

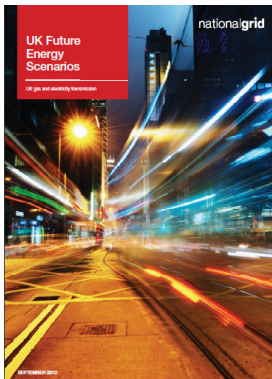
Electricity Ten Year Statement

- Electricity Ten Year Statement (ETYS) covers:
 - Impact of energy scenarios on the development & operation of the electricity transmission network
 - Network Development Policy (NDP) for England & Wales - defines how we assess the need to progress wider system reinforcements



Electricity Ten Year Statement

- The Electricity Ten Year Statement covers:



Summary of UK Future Energy Scenarios

Development of the Electricity Transmission System

System Operation

Developing the ETYS



Development of the Electricity Transmission System

nationalgrid

- Policies used in developing the Electricity Transmission System
 - How to connect
 - Design criteria for the system
 - Network Development Policy
 - Technologies available

What information do you use?

What would you like to see here?

Network Development Policy (NDP)

- The NDP considers the timing of wider system reinforcements against the risks including

If too early	If too late
<ul style="list-style-type: none">• Higher financing costs• Increased stranding risks• Higher securities costs	<ul style="list-style-type: none">• Higher BSUoS costs• Network access issues

- NDP approach aims to deliver a transparent dynamic process to promote timely investment for aggregate demand and generation patterns.
- NDP should allow stakeholders to understand why decisions to build, and not to build, have been taken.

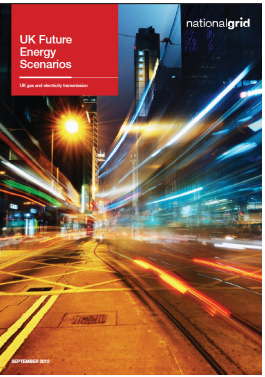
What are your views on our NDP approach?

Does the NDP represent the appropriate balance between investment and alternative options?

Proposed Network Development Policy

Input

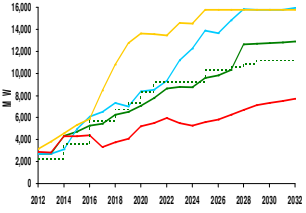
Stakeholder engagement process



UK Generation and demand Scenarios

Requirements

Identify future transmission capability requirements

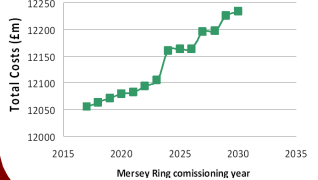


Solutions

Identify future transmission solutions

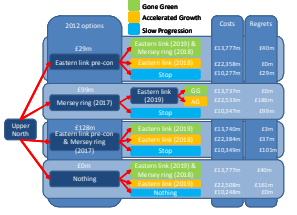
Options	Route	Length (km)	AC	DC	Project Status	Stage of Development
East of London	100	1.0	A	1.7	2012	Approved
East of London	100	2.0	A	3.4	2012	Approved
East of London	100	3.0	A	5.1	2012	Approved
East of London	100	4.0	A	6.8	2012	Approved
East of London	100	5.0	A	8.5	2012	Approved
East of London	100	6.0	A	10.2	2012	Approved
East of London	100	7.0	A	11.9	2012	Approved
East of London	100	8.0	A	13.6	2012	Approved
East of London	100	9.0	A	15.3	2012	Approved
East of London	100	10.0	A	17.0	2012	Approved
East of London	100	11.0	A	18.7	2012	Approved
East of London	100	12.0	A	20.4	2012	Approved
East of London	100	13.0	A	22.1	2012	Approved
East of London	100	14.0	A	23.8	2012	Approved
East of London	100	15.0	A	25.5	2012	Approved
East of London	100	16.0	A	27.2	2012	Approved
East of London	100	17.0	A	28.9	2012	Approved
East of London	100	18.0	A	30.6	2012	Approved
East of London	100	19.0	A	32.3	2012	Approved
East of London	100	20.0	A	34.0	2012	Approved
East of London	100	21.0	A	35.7	2012	Approved
East of London	100	22.0	A	37.4	2012	Approved
East of London	100	23.0	A	39.1	2012	Approved
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East of London	100	71.0	A	120.7	2012	Approved
East of London	100	72.0	A	122.4	2012	Approved
East of London	100	73.0	A	124.1	2012	Approved
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East of London	100	75.0	A	127.5	2012	Approved
East of London	100	76.0	A	129.2	2012	Approved
East of London	100	77.0	A	130.9	2012	Approved
East of London	100	78.0	A	132.6	2012	Approved
East of London	100	79.0	A	134.3	2012	Approved
East of London	100	80.0	A	136.0	2012	Approved
East of London	100	81.0	A	137.7	2012	Approved
East of London	100	82.0	A	139.4	2012	Approved
East of London	100	83.0	A	141.1	2012	Approved
East of London	100	84.0	A	142.8	2012	Approved
East of London	100	85.0	A	144.5	2012	Approved
East of London	100	86.0	A	146.2	2012	Approved
East of London	100	87.0	A	147.9	2012	Approved
East of London	100	88.0	A	149.6	2012	Approved
East of London	100	89.0	A	151.3	2012	Approved
East of London	100	90.0	A	153.0	2012	Approved
East of London	100	91.0	A	154.7	2012	Approved
East of London	100	92.0	A	156.4	2012	Approved
East of London	100	93.0	A	158.1	2012	Approved
East of London	100	94.0	A	159.8	2012	Approved
East of London	100	95.0	A	161.5	2012	Approved
East of London	100	96.0	A	163.2	2012	Approved
East of London	100	97.0	A	164.9	2012	Approved
East of London	100	98.0	A	166.6	2012	Approved
East of London	100	99.0	A	168.3	2012	Approved
East of London	100	100.0	A	170.0	2012	Approved

