

# Deep emissions reductions in the power sector: UK scenarios for 2050

Presentation to NIES event, “Global challenges toward a low-carbon economy”  
Montreal, 3 Dec 2005

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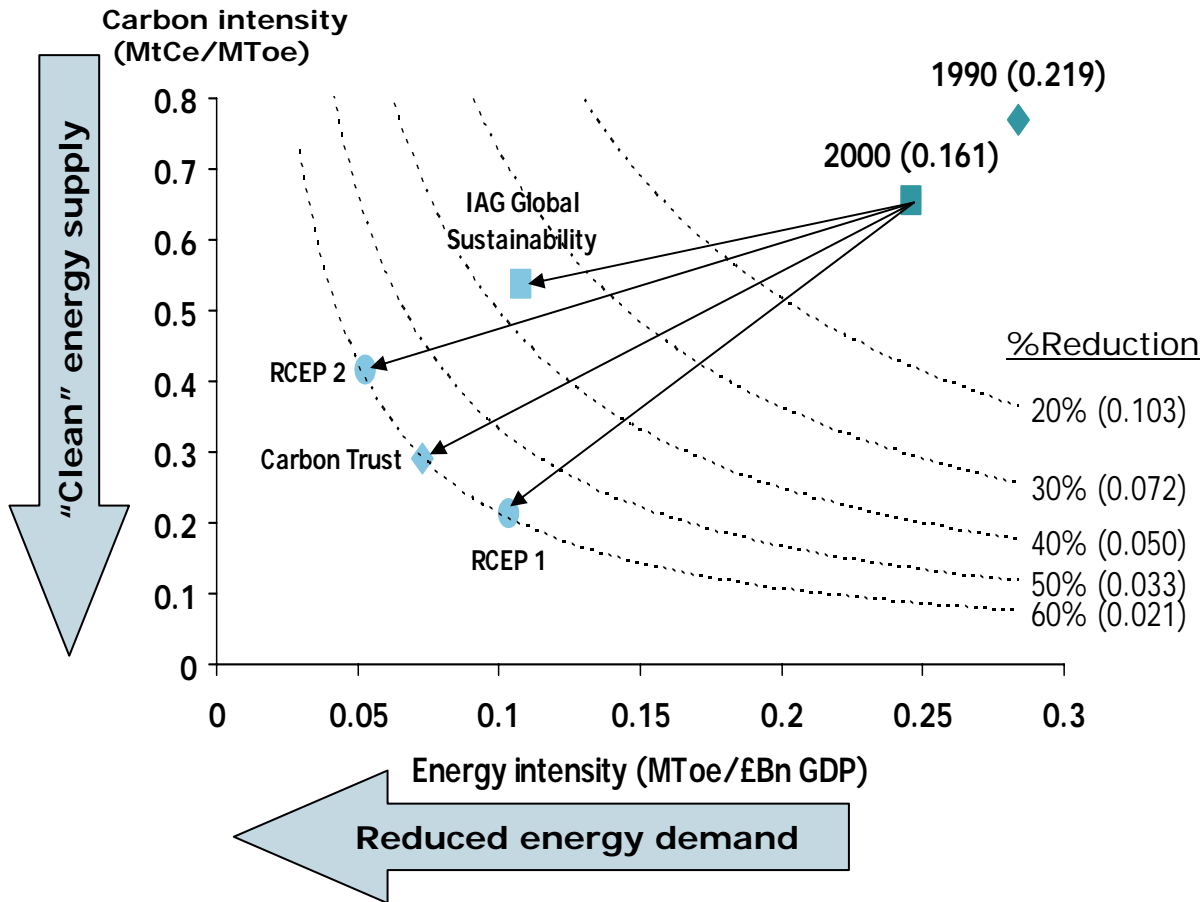
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# UK policy context set by UK Energy White Paper target (60% CO2 reduction by 2050), implies both much cleaner energy and big improvements in energy efficiency (x10 C.intensity)



The 2003 Energy White Paper set the UK on a path to reduce carbon emissions by 60% by 2050 through a combination of energy efficiency in the short term and renewables in the long term:

