

Current & future grid infrastructure

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nationalgrid

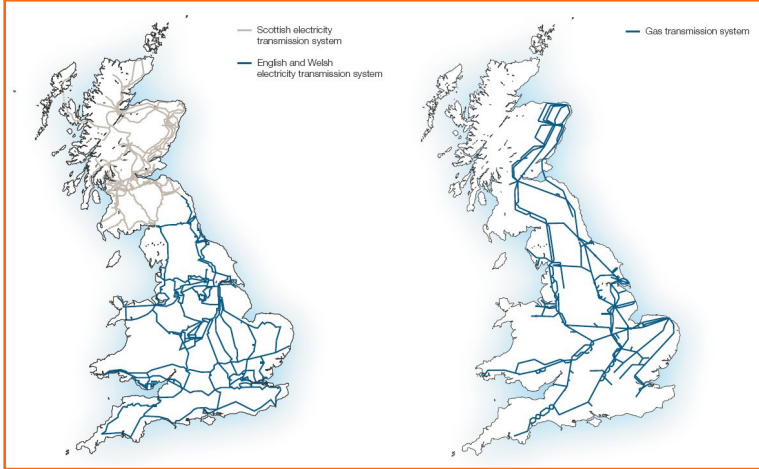
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Content

- ◆ **Introduction to National Grid**
- ◆ **What infrastructure is required?**
 - ◆ Meeting energy policy targets
 - ◆ New technologies (generation, supply & network)
 - ◆ Aging equipment
- ◆ **National Grid's view of what might be needed**
- ◆ **Getting there**

Transmission – our activities

Transmission UK – electricity and gas



Electricity transmission owner

We own the electricity transmission system in England and Wales. Our assets comprise ~7,200km of overhead line; ~675km of underground cable; and 337 substations at 244 sites.

Electricity system operator

We are the Great Britain System Operator, responsible for managing the operations of both the England and Wales transmission system that we own, and also the two independently owned high-voltage electricity transmission networks in Scotland.

Gas transmission owner

We own the gas national transmission system in Great Britain. Our assets comprise ~7,400km of high pressure gas pipe and 26 compressor stations, connecting to 8 regional distribution networks and to third party independent systems.

Gas system operator

We are the gas national transmission system operator, responsible for managing the operations of the Great Britain transmission system that we own.

French interconnector

We own and operate the UK assets, and a portion of the sub sea cables, that comprise the electricity interconnector between England and France as part of a joint agreement with the French transmission operator.

LNG storage

We own and operate four liquefied natural gas (LNG) storage facilities in Great Britain.

Electricity transmission owner/operator

We own and operate the electricity transmission network spanning upstate New York, Massachusetts, Rhode Island, New Hampshire, and Vermont. Our assets comprise ~13,700km of overhead line; ~160km of underground cable; and 501 substations.

Canadian interconnector

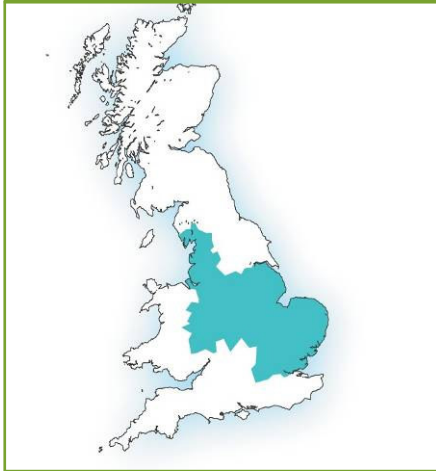
We own and operate a 224km direct current transmission line rated at 450kV that is a key section of an electricity interconnector between new England and Canada.

Transmission US – electricity



Gas Distribution – our activities

Gas Distribution UK



Gas Distribution UK

Comprises four of the eight regional gas distribution networks in Great Britain

UK Networks

Comprise approximately 132,000 kilometres of gas distribution pipelines.

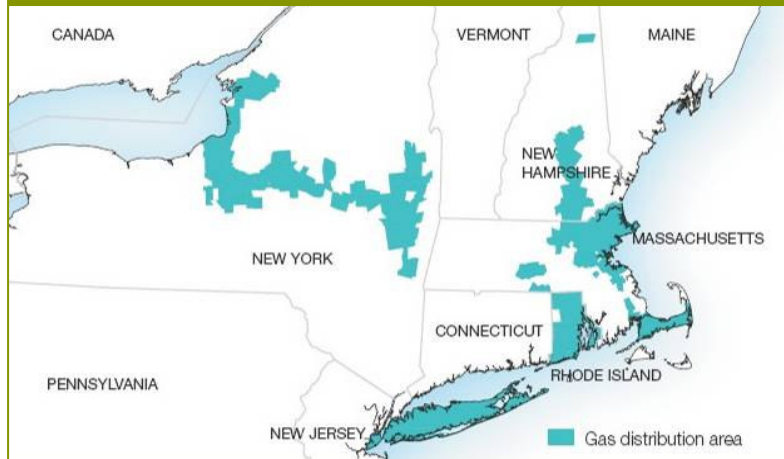
UK Customers

We transport gas on behalf of approximately 33 active shippers from the gas national transmission system to 10.8 million consumers.

UK additional services

In addition we also manage the national emergency number for all the gas distribution networks and for other transporters in the UK.

Gas Distribution US



Gas Distribution US

Comprises gas distribution networks across the northeastern US, located in service territories in upstate New York, New York City, Long Island, Massachusetts, New Hampshire and Rhode Island.

US Networks

Our network of approximately 58,000 kilometres of gas pipelines covers an area of approximately 28,800 square kilometres.

