating the Energy Supply Chain
up to and beyond 2050'*

Dr Aoife Foley

Queen's University Belfast

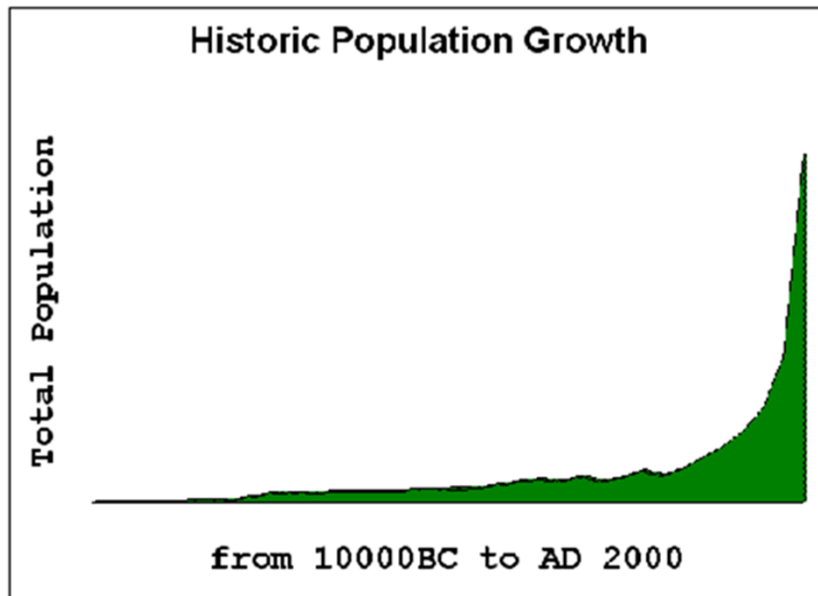
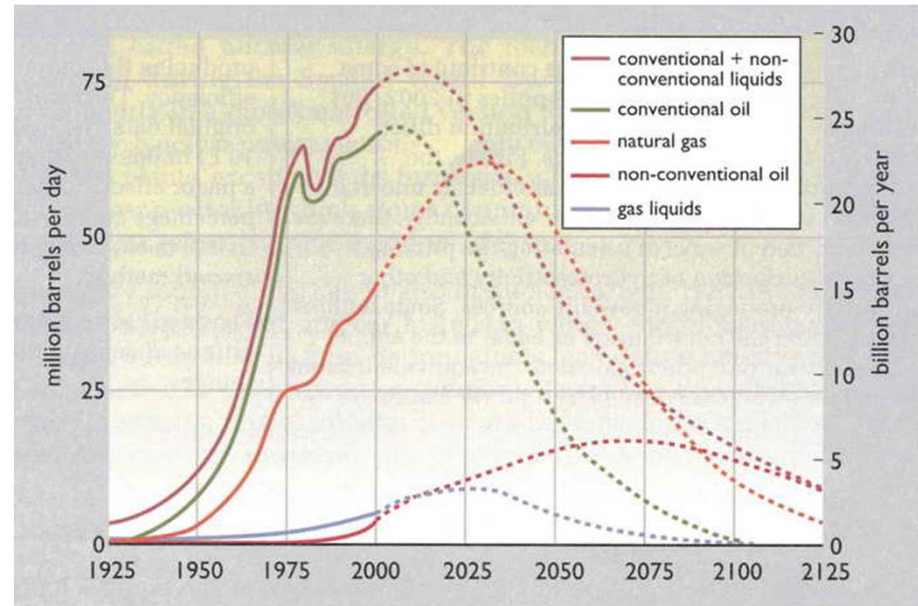
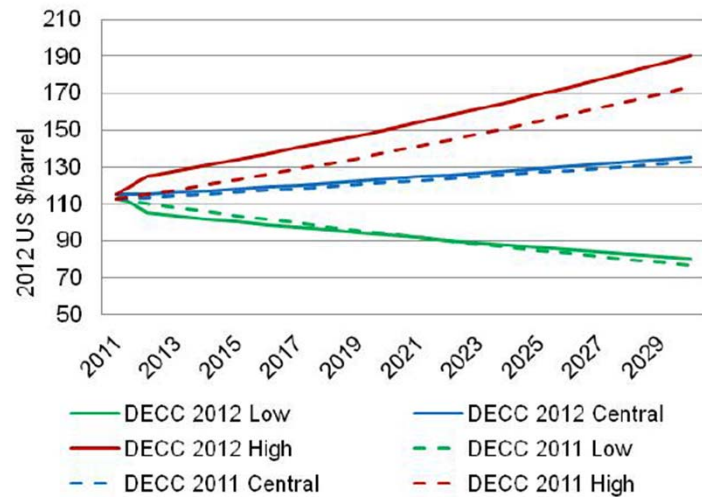
The power system!