*"[To achieve the required savings from energy efficiency] would need roughly a doubling of the rate of energy efficiency improvement seen in the past thirty years"*

*"Technology innovation will have a key part to play in underpinning all our goals and delivering a low carbon economy"*

*"To deliver these outcomes our aim will be to provide industry and investors with a clear and stable policy framework"*

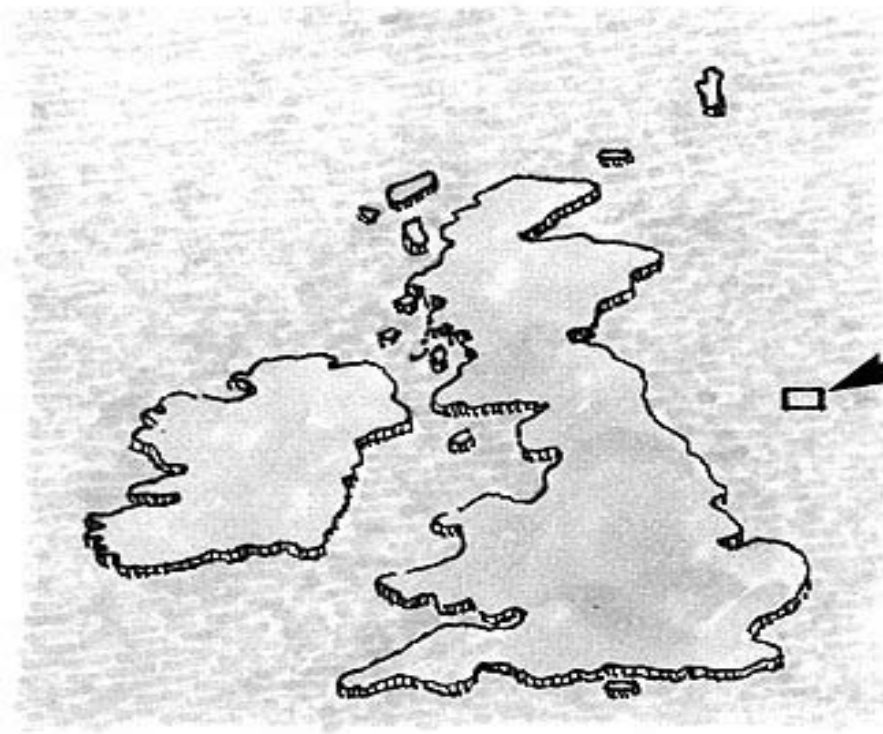
Note: Figures in brackets show UK carbon intensity (MtC/£Bn), Scenarios show 2050 projections

Source: RCEP 1998, DTI EP68 GDP growth forecasts, IAG "Long-term Reductions in GHG in the UK", Feb 2002

# Different countries have different supply options

*A key technology for UK is likely to be offshore wind*

... but this – like other large-scale non-carbon power sources - is currently stalled without stronger drivers