US Customers

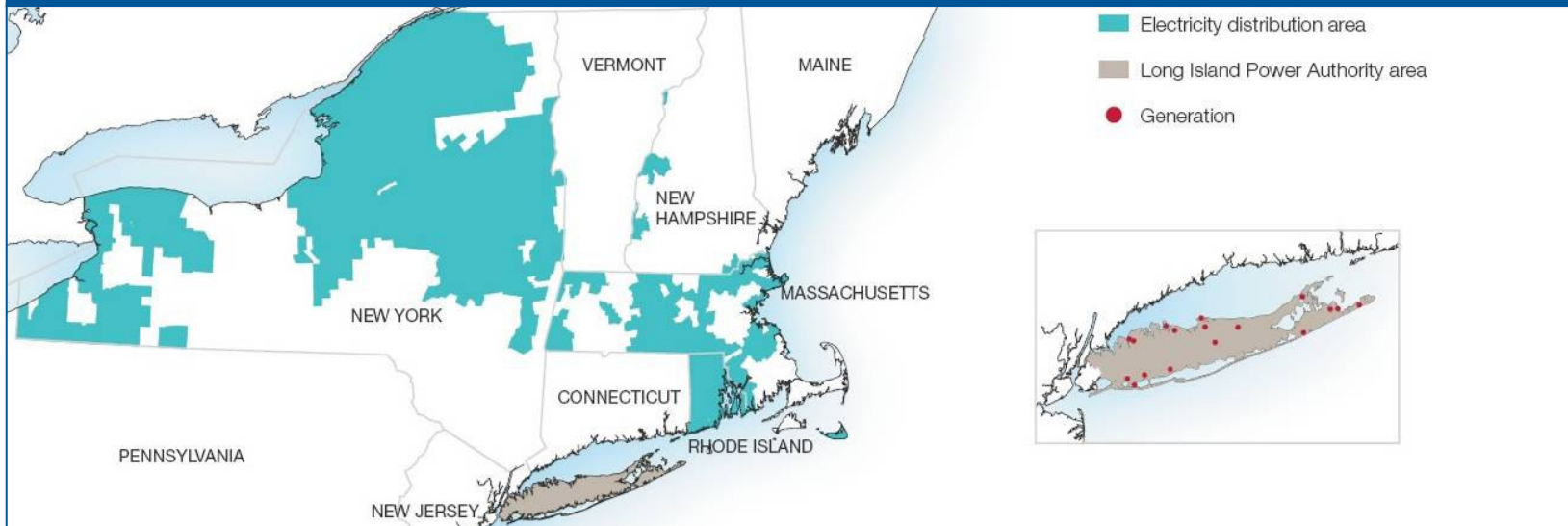
Provide services to 3.5 million consumers.

US additional services

Our core services are the operation and emergency responses for each of our gas distribution networks, in addition to billing, customer service and supply services.

Electricity Distribution & Generation – our activities

Electricity Distribution & Generation operations



Electricity distribution

We own and manage electricity distribution networks in New York, Massachusetts, Rhode Island and New Hampshire. Our assets comprise ~116,000km of electricity circuits, serving ~3.4m electricity customers.

Long Island generation

We own 57 electricity generation plants on Long Island that together provide 4.1GW of power under regulated contract to the Long Island Power Authority (LIPA). We manage fuel supplies for LIPA to fuel our plants and purchase energy, capacity and ancillary services in the open market on LIPA's behalf.

LIPA T&D services

On Long Island, we are responsible for managing the electricity transmission and distribution system on behalf of LIPA. LIPA owns approximately 2,100km of transmission lines, ~170 substations, and ~21,000km of distribution circuits, serving ~1.1m electricity customers.

Other group businesses

- ◆ Grain LNG
 - ◆ The UK's first modern LNG import terminal
 - ◆ Able to deliver ~13% of UK gas demand by 2008
 - ◆ Phase 1 operational since July 2005
 - ◆ Phase 2 to be commissioned late 2007
 - ◆ Phase 3 in regulatory consents process
- ◆ National Grid Metering
 - ◆ 22m industrial, commercial and domestic meters in the UK
 - ◆ Advanced meter reading product released to UK industrial market mid 2006
- ◆ National Grid Interconnectors
 - ◆ 2000MW Britain-French interconnector
 - ◆ 1300MW Britain-Netherlands (under construction)

