



Campaign to Protect
Rural England



The National Association for AONBs
Cymdeithas Genedlaethol AoHNE

A Countryside Friendly Smart Grid

An environmental manifesto for the National Policy Statement on electricity transmission

Introduction

A new alliance of countryside campaigners has formed to call for a 'smart grid' to parallel President Obama's plans in the USA. The Government will issue a policy statement on the future development of the nation's electricity transmission network for the first time in the summer, and the Conservative Party has issued a Policy Green Paper on moving towards a low carbon economy, which floats the possibility of a smart grid in Britain.¹ Some indication as to the approach the policy statement might take is set out in a major report issued in March 2009 by the Electricity Networks Strategy Group.² This is a cross industry group jointly chaired by the Department for Energy and Climate Change (DECC) and Office of Gas and Electricity Regulatory Markets (Ofgem).

The alliance believes that the crucial elements of a 'smart grid' are that it makes the best use of available energy resources, particularly through actively managing demand for electricity, and avoids harm to our most important areas of countryside. We strongly welcome the recent endorsement of the 'smart grid' concept by Ed Miliband MP, the Secretary of State for Energy and Climate Change.³ The electricity transmission network transmits energy from major power stations over high voltage lines to substations, where it is switched to the electricity distribution network of lower voltage lines. The transmission network consists of 22,000 high voltage pylons spaced across 4,375 miles (or 7,000 km) of overhead lines across England and Wales, most of which are in the countryside, alongside many more lower voltage pylons forming part of the distribution network.

National Grid is the international electricity and gas company that owns the high-voltage electricity transmission network in England and Wales and operates the system across Great Britain. National Grid's approach will therefore be a major influence on the future development of the network, although its activities are subject to the framework administered by Ofgem. Ofgem's main stated priority is to protect gas and electricity consumers, and it also regulates National Grid's investment in its assets. Ofgem has established price control mechanisms that restrict the amount of revenue that can be earned by regulated businesses such as National Grid, typically covering five year price control periods. National Grid's revenue largely comes from charges levied on power generation companies, who in turn pass much of their costs on to consumers. National Grid has some freedom of manoeuvre in terms of investment, but is currently obliged to offer connecting terms to any generator that requests them.

1 *The Low Carbon Economy: Security, Stability and Green Growth*, available from www.conservatives.com.

2 Electricity Networks Strategy Group, *Our Electricity Transmission Network: A Vision for 2020*, available from www.berr.gov.uk/files/file50333.pdf

3 See Ed Miliband's interview with *The Guardian* on 6 March 2009, www.guardian.co.uk/politics/2009/mar/06/green-politics-ed-miliband-low-carbon.

The new national policy will provide an opportunity for the Government to set a clear policy lead for National Grid, Ofgem and the electricity distribution companies. Major investment will be needed, along with changes in approach from all these organisations, to deliver the kind of ‘smart grid’ we need. We are pleased that the Energy Networks Strategy Group has recognised this, in its call for £4.7 billion of new investment in transmission networks until 2020. Worrying evidence has come to light, however, that the national policy could in fact propose more inefficient centralised generation, high voltage pylons and overhead transmission lines – taking us in the opposite direction from a truly smart grid that should be energy efficient and countryside friendly.

Why are pylons an issue now?

The Energy Networks Strategy Group report outlines where future ‘reinforcement’, or new development, of the transmission network, may take place, giving a broad outline of where lines might be located. Worryingly, recently released documents by National Grid suggest that much of this future development of the transmission grid could come at a high cost to the landscape. There are already at least 22,000 high voltage pylons in England and Wales.⁴ The overhead lines on which they are spaced are shown on CPRE’s map *Power connection: at what cost to the landscape?*. There could soon be many more. We face the biggest growth in new electricity transmission lines for 50 years. This is mainly because we have not yet taken sufficient steps to move away from reliance on centralised forms of energy generation such as large fossil fuel and nuclear stations.

