

# PYLON DESIGN COMPETITION

## Competition Brief

### INTRODUCTION

#### 1.1 The Challenge

The UK has an ambitious target to meet to ensure an 80% cut in carbon emissions by 2050. This means substantial change in our energy infrastructure and as we move away from our reliance on fossil fuels, electricity will become an even greater part of our energy mix.

The electricity pylon is an iconic image of how electricity has changed our lives, and our landscape. It divides opinion and stirs emotion. The steel lattice design familiar across Britain has barely changed in 75 years. And across the world, the vast majority of electricity pylons are of similar construction, although in different shapes and sizes.

But how and why has the lattice pylon stood the test of time? And as technology, material and design evolve, what impact might they have on the pylon of the future?

This new RIBA competition invites architects, engineers, designers, and university level students of these disciplines to come up with proposals for a new generation of electricity pylon. As well as exploring the design of the 'object', this competition also seeks to explore the relationship between our energy infrastructure and the environment within which it needs to be located. The challenge is to design a pylon that has the potential to deliver for future generations, whilst balancing the needs of our communities and preserving the beauty of our countryside.

The competition is being organised by the Royal Institute of British Architects (RIBA) Competitions on behalf of the Department of Energy & Climate Change and National Grid.

A key element to this competition will be a public consultation exercise which will provide members of the public with a chance to comment on, and to see and exchange views on the best designs, via this interactive website.

Our panel of experts drawn from the architecture, design and engineering worlds, together with leaders from the energy industry will judge the final winner. The panel of judges will be chaired by the Secretary of State for Energy and Climate Change, Chris Huhne.

## **1.2 History**

The United Kingdom Parliament passed the Electricity (Supply) Act in 1926 to create a Central Electricity Generating Board (CEGB), responsible for creating a national electricity transmission system to link up power stations and local power stations.

In 1927 the CEGB commissioned architect Sir Reginald Bloomfield QA to design a structure that could carry high-voltage electricity conductors across the country, that could stand 300 yards apart, that would withstand the weather and that would be as unobtrusive as possible.

Sir Reginald designed a tall steel tower, wide at the bottom and narrowing to the top, anchored on four separate legs for stability and with cross-arms to carry the conductors. It was of lattice construction, so the wind could blow through it and people could see the background and the sky.

In September 1933 the first national network was complete, with 3,000 miles (4,800km) of power lines transmitting electricity at 132kV (132,000 volts). But by 1950 the network was struggling to cope with demand, and new, much larger pylons were needed to transmit electricity at 275kV. The new pylons were twice the height of the old ones at an average 137 feet high, and designed – with the future in mind – to be capable of carrying two 400kV circuits of four conductors per phase (24 conductors in all), the configuration of much of today's network.

## **1.3 Durability**

The steel lattice tower is strong and efficient. It has to withstand not only gale force winds, ice, snow, floods and lightning strikes, but also the load from the weight and high tension of the conductors and insulator strings. Each pylon leg is rooted in concrete foundations, and the whole steel structure is coated with thick weather-proof grey paint to minimise rust and prolong life.

## **1.4 Flexibility**

The design allows for variations in height, width and bulk to take account of local topography, ground conditions and the job the pylon is required to perform. Britain's tallest pylons stand either side of the River Thames at Dartford in Kent at a height of 630ft (192m). Most pylons are suspension towers, where the conductors hang from vertical insulator strings suspended from the cross-arms. But where power lines change direction, tension towers or angle towers are required. These are bulkier to withstand being pulled sideways due to tension in the conductors, arriving at and leaving the pylon sometimes at right-angles to each other.

The design can also accommodate other infrastructure; fibre-optic communication cables can be wrapped around or built into the earth wire

which runs from the top of one pylon to another, and often mobile phone aerials are bolted to the pylon itself.

## **1.5 Maintenance**

A key benefit of the lattice design is ease of maintenance. Engineers can climb them to carry out maintenance, and can stand on the flat base of each cross-arm. Fittings, struts, steel members, conductors and other components can be replaced individually when required. The design also means engineers can switch off one circuit on one side of the pylon and work safely while the circuit on the other side remains live.