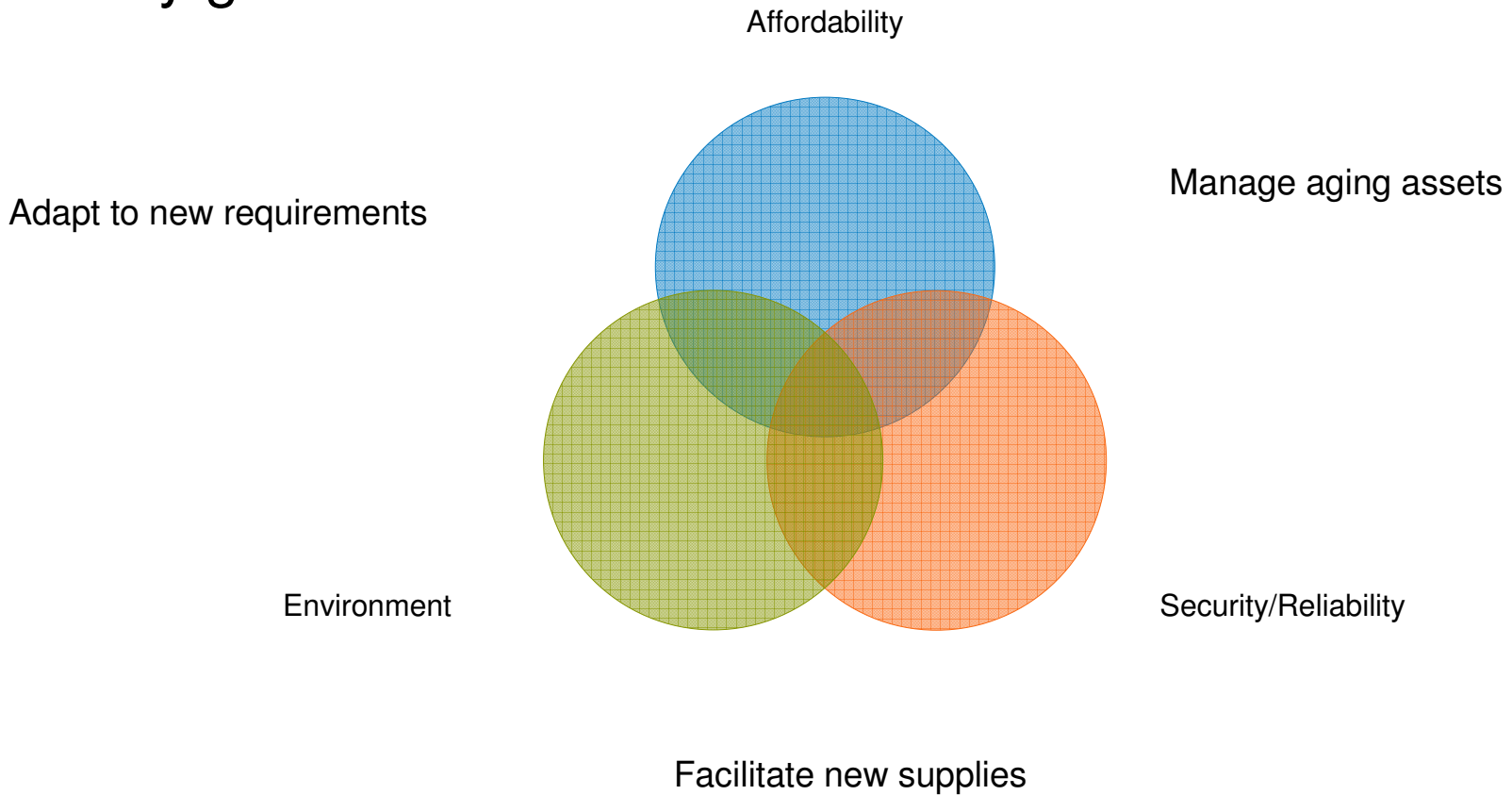


National Grid's environmental commitments

- ◆ Reduce our own CO2 emissions by 80% by 2050
- ◆ Continue our 30 year programme to replace iron gas mains - reducing methane leakage
- ◆ Installing generation to recover energy at gas network pressure reduction stations
- ◆ Improve efficiency of gas compressors
- ◆ Reduce SF6 leakage from our electricity equipment

What infrastructure is required?

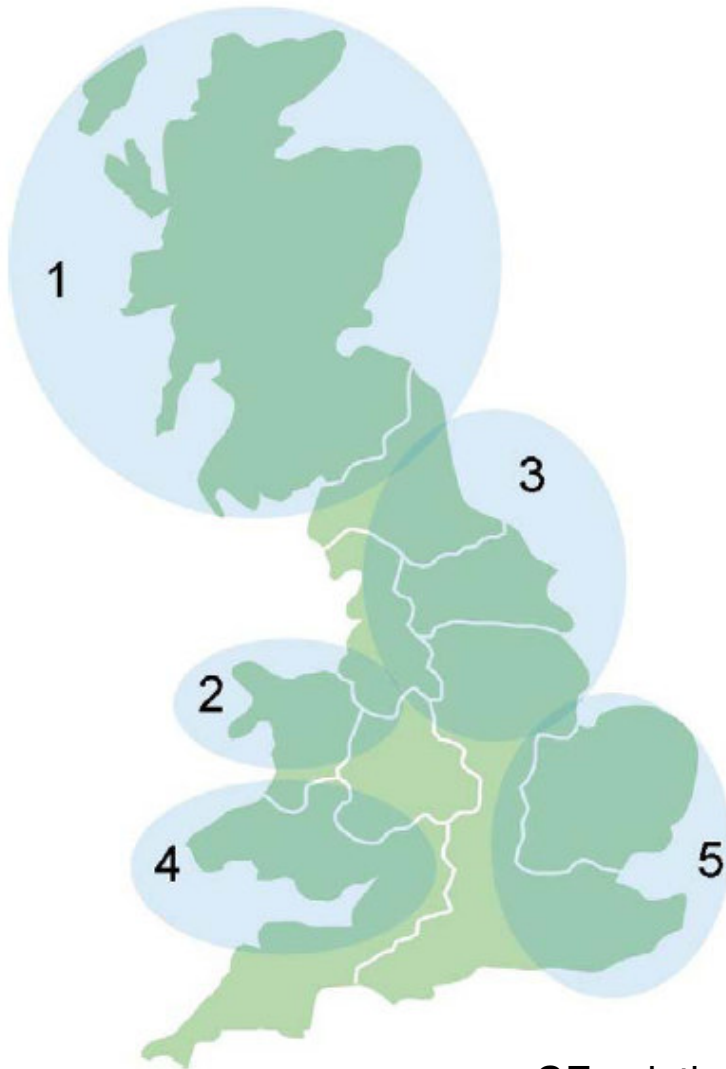
Policy goals



Electricity industry infrastructure

- ◆ **Unprecedented new generation development (& transmission connections)**
 - ◆ Replacement of aging / high emissions generation stock
 - ◆ Renewable energy sources
 - ◆ Other low carbon technologies
 - New nuclear
 - Carbon capture & storage
- ◆ **Demand changing**
 - ◆ Continuing energy efficiency improvements
 - ◆ Likelihood of heat and transport increasingly using low carbon electricity
- ◆ **Many new technical options**
 - ◆ New generation technology and characteristics (esp. wind)
 - ◆ SMART metering & increased demand side participation
 - ◆ New IT options
 - ◆ New transmission options (e.g. voltage source HVDC)
- ◆ **Increasing need for transmission and distribution asset renewal**