There will therefore be more powerful new conventional generating stations, often on existing sites. In order to meet its international obligations for tackling climate change and increasing renewable energy generation, the Government has also indicated that it will seek to develop a host of major new offshore wind generating stations. As a result of both of these issues, National Grid argue that new high voltage overhead lines are, or will be, needed, alongside new or expanded electricity substations, in a number of possible locations (see below).

Possible new high voltage electricity transmission lines in England and Wales⁵

Derbyshire:	Chesterfield to Willington
English East Coast:	Bicker Fen (near The Wash) to Peterborough Drax power station (near Selby) eastward to Creyke Beck (near Hull) Bradwell to Rayleigh (following route of existing line): 28 km Bramford (near Ipswich) to Twinstead (south of Sudbury): 27 km Grimsby to Walpole (near The Wash) Killingholme (opposite Hull on south bank of Humber) to West Burton power station (near Retford)
Kent:	Lydd to south London: 95 km (a new line would be needed if more than one new reactor is built at Dungeness nuclear power station)
London area:	Tilbury to Elstree; Waltham Cross to Hackney (both are ‘uprating’ of existing 275 kV lines to 400 kV, potentially meaning larger pylons)
South Yorkshire:	Brinsworth (near Rotherham) to Chesterfield (‘uprating’ of existing 275 kV line to 400 kV, potentially meaning larger pylons)
South West:	Hinkley Point to Avonmouth: 65 km

4 National Grid Transco (now National Grid), *A Vision for England’s Future*, undated, downloaded from www.tcpa.org.uk/reg_futures/national_grid.pdf on 21 January 2009.

5 National Grid, *National Grid Input into UK Offshore Energy SEA: Impact on Onshore Electricity Transmission System*, December 2008, accessed at www.offshore-sea.org.uk/site/scripts/consultation_download_info.php?downloadID=238 on 19 February 2009; also National Grid, *Mid-Wales User Workshop*, presentation dated 21 June 2007, downloaded from www.nationalgrid.com/NR/rdonlyres/17667FB3-7686-4803-8488-EE0663899FF6/17994/MidWalesUserWorkshop.pdf on 25 February 2009. Distances of possible new lines are given where these are known. See also CPRE’s map *Power connection: at what cost to the landscape?*.

Wales:	Shrewsbury to south east of Machynlleth Trawsfynydd to south east of Machynlleth (joining line from Shrewsbury) Wylfa to Pentir (near Bangor): 35 km
Offshore: (Scotland to England and Wales)	Hunterston to Deeside (undersea Direct Current [DC] cable) Peterhead to Hartlepool (undersea Direct Current [DC] cable)

In addition, we also understand that energy companies are considering proposals for new nuclear power stations in the North West. If these were developed then they would probably also need a further overhead high voltage transmission line to serve them. Substations at the following locations may need expansion for additional transmission of electricity generated by new nuclear stations and/or offshore wind farms.

Anglesey:	Wylfa
Devon:	Alverdiscott (near Barnstaple)
Dorset:	Chickerell (near Weymouth)
East Riding:	Creyke Beck
Essex:	Rayleigh
Flintshire:	Deeside
Gwynedd:	Pentir
North Lincolnshire:	Grimsby, Keadby (near Scunthorpe), Killingholme
London:	Barking
Norfolk:	Norwich, Walpole
North Yorkshire:	Drax, Thornton (near York)
Suffolk:	Bramford, Sizewell
Sussex:	Bolney

All of these new developments will be considered over the coming years through the planning system, specifically the new procedures set out in the *Planning Act 2008* (see below).

The National Policy Statement (NPS) on electricity transmission

The Planning Act 2008 is intended to speed the handling of major infrastructure projects through the planning system. The Act brings in a new two-stage process of addressing (i) the need for new infrastructure in a National Policy Statement (NPS), and then (ii) the local impacts of a specific proposed development by a new Infrastructure Planning Commission (IPC) rather than by Ministers and their inspectors. The development of new high voltage power lines (of 132 kilovolts [kV] or above) will be covered by the Act.