## **1.6 Alternative designs**

Over the years a number of innovative alternative pylon designs have been considered, and National Grid has developed a single-pole design for use on new power line projects. However it has received little public support. When asked to choose, most people have continued to prefer the traditional lattice tower design.

With new technology, materials and construction techniques, different designs of electricity pylon are now starting to appear around the world. New infrastructure is needed to connect new forms of power generation, such as offshore wind farms, and new designs will help change our landscape for generations to come.

# THE COMPETITION

## **2.1 Competition Format**

The competition is a call for ideas only with no commitment beyond the competition to develop any of the schemes. However, in the event that the winning scheme or schemes are built then the authors will be fully involved in the design development process, and credited accordingly. Entrants invited to stage two will be expected to further explore the viability of their proposals therefore this should be borne in mind from the outset.

A prize fund of £10,000 will be awarded to the winners (£5000 to the outright winner and £1000 to each of the shortlisted candidates).

The competition will run as follows:

- Stage 1: Submission of concept designs, from which a shortlist of up to six will be selected and invited to proceed to stage two.
- Stage 2: Stage two will involve further exploration and refinement of the stage one design ideas. This stage will commence with one-to-

one briefing sessions with shortlisted designers and technical advisers from National Grid. Feedback from stage one judging will also be available during this session. The refined submissions will be subject to a web-based public consultation exercise, and a technical appraisal. Feedback from both will be made available to the Jury Panel in their final deliberations.

National Grid will also arrange for designs to be modelled for final judging.

## **2.2 Competition Objective**

The challenging target of an 80% reduction in carbon emissions by 2050, means substantial change in our energy infrastructure with electricity becoming an increasingly important part of our energy mix. In order to deliver that electricity to our homes, communities and businesses, the UK will see a significant increase in the number of pylons, together with underground cables.

This network of pylons and cables have the potential to transform our landscapes for good or bad, and for generations to come.

The competition aims to help initiate and inform this debate through the vehicle of design and to explore the potential for a new generation of pylon within our landscapes.

We are therefore seeking highly innovative and imaginative solutions that nevertheless respond to the exacting technical requirements and offer the potential for development into deliverable projects. Proposals should be both grounded in reality and be beautiful.

## **2.3 Location**

There is no specific site set for this project however at least one image should show the scheme in the context of the image provided in section 1.6.

### **Holford Rules**

Guidelines known as the 'Holford Rules' were first developed in 1959 by Lord Holford adviser to the CEGB\*. These were later reviewed by National Grid in the 1990s and are used by the electricity industry as a mitigation measure when considering the routing of a new overhead line. These Rules seek to reduce the visual effect for the siting of pylons against the landscape, for instance choosing hill and tree backgrounds in preference to sky background wherever possible, approaching urban areas through industrial zones rather than residential etc. In general terms for this competition you may wish to consider how your design might have an effect in similar landscapes.

\* Further information about the Holford Rules can be accessed on the National Grid website (link to <http://www.nationalgrid.com/NR/rdonlyres/E9E1520A-EB09-4AD7-840B-A114A84677E7/41421/HolfordRules1.pdf>)

## 2.4 Jury Panel

A high-profile jury panel will consider and select the winning entry. The Jury Panel, which may be subject to change, will be as follows:

Chris Huhne, Secretary of State for Energy and Climate Change  
Bill Taylor, Architect and RIBA Adviser  
Nick Winser, Executive Director UK, National Grid  
Ruth Reed, President RIBA  
Sir Mark Jones, Director V&A Museum  
Sir Nicholas Grimshaw, Partner, Grimshaw Architects  
Chris Wise, Director, Expedition Engineering  
Jim Sutherland, Network Development Director, ScottishPower – Energy Networks  
Jonathan Glancey, Architecture and Design Correspondent, The Guardian

The Jury Panel will be supported by a technical assessment panel which will include:

Bill Taylor, Architect and RIBA Adviser  
Denise Libretto, Head, Electricity Networks (Planning & Consents) DECC  
Boud Boumecid, Asset Policy Engineer, National Grid

In the event of a Jury Panel member being unable to continue to act through illness or any other cause, we reserve the right to appoint an alternative panel member.