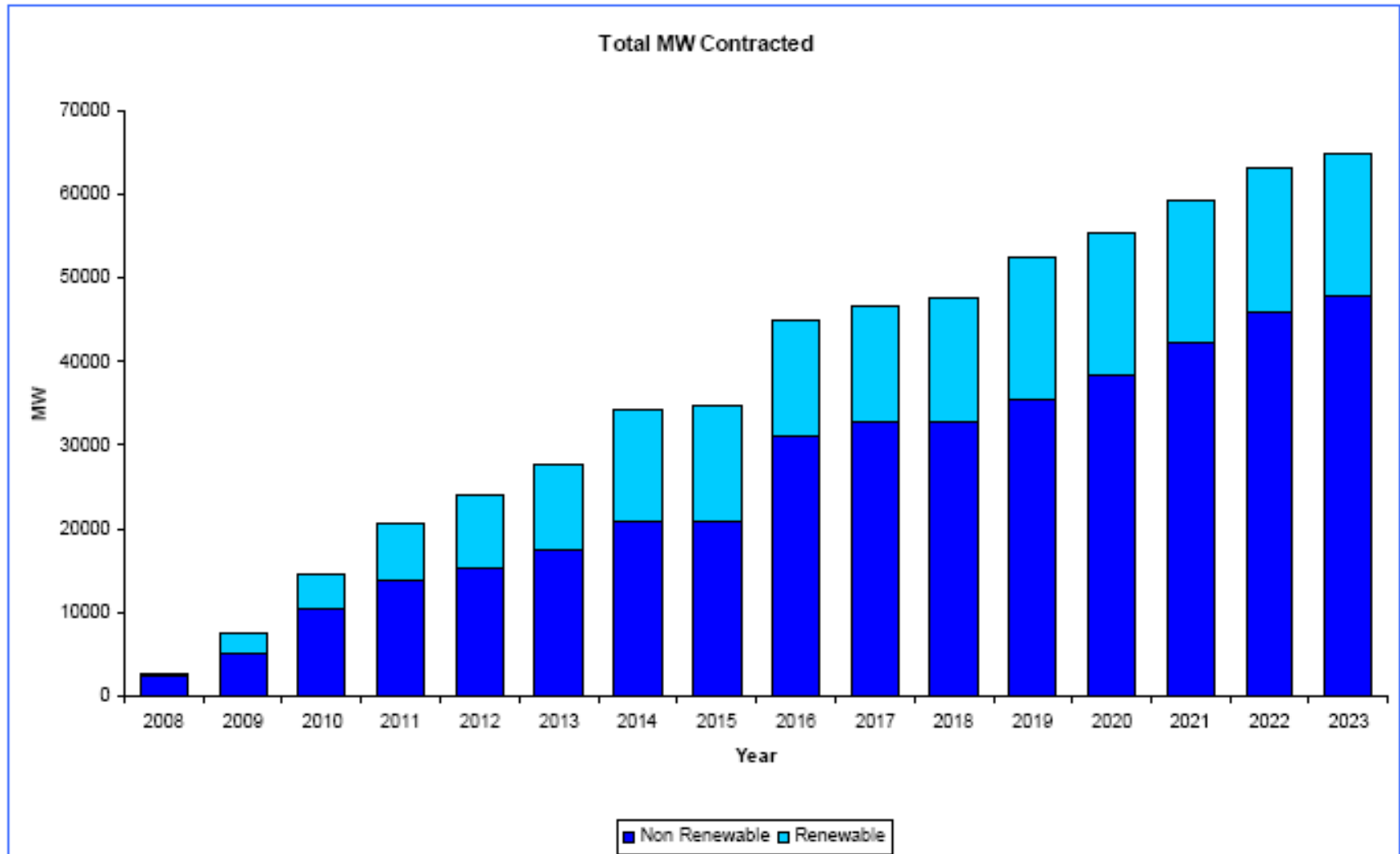
Unprecedented new connection requests



Area	No. of Contracts	GW
Area 1	106	9.2
Area 2	20	8.9
Area 3	14	5.9
Area 4	16	14.5
Area 5	28	18.6
Other	11	7.7
Totals	195	64.8

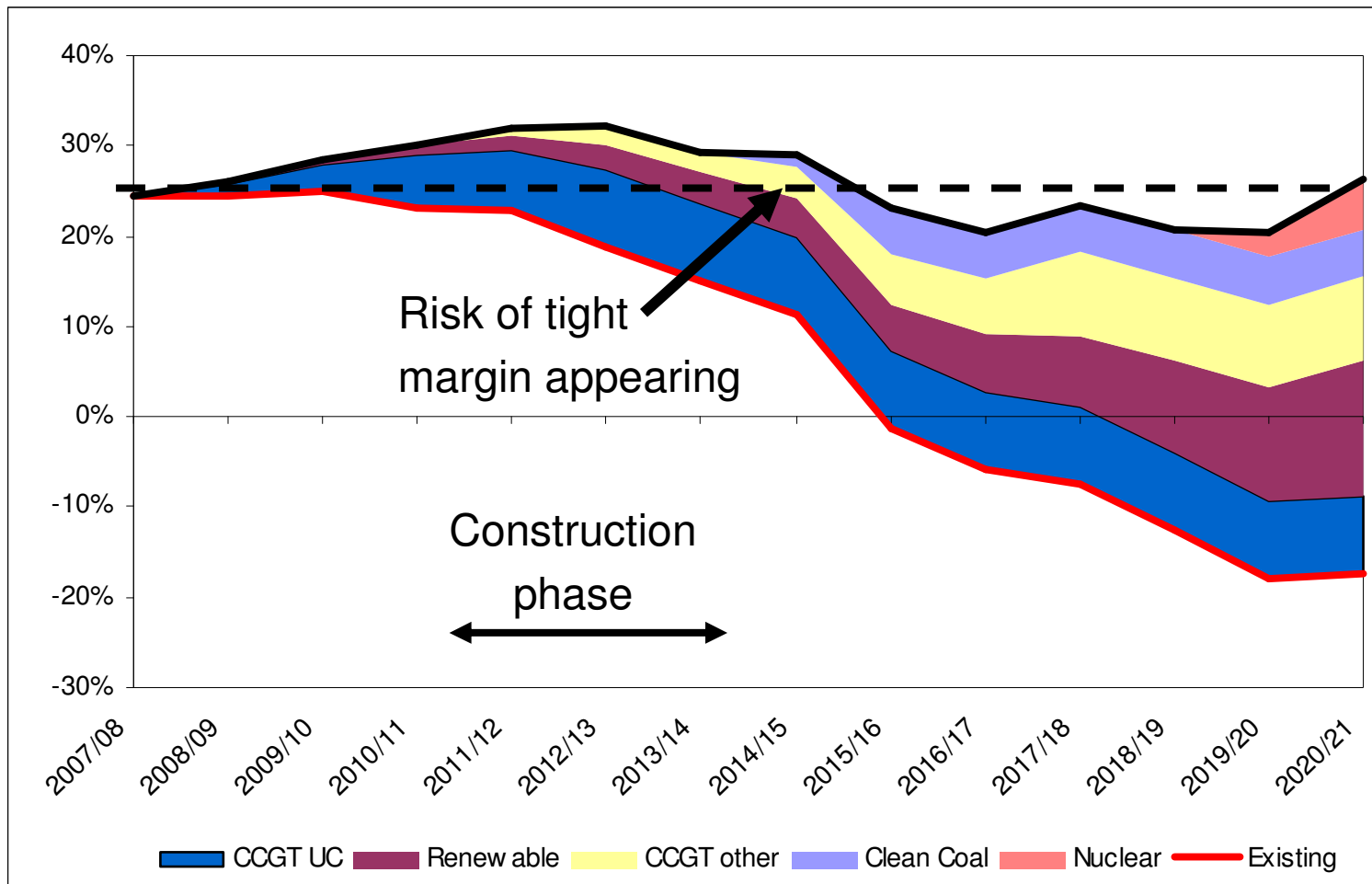
CF existing generation capacity = 84GW

But connections not yet as fast as we want



As of Apr 2009

Risk of security of supply pinch



Risk of missing renewables targets

Business as Usual scenario

Plant closures...