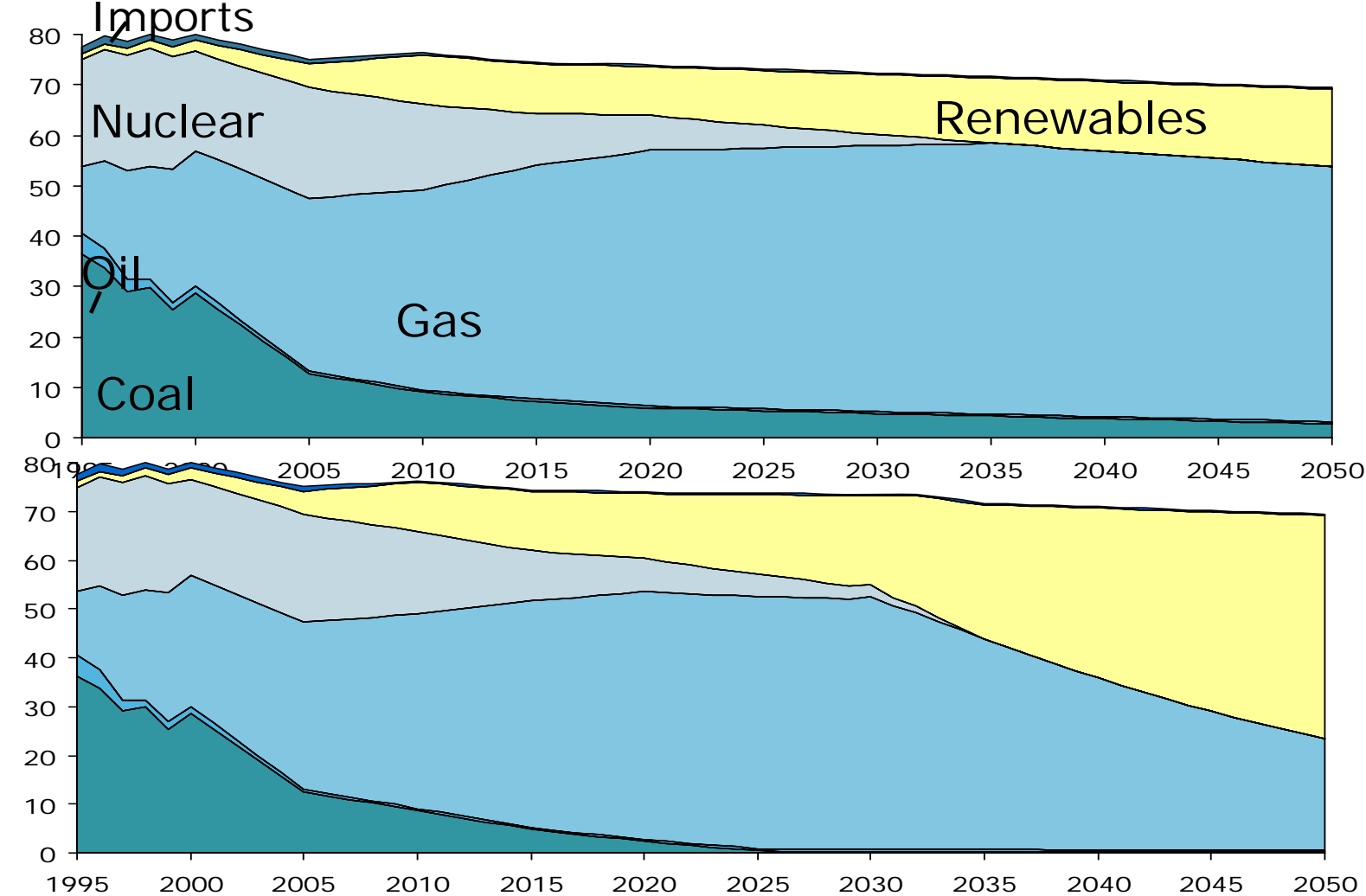


**This is approximately 30x40kms, the total area of seabed required to locate sufficient turbines to supply 10% of the UK's electricity power needs.**

