AINSTY (2008) INTERNAL DRAINAGE BOARD

(A Member of the York Consortium of Drainage Boards)

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Thursday 27 July 2023

The Planning Inspectorate
National Infrastructure Planning
Temple Quay House
2 The Square
Bristol
BS1 6PN

Dear Sir/Madam,

Planning Inspectorate Reference:	EN020024
Application Description:	Application by National Grid Electricity Transmission (NGET) for an Order Granting Development Consent for the Yorkshire Green Energy Enablement (GREEN) Project

The Board has now reviewed the amended Development Consent Order – Draft D.

Article 19 – Paragraph 12(10)

The Board has no objection to subsection 10(a) and 10(b).

Article 19 – Paragraph 12(11)

The Board objects to the applicant's proposed wording in subsection 11. This states:

> (11) No consent is required under any byelaw made by an internal drainage board under this section if it relates solely to the oversail of an overhead electric line which meets the minimum statutory clearances contained in Schedule 2 of the Electricity Safety, Quality and Continuity Regulations 2002(**b**) when measured from the top of the bank of any watercourse maintained by an internal drainage board."

By way of background, we feel it is helpful to explain that each IDB has a specific district/area which they oversee. We then also have specific watercourses which we maintain every year or so. These are generally the larger watercourses which small watercourses/ditches drain into. It is therefore vital that we keep these free flowing so that the smaller watercourses (which farms etc. will use) can keep discharging into them, and hopefully avoid flooding.

We have a few members of permanent staff who carry out maintenance works to those watercourses. These maintenance works are done by machinery which drives along the top of the embankment of a watercourse.

We do not work under cables on a day-to-day basis and generally avoid working under overhead cables wherever possible. Accordingly, whilst our Maintenance Team do have training on overhead cables, it is not something they have to deal with every day.

William Symons Clerk to the Board
[redacted] www.yorkconsort.gov.uk

National Grid are requesting that they do not obtain our consent for any overhead line which is above the minimum heights specified with Schedule 2 of the Electricity Safety, Quality and Continuity Regulations 2002.

We have no objection to the principle of there being overhead lines over watercourses, but we must ensure that those overhead lines are at a safe distance where we can access the watercourses to carry out maintenance.

If we do not carry out those maintenance works to the watercourses, we could end up with metres and metres where the watercourse is not maintained. Over time, this will effect flows and could cause blockages and then flooding. It is therefore vital that we can carry out these works and safely.

Schedule 2 of the Electricity Safety, Quality and Continuity Regulations 2002 states:

SCHEDULE 2 Regulation 17(2)

MINIMUM HEIGHT ABOVE GROUND OF OVERHEAD LINES

Column 1 *Nominal Voltages*	*Column 2* *Over Roads*	*Column 3* *Other Locations*
Not exceeding 33,000 volts	5.8 metres	5.2 metres
Exceeding 33,000 volts but not exceeding 66,000 volts	6 metres	6 metres
Exceeding 66,000 volts but not exceeding 132,000 volts	6.7 metres	6.7 metres
Exceeding 132,000 volts but not exceeding 275,000 volts	7 metres	7 metres
Exceeding 275,000 volts but not exceeding 400,000 volts	7.3 metres	7.3 metres

In this instance, the relevant measurements are 7 metres for 275 volt overhead lines and 7.3 metres for 400 volt overhead lines.

We have tried to discuss and agree something with National Grid on this point but we cannot come to an agreement / compromise.

As a starting point, we have been told by National Grid that the existing clearances are as follows:

Tower Number	Watercourse	Bank 1 Clearance	Bank 2 Clearance
XC424	The Foss	N/A new	
XC427	Red House Wood Dyke	N/A new	
XC429	Red House Wood Dyke	8.2	8.1
XC432	Great Gutter	10.3	10.4
XC438	White Sike	11.3	12.1
XC439	White Sike	-	13.5
XC452	Sike Beck (Redwith dyke)	12.4	12.0
XC459	The Foss	8.2	8.0

The Board does not profess to be experts in this area but our understanding is that the Electricity Safety, Quality and Continuity Regulations 2002 is there to provide the **very minimum** heights.

The Health and Safety Executive website provides further guidance on the Electricity Safety, Quality and Continuity Regulations 2002.

In particular, it refers to formal Health and Safety Executive guidance - ***"Avoiding danger from overhead power lines - Guidance Note GS6 (Fourth edition)"***.

The Board have attached this document but it can also be found here:
https://www.hse.gov.uk/pubns/gs6.pdf

An extract from that guidance ***"Avoiding danger from overhead power lines - Guidance Note GS6 (Fourth edition)"*** is below:

25 If you cannot avoid transitory or short-duration, ground-level work where there is a risk of contact from, for example, the upward movement of cranes or tipper trailers or people carrying tools and equipment, you should carefully assess the risks and precautionary measures. Find out if the overhead line can be switched off for the duration of the work. If this cannot be done:

- refer to the Energy Networks Association (ENA) publication *Look Out Look Up! A Guide to the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines.*[2] This advises establishing exclusion zones around the line and any other equipment that may be fitted to the pole or pylon. The minimum extent of these zones varies according to the voltage of the line, as follows:
  - low-voltage line – 1 m;
  - 11 kV and 33 kV lines – 3 m;
  - 132 kV line – 6 m;
  - 275 kV and 400 kV lines – 7 m;

- under no circumstances must any part of plant or equipment such as ladders, poles and hand tools be able to encroach within these zones. Allow for uncertainty in measuring the distances and for the possibility of unexpected movement of the equipment due, for example, to wind conditions;

The first port of call is noted as having the overhead line switched off. From past experience, this is not a straight forward process and in general, National Grid will not want to do this unless absolutely necessary.

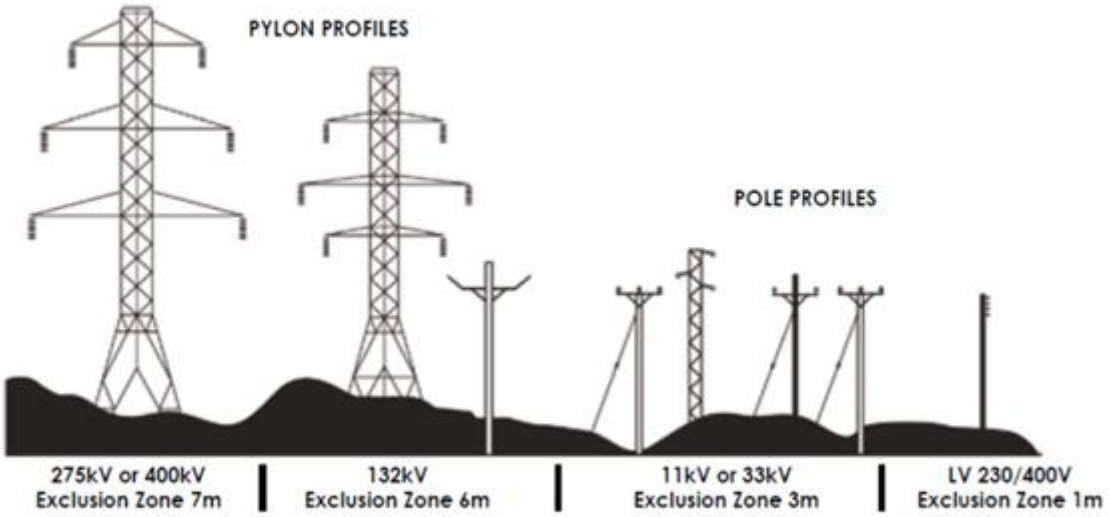
Assuming the overhead line cannot be switched off, the Health and Safety Executive guidance refers to the Energy Network Association's ***"Look Out Look Up! A guide to the safe use of mechanical plant in the vicinity of electricity overhead lines"***.

The Board have attached this document but it can also be found here:
https://www.energynetworks.org/industry-hub/resource-library/mechanical-plant-safety-advice.pdf

An extract from the Energy Network Association's ***"Look Out Look Up! A guide to the safe use of mechanical plant in the vicinity of electricity overhead lines"*** guidance is below:

- You must not allow any part of your plant to enter the **EXCLUSION ZONE**.
- The diagram below shows typical types of overhead lines and provides a guide to help assess the line voltage of lines on wooden poles or steel pylons.

The minimum **EXCLUSION ZONE DISTANCE** is shown for each example.



- Please note that these are absolute minimum distances that should under no circumstances be infringed. ***If you do - it could prove fatal.***

This clearly states that we should not be letting any part of our equipment in the "Exclusion Zone" and the "Exclusion Zone" for 275kV and 400kV is 7 metres.

The Board's equipment height is 3.5 metres. This takes us to needing the overhead lines to be 10.5 metres above ground level.

The above diagram and information is what is within the Board's Code and Practice, and is on each Risk Assessment a member of staff has to complete when working under an overhead line.

National Grid have referred us to their Guidance, ***"Development near overhead lines"***. The Board have attached this document. This refers to Table 1:

Table 1: Overhead line conductor clearances

Description of Clearance	Minimum clearance (metres) at 400kV	Minimum clearance (metres) at 275kV
To ground	7.6	7.0
To normal road surface	8.1	7.4
To road surface of designated '6.1 metres high load' routes	9.2	8.5
To motorway or other road surface where Skycradle can be used	10.5	9.8
To motorway road surface where scaffolding is to be used on: (i) Normal 3 lane motorways (ii) Elevated 2 lane motorways	 16.3 13.3	 15.6 12.6
To any object on which a person may stand including ladders, access platforms etc.	5.3	4.6
To any object to which access is not required AND on which a person cannot stand or lean a ladder	3.1	2.4
To trees under or adjacent to line and: (i) Unable to support ladder/climber	3.1	2.4

(ii) Capable of supporting ladder/climber (iii) Trees falling towards line with line conductors hanging vertically only	5.3 3.1	4.6 2.4
To trees in orchards and hop gardens	5.3	4.6
To irrigators, slurry guns and high pressure hoses	30.0	30.0
To street lighting standards with: (i) Standard in normal upright position (ii) Standard falling towards line with line conductors hanging vertically only (iii) Standard falling towards line	 4.0 4.0 1.9	 3.3 3.3 1.4

References

a) The Electricity Safety, Quality and Continuity Regulations 2002 (S.I. 2002 No 2665).
b) Energy Networks Association Technical Specification 43-8 Issue 3, 2004 - Overhead Line Clearances.
c) Health & Safety Executive Guidance Note GS6(rev) - Avoidance of danger from overhead electrical lines.
d) Health & Safety Executive Guidance Note HSG47 - Avoiding danger from underground services (Second edition).

National Grid have said that the relevant row of Table 1 for the IDB is row 7 –

To any object to which access is not required AND on which a person cannot stand or lean a ladder	3.1	2.4

The Board have asked National Grid to explain where these clearances have come from.

As part of this, we reviewed the references referred to at the bottom of Table 1:

Reference (a) – this is Schedule 2 of the Electricity Safety, Quality and Continuity Regulations 2002 as we have noted above.

Reference (b) – Issue 3 is an older version of the Technical Specification – Issue 5 now being the latest. The Board do not have a copy of Issue 5 but note Issue 4 was specifically amended to reflect and align with the Health & Safety Executive's Guidance Note GS6 - which is the very same document which the Board got our distances from.

Reference (c) – this is the Health & Safety Executive's Guidance Note GS6 which we referenced above.

Reference (d) - HSG47 seems to be for underground services and so not relevant in these circumstances.

We have explained all of this to National Grid and they have said:

"In terms of the 7m you reference, this is intended for those working under overhead lines with no procedures in place/ knowledge of working under overhead lines. The guidance attached seeks to ensure working under overhead lines can take place safely, while complying with the necessary legislation."

The guidance which was attached is National Grid's Technical Guidance Note 287 – ***"Third-party guidance for working near National Grid Electricity Transmission equipment"***. An extract from Page 6 is below:

Electrical clearance from overhead lines

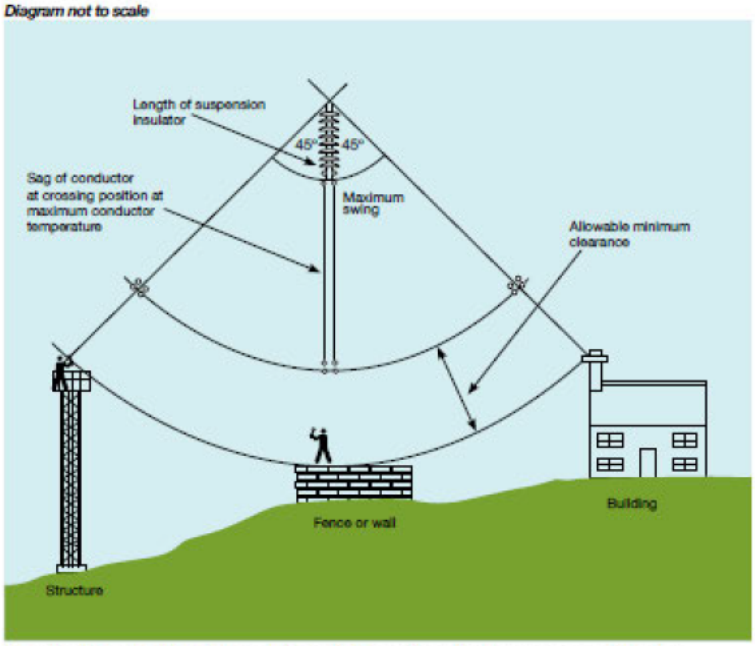
The clearance distances referred to in this section are specific to 400kV overhead lines. National Grid can advise on the distances required around different voltages i.e. 132kV and 275kV.

As we explained earlier, *Electrical Networks Association TS 43-8* details the legal clearances to our overhead lines.The minimum clearance between the conductors of an overhead line and the ground is 7.3m at maximum sag. The sag is the vertical distance between the wire's highest and lowest point. Certain conditions, such as power flow, wind speed and air temperature can cause conductors to move and allowances should be made for this.

The required clearance from the point where a person can stand to the conductors is 5.3m. To be clear, this means there should be at least 5.3m from where someone could stand on any structure (i.e. mobile and construction equipment) to the conductors. Available clearances will be assessed by National Grid on an individual basis.

National Grid expects third parties to implement a safe system of work whenever they are near overhead lines. We recommend that guidance such as *HSE Guidance Note GS6 (Avoiding Danger from Overhead Power Lines)* is followed, which provides advice on how to avoid danger from all overhead lines, at all voltages. If you are carrying out work near overhead lines you must contact National Grid, who will provide the relevant profile drawings.

Diagram not to scale



There should be at least 5.3m between the conductors and any structure someone could stand on

7.3m

The required minimum clearance between the conductors of an overhead line, at maximum sag, and the ground

Section continues on next page »

National Grid's own guidance refers to HSE Guidance Note GS6 which is again the exact guidance note we used when formulating our clearance distances.

They have stated that the 7 metre clearance we have used is based on someone not having any ***"procedures in place/ knowledge of working under overhead lines".*** Firstly, we disagree with that and secondly, as we explained at the start of this letter, working under overhead lines is not something our Maintenance Team do day-to-day.

National Grid have mentioned whether we have RAMS in place. The Board's Engineer has said that the Board is at liberty to choose to implement RAMS documentation for certain tasks. A risk assessment is always undertaken, as required by law, and that risk assessment is always in line with the Board's Code of Practice – which when involving overhead power lines would comply with the above requirements. Implementing a RAMS document for any works within the vicinity of overhead powerlines would see the HSE Guidance and the Energy Networks Association guidance referred to and then implemented – this again matches the Board's Code of Practice and its recommended exclusion zones. Whether a RAMS document is therefore in place or not, would not change the way the Board operates when in the vicinity of overhead lines.

The Board do not feel comfortable in reducing our clearance request from 10.5 metres. We feel that to do so would put our staff in danger and would be breaching the Board's Health and Safety Policy, and against the advice of the Health and Safety Executive.

Accordingly, we will not agree the proposed amendment to Article 19 – Paragraph 12(11). The Board would ask that this part of the paragraph is removed so that the Board's consent **is** required. We have explained to

National Grid we are more than happy to agree that no consent is required for any overhead lines which are 10.5 metres above ground level but our consent must be obtained for any overhead lines under the 10.5 metre clearance.