## 2.5 Submission Requirements

**Stage One** submissions should be presented as follows:

- a) A single A1 lightweight board, to illustrate the design concept. The content is left to competitors' discretion however at least one image should show the scheme in the context of the view provided in Section 1.6. The board should include a short description of no more than 300 words to describe the concept (the A1 board alone should provide the judges with sufficient information to explain the key principles behind the scheme).
- b) An accompanying report, on no more than four single A4 sides, to describe the concept and key principles behind it. Plus, an additional two A4 sides to provide a short introduction to the author/s of the design, outlining the author/s design philosophy behind the submission. The key images indicated in a) should be provided on a separate single A4 page.

- c) CD-Rom (marked design submission) containing a pdf version of the above.
- d) CD-Rom (marked publicity images) containing two images in jpeg format at low (72 dpi) and high (300 dpi) resolution. The publicity images should be representative of the design ideas proposed and be readily identifiable as such. This material may be used for any publicity purposes associated with promoting the competition results, and on the post-competition gallery on this website.
- e) The signed declaration form.

Architectural models will not be accepted at stage one, however photographs of models may be included on the design board if used to develop the proposal.

Note : The A1 submission board should be anonymous (see section 4.3 'anonymity').

**All documentation (including the CD's) should be clearly marked with the unique identification number which will be issued upon registration.**

## **Stage Two**

Stage two will commence with one-to-one briefings with technical advisers from National Grid. This session provides teams with an opportunity to individually discuss their proposals with the advisers and to ask any technical questions specific to the ideas proposed.

Additionally shortlisted competitors will be provided with feedback from stage one judging process. Stage two will require shortlisted entrants to refine and develop their concepts in light of the feedback/technical support provided.

A further two A1 boards will be required plus an additional A4 report.

It is also anticipated that a modelling workshop will be held which will be supported and funded by National Grid. Further details will be provided at stage two.

Interviews may form part of the final judging process and shortlisted designers will be advised accordingly in advance.

## **Public Consultation**

The public will have the opportunity to view and comment on the shortlisted designs via the competition website.

In addition there will be a physical exhibition of the shortlisted A1 boards and models at the V&A museum during September, which will be part of the London Design Festival programme of events.

## 2.6 Assessment Criteria

### Stage One

- § Design Quality (40%)
  - appearance
  - creative response
  - quality and clarity of presentation
- § Response to and understanding of Brief (40%)
  - construction approach
  - technical viability
  - functionality and practicality
- § Philosophy and Approach (20%)
  - design philosophy

### Stage Two

- § Design Quality in response to feedback (appearance, creative response, quality and clarity) (35%)
- § Construction, viability, functionality, practicality (in response to feedback) (35%)
- § Team capability (10%)
- § Public Response (20%)

## 2.7 Competition Timetable

The timetable, which may be subject to change, is as follows:

Competition launched, brief available:	23 <sup>rd</sup> May 2011
Deadline for questions:	16.00 hours, 2 <sup>nd</sup> June 2011
Response to questions:	10 <sup>th</sup> June 2011
Deadline for registration	5 <sup>th</sup> July 2011
Stage 1 submission of designs:	14.00 hours, 12 <sup>th</sup> July 2011
Assessment of designs:	18 <sup>th</sup> & 19 <sup>th</sup> July 2011
Shortlisted designers notified:	w/c 25 <sup>th</sup> July 2011*
One-to-one briefings/modelling workshop:	w/c 15 <sup>th</sup> August 2011 *
Submission of stage two designs:	w/c 5 <sup>th</sup> September 2011 *
Public consultation / technical appraisal:	w/c 12 <sup>th</sup> September 2011 *
Final judging & Winner announced:	w/c 10 <sup>th</sup> October 2011*

These dates are indicative only at this stage, and will be finalised during the course of the competition. This website will be updated accordingly.

## 2.8 Honoraria / Prize Money

There is a total prize fund of £10,000 (+ VAT). The author of the scheme placed first will receive £5,000. The remaining funds will be distributed amongst the stage two finalists.

National Grid will arrange and pay for the final designs to be modelled up to a maximum of £5,000 per shortlisted design.

## 2.9 Publicity

All entries will be displayed (with the name of the designer) in a public online gallery via this website at the end of the competition. The competition is the first of its kind to be run in the UK and is expected to receive widespread media interest.

