

# Wind power: your questions answered





Gethy

## About Friends of the Earth

For more than 40 years we've seen that the well-being of people and planet go hand in hand – and it's been the inspiration for our campaigns. Together with thousands of people like you we've secured safer food and water, defended wildlife and natural habitats, championed the move to clean energy and acted to keep our climate stable. Be a Friend of the Earth – see things differently.

Come and find out more at [www.foe.co.uk](http://www.foe.co.uk)

## DID YOU KNOW?

Many environmental organisations recognise the importance of wind power as an essential component of our strategy to fight climate change, including Natural England, the RSPB and WWF. Renewable UK has worked with these organisations to provide guidance on designated areas and wind developments. See page 19 for contact details.

## Global warming: time for action

Climate change is the biggest and most urgent environmental threat we face. The greenhouse gases responsible are caused by human activity. The most important is carbon dioxide (CO<sub>2</sub>) which is produced when we burn fossil fuels such as coal, oil and gas for energy. Rising levels of CO<sub>2</sub> in the atmosphere are causing increases in global temperatures, leading to more severe weather patterns such as floods, droughts and storms, rising sea levels and threats to entire ecosystems. To avoid catastrophic climate change we must curb rising global emissions within the next 10 years. This means we need to switch to forms of energy that do not produce CO<sub>2</sub>.

In the UK around a third of our emissions of CO<sub>2</sub> come from power stations which are producing electricity. Other emissions from these stations pollute the air we breathe and contribute to acid rain which threatens wildlife. Our demand for energy is higher than ever. Even if we make massive improvements in energy efficiency, it's vital that we find cheap and clean ways of generating electricity to replace the polluting forms of energy we currently use.

**The time for action is now. We are already witnessing changes to our climate. We have to cut emissions of CO<sub>2</sub> to avert catastrophe. We can achieve this by harnessing the natural, clean and inexhaustible energy sources around us: the sun, wind and waves.**



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A modern 2.5MW turbine at a reasonable site will generate 6.5 million units of electricity each year, enough to meet the annual needs of more than 1,400 households.



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## Wind power as a source of renewable energy

Electricity generation from the wind is the best-developed of the newer renewable energy technologies and it is available now. Wind power relies on relatively simple mechanical processes, once built the running costs are very low, and it has benefited from recent technological advances in the aeronautics industry. The fuel is free and inexhaustible and there are no waste products. This means it can compete with the cost of energy based on conventional fossil fuels. And as oil and gas prices continue to rise, wind power can only become more competitive.

The UK has the greatest potential for wind power in Europe, but we have been slow to exploit it. Germany and Denmark lead the way. Wind energy could be providing almost a quarter of our electricity needs by 2020. As the UK is now a net importer of oil and gas, wind offers additional benefits in terms of secure energy supplies.

### DID YOU KNOW?

There is no safe level of exposure to nuclear radiation. Highly radioactive toxic waste from nuclear reactors will last for tens of thousands of years, and nobody knows how to store it safely. Nuclear power plants are also potentially catastrophic terrorist targets. Friends of the Earth believes nuclear power is not the solution to cutting CO<sub>2</sub> emissions.

As well as the urgent environmental need for clean energy, wind power has many social and economic benefits. Wind power creates new jobs, often in areas of high unemployment.

Friends of the Earth supports the development of wind power in the UK. We must invest in renewable energy like wind power to offset the threat of climate change and to help avoid new nuclear power stations, both of which threaten huge environmental problems for the generations that succeed us. We want to encourage wind farms which are appropriately sited, well designed and locally supported.

**Friends of the Earth believes the debate about wind power must be balanced and informed. This booklet answers some common questions about wind power and puts into perspective the arguments often used to oppose wind developments.**

Image Source



# Your questions answered

## Will building wind farms help prevent global warming?

Carbon dioxide (CO<sub>2</sub>) is the most important of the greenhouse gases which are changing our climate. If we are to avoid dangerous levels of climate change we must cut our CO<sub>2</sub> emissions by 80-90 per cent by 2050.