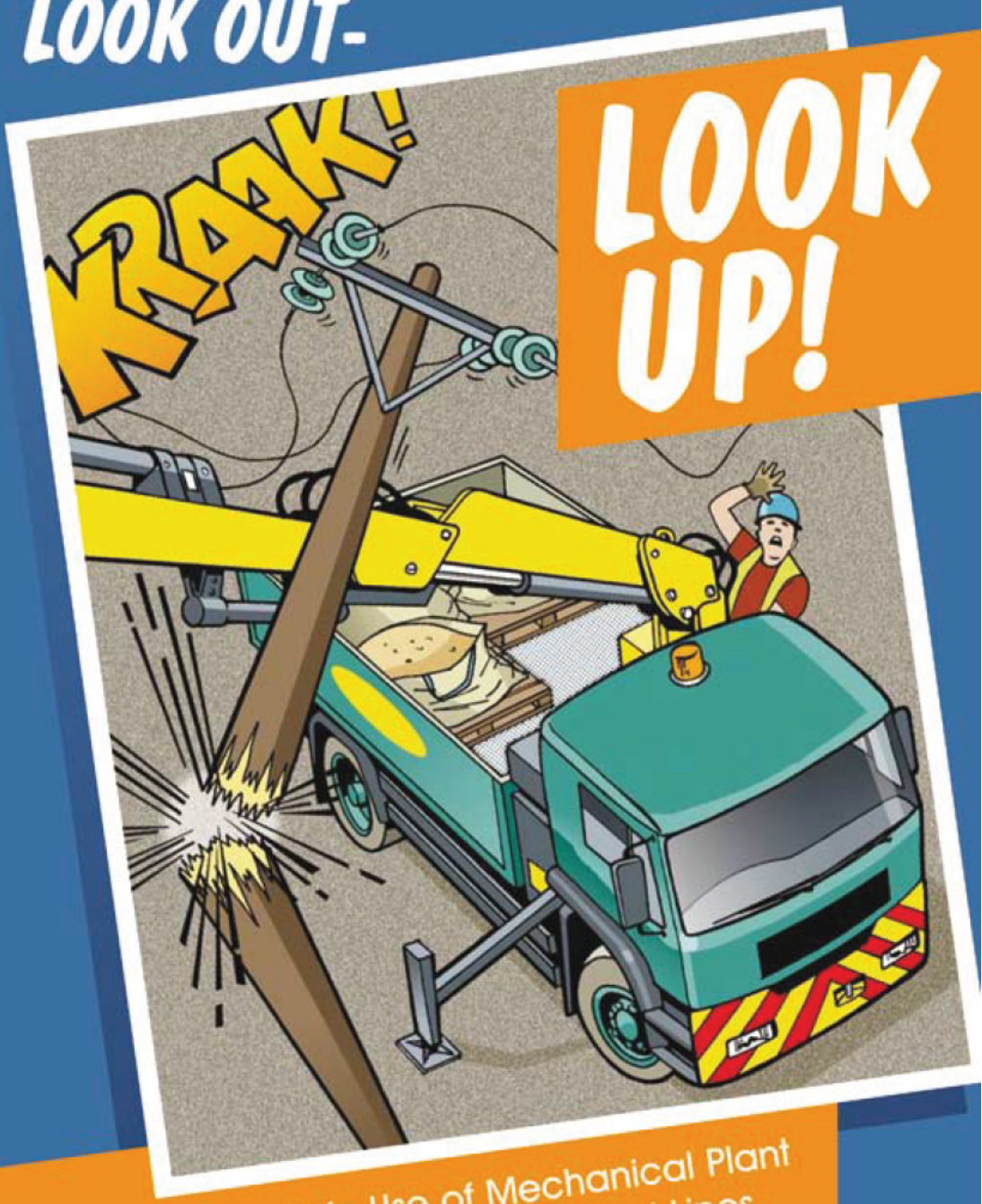
Finally, National Grid's proposal of 7 metres or 7.3 metres could make existing line clearances significantly less than they currently are. They may be concerned about setting a precedent nationally but surely, they should want to make the overhead lines as safe as possible for everyone to work under. The Board have no objection to the principle of the overhead lines, we merely want them higher to ensure our Maintenance Team are as safe as possible when working under them which in turn means that the watercourses can be maintained, water can remain free flowing and we can try and prevent flooding.

Yours faithfully,

[redacted]

Charlotte Gill
Planning Officer
Email: Planning@yorkconsort.gov.uk

LOOK OUT-



A Guide to the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines

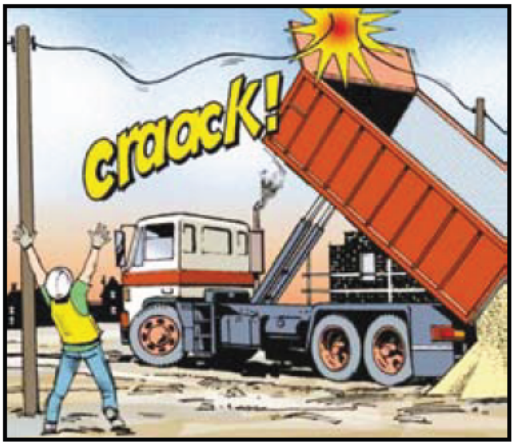
energynetworks association

The Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines

Introduction

Every year in the UK on average, two people are killed and many more are injured when mechanical plant and machinery comes into contact or close proximity to overhead electricity lines.

This booklet has been produced for anyone who uses mobile plant, (such as Hiabs, MEWPs, Tipper Lorries and Trailers, Grab Lorries, Concrete Conveyors and Excavators) for short duration work and provides general guidance on how to avoid becoming part of these statistics.



1 BEFORE STARTING WORK

- Overhead lines have the advantage that they can easily be seen, so before you set up your vehicle or plant always:

STOP AND LOOK UP!

- If you are working at night, or in conditions of poor visibility, you should use spotlights or a torch to carefully check that there are no overhead lines within your vehicle's reach.

- Always assume that overhead lines are live unless informed otherwise in writing by your local electricity company.

- If you are in any doubt about whether the lines in question are power or telephone (this is a very common mistake) – always assume that they are power lines and are live.

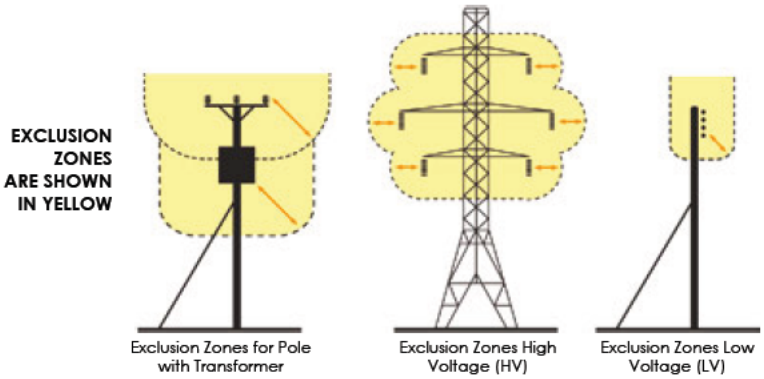
- It is not normally practical for electricity companies to shroud high voltage conductors and even when low voltage conductors are shrouded, the shrouding is not designed to protect against contact by mechanical plant – again, always assume the lines are live.

2 EXCLUSION ZONES

- Overhead power lines are not normally insulated and so any contact can result in serious or fatal injuries.

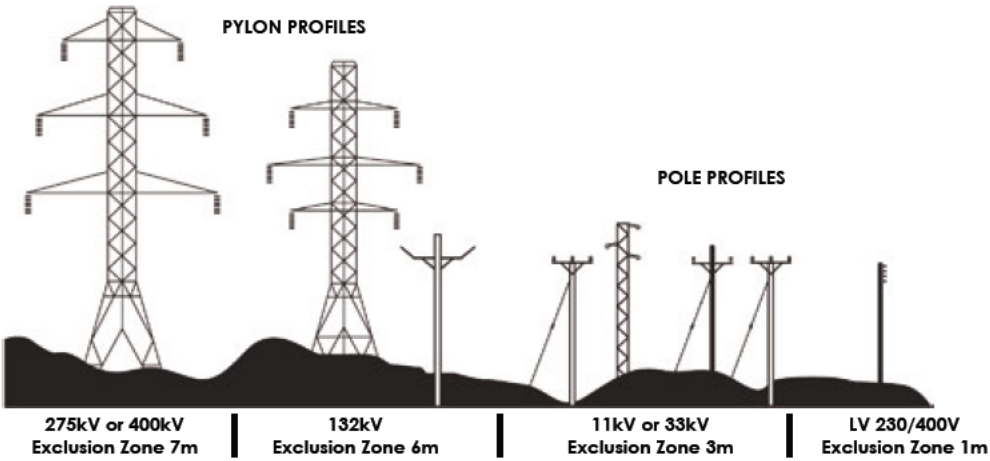
- Electricity at high voltages can also jump gaps with no warning whatsoever, so it is also dangerous to let your plant approach too close to a line.

- The distance that electricity can jump depends on the voltage of the line. The higher the voltage, the further you must stay away from the line and any other equipment that may be fitted to the pole or pylon. This distance is called the **EXCLUSION ZONE**. Examples of this are shown highlighted in the diagram below.



- You must not allow any part of your plant to enter the **EXCLUSION ZONE**.

- The diagram below shows typical types of overhead lines and provides a guide to help assess the line voltage of lines on wooden poles or steel pylons. The minimum **EXCLUSION ZONE DISTANCE** is shown for each example.



- Please note that these are absolute minimum distances that should under no circumstances be infringed. ***If you do - it could prove fatal.***

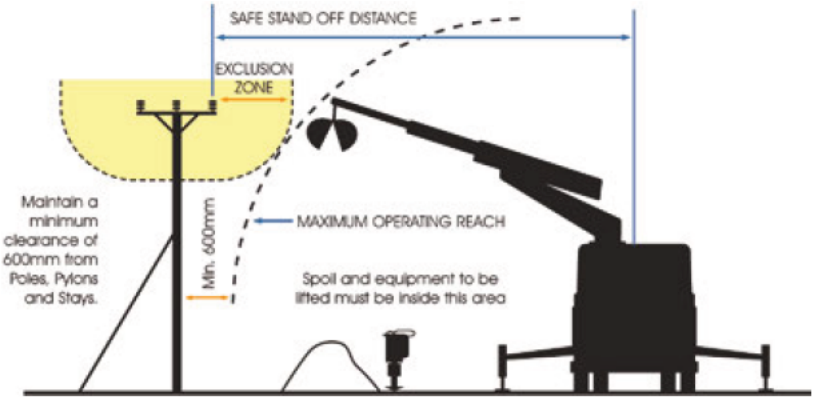
- As well as staying away from the lines or equipment, you should also stay at least 600mm away from any part of poles, pylons and stay wires.

- Please remember that is for guidance only, and if you are in any doubt, please call your local electricty company for advice before setting up your plant or starting work.

3 STAND OFF DISTANCES

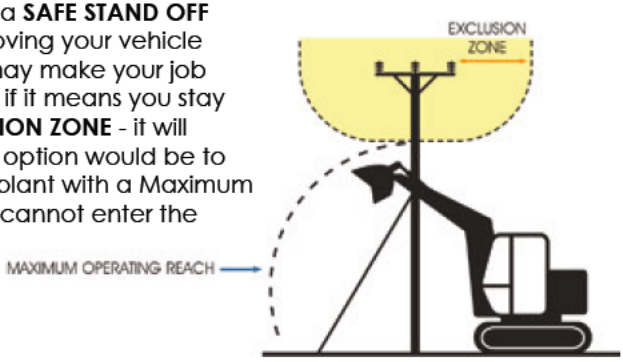
- If there are power lines in the vicinity of your work the best way to make sure you stay out of the **EXCLUSION ZONE** is to position your vehicle at a **SAFE STAND OFF DISTANCE** so that, even when fully extended, no part of it can accidentally reach inside the **EXCLUSION ZONE**.

- This **SAFE STAND OFF DISTANCE** can be calculated by adding the **EXCLUSION ZONE** distance for the appropriate voltage of the line to the Maximum Operating Reach of your vehicle. This is shown in the diagram below.



- If you position your vehicle outside of the **SAFE STAND OFF DISTANCE**, there is no risk of accidental contact with the lines and no dange of electricity jumping from the line to your vehicle.

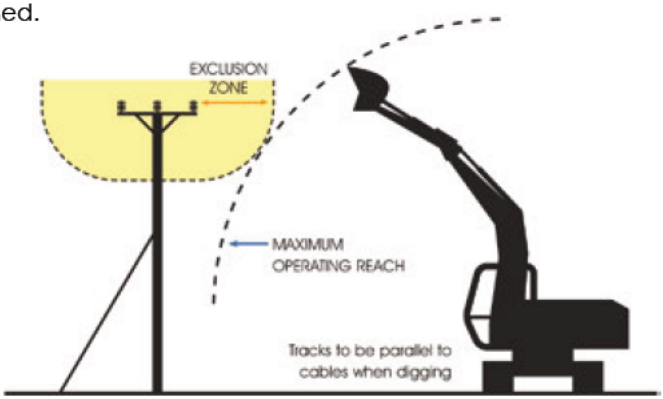
- If you cannot achieve a **SAFE STAND OFF DISTANCE**, consider moving your vehicle to a safer location. It may make your job a bit more difficult, but if it means you stay away from the **EXCLUSION ZONE** - it will be safer. The next best option would be to consider using smaller plant with a Maximum Operating Reach that cannot enter the **EXCLUSION ZONE**.



- You may not be able to achieve either of these options, so, as a last resort, if you cannot avoid operating large items of plant in the vicinity of lines, you **MUST** make sure that the plant is fitted with restraints to ensure that the **EXCLUSION ZONE** cannot be entered. These restraints may be electrical or hydraulic systems fitted to the plant, or mechanical devices such as chains.

  Please seek advice from the plant manufacturer for more information on choices available for your particular item of plant.

- If you are using a mechanical excavator to dig parallel to the line, it is good practice to position the excavator with the tracks or wheels parallel to the line, so as you move along the excavation the **SAFE STAND OFF DISTANCE** is easily maintained.



- Care must also be taken to avoid non-mechanical equipment, (e.g. scaffold poles, ladders and long loads such as lengths of steel or timber) from entering the **EXCLUSION ZONE**.

- Always maintain at least 600mm clearance from your plant to any of our poles, stay wires or pylons. Any contact with these by your plant could cause the line to break and fall to the ground.

4 EMERGENCY PROCEDURES

If contact is made with an overhead line, you must immediately clear the area and suspend all work within 50m of the damage because the line could still be live, or become live again.

The operator of a machine that is in contact with an overhead line should take the following steps:

- **If the machine is still operable**:

  - lower any raised parts that are controlled from the driving position and/or drive the vehicle clear of the line, as long as neither of these actions risk breaking the line or dragging it to the ground.

- **If the machine is not operable or cannot be driven clear of the line:**
  - stay in the cab.
  - contact your site manager immediately by radio or mobile phone or as soon as possible by any other method and ask them to inform the electricity company.
  - instruct everyone outside the vehicle not to approach it.
  - do not exit the cab until given confirmation BY ELECTRICITY COMPANY PERSONNEL that it is safe to do so.

- **If the machine is inoperable or cannot be driven free and there is risk of fire or other immediate hazard:**
  - jump clear of the vehicle, avoiding simultaneous contact with any part of the machine and the ground.
  - try to land with your feet as close together as possible.-where possible, continue to move away from the vehicle using "bunny hops" with your feet together until at least 15m from the vehicle.
  - instruct other people in the vicinity not to approach the vehicle.
  - do not return to the vehicle until given confirmation BY ELECTRICITY COMPANY PERSONNEL that it is safe to do so.

Whatever the circumstances please contact your local electricity company immediately and tell them what has happened.

Please be ready to provide them with a contact telephone number and an accurate location or set of directions – this will help them in getting staff to site quickly to minimise any danger and to reduce any disruption to your work.

Please report any damage or contact no matter how minor they may seem to you at the time. Whilst the damage may not cause a serious problem at the time of contact it could fail later, causing danger to electricity company staff and members of the public, disruption to supplies, and – if the damage is traced back to you – a larger repair bill!

5 MORE INFORMATION

- Proximity Warning Systems (such as Wire Watcher – see *wirewatcher.co.uk* for information) may be fitted to your vehicle. Never turn these devices off or disable them in any way.
- Take note of any warnings these proximity warning systems may provide but do not use the presence of such devices as a reason not to follow the advice provided in this leaflet

6 FURTHER READING

More detailed general information on this subject is available in the following publications from the Health and Safety Executive (HSE):

GS6 – Avoidance of Danger from Overhead Lines.

HS(G) 47 – Avoiding Danger from Underground Services.