A draft NPS on the electricity transmission network is expected to be issued for public consultation in summer 2009. The NPS will allow for full and open public debate of the issues surrounding electricity transmission, including whether and how the expansion advocated by the Electricity Networks Strategy Group and National Grid should take place. We are particularly keen to see that such a debate takes place, especially as the Planning Act is designed to rule out consideration of the need for an individual project at the planning application stage.

The NPS presents a major opportunity to move towards a truly smart electricity grid. The Electricity Networks Strategy Group report, and the environmental groups that have supported it such as Friends of the Earth and Green Alliance, have shown a welcome recognition of the need to encourage renewable energy and the scale of investment that will be needed to achieve a smart grid. It is also welcome that Secretary of State Ed Miliband has promised to set out a vision for a 'smart grid' that will involve actively managing demand, thereby reducing the overall need for generating capacity.⁶

⁶ Ed Miliband interview, 6 March 2009, *ibid*.

But so far the debate has missed the need to combine investment in the grid, and more active management of demand for energy, with a reduction in the environmental impact of grid infrastructure. Worryingly, the Electricity Networks Strategy Group report makes little reference to the environmental consequences, particularly landscape impacts, of continued development of large high voltage overhead lines. If such consequences are not properly considered, there could be widespread environmental damage and, in association with other national energy policies, we could be locked into a continuing dependence on unsustainable forms of energy generation, transmission and distribution.⁷

Pylons in the countryside – what is the problem?

Society increasingly questions the need for overhead transmission lines, mainly because of landscape impacts. High voltage lines typically comprise a profusion of overhead wires connected to pylons that are often 50 metres high. National Grid works to the Holford and Horlock Rules, internal guidelines for the routing of transmission lines and substations respectively.⁸ These state as a first principle that new lines should ‘avoid altogether, if possible, the major areas of highest amenity value’, meaning Areas of Outstanding Natural Beauty (AONBs), National Parks, Heritage Coasts and World Heritage Sites.

Despite these guidelines, overhead transmission lines directly intrude into designated landscapes at a number of locations (and indirectly at many more), for example in and around Trawsfynydd in Snowdonia National Park and at two points in the Cotswold Area of Outstanding Natural Beauty north of both Bath and Cirencester respectively. A 2003 report by the UK Centre for Economic and Environmental Development found clear evidence that the public find the landscape impacts of overhead lines unacceptable.⁹ The most recent major line upgrade project in England, in North Yorkshire, took nearly 6½ years from application to final grant of permission. Significant amounts of this time involved the developer in considering ways to lessen the impact of the line on the landscape, not fully addressed in the initial proposal.¹⁰

There are economic as well as aesthetic consequences of the visual intrusion caused by overhead transmission lines. Research published by the Campaign for National Parks in 2006 indicated that 69% of businesses in National Parks in the Yorkshire and Humber Region believe high environmental quality has a positive impact on their business performance. 95% of respondents to the 2006 Cumbria Visitor Survey stated that they visit Cumbria ‘because of the physical scenery and landscape of the area’.¹¹ Undergrounding of overhead transmission lines in the countryside has taken place in a limited number of cases, for example at Woodhead in the Peak District.

Further recognition of these points, albeit in an urban context, has been shown in the major work that has been recently completed to underground high voltage overhead lines and remove 52 pylons (including both transmission and smaller distribution pylons) in and around the site of the London 2012 Olympic Games. At the beginning of the project Lord Coe and David Higgins, both leading figures in the delivery of the 2012 Games, respectively stated that ‘the undergrounding of powerlines will provide an uncluttered landscape against which the Games can be staged’ and ‘placing the powerlines underground is a vital part of our long term regeneration of East London’.¹² This has led to a growing public interest in the possibilities for undergrounding transmission lines in other locations.

7 See also Professor Catherine Mitchell, ‘Labour’s preference for market principles and big companies betrays its low-carbon rhetoric’, *The Guardian*, Friday 27 February 2009.