## TECHNICAL REQUIREMENTS

### 3.1 Introduction

This section outlines the high level technical requirements to be considered in the design of a new pylon structure that may be developed and used on National Grid's high-voltage overhead line (OHL) electricity transmission network and providing a satisfactory service life of 80 years minimum.

### 3.2 Scope of work

The initial stage of this competition will focus on the production of an outline of the proposed structures. These should include a suspension (intermediate or line), and a light angle from 0 – 30 degrees tension (deviation) pylon structure.

The design should take into account environmental loadings.

Reliability, security, safety and maintenance considerations shall also be taken into account. **Structures shall be self supporting and exclude guyed structures** for reasons of safety and security (in the UK most towers are installed on private land.)

The outline drawings to be submitted should show all main pylon dimensions including height, base dimensions, length of any crossarms and size of main members. Structure colour and materials should also be shown. Existing pylons – lattice towers – are fabricated from steel and painted grey.

National Grid will work with the competition winner to see if the design can be made fully compliant with its system standards and relevant British Standards, such as BSEN50341 part 3-9.

National Grid are in the process of developing and adopting a Whole Life Value (WLV) framework to enable optimum policy decisions be made. The policy will apply across the whole asset life cycle, from design to decommissioning and disposal. It is anticipated that the new structure design will consider the concepts of WLV which not only optimises capital costs against operational costs but also achieves an optimum balance between all the other key life cycle choices such as: safety, maintenance, performance, life expectancy and sustainability etc.... Stage 1 competitors will be expected to provide an outline on the implementation of WLV concepts in support of their submission. The new design shall not be based on site specific principles but as a generic application that could be deployed anywhere on National Grid network.

### **3.3 System Requirements**

The new pylon design should be based on the parameters listed in the following sections.

Nominal voltage:	400kV
Number of Circuits:	2
Number of phases:	3 per circuit
Number of earth wires	1-2 dependent on design to ensure adequate lightning protection

Maintenance must be possible on one side of the pylon at a time – in other words, with one single circuit outage while the other circuit is live. Work on earth wires is also carried out with a single circuit outage.

### **3.4 Statutory requirements**

The requirements of the 2002 Electricity Safety, Quality and Continuity Regulations shall be met. Statutory clearances shall comply with the requirements of Electricity Networks Association Technical Specification ENATS 43-08. Internal and external electrical clearances are as shown in figures 1 and 2 for suspension and angle pylon structures respectively

### **3.5 Design Parameters**

Environmental loadings for structure design must be taken into account and based on a maximum altitude of 250m above mean sea level, terrain category II, basic mean hourly wind speed 25m/s, radial ice thickness (without wind) 65mm and (with wind) 15mm. Insulator set length shall be 5.2m for suspension and 6.25m for tension pylons.

### **3.6 Spatial Design**

Existing standard pylon height requirement is based on a standard span of 360m in flat terrain, having a minimum conductor to ground clearance of 8.1m at maximum operating temperature. Earth wire shielding angle at tower structure, shall be 35° or less.

The minimum conductor separation between phases of the same or different circuits shall be 8.0m.

The conductor sag at maximum operating temperature is taken as 12.05m.

New pylon designs with multiple contact points with the ground should have the capability to vary leg length, so they can be safely erected on uneven ground.

### **3.7 References**

Environmental Loadings

BS EN 50341 (parts 3-9) (<http://www.bsigroup.com/>)

National Normative Aspects (NNA) for the United Kingdom and Northern Ireland.

ENATS 43-08

Overhead line clearances

Figure 1 & 2.

## COMPETITION CONDITIONS

### **4.1 Invitation**

Submissions are invited from suitably qualified architects, engineers and related design disciplines. University level students of the same disciplines are also eligible to make a submission.

### **4.2 Public Consultation**

A key part of the assessment process will be the engagement of the general public. Schemes shortlisted to Stage Two will be displayed anonymously for public comment on this website. Comments collected during this consultation period will be made available to the Jury Panel for their consideration in the final judging stage.