NOT TO SCALE

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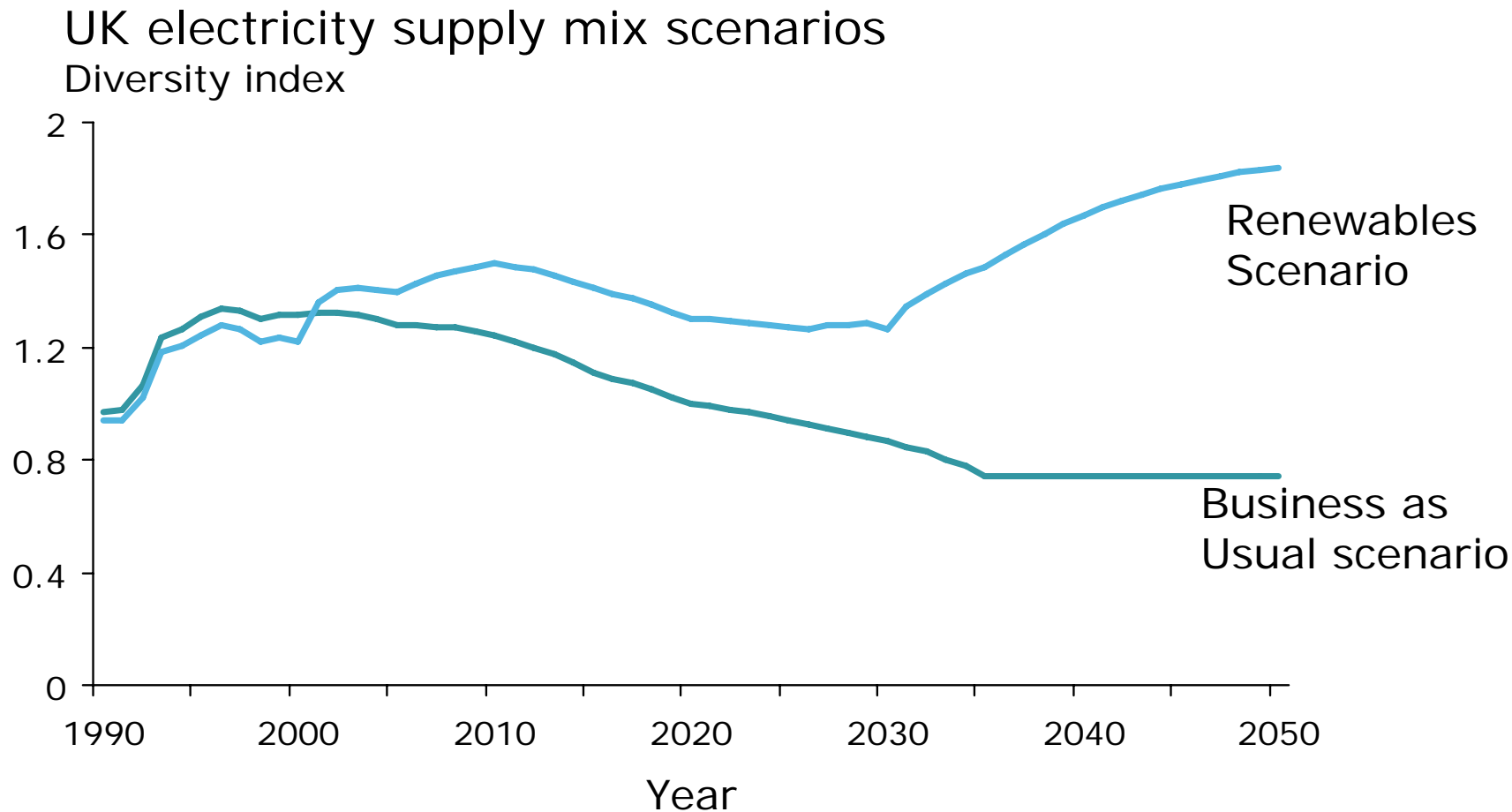
# UK White Paper scenarios for electricity suggest that in absence of nuclear, 60% reduction will lead renewables to displace the dominant conventional source



























Note: Assumes no new nuclear build  
Sources: DTI - IAG, DUKES, EP68

Year

# Diversity can be quantified and is enhanced under an increased renewables scenario



# Supergen scenarios have begun to assess in far more depth the complexity and range of low-carbon scenarios for electricity

	Local rural network		Offshore wind		Tidal generation
	Local urban network		Onshore wind		Biomass
	Interconnector		CCGT		Photovoltaic generation
	Overhead AC transmission		CCGT with carbon sequestration		CHP
	Overhead DC transmission		Coal generation		FACTS
	Undersea DC transmission		Coal with carbon sequestration		Microgrid
	Underground AC transmission		Nuclear		Energy storage
	Underground DC transmission		Wave generation		Demand-side control

Even under “business as usual” social assumptions, 60% drives a different and diverse future..