Wind power is a clean, renewable form of energy, which during operation produces virtually no carbon dioxide. It also emits no sulphur dioxide, the cause of acid rain. While some emissions of these gases will take place during the design, manufacture, transport and erection of wind turbines, enough electricity is generated from a wind farm within a few months to compensate for these emissions. When wind farms are dismantled (usually after 20 years of operation) they leave no legacy of pollution for future generations.

## Can wind farms produce significant amounts of electricity?

Although there are vast quantities of wind energy available, harnessing the wind involves capturing energy that is relatively diffuse in the environment. Critics claim large, centralised power stations are more efficient, and that wind power will never be able to replace them.

An individual turbine might not contribute much on a national scale, but together many can make a huge difference. The UK Government calculates that onshore wind could theoretically meet 80 per cent of our current electricity demand, and that the offshore resource could supply 10 times this amount. More conservative estimates, taking into account things like land availability, suggest an achievable figure of about 70 per cent of current electricity generation from on- and offshore wind by 2030.

### DID YOU KNOW?

The Committee on Climate Change concluded that the best way for the UK to reduce its carbon emissions on the scale needed is to make electricity generation virtually carbon-free by 2030. But overall electricity demand is likely to rise, as it is used more for heating and transport. Electric vehicles are a useful form of energy storage, as batteries can be charged at night when other demands on the grid are low but wind turbines are still generating.



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## Isn't wind power expensive and heavily subsidised?

No. The cost of generating electricity from the wind has fallen dramatically over the past few years. Wind power can now produce electricity at a cheaper price than nuclear power in the UK. Energy from the wind will become even cheaper in the future as greater experience is gained in manufacturing and developing this relatively new technology.

When the full costs of the environmental damage caused by fossil fuels and nuclear power are taken into account, wind power is an even better buy. For example, it has been estimated that if the cost of environmental damage were included, the price of electricity from coal would be three times higher than electricity from the wind. The full costs of nuclear power, including dealing with highly-radioactive waste and decommissioning of old plants, are still not included in the price of electricity after decades of operating stations in the UK, and the nuclear industry is still dependent on massive Government subsidy.

The cost to the consumer of supporting the initial development of wind power in the UK has been very small. The Non-Fossil Fuel Levy, set up at the time of electricity privatisation, supported all non-fossil fuel sources of electricity: nuclear power and renewable energy. However, almost 90 per cent of that subsidy went to the nuclear industry. The Government has replaced this arrangement with the Renewables Obligation, which requires electricity suppliers to provide up to 20 per cent of their electricity from a variety of renewable sources by 2020. The cost of the Renewables Obligation made up about 1 per cent of our household energy bills in 2010.

### DID YOU KNOW?

The UK is the windiest country in Europe but lags behind many of our European neighbours in developing this resource. By the end of 2011 Germany had installed more than 29 GW capacity of wind power, and Spain more than 21 GW. The UK was well behind with only 6.5 GW.

Other countries generate a far higher proportion of their electricity from wind. Denmark leads the way with almost 26 per cent of its annual electricity consumption coming from wind power, with Spain and Portugal each approaching 16 per cent of annual consumption from this source.

But after a slow start the UK is beginning to take its wind resource more seriously; electricity generated from the wind rose by more than half in 2011, to just over 4 per cent.

## Is electricity from the wind reliable?

It's true that wind turbines only operate when the wind blows. However, the UK is the windiest country in Europe so we have a large resource waiting to be used. Less windy countries such as Germany are already meeting more than 10 per cent of their electricity needs from wind.