- ◆ 12GW coal & oil (LCPD)
- ◆ 7.5GW nuclear

Demand growth ~0.5% pa

Incremental nuclear

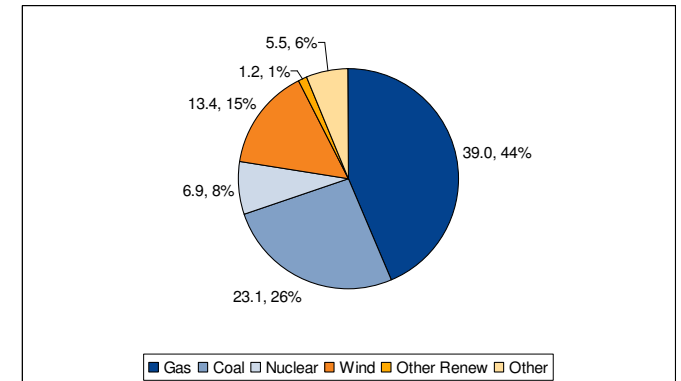
- ◆ Lifetime extensions
- ◆ Two new stations in 2020

Modest renewable growth

- ◆ 6GW offshore & 7GW onshore

Strong fossil growth

- ◆ 3GW of new supercritical coal (some with CCS)
- ◆ 15GW new gas
- ◆ Gas dominates at 44% share



2020 Target Description	Progress
EU Renewable Energy Target; 15% of final energy demand	✗
2050 CO ₂ Target on correct 'flight path'	✗
Scottish Renewables Target	✓

Summary

Generation gap caused by closures is largely filled with gas-fired plant, augmented with incremental nuclear and some renewable wind

What might be needed? Gone Green Scenario

Plant closures

- ◆ 12GW Coal & oil LCPD
- ◆ 7.5GW nuclear
- ◆ Some gas & additional coal

Significant new renewable

- ◆ 30 GW wind (19GW offshore & 11GW onshore)
- ◆ Some tidal, wave, biomass & solar PV

Significant new non renewable build

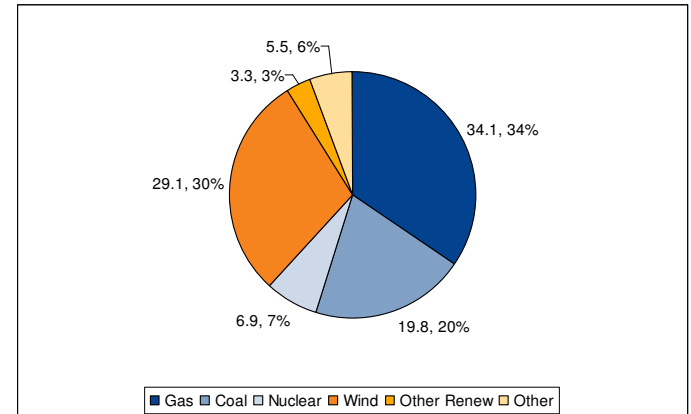
- ◆ 3GW of new nuclear
- ◆ 3GW of new supercritical coal (some with CCS)
- ◆ 11GW of new gas

Renewable share of generation grows from 5% to 36%

Electricity demand remains flat

- ◆ Reductions from energy efficiency measures
- ◆ Increases from heat pumps & cars

Contribution also required from heat & transport



2020 Target Description	Progress
UK Renewable Energy Target 15% of final energy demand	<input checked="" type="checkbox"/>
2050 CO ₂ Target on correct 'flight path'	<input checked="" type="checkbox"/>
Scottish Renewables Target	<input checked="" type="checkbox"/>

Summary

Generation gap caused by closures is filled with wind, augmented by gas & clean coal. Nuclear returns in 2020.

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Network infrastructure - Removing constraints

Issues to solve...

1. Build more transmission capacity faster

2. Allocate available transmission capacity more sensibly

3. Planning Difficulties

Our proposals...