AFAG 804 – Electricity at Work: Forestry and Arboriculture.

This information can also be obtained at *hsebooks.com*.

FINALLY…. Please, always remember that electricity overhead lines can be very dangerous **– the general rule is *STAY AWAY and STAY SAFE!***

For the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines ALWAYS FOLLOW THESE SIMPLE RULES – THEY COULD SAVE YOUR LIFE!

- **Treat all overhead lines as live and dangerous**
- **Any contact may be fatal or cause very serious injuries**
- **Electricity can jump gaps**
- **Before you set up or use plant near to lines – STOP and LOOK UP**
- **Take special care and use lights in the dark or poor light conditions**
- **If there are lines in the vicinity of your work – stay well away**
- **Set up your plant with care to reduce the chance of contact**

Communication Information

For advice, telephone your local electricity company. The telephone number is in the telephone book under 'Electricity'.

Alternatively log on to the Energy Networks Association website www.energynetworks.org

energynetworks association

WESTERN POWER DISTRIBUTION
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This leaflet is published by ENA (Energy Networks Association) on behalf of electricity companies. Content kindly provided by Western Power Distribution

Avoiding danger from overhead power lines

Guidance Note GS6 (Fourth edition)

This general series guidance note is for people who may be planning to work near overhead lines where there is a risk of contact with the wires, and describes the steps you should take to prevent contact with them. The fourth edition makes the advice easier to follow and has brought the supporting visuals up to date. The guidance has not fundamentally changed from the previous version.

It is primarily aimed at employers and employees who are supervising or in control of work near live overhead lines, but it will also be useful for those who are carrying out the work.

Contents

Introduction

1 Every year people at work are killed or seriously injured when they come into contact with live overhead electricity power lines. These incidents often involve:

- machinery, eg cranes, lorry-loader cranes, combine harvesters, and tipping trailers;
- equipment, eg scaffold tubes and ladders;
- work activities, eg loading, unloading, lifting, spraying, and stacking.

2 If a machine, scaffold tube, ladder, or even a jet of water touches or gets too close to an overhead wire, then electricity will be conducted to earth. This can cause a fire or explosion and electric shock and burn injuries to anyone touching the machine or equipment. An overhead wire does not need to be touched to cause serious injury or death as electricity can jump, or arc, across small gaps.

3 One of the biggest problems is that people simply do not notice overhead lines when they are tired, rushing or cutting corners. They can be difficult to spot, eg in foggy or dull conditions, when they blend into the surroundings at the edge of woodland, or when they are running parallel to, or under, other lines.

4 Always assume that a power line is live unless and until the owner of the line has confirmed that it is dead.

5 This guidance is for people who may be planning to work near overhead lines where there is a risk of contact with the wires, and describes the steps you should take to prevent contact with them. It is primarily aimed at employers and employees who are supervising or in control of work near live overhead lines, but it will also be useful for those who are carrying out the work.

Types of overhead power lines and their heights

6 Most overhead lines have wires supported on metal towers/pylons or wooden poles – they are often called ‘transmission lines’ or ‘distribution lines’. Some examples are shown in Figures 1–3.

Figure 1 275 kV transmission line

Figure 2 11 kV distribution line

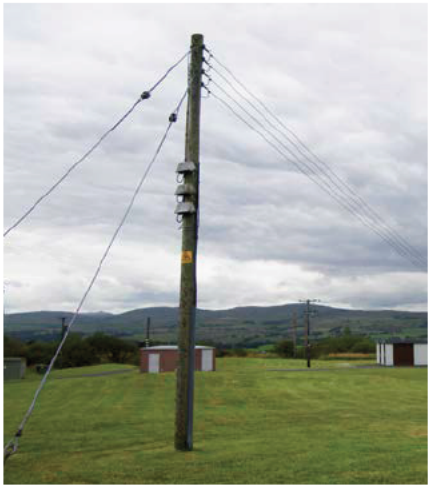


Figure 3 400 V distribution line

7 Most high-voltage overhead lines, ie greater than 1000 V (1000 V = 1 kV) have wires that are bare and uninsulated but some have wires with a light plastic covering or coating. All high-voltage lines should be treated as though they are uninsulated. While many low-voltage overhead lines (ie less than 1 kV) have bare uninsulated wires, some have wires covered with insulating material. However, this insulation can sometimes be in poor condition or, with some older lines, it may not act as effective insulation; in these cases you should treat the line in the same way as an uninsulated line. If in any doubt, you should take a precautionary approach and consult the owner of the line.

8 There is a legal minimum height for overhead lines which varies according to the voltage carried. Generally, the higher the voltage, the higher the wires will need to be above ground (see Figure 4). Equipment such as transformers and fuses attached to wooden poles and other types of supports will often be below these heights. There are also recommended minimum clearances published by the Energy Networks Association (ENA Technical Specification 43–8 *Overhead Line Clearances*)[1] between the wires and structures such as buildings and lamp posts.

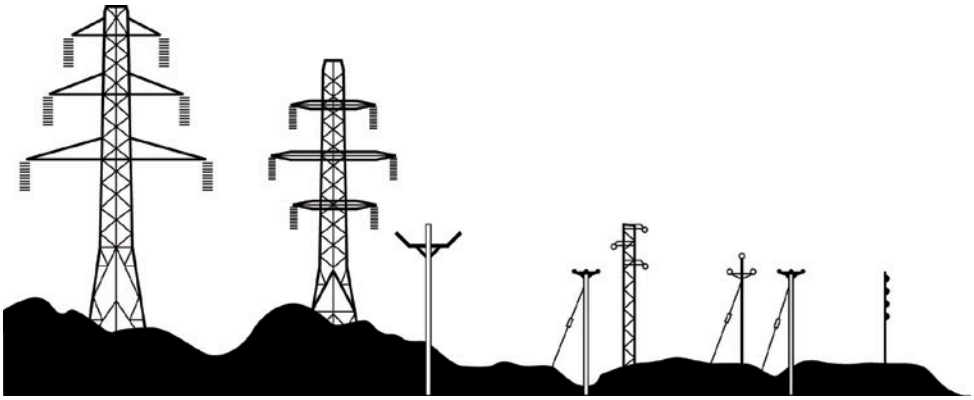


Figure 4 Minimum heights above ground level for overhead power lines

What does the law require?

9 The law requires that work may be carried out in close proximity to live overhead lines only when there is no alternative and only when the risks are acceptable and can be properly controlled. You should use this guidance to prepare a risk assessment that is specific to the site. Guidance on how to carry out a risk assessment is available at www.hse.gov.uk/toolbox/managing/managingtherisks.htm.

10 Businesses and employees who work near to an overhead line must manage the risks. Overhead line owners have a duty to minimise the risks from their lines and, when consulted, advise others on how to control the risks. The line owner will usually be an electricity company, known as a transmission or distribution network operator, but could also be another type of organisation, eg Network Rail, or a local owner, eg the operator of a caravan park. More details about legal responsibilities can be found in Annex 1.

Preventing overhead line contact accidents

11 Good management, planning and consultation with interested parties before and during any work close to overhead lines will reduce the risk of accidents. This applies whatever type of work is being planned or undertaken, even if the work is temporary or of short duration. You should manage the risks if you intend to work within a distance of 10 m, measured at ground level horizontally from below the nearest wire.

Remove the risk

12 The most effective way to prevent contact with overhead lines is by not carrying out work where there is a risk of contact with, or close approach to, the wires.

13 If you cannot avoid working near an overhead line and there is a risk of contact or close approach to the wires, you should consult its owner to find out if the line can be permanently diverted away from the work area or replaced with underground cables. This will often be inappropriate for infrequent, short-duration or transitory work.

14 If this cannot be done and there remains a risk of contact or close approach to the wires, find out if the overhead line can be temporarily switched off while the work is being done. The owner of the line will need time to consider and act upon these types of requests and may levy a charge for any work done.

Risk control

15 If the overhead line cannot be diverted or switched off, and there is no alternative to carrying out the work near it, you will need to think about how the work can be done safely. If it cannot be done safely, it should not be done at all. Your site-specific risk assessment will inform the decision. Things to consider as part of your risk assessment include:

- the voltage and height above ground of the wires. Their height should be measured by a suitably trained person using non-contact measuring devices;
- the nature of the work and whether it will be carried out close to or underneath the overhead line, including whether access is needed underneath the wires;
- the size and reach of any machinery or equipment to be used near the overhead line;
- the safe clearance distance needed between the wires and the machinery or equipment and any structures being erected. If in any doubt, the overhead line's owner will be able to advise you on safe clearance distances;
- the site conditions, eg undulating terrain may affect stability of plant etc;
- the competence, supervision and training of people working at the site.

16 If the line can only be switched off for short periods, schedule the passage of tall plant and, as far as is possible, other work around the line for those times.

17 Do not store or stack items so close to overhead lines that the safety clearances can be infringed by people standing on them.

Working near but not underneath overhead lines – the use of barriers

18 Where there will be no work or passage of machinery or equipment under the line, you can reduce the risk of accidental contact by erecting ground-level barriers to establish a safety zone to keep people and machinery away from the wires. This area should not be used to store materials or machinery. Suitable barriers can be constructed out of large steel drums filled with rubble, concrete blocks, wire fence earthed at both ends, or earth banks marked with posts.

- If steel drums are used, highlight them by painting them with, for example, red and white horizontal stripes.
- If a wire fence is used, put red and white flags on the fence wire.
- Make sure the barriers can be seen at night, perhaps by using white or fluorescent paint or attaching reflective strips.

19 The safety zone should extend 6 m horizontally from the nearest wire on either side of the overhead line. You may need to increase this width on the advice of the line owner or to allow for the possibility of a jib or other moving part encroaching into the safety zone. It may be possible to reduce the width of the safety zone but you will need to make sure that there is no possibility of encroachment into the safe clearance distances in your risk assessment.

20 Where plant such as a crane is operating in the area, additional high-level indication should be erected to warn the operators. A line of coloured plastic flags or 'bunting' mounted 3–6 m above ground level over the barriers is suitable. Take care when erecting bunting and flags to avoid contact or approach near the wires.

Passing underneath overhead lines

21 If equipment or machinery capable of breaching the safety clearance distance has to pass underneath the overhead line, you will need to create a passageway through the barriers, as illustrated in Figure 5. In this situation:

- keep the number of passageways to a minimum;
- define the route of the passageway using fences and erect goalposts at each end to act as gateways using a rigid, non-conducting material, eg timber or plastic pipe, for the goalposts, highlighted with, for example, red and white stripes;
- if the passageway is too wide to be spanned by a rigid non-conducting goalpost, you may have to use tensioned steel wire, earthed at each end, or plastic ropes with bunting attached. These should be positioned further away from the overhead line to prevent them being stretched and the safety clearances being reduced by plant moving towards the line;
- ensure the surface of the passageway is levelled, formed-up and well maintained to prevent undue tilting or bouncing of the equipment;
- put warning notices at either side of the passageway, on or near the goalposts and on approaches to the crossing giving the crossbar clearance height and instructing drivers to lower jibs, booms, tipper bodies etc and to keep below this height while crossing;
- you may need to illuminate the notices and crossbar at night, or in poor weather conditions, to make sure they are visible;
- make sure that the barriers and goalposts are maintained.

Figure 5 Typical passageway through barriers

22 On a construction site, the use of goalpost-controlled crossing points will generally apply to all plant movements under the overhead line.

Working underneath overhead lines

23 Where work has to be carried out close to or underneath overhead lines, eg road works, pipe laying, grass cutting, farming, and erection of structures, and there is no risk of accidental contact or safe clearance distances being breached, no further precautionary measures are required.

24 However, your risk assessment must take into account any situations that could lead to danger from the overhead wires. For example, consider whether someone may need to stand on top of a machine or scaffold platform and lift a long item above their head, or if the combined height of a load on a low lorry breaches the safe clearance distance. If this type of situation could exist, you will need to take precautionary measures.

25 If you cannot avoid transitory or short-duration, ground-level work where there is a risk of contact from, for example, the upward movement of cranes or tipper trailers or people carrying tools and equipment, you should carefully assess the risks and precautionary measures. Find out if the overhead line can be switched off for the duration of the work. If this cannot be done:

- refer to the Energy Networks Association (ENA) publication *Look Out Look Up! A Guide to the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines.*[2] This advises establishing exclusion zones around the line and any other equipment that may be fitted to the pole or pylon. The minimum extent of these zones varies according to the voltage of the line, as follows:
  - low-voltage line – 1 m;
  - 11 kV and 33 kV lines – 3 m;
  - 132 kV line – 6 m;
  - 275 kV and 400 kV lines – 7 m;

- under no circumstances must any part of plant or equipment such as ladders, poles and hand tools be able to encroach within these zones. Allow for uncertainty in measuring the distances and for the possibility of unexpected movement of the equipment due, for example, to wind conditions;
- carry long objects horizontally and close to the ground and position vehicles so that no part can reach into the exclusion zone, even when fully extended. Machinery such as cranes and excavators should be modified by adding physical restraints to prevent them reaching into the exclusion zone. Note that insulating guards and/or proximity warning devices fitted to the plant without other safety precautions are not adequate protection on their own;
- make sure that workers, including any contractors, understand the risks and are provided with instructions about the risk prevention measures;
- arrange for the work to be directly supervised by someone who is familiar with the risks and can make sure that the required safety precautions are observed;
- if you are in any doubt about the use of exclusion zones or how to interpret the ENA document, you should consult the owner of the overhead line.

26 Where buildings or structures are to be erected close to or underneath an overhead line, the risk of contact is increased because of the higher likelihood of safety clearances being breached. This applies to the erection of permanent structures and temporary ones such as polytunnels, tents, marquees, flagpoles, rugby posts, telescopic aerials etc. In many respects these temporary structures pose a higher risk because the work frequently involves manipulating long conducting objects by hand.

27 The overhead line owner will be able to advise on the separation between the line and structures, for example buildings using published standards such as ENA Technical Specification 43–8 *Overhead Line Clearances.*[1] However, you will need to take precautions during the erection of the structure. If the overhead line cannot be diverted or switched off then you should take account of the guidance in paragraphs 23 to 26 relating to working underneath such lines.

28 Consider erecting a horizontal barrier of timber or other insulating material beneath the overhead line to form a roof over the construction area – in some cases an earthed, steel net could be used. This should be carried out only with the agreement of the overhead line owner, who may need to switch off the line temporarily for the barrier to be erected and dismantled safely.

29 Ideally, work should not take place close to or under an overhead line during darkness or poor visibility conditions. Dazzle from portable or vehicle lighting can obscure rather than show up power lines.

Working near overhead lines connected to buildings

30 Sometimes, work needs to be carried out near uninsulated low-voltage overhead wires, or near wires covered with a material that does not provide effective insulation, connected to a building. Examples of such work are window cleaning, external painting or short-term construction work. If it is not possible to re-route or have the supply turned off, the line's owner, eg the distribution network operator, may be able to fit temporary insulating shrouds to the wires, for which a charge may be levied. People, plant and materials still need to be kept away from the lines.

Emergency procedures

31 If someone or something comes into contact with an overhead line, it is important that everyone involved knows what action to take to reduce the risk of anyone sustaining an electric shock or burn injuries. Key points are:

- never touch the overhead line's wires;
- assume that the wires are live, even if they are not arcing or sparking, or if they otherwise appear to be dead;
- remember that, even if lines are dead, they may be switched back on either automatically after a few seconds or remotely after a few minutes or even hours if the line's owner is not aware that their line has been damaged:
- if you can, call the emergency services. Give them your location, tell them what has happened and that electricity wires are involved, and ask them to contact the line's owner:
- if you are in contact with, or close to, a damaged wire, move away as quickly as possible and stay away until the line's owner advises that the situation has been made safe:
- if you are in a vehicle that has touched a wire, either stay in the vehicle or, if you need to get out, jump out of it as far as you can. Do not touch the vehicle while standing on the ground. Do not return to the vehicle until it has been confirmed that it is safe to do so;

- be aware that if a live wire is touching the ground the area around it may be live. Keep a safe distance away from the wire or anything else it may be touching and keep others away.

Industry-specific guidance

32 HSE and other organisations publish industry and sector-specific guidance based on this guidance. The main industries and sectors covered by this are construction, agriculture, horticulture, forestry and arboriculture. The Energy Networks Association (ENA), the body representing transmission and distribution network operating companies, also publishes guidance leaflets (see the References section).

Annex 1 The law

1 The Health and Safety at Work etc Act 1974 (HSW Act) places responsibilities on everyone concerned with work activities, including employers, the self-employed and employees.