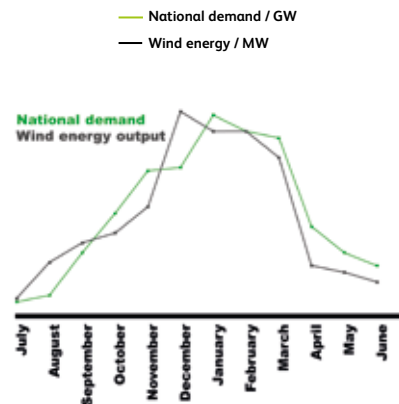
There is a lot of confusion about the reliability of different sources of electricity. No power stations are able to operate all the time without stopping. Many so-called reliable sources such as nuclear plants must be shut down, often at short notice, for essential safety maintenance. By comparison the variation in output from wind farms distributed around the country is scarcely noticeable. Wind speeds can be reliably predicted too, which allows other generation to be brought on line.

At present the National Grid can be operated effectively and economically with up to 20 per cent of the electricity capacity being provided by variable energy sources such as wind. At the levels being considered over the next few decades for wind energy production, such variability can easily be accommodated by the grid system. It is true that we could never rely on wind turbines alone to provide for all our electricity needs. But there are storage technologies we can use, such as pumped storage hydro power schemes, and other innovative solutions such as dynamic demand.

With a more flexible generation system wind farms can replace a large portion of our existing nuclear and fossil-fired electricity generation without reducing the overall reliability of our electricity supplies.

### DID YOU KNOW?

Wind energy coincides well with periods of peak electricity demand. Demand often peaks on cold, windy winter days – just when wind turbines are at their most productive. The figure below shows how well wind energy is matched to demand in a typical year.



Typical annual pattern in national demand and wind energy output

## If we saved more energy, we wouldn't need wind power, would we?

However much we improve the way we use energy, we are always going to have to generate electricity, and it is vital that we make more use of energy sources that are safe, clean, secure and renewable. Future predictions for transport indicate that we will become even more reliant on electricity, either as a direct source of power or as a means of producing hydrogen for fuel cells. Both energy efficiency and wind power have important roles to play in a sustainable energy policy of the future and have massive potential to help solve serious local, national and international environmental problems.

Friends of the Earth continues to campaign for greater investment in energy efficiency. For example, Friends of the Earth took a court case against the Government for its failure to reach the targets set in the Warm Homes and Energy Conservation Act 2000.

Danish Wind Industry Association / Flickr CC



## How much land do wind farms take up?

A typical wind farm of about 20 turbines extends over an area of about 1-2 square kilometres. But only a small fraction of this land, about 1-2 per cent, is occupied by the turbines and access tracks. The bulk of the land is unaffected and can continue to be used for agriculture, grazing, etc. To produce 10 per cent of the UK's current electricity from the wind would use about 1 per cent of the total UK land area, with the turbines occupying only about 0.02 per cent. When a wind farm has finished generating, the turbines can be dismantled, and the land returned completely to its previous use.

## Why not site wind turbines offshore?

The UK is now the world leader for offshore wind, with 15 operational offshore wind farms. A further 13 projects are being built or have planning consent, while eight more are being considered for locations around the British coast. The world's largest offshore wind farm, at Walney in Cumbria, has 102 turbines and should provide enough power to meet the demand of 320,000 homes.

But the urgent need to respond to climate change means that we'll need to use as many renewable resources as quickly as possible, including both onshore and offshore wind. At present onshore wind is one of the most economically competitive of the renewable technologies. Due to the technical hurdles of offshore construction and connection to the National Grid, the cost of delivered energy from initial offshore wind farms is estimated to be up to twice that from equivalent land-based turbines – although this is expected to fall as the industry matures. There are also other constraints on the development of offshore wind resources including a limited number of suitable locations, new consents procedures and objections from the Ministry of Defence, which are slowing progress at some of these sites.

The offshore wind resource is huge – the Government estimates it could theoretically supply today's electricity demand 10 times over. But onshore wind is currently the key technology if the UK renewable energy market is to be successful, and if the Government's target of 15 per cent of energy from renewable sources by 2020 is to be met.