1a. “Strategic Investment” in transmission – Technical Studies

1b. Regulatory Reform for Strategic Investment




2a. Transmission Access Reform

2b. Connections Advancement



3. Ensuring NPS capture need case for key transmission investment

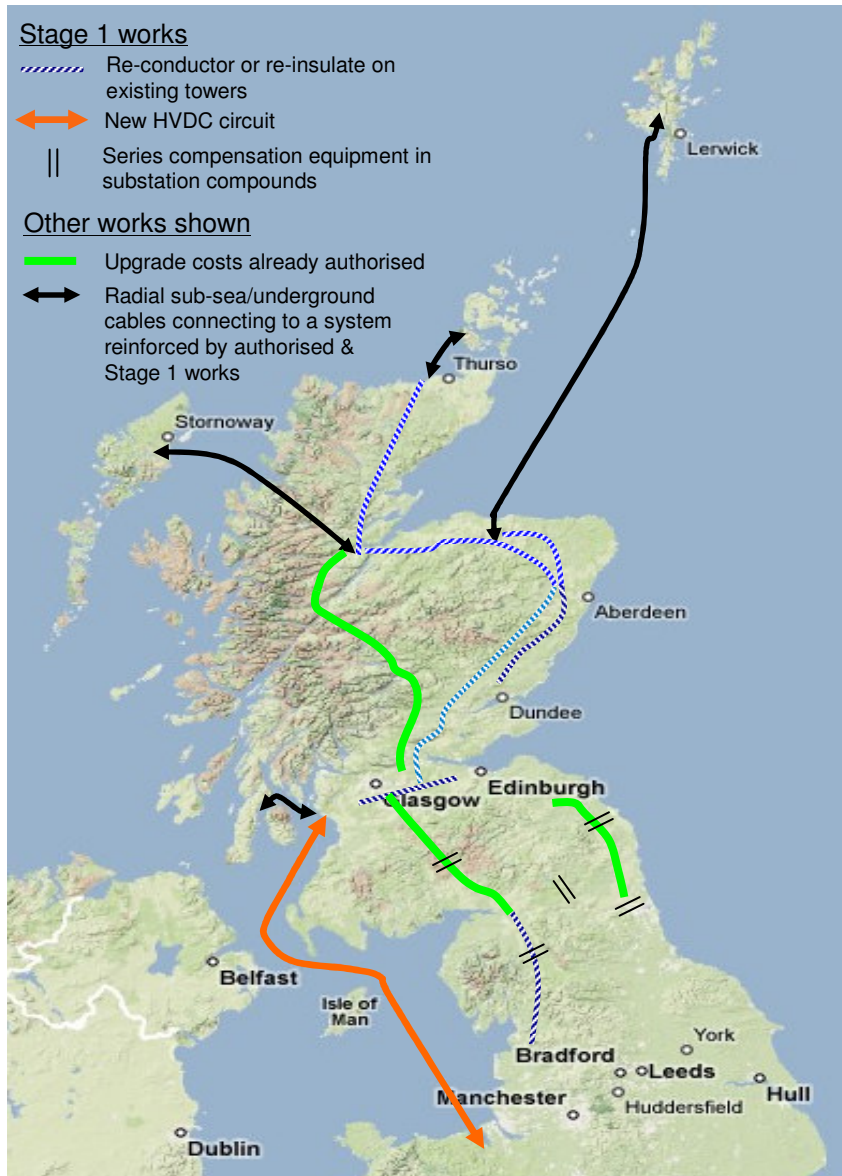
Stage 1 and 2 Transmission Reinforcements in Scotland

Stage 1 works



-  Re-conductor or re-insulate on existing towers
-  New HVDC circuit
-  Series compensation equipment in substation compounds

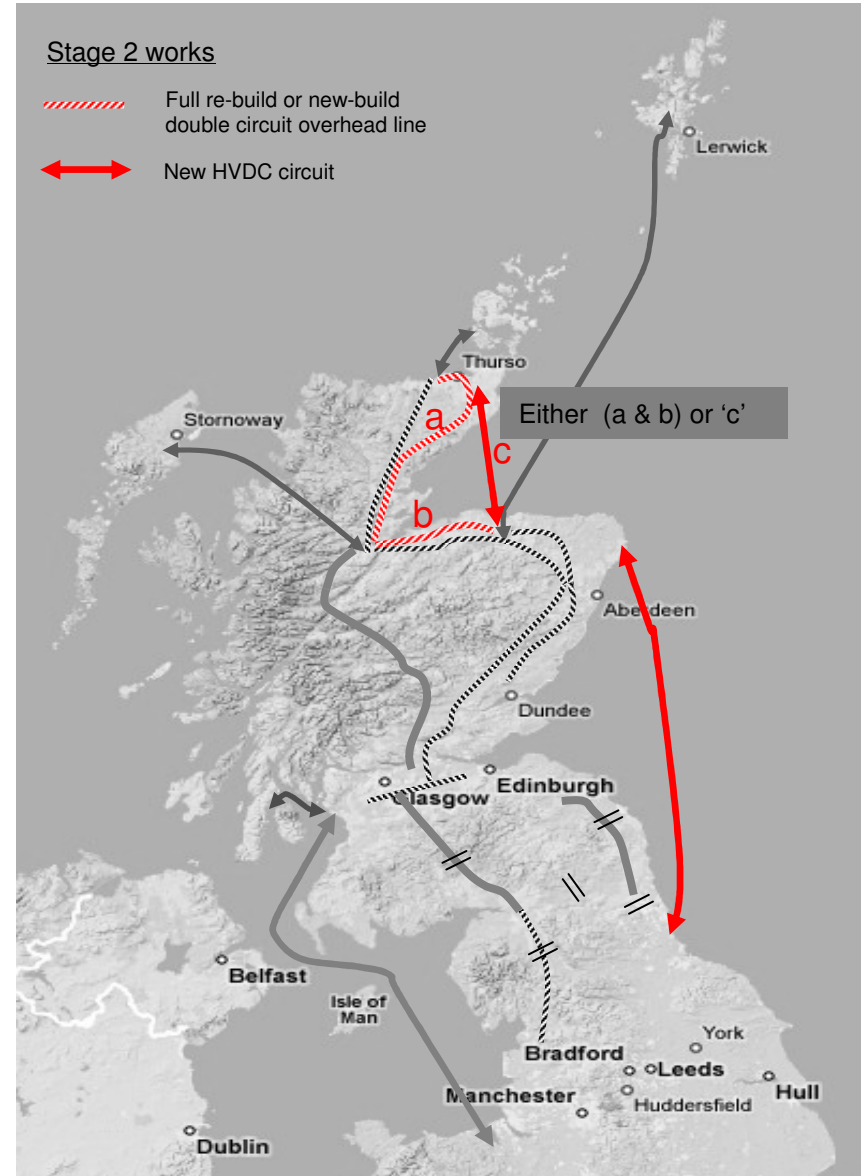
Other works shown

-  Upgrade costs already authorised
-  Radial sub-sea/underground cables connecting to a system reinforced by authorised & Stage 1 works