Calculate operational costs for transmission solutions



Select

Development of Options



Selection of preferred option

Table 8: Summary of recommendations for current year					
Reinforcement	480 Substation			-ETYS	
	-2011 GO (Year)	-2012 GO (Year)	-2012 AG (Year)	-2012 GO (Year)	-2012 SP (Year)
-East HVOCC line	Q4/18	-2018/19	-2018/19	-2020/21	-2018/19
-No construction East Coast HVOCC Link (Year 0)	-Yes	-Yes	-Yes	-No	-Yes
-Mersey Ring	-Not required	-2018/19	-2018/19	-Not required	-No
-No construction Mersey Ring (Year 0)	-No	-No	-No	-No	-No
-East Siba reconductor series comp	-Not required	-2022/23	-2022/23	-Not required	-No
-No construction Link Siba reconductor series comp (Year 0)	-No	-Delay	-Delay	-No	-No
-0+ and 4+ AC reconductors	-Not required	-Not required	-Not required	-Not required	-Not required
-No construction for 3+ and 4+ AC reconductors (Year 0)	-Not required	-Not required	-Not required	-Not required	-Not required

Output

ETYS



Capital Plan

Development of the Electricity Transmission System

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- Impact of demand and generation scenarios on the development of the Electricity Transmission System
 - Connection Opportunities
 - Potential reinforcements across system boundaries
 - Regional Strategies
 - European interconnection

How would you like to see potential connection opportunities highlighted?

What would you like to see explained for each region?

Example Boundary Section from 2012 (1)

3.7.7 Boundary B7

Figure B7.1:
Geographical representation of boundary B7



Boundary B7 bisects England south of Teesside. It is characterised by three 400kV double circuits, two in the east and one in the west. The area between B6 and B7 is traditionally an exporting area, and constrained by the power flowing through the region from Scotland towards the South with the generation surplus from this area added.

Generation Background

In all scenarios there is an increase in generation output over the period considered, as the boundary is influenced by everything north of Teesside. In addition to that identified in the B6 section there is a further 4 GW of offshore wind, 3 GW of new nuclear and 1.4 GW of new interconnector capacity contracted to connect.

Potential Reinforcements

Potential reinforcements for the period to 2032 are listed in Table B7.1 on page 118. This boundary tends to be limited by thermal constraints, so most of the reinforcements involve either upgrading existing lines or constructing new ones.

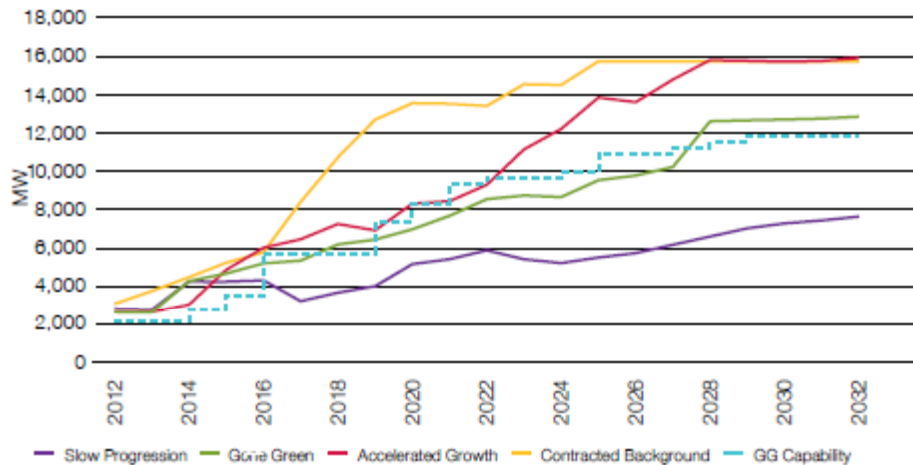
- Map
- Generation Background
- Potential reinforcements