8 The Holford and Horlock Rules are reproduced in full in EURELECTRIC, *Public Acceptance for new transmission overhead lines and substations*, March 2003, accessed 23 February 2009 from www.eurelectric.org/Download/Download.aspx?DocumentID=12983, pp.106-114.

9 See UK CEED, *The Scope for Undergrounding Overhead Electricity Lines*, March 2003. Downloaded from www.ukceed.org/downloads/files/15-undergrounding_summary_with_contents.pdf on 19 February 2009.

10 See Department for Communities and Local Government, *Planning for a Sustainable Future – White Paper*, May 2007, p.31.

11 CNP, *Prosperity and Protection*, 2006; Cumbria Tourism, 2006.

12 London Development Agency, *Olympic regeneration powers ahead*, 6 April 2006, accessed from www.lda.gov.uk/server.php?show=ConWebDoc.1486 on 25 February 2009.

What is a 'smart grid'?

Financial Times: 'An electricity network that uses information technology to manage generation and consumption more flexibly, seeking to address problems of storage and transmission of clean or renewable energy'.¹³

Wikipedia: 'The term represents a vision for a digital upgrade of distribution and long distance transmission grids to both optimise current operations, as well as open up new markets for alternative energy production... smart grid is an aggregate term for a set of related technologies rather than a name for a specific technology with a generally agreed on specification.'¹⁴

What is the solution?

Over the coming months, and as the NPS is produced, we will call for a number of issues to be properly recognised, ranging from the impact that overhead lines have on landscapes of national as well as local importance, as well as the imperative to reduce reliance on large power stations and centralised transmission grids if we are serious about tackling climate change and moving towards a sustainable supply of energy.

The 'smart grid' idea clearly embodies radical reform to the electricity grid we currently have, through making more efficient use of energy and other resources, and addressing problems caused by current methods of long distance transmission. This also suggests a grid that is more environmentally friendly than the current National Grid. 'Smart' should therefore also mean that the grid develops in a way that respects the valuable resources of our designated landscapes and Green Belts, as well as avoiding visual intrusion to our towns and cities. We should look to reduce the use of high voltage overhead lines and pylons, such a visible characteristic of the current grid.

If we recognise these issues, we believe that this should be the last time that the need for more high voltage overhead transmission lines should arise, even though a national transmission network is likely to be necessary for the foreseeable future. Moving towards a smart grid will take a major commitment to invest from Ministers, National Grid and the electricity price regulator Ofgem. The Electricity Networks Strategy Group have stated that up to £4.7 billion of investment will be involved.

An environmental manifesto for the National Policy Statement on electricity transmission

We believe that the new NPS needs to actively guide a major programme of investment to maximise economic, social and environmental benefits. We are calling for:

New high voltage lines to avoid AONBs, National Parks and Green Belt land. We recognise that, in drawing up its requirements for new lines, that National Grid has actively sought to fulfil its obligations to avoid damage to AONBs and National Parks. Some of the proposals involve new lines on existing routes or reinforcement of existing lines, and are also reasonable in our view.

We are gravely concerned, however, that suggested new overhead lines could potentially pass through and directly affect four AONBs, in Anglesey, the Kent Downs, the Lincolnshire Wolds and the Mendip Hills. The possibility of new overhead pylons in Snowdonia National Park, on a proposed new line running south from Trawsfynydd power station, is also not expressly ruled out. CPRE is also concerned to protect the open, undeveloped character of the Green Belt around our largest towns and cities and to improve its value for

¹³ Ed Crooks, 'Obama's smart vision for the electricity grid', *Financial Times* 16 January 2009.

¹⁴ Downloaded from http://en.wikipedia.org/wiki/Smart_Grid on 19 February 2009.

people to live near them. Pylons have already damaged the appearance of the Green Belt around London and other major cities. Possible new lines in Derbyshire, Essex, Kent, and Somerset, and larger pylons in London and South Yorkshire, could have a further damaging impact on the Green Belt in those areas.