Stage 2 works

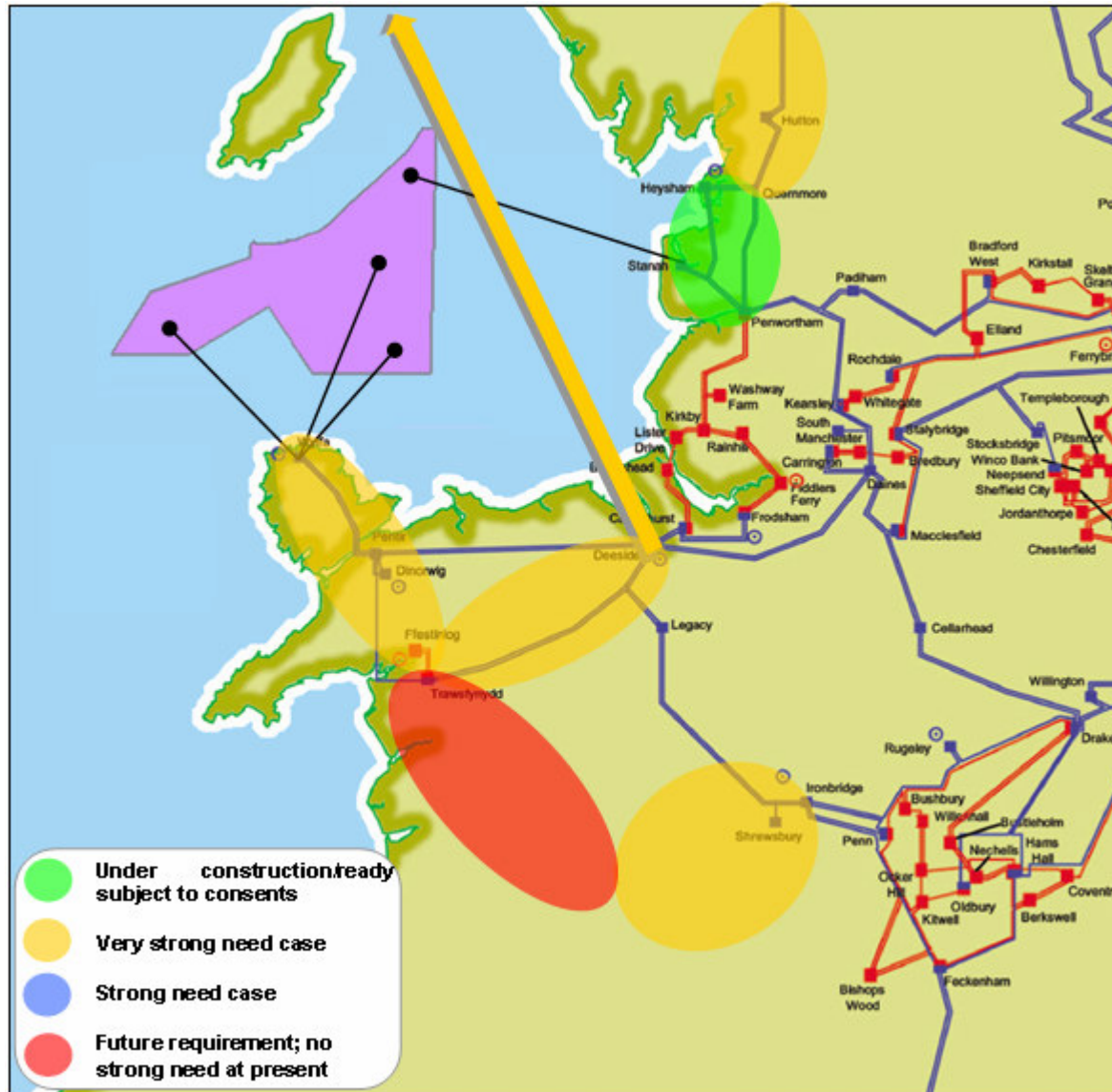
-  Full re-build or new-build double circuit overhead line
-  New HVDC circuit



Reinforcements Identified Across Anglo-Scottish Border



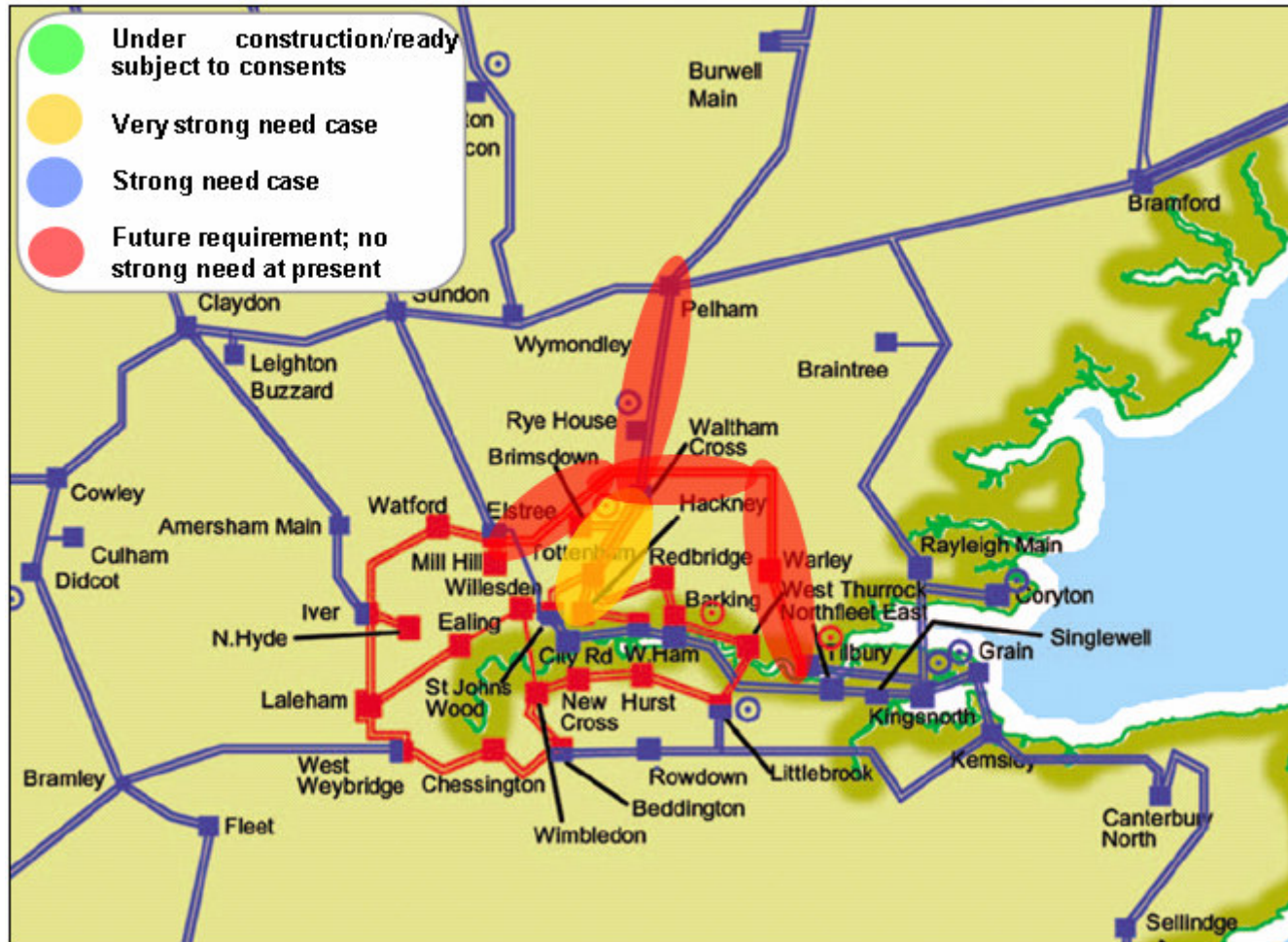
Reinforcements Identified in North Wales – 2020