### DID YOU KNOW?

Ambitious plans are afoot to build huge wind farms far offshore, connected to a Europe-wide electricity grid. The first such proposal located between the UK, Germany and the Netherlands could see 2,000 turbines generating enough electricity for eight million homes.



### DID YOU KNOW?

A group of 19 of North East England's leading energy companies have invested almost £400 million to help the region become a global hub for offshore renewable energy. The group's members employ around 6,000 people, and this is forecast to grow by 30 per cent as offshore wind activities gather pace.

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## Do wind farms create jobs?

The wind industry already provides around 10,000 full time equivalent jobs. If jobs in other industries which supply wind power developments are factored in then that figure rises to over 30,000. The Renewable Energy Association estimates that to fulfil the legally binding target of 15 per cent of energy from renewable sources by 2020 will require 400,000 jobs in the renewables industries in total. Many of these jobs are likely to be in areas which have been badly hit by recession, on top of losing their historic manufacturing base. Former steel and shipbuilding towns in the North East of England could see massive investments in new offshore wind facilities in the North Sea.

Wind farm developments can provide an important source of income for local people, helping to regenerate areas and enabling farmers to diversify, aiding rural economies.



www.cmpgry.com (Flickr CC)



## Aren't wind farms unpopular?

Many opinion polls show that the majority of people are in favour of wind power. A before and after study by the then DTI at the UK's first wind farm at Delabole in Cornwall showed that 80 per cent of those asked felt that it made no difference to their daily life. Six months after construction, 84 per cent of those living nearby were found to either approve or strongly approve of wind power. A recent survey for the Countryside Council for Wales showed that between 74 and 83 per cent of people living near three Welsh wind farms found them acceptable developments, and 70 per cent said they would be happy to have more in the area. The Scottish Executive conducted a survey of residents near four wind farms, and 74 per cent said there was nothing they disliked about the farms while 67 per cent liked something about the farms.

Some residents may be apprehensive about any proposed local developments. When accurate information and knowledge is made available, experience shows that initial concerns are reduced and support for wind farm schemes increases. In the Scottish Executive survey, 40 per cent of respondents anticipated problems prior to the development, but only 9 per cent of respondents reported experiencing any problem once it was built. Independent surveys typically show that 90 per cent of people either support wind energy developments once they are in place, or are not concerned by them.

## Do wind turbines spoil the landscape?

Friends of the Earth believes the visual appearance of wind farms cannot be ignored. The number of turbines, their layout in the landscape and whether there are other wind farms nearby (producing a cumulative visual effect) should all be considered. Areas of Outstanding Natural Beauty (AONBs) or National Parks are unlikely to be appropriate for large wind farms.

This is a highly subjective issue. Being visible is not necessarily the same as being intrusive. While some people express concern about the effect wind turbines have on the beauty of our landscape, others see them as symbols of a better, less polluted future.

The landscape we inhabit is largely man-made and it evolves over time. In comparison to developments like quarries, power stations or open cast mining, wind farms have the advantage that they can be easily removed from the landscape at the end of their lives, leaving virtually no sign that they have been there. If we don't switch to cleaner forms of energy, climate change will severely and irrevocably alter much of our landscape and the animal and plant life it contains.

Friends of the Earth believes that each project should be considered on an individual basis by the relevant planning authority and judged against planning policies that promote both renewable energy and landscape value. Local authorities should assess the potential for renewable energy in their areas and help identify sites that are appropriate for development. All significant impacts should be considered within a project's environmental assessment.

By consulting local people, avoiding the most sensitive areas, and careful siting, wind power companies can do much to ensure that turbines can be successfully integrated into our landscape.

## DID YOU KNOW?

The Planning Inspector for the Cemmaes wind farm in Wales described turbines as "elegantly designed, having clean lines with no extraneous features of visual clutter". Visitors to wind farms have variously described them as visions of the future, relaxing to watch, elegant, majestic and utterly beautiful. Surveys in Scotland and Cornwall have found most people thought wind turbines did not spoil the scenery.