An attractive, uncluttered environment provides clear economic benefits for rural business and tourists, as we noted above. Designated landscapes, moreover, are an asset for the nation, not merely the locality. National Grid should seek to avoid impacts in designated areas altogether through re-routing or placing lines under the ground or sea, or by using less intrusive designs if re-routing is not feasible. We also want to see clear evidence that the increasing of capacity of existing transmission lines outside designated areas, using techniques such as 'series compensation', has been fully explored before new overhead lines are considered. Such techniques are already intended for application on the overhead lines running from Scotland to England. We recognise that undergrounding the highest voltage lines can carry significant expense (for example, £250 million in the case of the London Olympic project), and can also give rise to issues of disruption to subsoil archaeological and landscape features.

The use of new pylon designs that reduce impacts on the landscape where new lines in the countryside are unavoidable. *The Planning Act* states that the Secretary of State should have regard, when drawing up any NPS, to achieving good design. Better design has already helped to tackle smaller forms of clutter such as road signs and telecommunications masts, and it is a pressing need for the electricity transmission network.

The Danish utility Energinet.dk has proposed new tower designs for high voltage lines with a typical height of between 30-35 metres.¹⁵ If such designs were applied in England, these could reduce the height of a typical high voltage pylon and line by around 33% from the current 50m. Although such designs will also involve the use of more towers over the length of a route than under present designs, there is still clear potential for landscape impacts to be reduced. National Grid should also apply the Holford and Horlock Rules for the development of overhead lines and substations, respectively.

In addition, we would like to see the NPS set a clear policy to improve the beauty and tranquillity of our countryside through calling on National Grid and Ofgem to underground, re-route and/or re-design existing (as well as new) lines in, or affecting, AONBs, National Parks, World Heritage Sites and Green Belts. The NPS should state that this is a priority for the next review of price controls for electricity transmission.

A roll out of demand management measures (such as 'smart metering'), the introduction of a feed-in tariff for 'microgeneration' appliances and renewable heating schemes, and research into effective methods of storage of electricity generated from renewable sources. We should aim to reduce reliance on wasteful forms of centralised electricity generation and transmission. Up to two thirds of the power generated from conventional power stations is lost in conversion to heat, transmission or distribution.¹⁶ The Government's promised vision for a 'smart grid' should therefore make reference to:

- encouraging the growth of energy storage, renewable heat and small-scale, decentralised energy generation and microgeneration, allowing such generation to be fed into the electricity distribution network and providing incentives such as a feed-in tariff; and
- radically reducing energy consumption through the use of demand management measures such as 'smart metering'.¹⁷

15 Elinfrastrukturudvalget (Denmark), *Technical report on the future expansion and undergrounding of the electricity transmission grid – Summary*, April 2008, downloaded from www.energinet.dk/NR/rdonlyres/CC966C3A-FE78-41D8-9DC7-6B455210B502/0/TechnicalReportSummary.pdf on 19 February 2009.

16 Department for Business, Enterprise and Regulatory Reform (BERR), *Energy Flowchart 2007*, accessed at www.berr.gov.uk/files/file46984.pdf on 9 March 2009.

17 See http://en.wikipedia.org/wiki/Smart_meter for a basic introduction.

Such programmes, if implemented to their full potential, could reduce demand on the main transmission grid and help reduce the bills of ordinary electricity consumers, as well as help meet the UK's carbon reduction targets. In the longer term, they would also minimise the need for new overhead transmission lines.

New offshore wind farms and connections to the National Grid to be provided using underground cables and existing substations on the grid. We support the development of more offshore wind farms, provided that significant impacts on designated landscapes can be avoided. National Grid's proposed sites for expanded substations to connect new offshore wind farms are on or adjoining existing substation sites. This strategy is broadly sensible in itself. We urge that National Grid seeks to reduce current levels of clutter and light pollution at these and all other substations.

We strongly support National Grid's proposals for new undersea cables to connect to other European countries and new offshore wind farms in Scotland with England and Wales. In such cases we are particularly concerned that there should be proper management of the construction process, so as to avoid significant effects on marine life.

CPRE

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