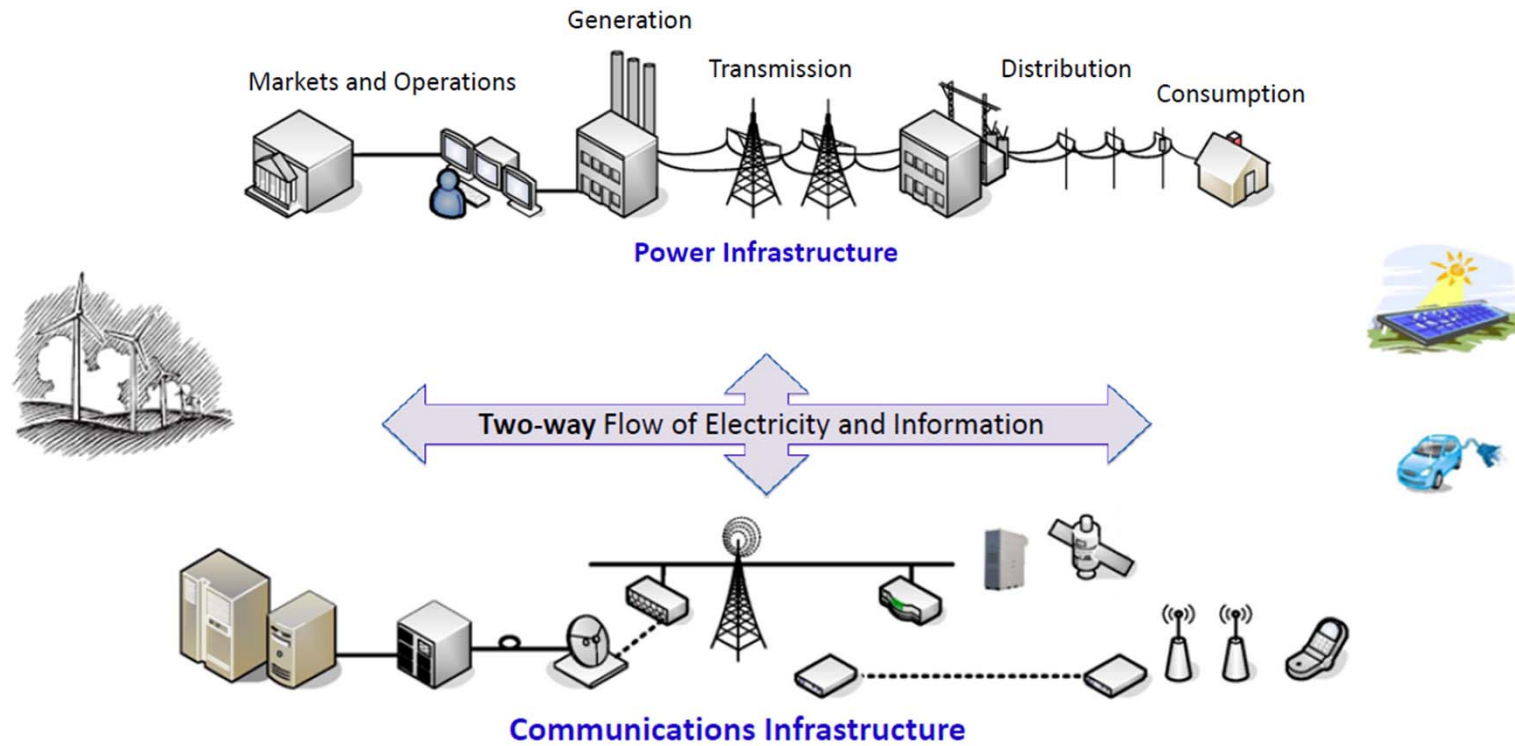




What are the pressures?



What is the Smart Grid?



EU Vision?



Factors affecting Smart Grid/Smart System development

Public policy

Industry restructuring

Environmental regulations

Fossil fuel prices

Carbon pricing

Security of Energy Supply

Market structure

Ageing infrastructure

Multidisciplinary field

Existing Power System v Smart Grid

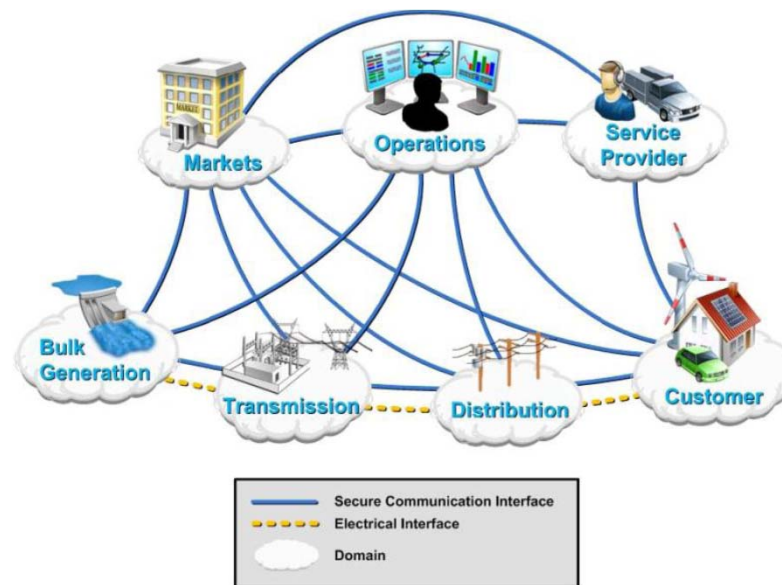
Existing 20 th Century Grid	Future 21 st Century Smart Grid
Analog & Electromechanical	Digital
One-way communication	Two-way communication
Centralised generation	Distributed generation
Hierarchical topology	Network topology
Few sensors	Sensors throughout
Manual monitoring	Self-monitoring
Manual restoration	Self-healing
Failures and black-outs	Adaptive and islanding
Limited control	Pervasive control
Generally average price	Real-time pricing
Commodity based	Service based
Few customer choices	Many customer choices

(adapted H. Farhangi, 2010)

Smart Grid Summary

EU Vision

A Smart Grid is an electricity network that can efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure an economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety (European SmartGrids Technology Platform, 2005).



USA Vision

Source: National Institute of Science and Technology. *Smart Grid: A Beginner's Guide*. Washington, DC: Government Printing Office, 2010, p. 5.

Smart System Summary!

A Smart ~~Grid~~ **System** is an ~~electricity~~ **energy** network that can efficiently integrate the behaviour and actions of all users connected to it – ~~generators~~ **producers**, consumers and those that do both – in order to ensure an economically efficient, sustainable ~~power~~ **smart energy** system with low losses and high levels of quality and security of supply and safety (European SmartGrids Technology Platform, 2005).

So really what is the Smart Grid?

- A. Anything policy makers tell you.
- B. Anything an OEM tells you and tries to sell you.
- C. Any new technology in the grid.
- D. ICT plus the power system.
- E. All of the above.