Regulations:
www.legislation.gov.uk/ukpga/1974/37/contents

2 The Management of Health and Safety at Work Regulations 1999 require that:

- risks are properly assessed and controlled;
- employees are provided with adequate health and safety training;
- employers who share a workplace consult and co-ordinate with each other.

Regulations:
www.legislation.gov.uk/uksi/1999/3242/contents/made

3 Regulation 9 of The Provision and Use of Work Equipment Regulations 1998 requires all people who use work equipment to have received adequate training in the use of that equipment.

Regulations:
www.legislation.gov.uk/uksi/1998/2306/contents/made

Approved Code of Practice:

Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Third edition) HSE Books 2008 ISBN 978 0 7176 6295 1 www.hse.gov.uk/pubns/books/l22.htm

4 The Electricity at Work Regulations 1989 require precautions to be taken against the risk of death or personal injury from electricity in work activities. Regulation 14 addresses live work activities, which include working on, or so near, live overhead lines that there is a risk of injury.

Regulations:

www.legislation.gov.uk/uksi/1989/635/contents/made

Guidance:

Memorandum of guidance on the Electricity at Work Regulations 1989. Guidance on Regulations HSR25 (Second edition) HSE Books 2007 ISBN 978 0 7176 6228 9 www.hse.gov.uk/pubns/books/hsr25.htm

5 The Electricity Safety Quality and Continuity Regulations 2002 require, among other things, owners of overhead lines to ensure that they are at the appropriate height and meet certain standards.

Regulations:

www.legislation.gov.uk/uksi/2002/2665/contents/made

Guidance:

www.berr.gov.uk/files/file26709.pdf

6 The Construction (Design and Management) Regulations 2007 place duties on construction clients, designers and contractors to plan and organise work so as to avoid danger from energy distribution networks.

Regulations:

www.legislation.gov.uk/uksi/2007/320/contents/made

Approved Code of Practice:

Managing health and safety in construction. Construction (Design and Management) Regulations 2007. Approved Code of Practice L144 HSE Books 2007 ISBN 978 0 7176 6223 4 www.hse.gov.uk/pubns/books/l144.htm

References

1 ENA Technical Specification 43–8 *Overhead Line Clearances* www.energynetworks.org/electricity/

2 *Look Out Look Up! A Guide to the Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines* Energy Networks Association (ENA) www.energynetworks.org/electricity/

Further reading

Agriculture

Working safely near overhead electricity power lines Agriculture Information Sheet AIS8(rev3) HSE Books 2012 www.hse.gov.uk/pubns/ais8.htm

Safety information for farmers and agricultural contractors ENA 2007

Safety information for farmers utilising polytunnels ENA 2008

Construction

Guidance is published by HSE under the heading *Electricity – Overhead power lines* at www.hse.gov.uk/construction/safetytopics/overhead.htm

Safe use of Lorry Loaders – Best practice guide the Association of Lorry Loader Manufacturers and Importers (ALLMI) and the Construction Plant-hire Association (CPA)

Safety information for demolition companies ENA 2008

Safety information for scaffolders ENA 2007

Quarries

Guidance is published by HSE at www.hse.gov.uk/quarries/hardtarget/electricity.htm

Arboriculture and forestry

Treework web pages: www.hse.gov.uk/treework/safety-topics/power-lines.htm

Safety information for tree trimming near overhead power lines ENA 2008 http://energynetworks.squarespace.com/tree-trimming/

Landscaping and ground maintenance

Safety information for landscaping and ground maintenance workers ENA 2011

Railways

Advice in relation to railways is available at www.rail-reg.gov.uk/upload/pdf/rgd-2011-05-web.pdf

Emergency services
Safety advice for the fire service ENA 2007
[redacted]

Safety advice for the police service ENA 2007
[redacted]

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This document is available at: www.hse.gov.uk/pubns/gs6.htm.

Development near overhead lines

Planning and amenity aspects of high voltage electricity transmission lines and substations

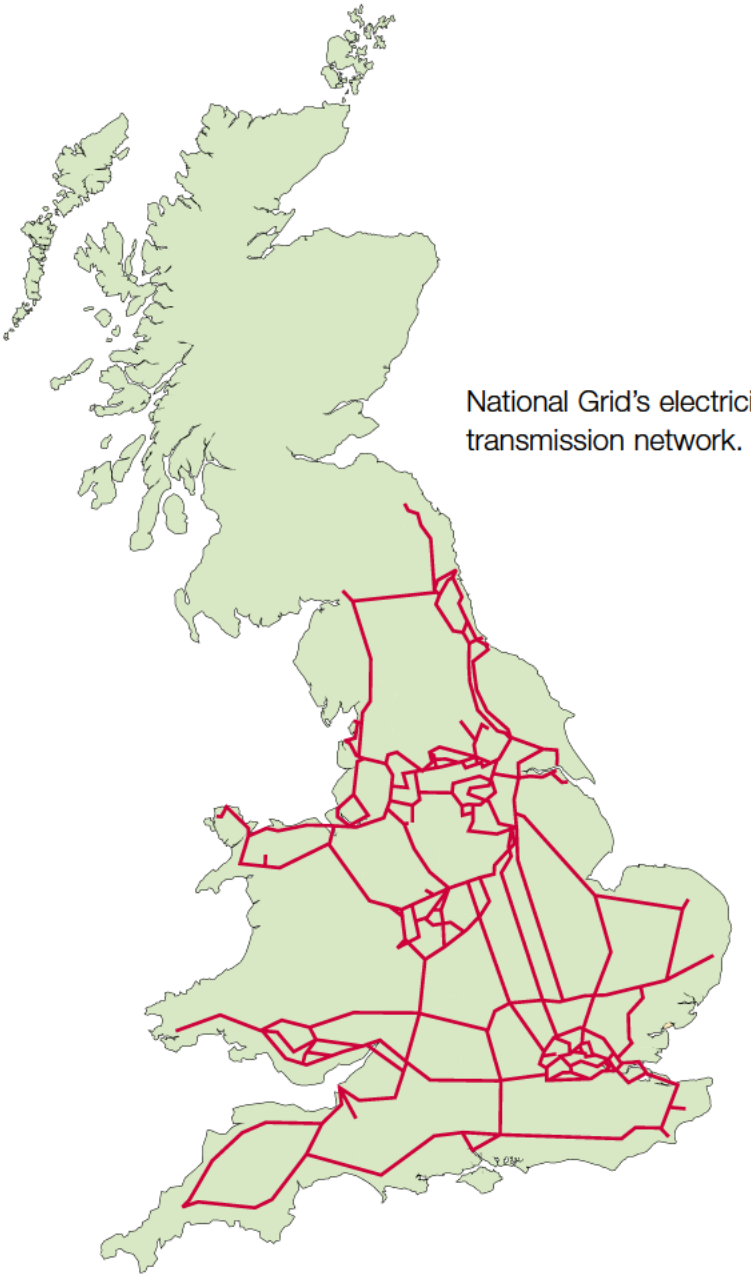
nationalgrid

Contents

This document provides information for planning authorities and developers on National Grid's electricity transmission lines and substations. It covers planning and amenity issues, both with regard to National Grid's approach to siting new equipment, and to development proposals near overhead lines and substations.

Who we are and what we do

Electricity is generated at power stations around the country. These power stations use a variety of fuels - principally coal, gas, oil, nuclear and wind - to generate electricity, and the stations are generally sited to be close to fuel and cooling water rather than to be near centres of demand.



National Grid's electricity transmission network.

Electricity is then transmitted from the power stations through a national network of electricity lines which operate at high voltage. National Grid owns the electricity transmission network in England and Wales and operates the electricity transmission system throughout Great Britain. Local distribution companies then supply electricity at progressively lower voltages to homes and businesses.

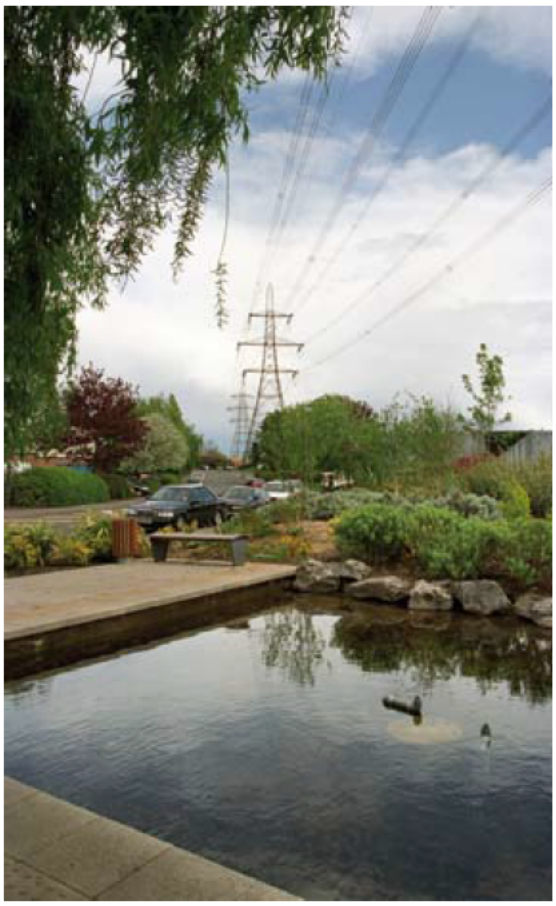
This transmission system which operates at 400,000 and 275,000 volts (400kV and 275kV) is known as the "national grid" and covers some 4,500 route miles of overhead line, 420 route miles of underground cable and more than 335 substations. The system, which connects the electricity generators' power stations with the networks of the local distribution companies, also connects with some large industrial customers who, by reason of their size and technical characteristics or location, are directly connected to the transmission system.

Under the Electricity Act 1989 National Grid is the holder of a transmission licence. It is required in this capacity to develop and maintain an efficient, coordinated and economical system of electricity transmission and to facilitate competition in the supply and generation of electricity.

Unlike virtually all other commodities, electricity cannot be stored in bulk until it is needed; it has to be generated in the right quantities, at the time it is needed. The vast majority of generating capacity in England and Wales is connected by National Grid's transmission system. This enables the operation of power stations to be coordinated, offering potential benefits of reducing the amount of spare generating capacity and generating reserve needed, and the ability to select power generation to supply the needs of the moment.

The energy industry is currently going through a period of significant change resulting in a multi-billion pound investment programme. This will encompass small and large scale electricity generation and substantial investment in energy networks to replace and upgrade ageing assets, construct new infrastructure to connect and efficiently deliver new energy sources, as well as maintaining the levels of safety and reliability to which everyone has become accustomed.

This note describes National Grid's amenity responsibilities. It briefly sets out both the amenity aspects which National Grid takes into account in siting new electricity lines and substations, and the amenity aspects which are relevant to proposed development near National Grid's electricity transmission equipment. The note goes on to explain these considerations in more detail, which we believe developers and local planning authorities may wish to take into account.



Overhead lines and substations

An electricity line consists of either an overhead line or an underground cable, or both. A typical National Grid overhead line route uses three main types of lattice steel tower (or pylon). These are:

- suspension towers which support the conductors on straight stretches of line;
- deviation towers at points where the route changes direction; and
- terminal towers where lines terminate at substations or are connected to underground cables.

Appendix II illustrates these features.

National Grid's substations are necessary for the efficient operation of the transmission system, for the specific role of switching circuits or transforming voltage. They are normally sited between power stations and the transmission network, and between the transmission network and the local distribution companies' networks. They can be sizeable developments, and including connecting terminal towers, can occupy up to 20 hectares.

However, advances in technology means that the equipment located at substations is now more compact than that of the 1950s and 1960s when many of the existing substations were built. Hence new substations are considerably smaller in size, both in height and area covered, and in certain circumstances, can be sited inside a building which resembles an industrial unit. Substations are usually contained within steel palisade fencing to ensure public safety, and the structures, excluding towers, are not usually more than 15m in height. Road access is necessary for staff, and for the transport of equipment during construction, maintenance or repair. Very occasionally, transformers or other very large items of plant may need to be moved into or out of sites as abnormal indivisible loads.

Consent procedures

National Grid is a statutory undertaker under the Town and Country Planning (General Permitted Development) Order 1995. The Order grants planning permission for certain defined classes of development. National Grid therefore has certain rights to carry out development under the Order without the need for planning permission from the local planning authority. This permitted development relates primarily to development in existing substations, on operational land and to underground cables. New substations or major extensions to existing substations may require planning permission from local planning authorities.

To construct a new overhead line in either England or Wales, National Grid requires formal consent, under section 37 of the Electricity Act 1989, from the Secretary of State for Business, Enterprise and Regulatory Reform, unless the new line is across land owned and occupied by the company. The Electricity Act 1989 contains a formal procedure for consultation with local planning authorities within whose areas the new line is proposed. If they maintain an objection to an application for section 37 consent then the Secretary of State is required to convene a public inquiry. When granting section 37 consent, the Secretary of State will usually direct that planning permission for the development will be deemed to be granted under the Town and Country Planning Act 1990.

Advice on the procedure for consulting local planning authorities is given in a Circular issued jointly by the then Department of the Environment (Circular 14/90 of that office) and the then Welsh Office (Circular 20/90).

Under its duty in the Electricity Act 1989 to facilitate competition in the supply and generation of electricity, National Grid must offer connection facilities to any new or proposed power station or plant, including offering connections to a local distribution company or major industry that requires a high voltage electricity supply. Therefore proposals for a new electricity generation project may also involve transmission works away from the power station site, such as new overhead lines, modifications to existing lines or new development at substations. These transmission works may be the responsibility of National Grid, the distribution companies or the generator itself depending upon the particular circumstances of each case.

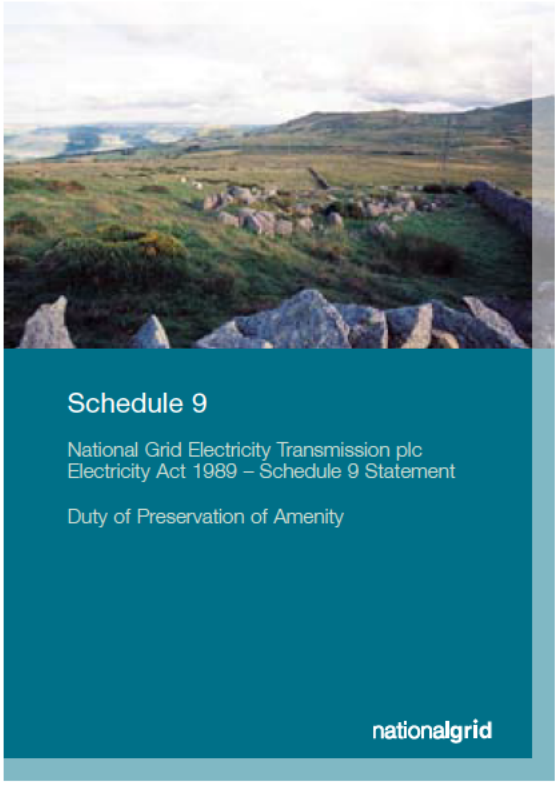
A generator promoting a new power station of over 50 megawatts generation capacity would seek consent under section 36 of the Electricity Act 1989. Although such an application would be separate from any associated transmission works, discussions between the generator and National Grid normally take place at an early stage. Indeed, National Grid would encourage prospective generators to consult it in advance of the consent process so that transmission and consent implications of the project can be fully considered.

Amenity responsibilities

Schedule 9 Statement

Under section 38 of the Electricity Act 1989, National Grid has a duty in formulating proposals for new development to "have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and shall do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects."

National Grid is also required under schedule 9 of the Act to produce and publish a statement setting out how it proposes to meet this obligation. The company's Schedule 9 Statement is available as a separate document. http://www.nationalgrid.com/uk/LandandDevelopment/SC/Responsibilities/



Environmental Impact Assessment

Overhead lines with a voltage of 220kV or more and a length of more than 15km which require consent under section 37 of the Electricity Act 1989 are included in schedule 1 of The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000 (as amended). These regulations implement European Directive 85/337/EEC as amended by Directive 91/11/EC which set out procedures for the assessment of the effects of certain projects on the environment. For all development listed in schedule 1 of the regulations, the preparation of an environmental statement is mandatory. As such National Grid will always undertake an environmental impact assessment of all new high voltage overhead line routes of more than 15km in length and submit an environmental statement.