Reinforcements Identified on the SW Peninsula - 2020



Reinforcements Identified in London



Onshore potential reinforcements - summary

Region	Reinforcement	Cost (£M)	Capacity of generation which can be accommodated (GW)			Potential saving in offshore network costs (£M)	Net costs (£M)
			Wind	Nuclear	Total		
Scotland – Stage 1, 2015	North of Scotland Upgrade	180	8	0	8	NA	1565
	Incremental Scottish Upgrade	625					
	Western HVDC Link	760					
Scotland – Stage 2, 2018	North of Scotland Upgrade	450	4	0	0	NA	1150
	Eastern HVDC Link	700					
Wales – Stage 1	North Wales – 2017	350	4 – 6	0 – 3.3	4 – 7.2	500	75
	Central Wales – 2015	225					
English East Coast – Stage 1	Humber side	510	7 – 11	0 – 3.3	4 – 14.2	350	560
	East Anglia	400					
London	London	190	1 – 2	–	1 – 2	–	190
South West	South West	340	2 – 3	3.3 – 3.3	5.3 – 6.3	–	340
Total		4730	26 – 34	3.3 – 9.9	29.3 – 44.9	850	3880

Strategic Investment Technical Studies & Regulatory Reform

Technical Studies (1a)

- ◆ Final Technical Report delivered to ENSG on 18 February.
- ◆ DECC/Ofgem published summary report on 4 March

Regulatory Reform (1b) – Ofgem incentives document published

- ◆ Preliminary funding to keep us on track agreed end March 2009
- ◆ Consultation on full regime during 2009

1. Build more transmission capacity faster

1a. "Strategic Investment" in transmission – Technical Studies

1b. Regulatory Reform for Strategic Investment

Sensible allocation of existing transmission capacity

Transmission Access Reform

- ◆ Enabling sharing of capacity (e.g. conventional & wind)
- ◆ Better signals from existing stations to inform investment decisions
- ◆ Ability for SO to release additional short term capacity
- ◆ The original 6 CUSC modifications now with Ofgem for impact assessment

Queue Management / Connections Advancement

- ◆ Solutions provided to enable new stations, previously in the 'GB Queue', to connect as soon as built
 - 450MW of projects already given advanced connection dates with more to come.

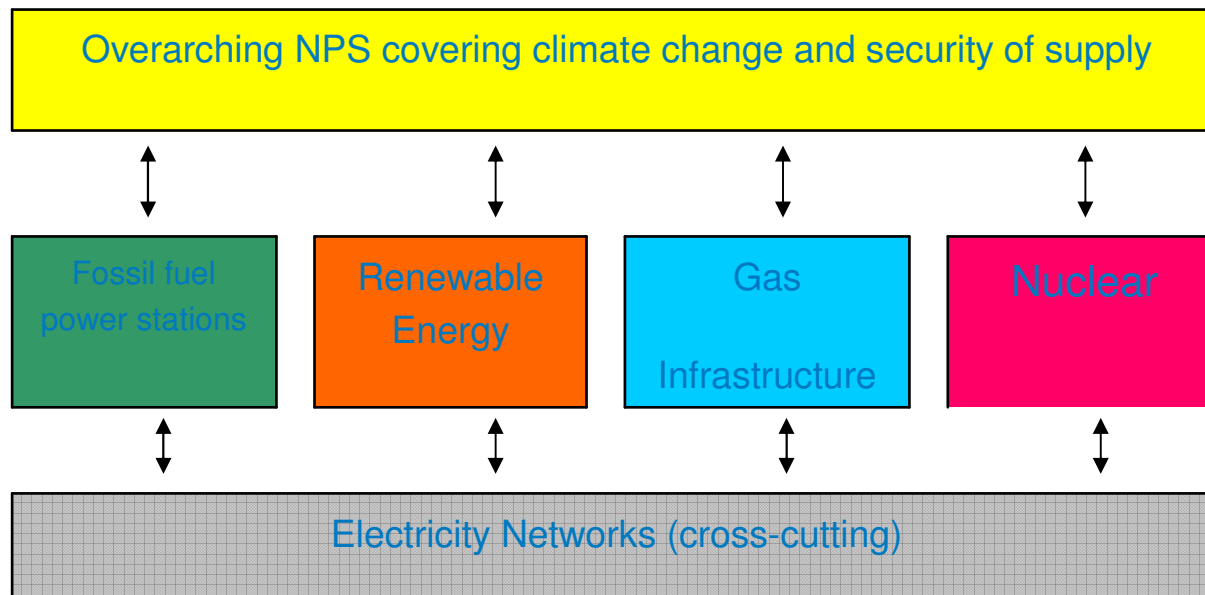
2. Allocate available transmission capacity more sensibly

2a. Transmission Access Reform

2b. Connections Advancement

Effective Planning Regime is essential

- ◆ National Policy Statements for the energy sector
- ◆ Intended to address ‘national need’ – avoiding repeated discussion on those aspects at Public Inquiries
- ◆ All NPSs to be subject to consultation, parliamentary scrutiny & ‘sustainability appraisals’. Where NPS addresses location aspects (e.g. nuclear sites) there will be a Strategic Environmental Assessment.



Electricity infrastructure – progress so far

A vision for the transmission network in 2020 produced

Preliminary engineering work commenced

Planning Act passed

A range of revised Transmission Access rules with Ofgem for consideration

An effective interim connect & manage regime delivering tangible results