### **4.3 Anonymity**

To allow the opportunity for the judges to assess schemes anonymously in the first instance, the A1 board should bear no name or identifying marks. The

designs should be accompanied by the declaration form supplied by RIBA Competitions (upon registration), which should be placed in a sealed envelope marked 'declaration and authorship' clearly displaying the unique identification number in the top right hand corner of the form and the envelope which will be issued upon registration.

A successful competitor must be able to satisfy the assessors that he/she is the bona fide author of the design he/she has submitted.

#### **4.4 Disqualification**

Submissions shall be excluded from the competition:

- § If received after the latest time stated under Section 4.9 'Submission Method'.
- § If, in the opinion of the jury panel, it does not fulfil the requirement of the brief.
- § If a competitor shall disclose his or her identity, or improperly attempt to influence the decision.
- § If any of the mandatory requirements of the competition brief and conditions are disregarded.

#### **4.5 Questions**

All questions relating to the competition brief and conditions must be made via RIBA Competitions to arrive in writing (by email), to arrive no later than **16.00 2<sup>nd</sup> June 2011**.

Response to all issues raised will be uploaded to this website no later than **10<sup>th</sup> June 2011**.

#### **4.6 Copyright**

The copyright of the design will be in accordance with the Copyright and Patents Act 1988 - that is copyright rests with the author.

The promoters and the RIBA reserve the right to exhibit or publish any design submitted to this competition and the result in any way or medium they consider fit. Illustrations of any design, either separately, or together with other designs, with or without explanatory text, may be used without cost.

#### **4.7 Appointment**

The competition is a call for ideas only and there is no commitment beyond the competition to develop any of the design proposals.

#### **4.8 Announcement of Award**

At the conclusion of each stage the RIBA will publish the short-listed and winning names after communicating them individually to each of the competitors.

#### **4.9 Submission Method**

The design of each competitor is to be contained in a single package and is to be sent, carriage paid, addressed to:

**RIBA Pylon Competition  
RIBA Competitions  
5<sup>th</sup> Floor, The Studio  
32 The Calls  
Leeds  
LS2 7EW**

#### **!!PLEASE NOTE OUR NEW ADDRESS!!**

Overseas competitors should note that for Customs purposes no commercial value should be assigned to the design submission. If a commercial value is given, this may result in your submission being delayed and/or returned to you unopened, as the RIBA will not be liable for any Customs charges otherwise incurred.

Your submission should arrive no later than **14.00hrs on Tuesday 12<sup>th</sup> July 2011**. Late submissions will not be accepted and it will not be possible to submit entries via email. UK competitors should note that First Class post does not necessarily guarantee next day delivery and should plan their submission schedule accordingly.

Competitors are advised to retain copies of designs submitted. Whilst the promoter and RIBA Competitions will exercise all reasonable care, they will not be responsible for loss or damage to the submission material that may occur either in transit, during exhibition, storage or packing.

#### **4.10 Enquiries**

The competition is being managed and administered by RIBA Competitions on behalf of the Department of Energy & Climate Change (DECC) and National Grid.

All enquiries relating to the general conditions of this competition should be directed to RIBA Competitions and not the promoter.

RIBA Competitions  
5<sup>th</sup> Floor  
The Studio  
32 The Calls  
Leeds LS2 7EW

T : ++44 (0) 113 2341335  
E : [riba.competitions@inst.riba.org](mailto:riba.competitions@inst.riba.org)

## HOW TO REGISTER/ENTER

You may only submit an entry to the competition if you are officially registered through RIBA Competitions. The competition is subject to a non-refundable registration and administration fee of £50.00 (plus VAT). There is a reduced registration fee of £15.00 (plus VAT) for students. Please visit [www.architecture.com/competitions](http://www.architecture.com/competitions) and follow the appropriate link under 'Live Competitions' to make an on-line payment.

Once your payment has been processed, you will be issued with a unique identification number and a Declaration Form. The declaration form acknowledges authorship of the design ideas submitted and by signing it, competitors agree to abide by the competition conditions and the decision of the Jury Panel. This duly completed Form should be placed in a sealed envelope to accompany the design material and should clearly bear the identification number in the top right hand corner of both the form and the envelope – see Submission Instructions.

## RESPONSE TO QUESTIONS

A statement in response to questions raised will be uploaded to the website after the response to questions deadline. Hard copies of the Q&A may also be emailed on request.