A separate list of developments is covered in schedule 2 of the regulations. A schedule 2 development project need only be subject to environmental assessment if it is likely to have a significant effect on the environment because of its size, nature or location. The regulations state that where proposals include a high voltage overhead line or an overhead line installed in a sensitive area, the need for an environmental impact assessment will be determined on a case-by-case basis. National Grid will therefore carry out environmental impact assessments for some overhead line developments which fall into schedule 2, dependent on consultation with the relevant local planning authorities and the outcome of the screening process.

Environmental statements are not required under the legislation for new substation proposals, however National Grid has given a commitment in its' Schedule 9 Statement to undertake relevant environmental investigations and report on these in any application for consent for new works.

Routeing of overhead lines

Guidelines for the routeing of new overhead lines were originally formulated by the Central Electricity Generating Board (CEGB), a predecessor to National Grid. These guidelines have subsequently been reviewed and supplemented by National Grid and are used as the basis of the company's approach to routeing new overhead lines.

The guidelines set out the principles to be applied in the routeing of new overhead lines. They cannot be expected to cover every possible situation and each case must be considered separately and on its own merits.

The selection of any new electricity line route will be a balance of all the various factors or constraints which have to be taken into account. Any overhead line will be a visual intrusion into the landscape through which it passes, and it is the dominant scale of towers which makes them difficult to absorb into the landscape.

In selecting a route National Grid seeks to reduce the visual effect of the line in terms of the number of people affected and the degree to which they are affected. The nature and topography of the landscape is considered and any statutory protection afforded to an area is also taken into account.

The selected route will typically seek to avoid crossing the highest contours, where towers would generally be the most prominent and will take account of the quality of the landscape and its ability to accommodate an overhead line. In other words an overhead line should 'fit' into the landscape as much as that landscape permits. The extent to which opportunities exist to screen the line will depend on existing vegetation, buildings and topographic features. When viewed from principal viewpoints, an overhead line should ideally be viewed against a background of existing landscape or other development rather than against the sky.

There may be a number of potential conflicts of interest in establishing a new overhead line route. Sometimes, for example, the best route through a landscape will be to follow a river valley rather than to cross the adjacent higher land. The valley, however, is likely to be more intensively populated and also may contain the major transport routes in the area as well as the better quality agricultural land. A new line so routed could have a greater effect on a larger number of people even though its effect outside the valley may be minimal. Conversely for example, upland areas, whilst having relatively little development, are likely to have protective designations and an overhead line across such areas may be visible over a much wider area.

These are all general routeing principles. In practice, the selection of a route will very much depend on the circumstances applicable to each case.

Siting of substations

The general location of a substation is initially determined by transmission requirements and line routeing. The substation may be required to increase the supply of electricity from a power station into the national grid system for transmission; or near an urban area, it may be required as a grid supply point to reduce the voltage to lower levels for the local distribution companies. Its general location is defined by these factors.
With regard to the precise location of a substation, National Grid has guidelines to assist in siting and designing substations to mitigate their environmental effects. The substation guidelines complement National Grid's line routeing guidelines and, where appropriate, are used in conjunction with them.

Proposals for new or significant extensions to substations, do not require environmental impact assessment under Government regulations or advice. However, National Grid normally undertakes relevant environmental investigations on such proposals, and would report on these investigations in submitting any planning application to the local planning authority.

This image shows an aerial view of St. John's Wood 400kV substation in north London. Amongst other factors, design of this GIS (gas insulated switchgear) substation had to take into account land constraints in this urban area.

Development near overhead lines and substations

National Grid owns the land occupied by its substations, but only exceptionally does it own the land which is crossed by its electricity lines. The line is retained by means of either wayleave agreements or permanent easements with the landowner. National Grid has the power to maintain and renew the electricity line and to gain access for these purposes.

National Grid seeks voluntary agreements with landowners. However, when these are not forthcoming National Grid has compulsory powers and can apply to the Secretary of State for a 'necessary wayleave' for the overhead line route, or compulsory purchase of the land occupied by the cable route. In such cases a hearing will take place which provides the opportunity for all issues to be discussed. Since it does not own the land, it cannot prevent development close to or under overhead lines (although, of course, safe electrical clearances must be maintained).

It has sometimes been suggested that minimum distances between properties and overhead lines should be prescribed. National Grid does not consider this appropriate since each instance must be dealt with on its merits. However, it has always sought to route new lines away from residential property on grounds of general amenity. Since the only limitation on new development has been the statutory safety clearances (Appendix III), a large amount of residential and other development has been carried out subsequently beneath and adjacent to overhead lines.

Where development takes place and how it is designed are principally matters for the landowner, developer and the local planning authority to determine. National Grid should be consulted at an early stage on proposals for development near lines and substations, when it is more likely that National Grid's advice and guidance on development near to electricity lines issues can be taken into account.

National Grid believes that the amenity considerations which are applied in routeing overhead lines and siting substations, should be considered in respect of development proposed in the vicinity of overhead lines and substations. Such amenity and other considerations are set out below. In addition National Grid has published comprehensive site layout, design and landscaping guidelines to provide advice and pragmatic solutions for anyone involved in the planning, design and development of sites near high voltage overhead electricity lines.
Visit the Sense of Place website at:
www.nationalgrid.com/uk/senseofplace

Safety aspects

Contact by people or objects with high voltage equipment must be avoided. At substations the high voltage compound is protected by the provision of high security fencing and all of National Grid's towers have anti-climbing guards. For overhead lines a statutory minimum safety clearance must be maintained between conductors and the ground: the higher the voltage of the line, the greater the clearance which is required. Appendix III gives information on statutory safety clearances and on where further information and advice can be obtained.

Safe clearances must be maintained from buildings constructed under or adjacent to overhead lines. Safe clearances must also be maintained for trees, structures such as street lighting, new roads, and ground levels where these will be altered by civil engineering operations.

Underground cables give rise to particular safety requirements. Requirements are dependent upon cable installation methods but generally the area above cables, and a distance on either side, must be kept clear of structures and trees. Access is required for maintenance and repair. It is essential that the cables and material surrounding them should not be disturbed. Further information on cables is available on our website.

Maintenance

From time to time access is required onto land to inspect, maintain and refurbish overhead lines and underground cables. National Grid's rights of access to undertake such works are contained within the wayleave agreement or permanent easement with the landowner.

Overhead lines are inspected on a routine basis both by foot and helicopter. Climbing inspections of towers also take place. Less frequently, overhead lines are refurbished; and conductors, insulators and associated fittings may be replaced, or towers painted. Occasionally towers and their foundations may also be refurbished.

For major refurbishment, such as replacing conductors, safety scaffolding may need to be erected over underlying properties, roads and other development. Certain maintenance techniques also involve the use of helicopters.

National Grid needs quick and easy access to carry out maintenance to its equipment, to ensure that it can be returned quickly to service and be available as part of the transmission system. Such access can be difficult to obtain without inconveniencing and disturbing occupiers and residents, particularly where development is in close proximity to overhead lines.

National Grid recognises that maintenance and refurbishment activities can cause disruption and adversely affect the general amenity of those occupying buildings beneath or adjacent to overhead lines and near to cable routes. Where possible, National Grid seeks to minimise the effects of such disruption. Developers should take into account the requirement of National Grid to maintain access to its equipment.

Visual impact

Since towers are such large and dominant structures, the opportunity to mitigate their effect on new development adjacent to an existing line is restricted. Nevertheless the layout of residential and other types of development, the orientation of main views out of a building, and the location of structural site planning by the developer can assist in reducing the visual impact on residents.

For further information please visit the Sense of Place website at: www.nationalgrid.com/uk/senseofplace

The siting, design and landscape treatment of new substations takes account of existing development. Landscaping, both through the modification of ground form and by planting, can help to mitigate the visual impact of a substation. Where new development is proposed in the vicinity of existing substations, the layout and design of the development can be planned to keep the adverse visual impact of the substation to a minimum.

Noise

High voltage overhead lines and substations can generate noise, the level of which depends mainly on the voltage of the overhead line or substation.

Noise from energised overhead lines is produced by a phenomenon known as “corona discharge” (a limited electrical breakdown of the air). While conductors are designed and constructed to minimise corona discharge, surface irregularities caused by damage, insects, raindrops or pollution may locally enhance the electric field strength sufficiently for corona discharges to occur. This can be audible in certain conditions as a “crackling” sound, occasionally accompanied by a low frequency hum. The noise level generated by a high voltage overhead line is weather-related, with highest noise levels occurring during damp conditions. Overhead lines are normally quiet during dry weather, except during long, dry spells when airborne debris adheres to the conductors. Any noise disappears when sufficient rain falls to wash the debris away.

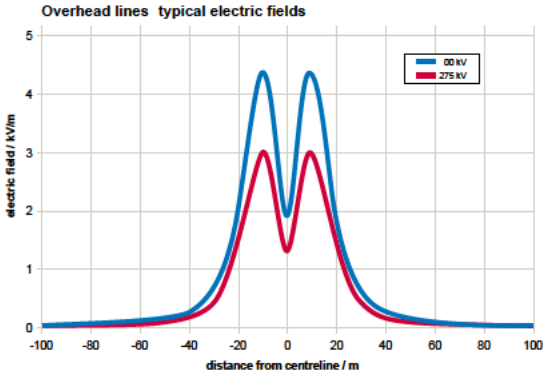
Transformers are installed at many substations, and generate low frequency hum. Whether the noise can be heard outside a substation depends on a number of factors, including transformer type and the level of noise attenuation present (either engineered intentionally or provided by other structures).

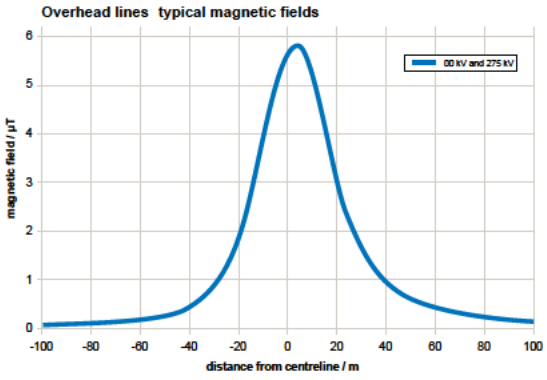
National Grid is able to provide information and advice on noise from high voltage plant to both planning authorities and developers. It is possible for the developer to mitigate significantly the effects of noise from an existing overhead line by attention to site layout and design of new developments, for example by including landscaping or by placing the noise-sensitive elements away from the high voltage plant.

The Department for Communities and Local Government Planning Policy Guidance 24 (PPG24, Planning and Noise), and Technical Advice Note (Wales) 11, guide local authorities on the use of their planning powers to minimise the adverse impact of noise. They outline the considerations to be taken into account in determining planning applications both for noise-sensitive developments and for those activities which generate noise. They also advise on the use of conditions to minimise the impact of noise.

Electric and magnetic fields

Electric and magnetic fields (EMFs) are associated with most electrical apparatus, including power lines, underground cables and domestic appliances. They diminish rapidly with distance from the source. Electric fields are associated with voltage and can cause small micro-shocks in certain instances (see “Other Electrical Effects” below). Magnetic fields vary with the current in the line or appliance. Both can be measured with appropriate meters. A separate guide to EMFs, “EMF The Facts”, is available.





While there is ongoing debate over the possibility of a hazard to health from low-level EMFs, the balance of the scientific evidence to date is against there being health effects.

The Health Protection Agency (HPA, previously the National Radiological Protection Board) is responsible for monitoring the hazards to health from all forms of radiation, and is highly respected for its independent scientific opinions. The Government relies on the scientific advice of the HPA, and has brought EMF exposure limits into force in the UK accordingly.

All of the electricity system, including all overhead lines, complies with these limits. The limits are set to prevent all established effects of EMFs on people, and the HPA advises that there is insufficient evidence of harmful effects (for example, cancer) below these levels to reduce the limits. The Government are considering whether any precautionary measures might be justified in addition to the exposure limits, based on a report from a stakeholder group called SAGE, but have not yet introduced any. Therefore, in the UK at present, there are no restrictions on EMF grounds on building close to overhead lines.

National Grid follows the advice of the Government and the HPA. National Grid recognises that some public concern exists over this matter. National Grid, together with the Energy Networks Association, can provide information on the research carried out worldwide on this subject or, alternatively, can direct interested parties to experts, independent of the electricity industry, who can provide advice and guidance.

Other electrical effects

Induced voltages

High voltage equipment produces electric fields which can cause nearby conductive objects to acquire a charge. When discharged to earth through a person touching the object, a small microshock may be experienced. For instance, a car parked under an overhead line can pick up a voltage and when a person touches it, a small spark may occur between the car and that person. Microshocks may sometimes be annoying, but are not normally regarded as dangerous or a health risk.

Metal-clad buildings and metal fences under overhead lines can similarly pick up a voltage. These should be appropriately earthed to reduce the effect of such voltages.

Magnetic fields from power cables and overhead lines can also induce voltages on conductive services, such as pipelines or telecommunication cables, that run parallel and close by. These voltages can be significant if the length of parallelism is considerable. In such cases, an assessment of the impacts of induced voltages will be required and National Grid should be consulted for further advice.

At petrol filling stations and other sites where flammable materials are stored, where spark discharges can be a safety hazard, appropriate electrical screening and earthing of the site may be required if it is located under a high voltage overhead power line. A safety assessment should be carried out with the effects of the nearby power line taken into account, and National Grid consulted for further advice.

Computer screen interference
Some monitors or display screens used with computers suffer a distortion of the displayed image, usually a “flicker” or “wobble” in the presence of 50 Hz magnetic fields above about 0.5 microteslas. Such magnetic fields can be found around most electrical equipment, including high voltage overhead power lines. The magnitude of interference will be dependent on the proximity and orientation of the display screen to the overhead line and the magnitude of current flowing in the line. Flat Screen Displays are not affected.

Distribution wiring in buildings and adjacent equipment can also generate a magnetic field of sufficient level to interact with computer screens.

For existing equipment that is being affected, there are techniques available that can reduce the interference. National Grid can provide information and advice to minimise interference to computer screens in the design and layout of new buildings. If Flat Screen Displays are specified for new installations, the need for any such mitigation will be removed.

Electromagnetic compatibility (EMC) issues
Some electronic and radio communications equipment may be susceptible to the electromagnetic fields and low level radio noise produced by high voltage equipment. Generally, it is easier and less costly to design and plan to avoid EMC issues than it is to correct the problems after they have arisen. As such, it would be prudent for the electromagnetic environment to be taken into consideration when new electronic equipment is being specified.

The locations of television and radio aerials relative to high voltage electricity transmission lines or substations can sometimes result in poor reception. The careful siting of such aerials can usually resolve this issue.

Development plan policy

Many of the considerations which have given rise to National Grid's approach to the siting of substations and the routeing of lines are also relevant to proposals for development close to such high voltage plant.

Some local planning authorities have included policies in their development plan documents which state that, when considering new development, the effect of overhead lines on amenity should be taken into account. National Grid believes that this is an appropriate approach. While National Grid cannot control development (except for safety reasons) under and adjacent to lines, it believes that there are operational benefits to National Grid, and amenity benefits to potential occupiers and the local community, in controlling the siting of such development.

National Grid will support policies in development plan documents which seek to control, on amenity grounds, built development under and immediately adjacent to lines. National Grid is pleased to be consulted on relevant development plan policies and wishes to encourage dialogue with local planning authorities in order to achieve these objectives.

National Grid cannot support policies or proposals in development plans which rely on EMF and related health concerns as justification to control or direct development and will therefore continue to make representations against such policies.

As previously stated, it is National Grid's policy to adhere to HPA (previously NRPB) guidelines.

By appropriate site design it is often possible to incorporate amenity areas free of built development along a overhead line route and round a substation without sterilising significant areas of land. Appropriate uses for this land are public open space; nature conservation; or structural landscaping in residential areas, or for parking and storage in employment areas. For further information please visit the Sense of Place website at: www.nationalgrid.com/uk/senseofplace

National Grid wishes to encourage local planning authorities to consult it on draft development plan documents and on planning applications. It would particularly welcome discussions early in the development plan documents process.

Appendix I

Glossary

The following terms are generally used by National Grid in relation to its transmission equipment:

Cable
An insulated conductor designed for underground electricity transmission or distribution.

Central Electricity Generating Board (CEGB)
Until March 1990, the CEGB was responsible for the generation of electricity in bulk and the transportation of this power through a nation-wide transmission system called the national grid to the then Area Boards.

Circuit
Term used to describe specific electrical paths on the transmission system. i.e. Overhead Line.

Conductor
Wire strung between towers, used for transmitting electricity.

Damper
Metal devices fixed to insulators to avoid conductor damage in windy conditions which can cause vibration of the conductors.