Demand	540TWh
Wind	12-15%
PV	1%
Biomass	10-15%
Marine	3-5%
CO2 capture	10-20GW
Nuclear	5-10%
MicroGen	20%

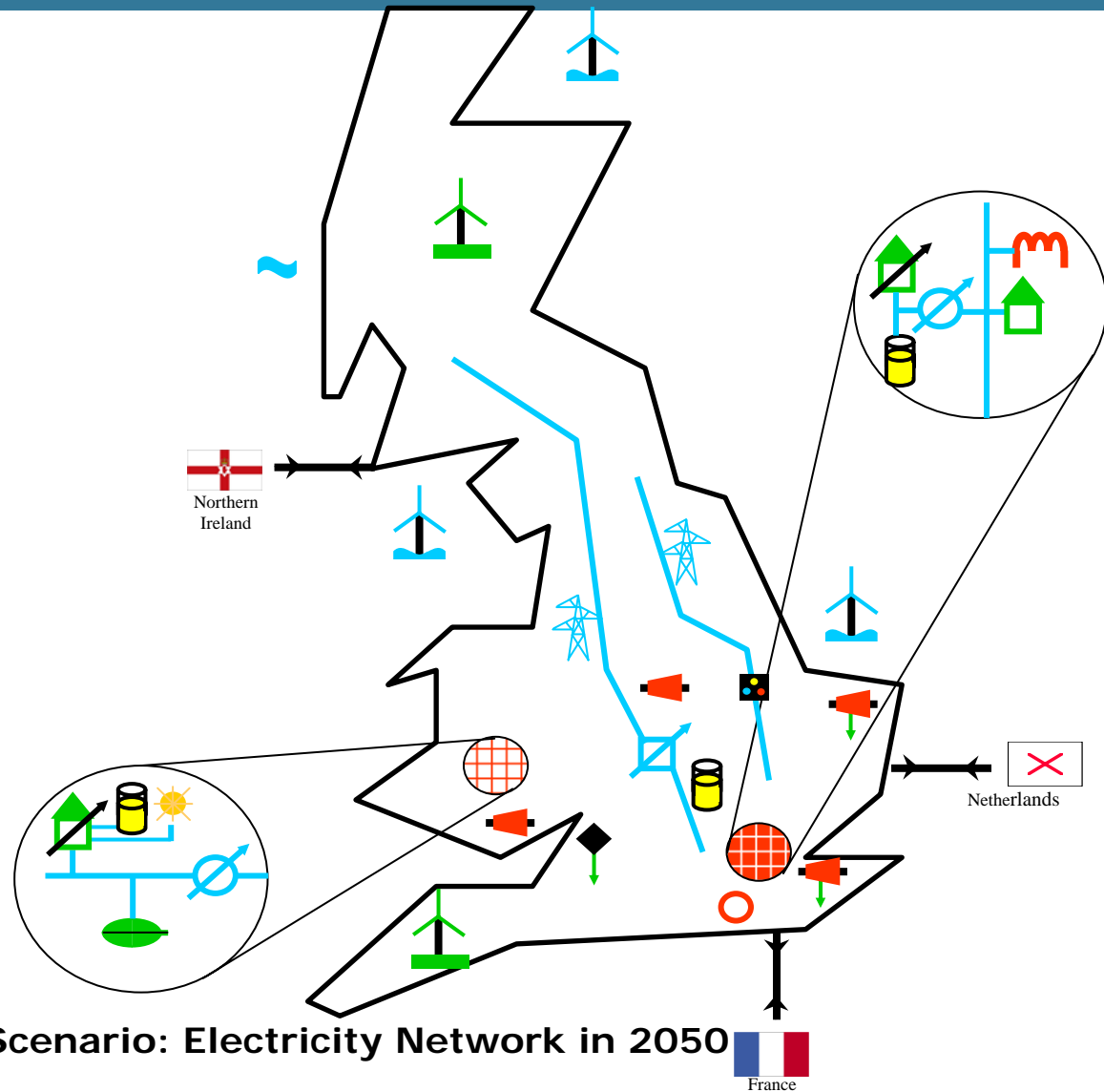


Figure 1.3 : “Business as Usual” Scenario: Electricity Network in 2050

Whilst a “Green plus” scenario requires more radical change to system structure and more use of advanced transmission and power control technologies