Table B7.1:
List of potential reinforcement projects in the EC1 boundary

Ref	Reinforcement	Works Description
B6-R01	Series and Shunt compensation	Series compensation to be installed in Harker-Hutton, Ecoles-Stella West and Strathaven-Harker routes. Two 225MVar MSCs are to be installed at Harker, one at Hutton, two at Stella West and one at Cookenzie. Strathaven-Smeaton route upgraded to 400kV and cables at Torness uprated
B7-R01	Harker-Hutton reconductoring	Reconductoring of the Harker-Hutton-Quernmore circuits with higher rated conductor
B6-R02	Western HVDC link	A new 2.4 GW (short-term rating) submarine HVDC cable route from Deeside to Hunterston with associated AC network reinforcement works on both ends
B7-R02	Harker-Stella West series compensation	Installation of series compensation in the Harker-Stella West circuits
B7a-R03	Yorkshire Lines reconductoring to 3100MVA	Reconductoring the existing two double circuits crossing B7 in the East, Lackenby-Thornton and Norton-Osbaldwick with higher rated conductor
B6-R03	Eastern HVDC link 1	A new ~2 GW submarine HVDC cable route from Peterhead to Hawthorn Pit with associated AC network reinforcement works on both ends. Possible Offshore HVDC integration in the Firth of Forth area
B6-R05	Eastern HVDC link 2	A new ~2 GW submarine HVDC link between Lackenby and Torness with associated AC network reinforcement works on both ends
B7-R03	Eastern HVDC link 3	~2 GW of second HVDC link from Peterhead to England with associated AC network reinforcement works on both ends
B7-R04	New Cumbria-Lancashire transmission route	Construction of new transmission route from Cumbria to Lancashire across the B7 and B7a boundaries
OS Link-01	Teesside-Humber Offshore Integration	Offshore integration between Teesside, Dogger Bank offshore project and Humber region
OS Link-03	Teesside-Wash Offshore Integration	Offshore integration between Teesside, Dogger Bank, Hornsea offshore projects and Wash region

Example Boundary Section from 2012 (2)

Figure B7.2:
Required transfer and capability for boundary B7



Boundary Discussion and Opportunities

Figure B7.2 above shows the required transfer capabilities from 2012 to 2032 for the four different scenarios, as well as the optimum reinforcements and their timing for the Gone Green scenario. Beneath, Table B7.2 identifies the reinforcements selected for each scenario.

- Transfer requirements & capabilities
- Timing of reinforcements by scenario

Table B7.2:
Selection and timing of reinforcements

Ref	SP	GG	AG	C
B6-R01	2015	2015	2015	2015
B7-R01	2014	2014	2014	2104
B6-R02	2016	2016	2016	2016
B7-R02	2029	2019	2016	2016
B7a-R03	-	2020	2018	2018
B6-R03	2026	2019	2019	2019
B6-R05	-	2021	2019	2019
B7-R03	-	2025	2020	2020
B7-R04	-	-	2025	2023
OS Link-01	2025 2027	2022	2019	2017 2019
		2024	2021	
		2027	2024	
		2028	2025	
			2029	
OS Link-03	-	2029	2026	-
			2028	
			2030	

The Harker-Hutton (B7-R01) reconductoring and Western HVDC link (B6-R02) works will increase system capability significantly by 2016. In order to realise the full benefit of B7-R01, the series and shunt compensation scheme on B6 (B6-R01) is required.

In the Slow Progression scenario, an Eastern HVDC link in 2020, and the Harker-Stella West series compensation in 2029 is required. As identified in section B6, for Gone Green and Accelerated Growth the reinforcements identified represent a significant challenge if they are to be delivered by the dates specified. The integrated connection of offshore wind generation provides additional capability in later years. The connection of new nuclear generation in the Contracted and Accelerated Growth backgrounds requires an additional transmission route across the boundary (B7-R04) which would increase capability by an estimated 3.5 GW. The Contracted Background still requires further reinforcement from 2023, as does Gone Green from 2028. These could include additional offshore or onshore circuitry, but at this time detailed solutions have not been developed.

System Operation in the ETYS

- System Operation chapter includes high level overview of:
 - Impacts of energy scenarios on network operability & dynamics
 - Options to resolve operability challenges including tools, products and technologies for design and operation of the transmission system:
 - E.g. Rapid Response to manage frequency
 - We're co-ordinating this area with Commercial Balancing Services Group

What information you would like to see on potential solutions to operational challenges?

ETYS & NDP Consultation

- Your opportunity to influence:
 - The information we provide to meet your needs & increase transparency
 - How we minimise network operation costs
 - Discussion of all opportunities to innovate
- Please take the time to respond to our consultation by **Thursday 16th May** at



<http://www.nationalgrid.com/uk/Electricity/ten-year-statement/consultation/transmission.ets@nationalgrid.com> or Juliana.Pollitt@nationalgrid.com