Development Plan Documents (DPDs)
Planning documents prepared by local planning authorities to outline key development goals. DPDs cover the core strategy for the area, a proposals map and site-specific development allocations.

Earth wire
Wire strung between the tops of towers, used for lightning and system protection. This wire may also be used to carry telecommunication signals.

Electricity line
Either an overhead line or an underground cable used to transmit electricity.

Electric and magnetic fields (EMFs)
Electric and magnetic fields (EMFs) are produced by any electrical apparatus, including domestic appliances and overhead power lines.

Flashover
A disruptive electrical discharge between equipment at phase voltage and earth, or between two phases, including breakdown across the surface of an insulator as well as sparkover through air.

High voltage
275,000 volts and over. National Grid's transmission lines generally operate at 275,000 volts and 400,000 volts. Lower voltage lines, such as 132,000 volts and 33,000 volts are generally owned by local distribution companies.

Insulator
Used to attach the conductors to the towers preventing electrical discharge to the steelwork. Usually made from porcelain or glass units, joined together to form an insulator string.

kV
Kilovolt (one thousand volts).

Local distribution companies
Generally own and operate lines with a voltage of 132,000 volts and below and supply electricity to homes and businesses.

MW
Megawatt (one million watts or one thousand kilowatts).

Outage
The withdrawal from service of any part of the transmission system for a period of time in connection with repair, maintenance, or construction of the transmission system.

Permanent easement
Legal right in perpetuity granting National Grid the right to install, use and maintain its equipment. A permanent easement is granted in exchange for a one-off capital payment. Also known as a Deed of Grant of Easement.

Pylon
See tower.

Refurbishment
Repair and renewal of conductors, earthwire, fittings and insulators and where necessary remedial works to the tower and foundations.

Route mile
The length, measured in miles, of the transmission line which connects two or more points on a transmission system, irrespective of the number of circuits of which the line is comprised.

Spacer
Metal device which maintains conductor separation at intervals along the span between towers.

Substations
Transforming or switching stations to control the voltage and direction of electricity. Transforming stations are used to increase the supply of electricity (to 275kV or 400kV) into the national grid system for transmission, and to reduce the voltage to lower levels (to 132kV) for distribution by the local distribution companies. Switching controls the direction of electricity and ensures fault protection.

System security
The ability of a transmission or distribution system to withstand a disturbance and/or the loss of certain circuits.

Tower
Overhead line structure used to carry overhead electrical conductors, insulators and fittings. They are commonly known as pylons and are of a lattice steel construction. See Appendix II.

Wayleave agreement
A licence granted by the owner and occupier of land giving National Grid the right to install, use and maintain its equipment. Terms of the Wayleave Agreement provide for the annual rental and compensation payments to be made.

Appendix II

Main features of a transmission line

National Grid uses a variety of tower designs for the support of overhead line conductors which transmit high voltage electricity from generating stations to where it is needed.

The national grid until the late 1950s consisted of a series of overhead lines at a voltage of up to 132kV. As demand grew, a system of 275kV lines was developed to feed the major conurbations. This system was further developed and uprated to 400kV in the 1960s. A 400kV line carries about three times as much power as a 275kV line, and about 18 times that of a 132kV line depending on the precise line designs. Local distribution companies generally own and operate lines with a voltage of 132kV and below.

Figure 1 shows National Grid's L2 and L6 double circuit towers which are those most widely in use for high voltage transmission. The L2, a typical transmission tower from the 1950s, carried steel-reinforced aluminium conductors in pairs from each insulator. When quadruple conductors were introduced in the 1960s, larger and more substantial towers were needed. The L6 designs were then introduced. The development of lighter all aluminium alloy conductors allowed the smaller L12 design to be brought into use in the 1980s.

The size, height and spacing of towers are determined by safety, topographical, operational and environmental considerations.

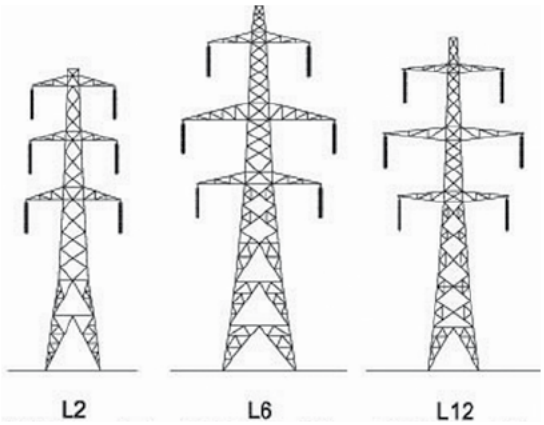


Figure 1: Typical suspension towers

A typical National Grid overhead line route will involve the use of three main types of tower. They are as follows:

- Suspension towers – these support the conductor on straight stretches of line. Conductors are suspended by a vertical insulator string
- Deviation towers – these occur at points where the route changes direction. Conductors are attached by horizontal insulator strings
- Terminal towers – these towers are of greater bulk in order to ensure stability. They occur at the end of overhead lines where they connect with substations or underground cables.

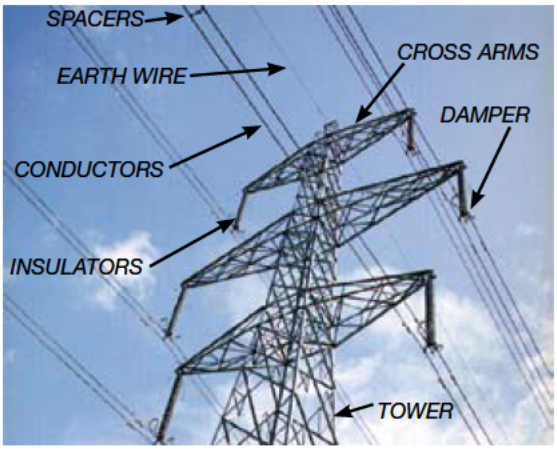


Figure 3: The main features of a transmission line

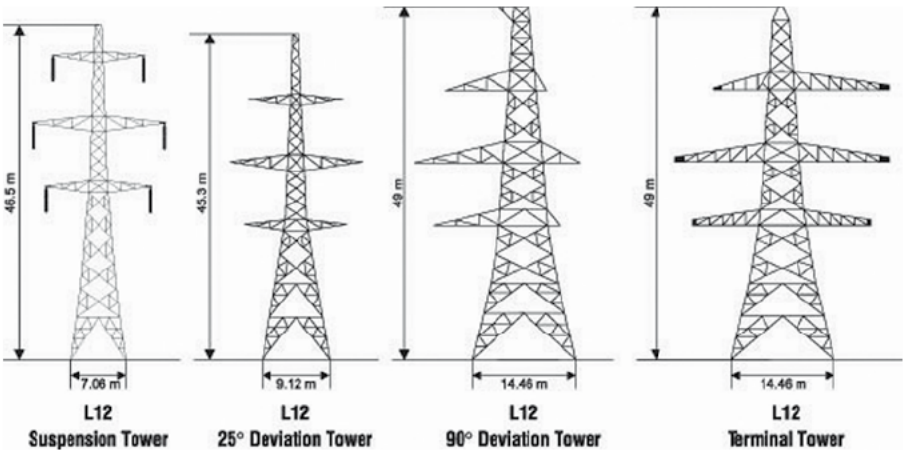


Figure 2: Typical towers in a 400kV route

Appendix III

Safety clearances

Making contact or near contact with overhead lines is dangerous. Overhead electric conductors are normally bare (uninsulated) and if an object approaches too closely it is possible that a flashover will occur and an electric current flow with the likelihood of fatal or severe shock and burns to any person nearby. In order to prevent such incidents minimum safety clearance for overhead lines are prescribed.

Overhead transmission lines must conform to the specifications contained in the Electricity Safety, Quality and Continuity Regulations 2002. The minimum heights at which the conductors are strung between towers are given for lines operating at specified voltages.

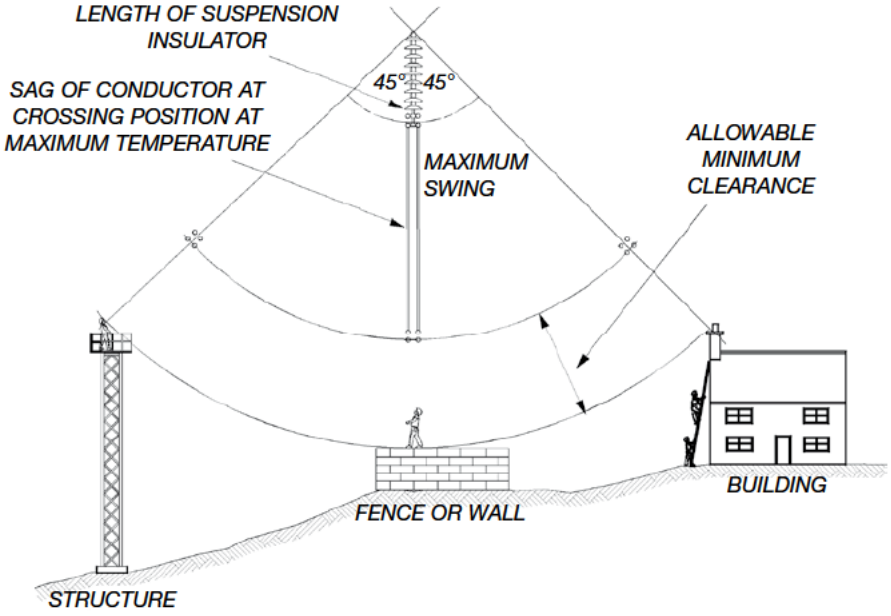


Figure 4: Clearance to objects (on which a person can stand)

Overhead lines are also constructed to conform with the Energy Networks Association's (ENA's) technical specifications which govern the minimum clearance to be maintained between the conductors, ground, roads, trees and objects on which a person may stand. A summary of ENA's Technical Specification 43-8 "Overhead Line Clearances" is given in table 1, the application of safety clearances are illustrated in figures 4, 5 and 6. The minimum clearance to ground for a 400,000 volt line is 7.6m and for a 275,000 volt line is 7.0m.

It is important to note that the information in table 1, giving the minimum safety clearances is for illustrative purposes only. The necessary clearance at a specific location will be dependent on factors including the location the line is passing over, the line's construction, design, and its operating voltage. It is therefore important to contact National Grid where it is intended to construct or alter the ground levels within the vicinity of a National Grid overhead line so that detailed advice on safety clearances and other relevant information may be given.

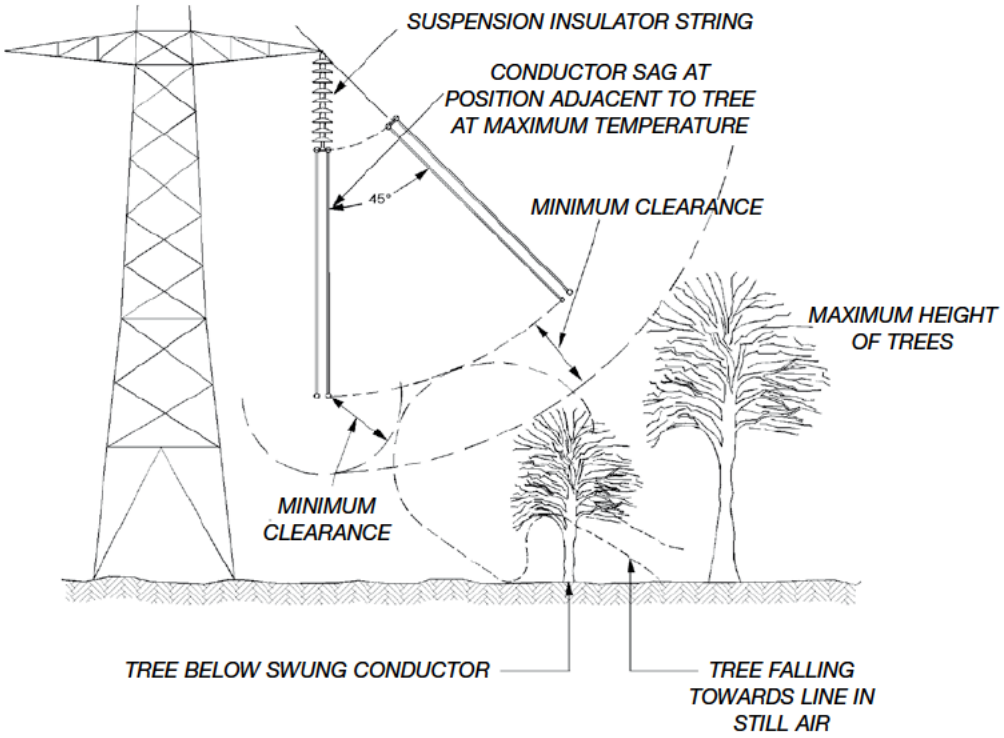


Figure 5: Clearance to trees

In order to ensure that safety clearances are not infringed where works are planned near to overhead lines, National Grid can provide profiles of the overhead line crossing specific sites which detail the height above ground of the lowest conductor. Line profiles are drawn at the time of construction to illustrate the position of the conductors at maximum sag. The position of the conductors at maximum swing should also be taken into account.

Developments adjacent to overhead lines should be designed to facilitate their construction without infringing electrical safety clearances. Care should be taken when unloading, stacking or moving material under conductors. Those involved should be acquainted with the Health and Safety Executive Guidance Notes GS6(rev) and HSG47 which advises on the avoidance of danger from overhead electrical lines and underground services respectively.

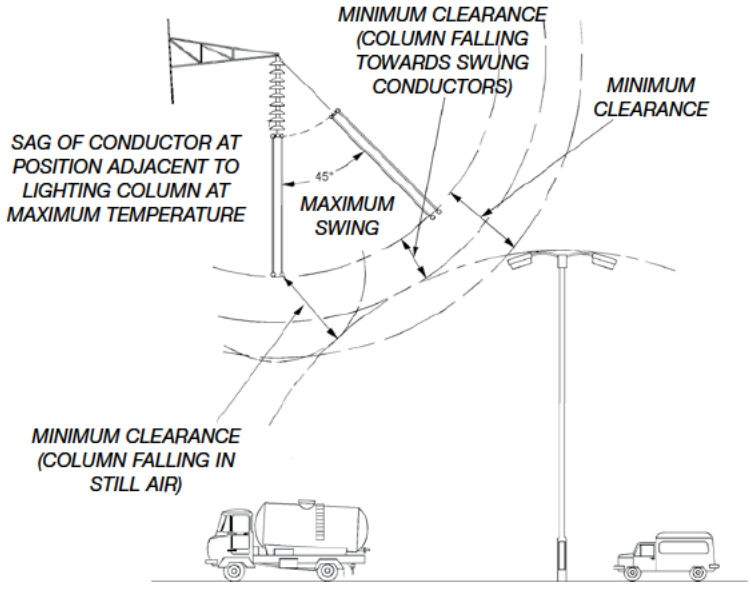


Figure 6: Clearance to lighting columns

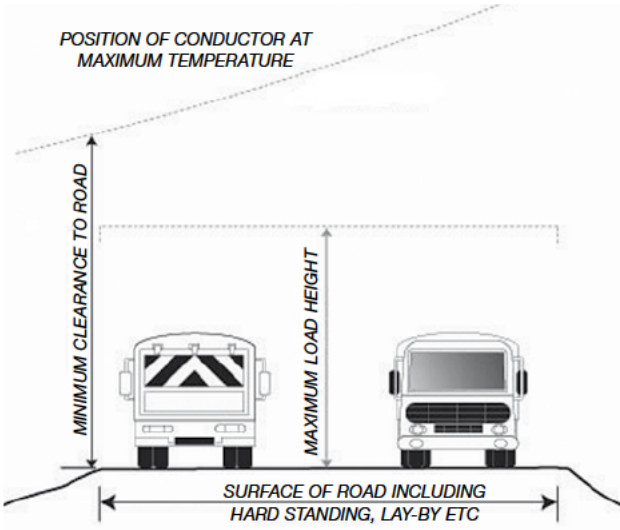


Figure 7: Clearance to roads

Table 1: Overhead line conductor clearances

Description of Clearance	Minimum clearance (metres) at 400kV	Minimum clearance (metres) at 275kV
To ground	7.6	7.0
To normal road surface	8.1	7.4
To road surface of designated '6.1 metres high load' routes	9.2	8.5
To motorway or other road surface where Skycradle can be used	10.5	9.8
To motorway road surface where scaffolding is to be used on: (i) Normal 3 lane motorways (ii) Elevated 2 lane motorways	 16.3 13.3	 15.6 12.6
To any object on which a person may stand including ladders, access platforms etc.	5.3	4.6
To any object to which access is not required AND on which a person cannot stand or lean a ladder	3.1	2.4
To trees under or adjacent to line and: (i) Unable to support ladder/climber (ii) Capable of supporting ladder/climber (iii) Trees falling towards line with line conductors hanging vertically only	 3.1 5.3 3.1	 2.4 4.6 2.4
To trees in orchards and hop gardens	5.3	4.6
To irrigators, slurry guns and high pressure hoses	30.0	30.0
To street lighting standards with: (i) Standard in normal upright position (ii) Standard falling towards line with line conductors hanging vertically only (iii) Standard falling towards line	 4.0 4.0 1.9	 3.3 3.3 1.4

References

a) The Electricity Safety, Quality and Continuity Regulations 2002 (S.I. 2002 No 2665).
b) Energy Networks Association Technical Specification 43-8 Issue 3, 2004 - Overhead Line Clearances.
c) Health & Safety Executive Guidance Note GS6(rev) - Avoidance of danger from overhead electrical lines.
d) Health & Safety Executive Guidance Note HSG47 - Avoiding danger from underground services (Second edition).