Demand	390TWh
Wind	45-50%
PV	3-5%
Biomass	25%
Marine	5-10%
CO2 capture	Only for hydrogen
Nuclear	-
MicroGen	20%

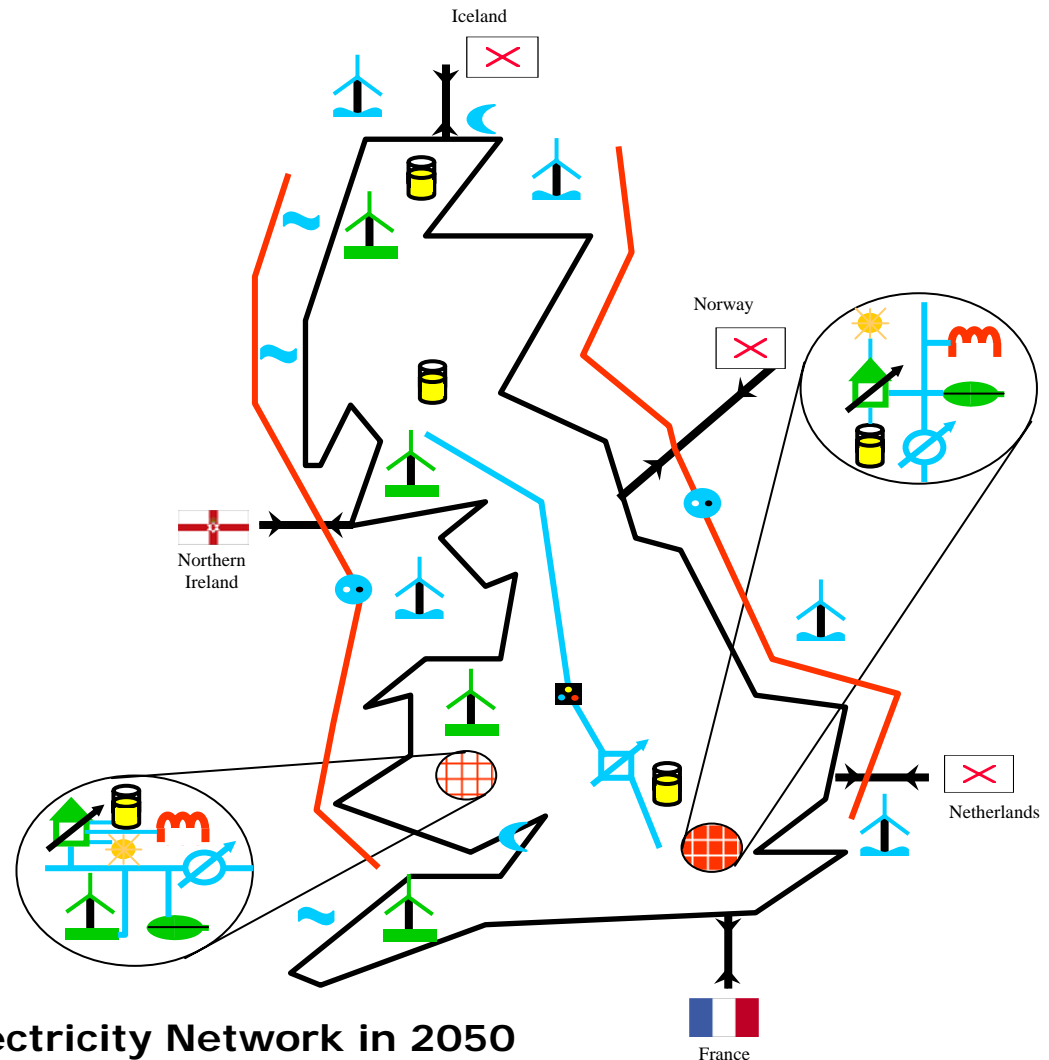


Figure 1.5 : “Green plus” Scenario: Electricity Network in 2050



# Deep emissions reductions in the power sector: UK scenarios for 2050

Book: Jamasb, Nuttall and Pollitt, CUP, Spring 2006  
and [www.econ.cam.ac.uk/supergen](http://www.econ.cam.ac.uk/supergen)

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