Contacts and further information

A. For planning application consultations, developer enquiries and advice on safety clearances, please contact the following:
Asset Protection Team
National Grid
Land and Development
PO Box 3484
Warwick
CV34 6TG
Switchboard: 0800 731 2961
Fax: 01926 656574

B. For development plan document consultations, general town and country planning and amenity issues, please contact the following:
Land and Development Stakeholder and Policy Manager
National Grid
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA
Tel: 01926 653000
Fax: 01926 656574

C. For questions on, or issues with, EMF please contact the following:
EMF Unit
National Grid
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA
Tel: 0845 7023270
Email: emfhelpline@uk.ngrid.com
Web: www.emfs.info

Land and Development
Stakeholder and Policy Team
National Grid
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

nationalgrid.com

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July 2008

Technical Guidance Note 287

Third-party guidance for working near National Grid Electricity Transmission equipment

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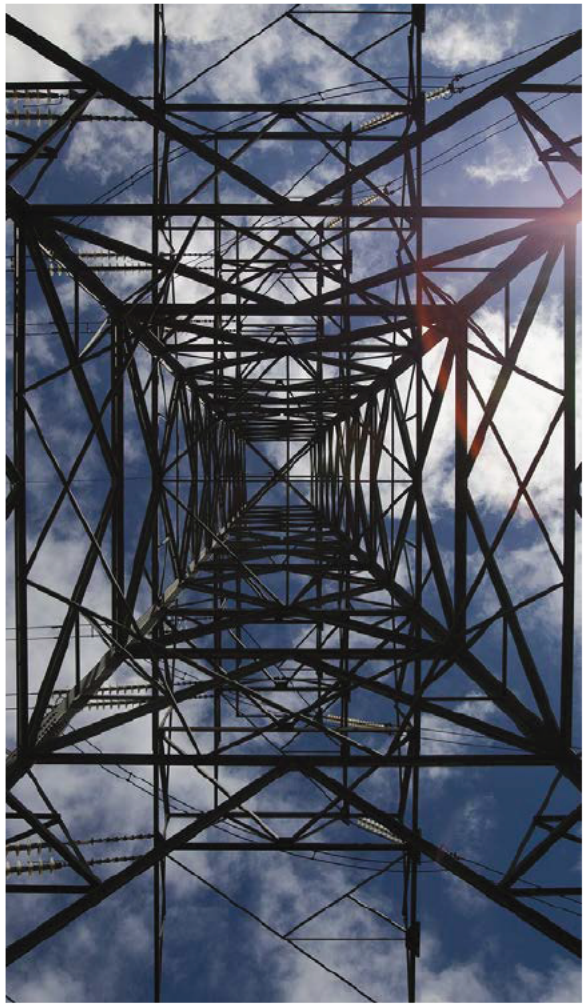


Purpose and scope

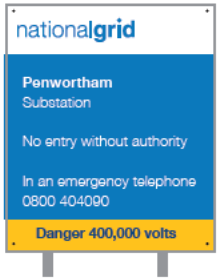
The purpose of this document is to give guidance and information to third parties who are proposing, scheduling or designing developments close to National Grid Electricity Transmission assets.

The scope of the report covers information on basic safety and the location of our assets – and also highlights key issues around particular types of development and risk areas.

In the case of electrical assets, National Grid does not authorise or agree safe systems of work with developers and contractors. However, we will advise on issues such as electrical safety clearances and the location of towers and cables. We also work with developers to minimise the impact of any National Grid assets that are nearby.

How to identify specific National Grid sites

Substations
The name of the substation and the emergency contact number will be on the site sign.



Overhead lines
The reference number of the tower and the emergency contact number will be on this type of sign.

Contact National Grid

Plant protection

For routine enquiries regarding planned, scheduled or emergency works, contact the Plant Protection team online, by email, post or phone.

www.beforeyoudig.nationalgrid.com

Email: plantprotection@nationalgrid.com

Phone: 0800 688 588

Write to:
National Grid Plant Protection
Brick Kiln Street
Hinckley
Leicestershire
LE10 0NA

Emergencies

In the event of occurrences such as a cable strike, coming into contact with an overhead line conductor or identifying any hazards or problems with National Grid's equipment, phone our emergency number 0800 404 090 (option 1).

If you have apparatus within 30m of a National Grid asset, please ensure that the emergency number is included in your site's emergency procedures.

Consider safety

Consider the hazards identified in this document when working near electrical equipment

Part 1
Electricity transmission infrastructure

National Grid owns and maintains the high-voltage electricity transmission network in England and Wales (Scotland has its own networks). It's responsible for balancing supply with demand on a minute-by-minute basis across the network.

Overhead lines
Overhead lines consist of two main parts – pylons (also called towers) and conductors (or wires). Pylons are typically steel lattice structures mounted on concrete foundations. A pylon's design can vary due to factors such as voltage, conductor type and the strength of structure required.

Conductors, which are the 'live' part of the overhead line, hang from pylons on insulators. Conductors come in several different designs depending on the amount of power that is transmitted on the circuit.

In most cases, National Grid's overhead lines operate at 275kV or 400kV.

Underground cables
Underground cables are a growing feature of National Grid's network. They consist of a conducting core surrounded by layers of insulation and armour. Cables can be laid in the road, across open land or in tunnels. They operate at a range of voltages, up to 400kV.

Substations
Substations are found at points on the network where circuits come together or where a rise or fall in voltage is required. Transmission substations tend to be large facilities containing equipment such as power transformers, circuit breakers, reactors and capacitors. Diesel generators and compressed air systems are also found there.

Part 2
Statutory requirements for working near high-voltage electricity

The legal framework that regulates electrical safety in the UK is *The Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002*. This also details the minimum electrical safety clearances, which are used as a basis for the Energy Networks Association (ENA) TS 43-8. These standards have been agreed by CENELEC (European Committee for Electrotechnical Standardisation) and also form part of the *British Standard BS EN 50341-1:2012 Overhead Electrical Lines exceeding AC 1kV*. All electricity companies are bound by these rules, standards and technical specifications. They are required to uphold them by their operator's licence.

Electrical safety clearances
It is essential that a safe distance is kept between the exposed conductors and people and objects when working near National Grid's electrical assets. A person does not have to touch an exposed conductor to get a life-threatening electric shock. At the voltages National Grid operates at, it is possible for electricity to jump up to several metres from an exposed conductor and kill or cause serious injury to anyone who is nearby. For this reason, there are several legal requirements and safety standards that must be met.

Any breach of legal safety clearances will be enforced in the courts. This can – and has – resulted in the removal of an infringement, which is normally at the cost of the developer or whoever caused it to be there. Breaching safety clearances, even temporarily, risks a serious incident that could cause serious injury or death.

National Grid will, on request, advise planning authorities, developers or third parties on any safety clearances and associated issues. We can supply detailed drawings of all our overhead line assets marked up with relevant safe areas.

Part 3

What National Grid will do for you and your development

Provision of information

National Grid should be notified well in advance of any works or developments taking place near our electrical assets. We can then provide the following services:

Drawings

National Grid will provide relevant drawings of overhead lines or underground cables to make sure the presence and location of our services are known. Once a third party or developer has contacted us, we will supply the drawings for free.

Risk or impact identification

National Grid can help identify any hazards or risks that the presence of our assets might bring to any works or developments. This includes both the risk to safety from high-voltage electricity and longer-term issues, such as induced currents, noise and maintenance access that may affect the outcome of the development. National Grid will not authorise specific working procedures, but we can provide advice on best practice.

400kV

The maximum nominal voltage of the underground cables in National Grid's network

Risks or hazards to be aware of

This section includes a brief description of some of the hazards and issues that a third party or developer might face when working or developing close to our electrical infrastructure.

Land and access

National Grid has land rights in place with landowners and occupiers, which cover our existing overhead lines and underground cable network. These agreements, together with legislation set out under the *Electricity Act 1989*, allow us to access our assets to maintain, repair and renew them. The agreements also lay down restrictions and covenants to protect the integrity of our assets and meet safety regulations. Anyone proposing a development close to our assets should carefully examine these agreements.

Our agreements often affect land both inside and outside the immediate vicinity of an asset. Rights will include the provision of access, along with restrictions that ban the development of land through building, changing levels, planting and other operations. Anyone looking to develop close to our assets must consult with National Grid first.

For further information, contact Plant Protection:

Email: plantprotection@nationalgrid.com
Phone: 0800 688 588

Electrical clearance from overhead lines

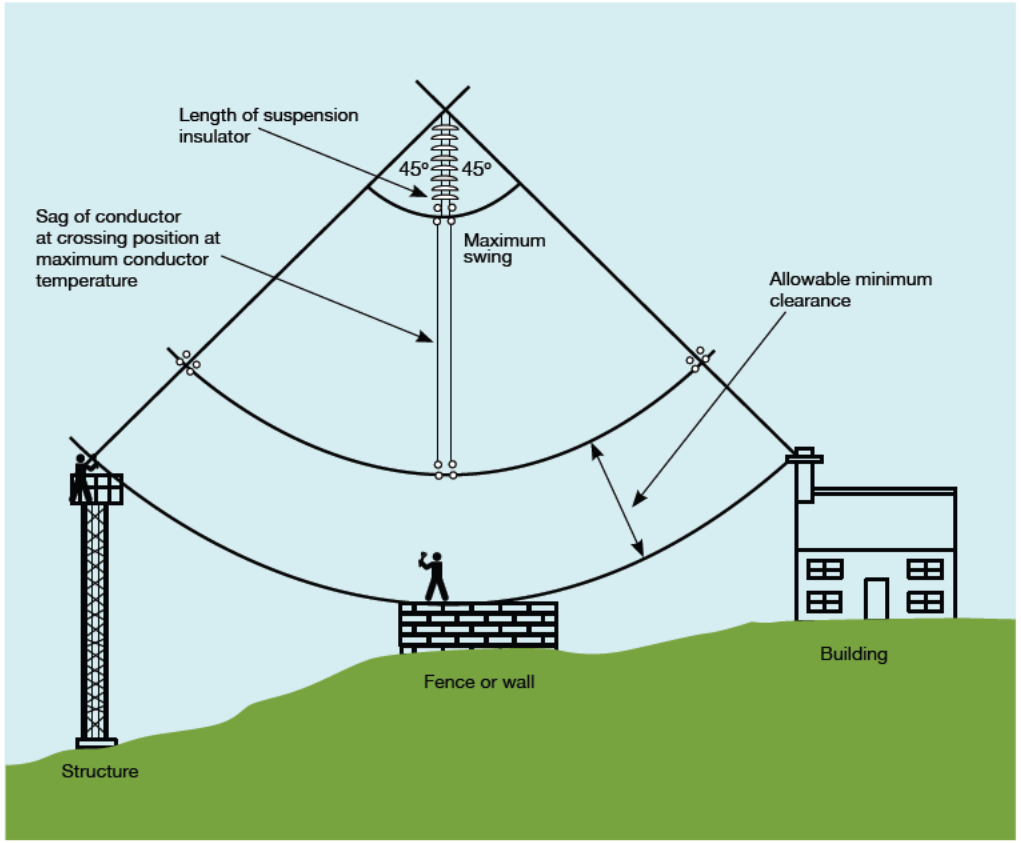
The clearance distances referred to in this section are specific to 400kV overhead lines. National Grid can advise on the distances required around different voltages i.e. 132kV and 275kV.

As we explained earlier, *Electrical Networks Association TS 43-8* details the legal clearances to our overhead lines.The minimum clearance between the conductors of an overhead line and the ground is 7.3m at maximum sag. The sag is the vertical distance between the wire's highest and lowest point. Certain conditions, such as power flow, wind speed and air temperature can cause conductors to move and allowances should be made for this.

The required clearance from the point where a person can stand to the conductors is 5.3m. To be clear, this means there should be at least 5.3m from where someone could stand on any structure (i.e. mobile and construction equipment) to the conductors. Available clearances will be assessed by National Grid on an individual basis.

National Grid expects third parties to implement a safe system of work whenever they are near overhead lines. We recommend that guidance such as *HSE Guidance Note GS6 (Avoiding Danger from Overhead Power Lines)* is followed, which provides advice on how to avoid danger from all overhead lines, at all voltages. If you are carrying out work near overhead lines you must contact National Grid, who will provide the relevant profile drawings.

Diagram not to scale



There should be at least 5.3m between the conductors and any structure someone could stand on

7.3m

The required minimum clearance between the conductors of an overhead line, at maximum sag, and the ground

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The undergrounding of electricity cables at Ross-on-Wye

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Underground cables

Underground cables operating at up to 400kV are a significant part of the National Grid Electricity Transmission network. When your works will involve any ground disturbance it is expected that a safe system of work is put in place and that you follow guidance such as *HSG 47 (Avoiding Danger from Underground Services)*.

You must contact National Grid to find out if there are any underground cables near your proposed works. If there are, we will provide cable profiles and location drawings and, if required, on-site supervision of the works. Cables can be laid under roads or across industrial or agricultural land. They can even be layed in canal towpaths and other areas that you would not expect.

Cables crossing any National Grid high-voltage (HV) cables directly buried in the ground are required to maintain a minimum seperation that will be determined by National Grid on a case-by-case basis. National Grid will need to do a rating study on the existing cable to work out if there are any adverse effects on either cable rating. We will only allow a cable to cross such an area once we know the results of the re-rating. As a result, the clearance distance may need to be increased or alternative methods of crossing found.

For other cables and services crossing the path of our HV cables, National Grid will need confirmation that published standards and clearances are met.

Impressed voltage

Any conducting materials installed near high-voltage equipment could be raised to an elevated voltage compared to the local earth, even when there is no direct contact with the high-voltage equipment. These impressed voltages are caused by inductive or capacitive coupling between the high-voltage equipment and nearby conducting materials and can occur at distances of several metres away from the equipment. Impressed voltages may damage your equipment and could potentially injure people and animals, depending on their severity. Third parties should take impressed voltages into account during the early stages and initial design of any development, ensuring that all structures and equipment are adequately earthed at all times.

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Earth potential rise

Under certain system fault conditions – and during lightning storms – a rise in the earth potential from the base of an overhead line tower or substation is possible. This is a rare phenomenon that occurs when large amounts of electricity enter the earth. This can pose a serious hazard to people or equipment that are close by.

We advise that developments and works are not carried out close to our tower bases, particularly during lightning storms.

Noise

Noise is a by-product of National Grid's operations and is carefully assessed during the planning and construction of any of our equipment. Developers should consider the noise emitted from National Grid's sites or overhead lines when planning any developments, particularly housing. Low-frequency hum from substations can, in some circumstances, be heard up to 1km or more from the site, so it is essential that developers find adequate solutions for this in their design. Further information about likely noise levels can be provided by National Grid.

Maintenance access

National Grid needs to have safe access for vehicles around its assets and work that restricts this will not be allowed. In terms of our overhead lines, we wouldn't want to see any excavations made, or permanent structures built, that might affect the foundations of our towers. The size of the foundations around a tower base depends on the type of tower that is built there. If you wish to carry out works within 30m of the tower base, contact National Grid for more information. Our business has to maintain access routes to tower bases with land owners. For that reason, a route wide enough for an HGV must be permanently available. We may need to access our sites, towers, conductors and underground cables at short notice.

30m

If you wish to carry out work within this distance of the tower base, you must contact National Grid for more information

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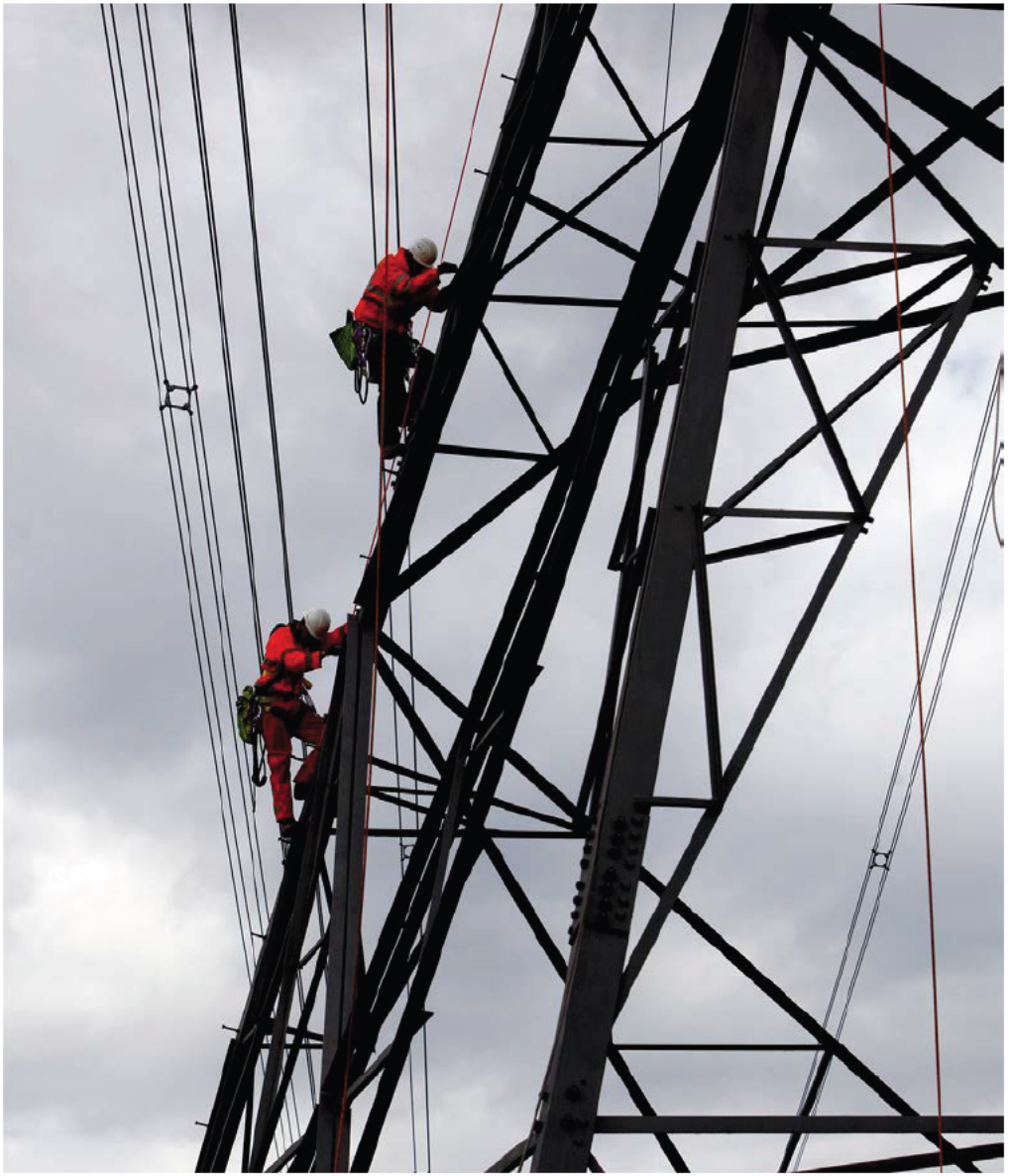

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Fires and firefighting

National Grid does not recommend that any type of flammable material is stored under overhead lines. Developers should be aware that in certain cases the local fire authority will not use water hoses to put out a fire if there are live, high-voltage conductors within 30m of the seat of the fire *(as outlined in ENA TS 43-8)*.

In these situations, National Grid would have to be notified and reconfigure the system – to allow staff to switch out the overhead line – before any firefighting could take place. This could take several hours.

We recommend that any site which has a specific hazard relating to fire or flammable material should include National Grid's emergency contact details (found at the beginning and end of this document) in its fire plan information, so any incidents can be reported.

Developers should also make sure their insurance cover takes into account the challenge of putting out fires near our overhead lines.

Excavations, piling or tunnelling

You must inform National Grid of any works that have the potential to disturb the foundations of our substations or overhead line towers. This will have to be assessed by National Grid engineers before any work begins.

BS ISO 4866:2010 states that a minimum distance of 200m should be maintained when carrying out quarry blasting near our assets. However, this can be reduced with specific site surveys and changes to the maximum instantaneous charge (the amount of explosive detonated at a particular time).

All activities should observe guidance layed out in *BS 5228-2:2009*.

Microshocks

High-voltage overhead power lines produce an electric field. Any person or object inside this field that isn't earthed picks up an electrical charge. When two conducting objects – one that is grounded and one that isn't – touch, the charge can equalise and cause a small shock, known as a microshock. While they are not harmful, they can be disturbing for the person or animal that suffers the shock.

For these reasons, metal-framed and metal-clad buildings which are close to existing overhead lines should be earthed to minimise the risk of microshocks. Anything that isn't earthed, is conductive and sits close to the lines is likely to pick up a charge. Items such as deer fences, metal palisade fencing, chain-link fences and metal gates underneath overhead lines all need to be earthed.

For further information on microshocks please visit **www.emfs.info.**

200m

The minimum distance that should be maintained from National Grid assets when quarry blasting

Specific development guidance

Wind farms

National Grid's policy towards wind farm development is closely connected to the *Electricity Networks Association Engineering Recommendation L44 Separation between Wind Turbines and Overhead Lines, Principles of Good Practice.* The advice is based on national guidelines and global research. It may be adjusted to suit specific local applications.

There are two main criteria in the document:

(i) The turbine shall be far enough away to avoid the possibility of toppling onto the overhead line

(ii) The turbine shall be far enough away to avoid damage to the overhead line from downward wake effects, also known as turbulence

The toppling distance is the minimum horizontal distance between the worst-case pivot point of the wind turbine and the conductors hanging in still air. It is the greater of:

- the tip height of the turbine plus 10%
- or, the tip height of the turbine plus the electrical safety distance that applies to the voltage of the overhead line.

To minimise the downward wake effect on an overhead line, the wind turbine should be three times the rotor distance away from the centre of the overhead line.

Wake effects can prematurely age conductors and fittings, significantly reducing the life of the asset. For that reason, careful consideration should be taken if a wind turbine needs to be sited within the above limits. Agreement from National Grid will be required.

Commercial and housing developments

National Grid has developed a document called *A Sense of Place*, which gives advice to anyone involved in planning or designing large-scale developments that are crossed by, or close to, overhead lines.

The document focuses on existing 275kV and 400kV overhead lines on steel lattice towers, but can equally apply to 132kV and below. The document explains how to design large-scale developments close to high-voltage lines, while respecting clearances and the development's visual and environmental impact.

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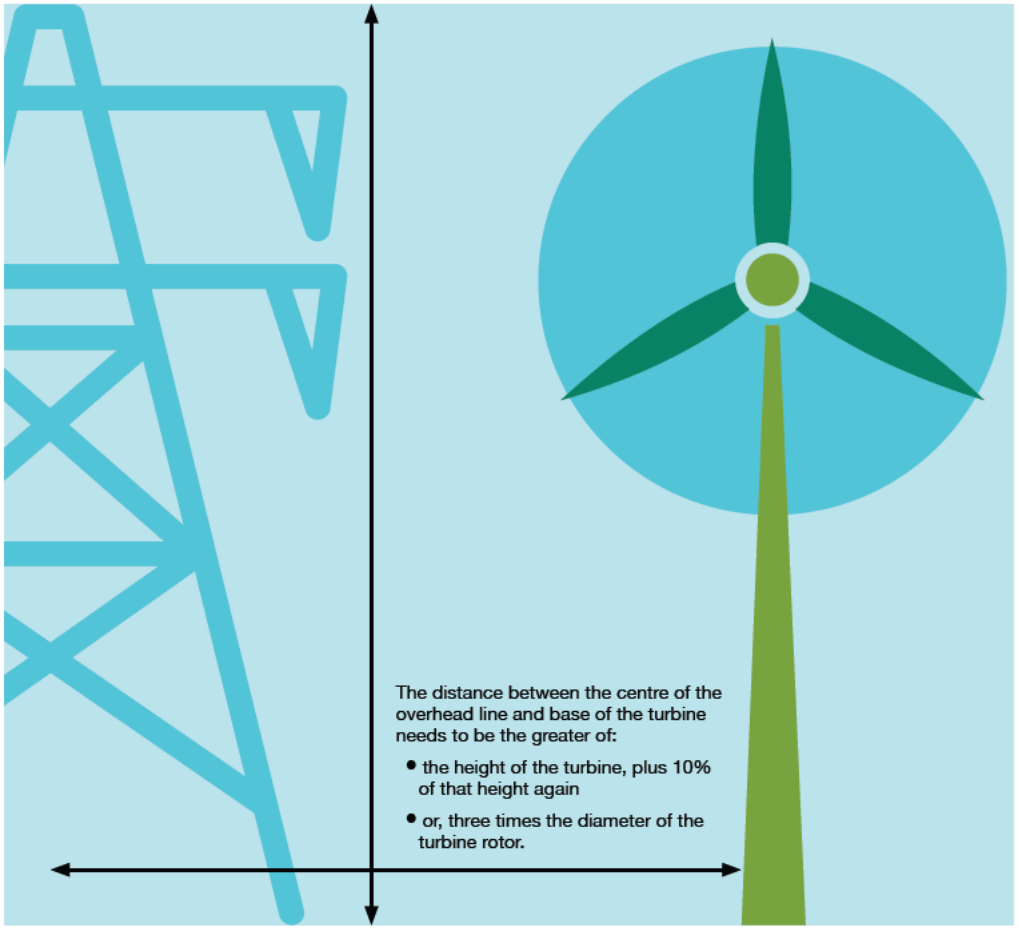
Diagram not to scale



Turbines should be far enough away to avoid the possibility of toppling onto the overhead line

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The advice is intended for developers, designers, landowners, local authorities and communities, but is not limited to those organisations.

Overall, developers should be aware of all the hazards and issues relating to the electrical equipment that we have discussed when designing new housing.

As we explored earlier, National Grid's assets have the potential to create noise. This can be low frequency and tonal, which makes it quite noticeable. It is the responsibility of developers to take this into account during the design stage and find an appropriate solution.

Solar farms

Development of solar farms is a relatively new phenomenon. While there is limited research and recommendations available, there are several key factors to consider when designing them.

Developers may be looking to build on arable land close to National Grid's assets. In keeping with the safety clearance limits that we outlined earlier for solar panels directly underneath overhead line conductors, the highest point on the solar panels must be no more than 5.3m from the lowest conductors.

This means that the maximum height of any structure will need to be determined to make sure safety clearance limits aren't breached. This could be as low as 2m. National Grid will supply profile drawings to aid the planning of solar farms and determine the maximum height of panels and equipment.

Solar panels that are directly underneath power lines risk being damaged on the rare occasion that a conductor or fitting falls to the ground. A more likely risk is ice falling from conductors or towers in winter and damaging solar panels.

There is also a risk of damage during adverse weather conditions, such as lightning storms, and system faults. As all our towers are earthed, a weather event such as lightning can cause a rise in the earth potential around the base of a tower. Solar panel support structures and supply cables should be adequately earthed and bonded together to minimise the effects of this temporary rise in earth potential.

Any metallic fencing that is located under an overhead line will pick up an electrical charge. For this reason, it will need to be adequately earthed to minimise microshocks to the public.

For normal, routine maintenance and in an emergency National Grid requires unrestricted access to its assets. So if a tower is enclosed in a solar farm compound, we will need full access for our vehicles, including access through any compound gates. During maintenance – and especially re-conductoring – National Grid would need enough space near our towers for winches and cable drums. If enough space is not available, we would require solar panels to be temporarily removed.

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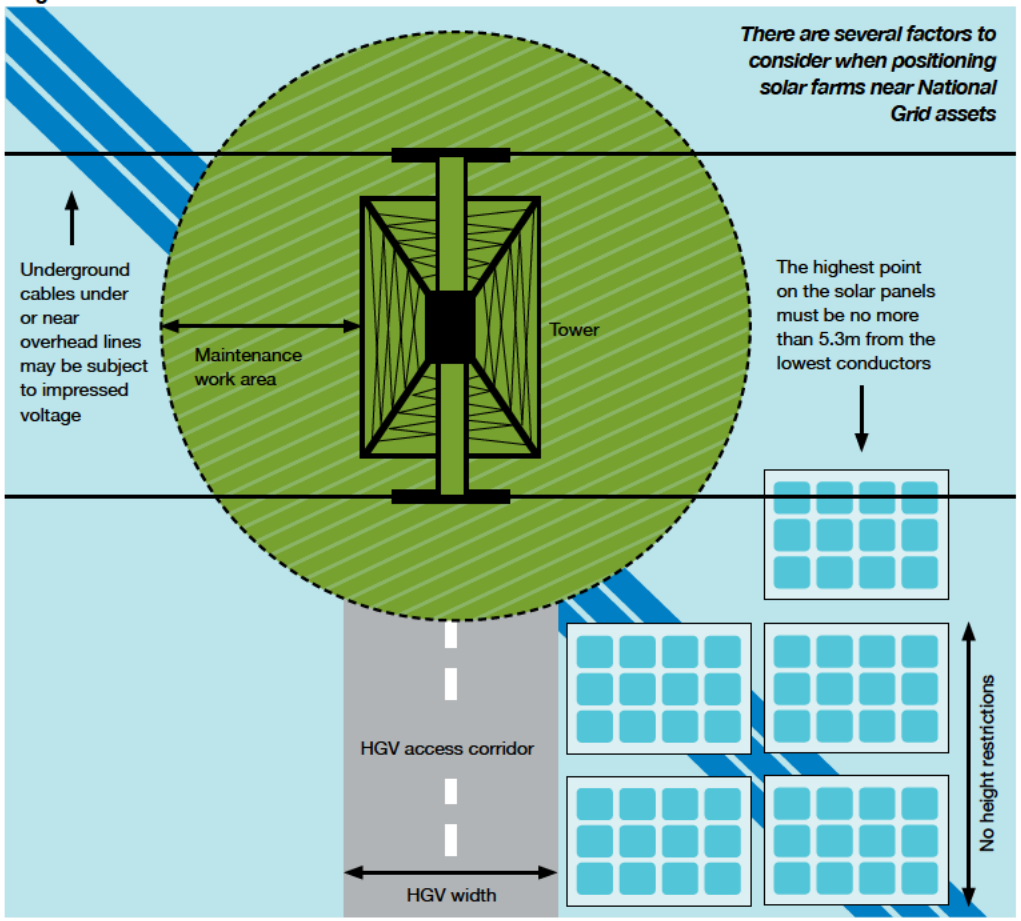

Asset protection agreements

In some cases, where there is a risk that development will impact on National Grid's assets, we will insist on an asset protection agreement being put in place. The cost of this will be the responsibility of the developer or third party.

Contact details

Emergency situations

If you spot a potential hazard on or near an overhead electricity line, do not approach it, even at ground level. Keep as far away as possible and follow the six steps below:

- Warn anyone close by to evacuate the area
- Call our 24-hour electricity emergency number: **0800 404 090 (Option 1)**[1]
- Give your name and contact phone number
- Explain the nature of the issue or hazard
- Give as much information as possible so we can identify the location – i.e. the name of the town or village, numbers of nearby roads, postcode and (ONLY if it can be observed without putting you or others in danger) the tower number of an adjacent pylon
- Await further contact from a National Grid engineer

[1] It is critically important that you don't use this phone number for any other purpose. If you need to contact National Grid for another reason please use our Contact Centre at **www2.nationalgrid.com/contact-us** to find the appropriate information or call 01926 653 000.

Routine enquiries

Email:
plantprotection@nationalgrid.com
(you will be sent an automated response to confirm receipt)

Call Plant Protection for free on:
0800 688 588

Opening hours:
Monday to Friday 08:00-16:30

Write to:
National Grid Plant Protection,
Brick Kiln Street,
Hinckley,
Leicestershire
LE10 0NA