## Are wind turbines noisy?

Thanks to advances in wind turbine technology, well-designed, well-sited turbines can be quiet enough to cause no disturbance to people living just a few hundred metres away. At these distances, any noise they do make is usually drowned out by the natural noise of the wind itself in trees and vegetation. To protect nearby residents from any undue disturbance, proposals to install wind turbines are required to meet strict noise standards.

Having read exaggerated claims in the press, people visiting wind farms are often surprised at how quiet they are. The Scottish Executive public opinion survey is one of several demonstrating that concerns about noise are often unfounded. Before construction of the Scottish wind farms, 12 per cent of people living near the sites thought that the turbines would cause a noise nuisance, but after construction, when people had experience of the wind farm operating, only 1 per cent thought they were noisy.

## DID YOU KNOW?

Scare stories about wind power attract press coverage and are frequently raised by the anti-wind lobby, seeking to create concerns over turbine safety by highlighting events such as loss of blades due to lightning strikes, ice falling from blades, turbines catching fire, or even blowing over in high winds. Experience with tens of thousands of wind turbines throughout the world has shown that whilst all these events are theoretically possible, they are very rare, and the risk of them occurring on a well-designed scheme is extremely small.

## Do wind farms kill birds or harm wildlife?

Siting is a crucial issue. Developers should contact specialists such as the RSPB and conduct a thorough analysis of the risk to birdlife as part of the environmental assessment of wind farm proposals. The RSPB supports wind power, and has said that from its own studies at three wind farms in Wales, “the scale of bird strike does not seem to be of serious concern”, and that wind turbines will have little effect on birds outside their main migration routes.

The RSPB objects to about only 6 per cent of the hundreds of wind turbine applications it looks at each year. The charity says: “If wind farms are located away from major migration routes and important feeding, breeding and roosting areas of those bird species known or suspected to be at risk, it is likely that they will have minimal impacts.”

Years of experience in other countries have highlighted a few specific problems where wind farms have been sited too close to high concentrations of migrant birds either feeding or roosting. When properly sited, wind turbines present no more danger to birds than other structures such as pylons or roads. Other forms of wildlife are generally not significantly affected - nor are agricultural livestock, which often graze right up to the bases of the turbine towers.

Friends of the Earth opposes development in protected areas such as Sites of Special Scientific Interest (SSSIs) unless it can be demonstrated that it will not cause damage to the special interest. However, SSSI designation does not constitute a blanket ban on development activities. In some cases the development may not cause significant impact. Friends of the Earth recommends a case-by-case approach, and caution where scientific evidence is weak. These sites and the species living there are at major risk from climate change, so cutting CO<sub>2</sub> emissions is vital for their long-term conservation.

## DID YOU KNOW?

A survey by the RSPB of Bryn Titli wind farm (near Rhayader in Wales) found no evidence of damage to local populations of red kites, buzzards, ravens, peregrines and red grouse.



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## Do wind farms interfere with television reception?

Wind farms can occasionally disrupt TV and radio signals, but any problems should be identified during the planning process and can be solved with suitable repeater equipment or TV aerial modifications. Planning authorities can ensure that developers undertake to provide the necessary equipment as part of the planning permission process.

## Aren't wind developers giant companies simply making profits for their shareholders?

Carefully developed wind power schemes can have many benefits, not just to the developer and owners, but to local communities, national energy security and global environmental protection. Friends of the Earth has been campaigning in support of a wider variety of wind projects, including small-scale and community-owned projects where local people receive a financial return from the sale of electricity, such as the Baywind cooperative in Cumbria.

Friends of the Earth would rather companies invested in renewable energy than in the fossil fuel and nuclear industries. It is only through such investment that a healthy and successful renewable energy industry will flourish in the UK.

## Can I have a wind turbine on my home?

Individual householders can now generate electricity from the wind with micro wind turbines. Performance differs widely between the different models available. However, urban areas have much lower wind speeds than open countryside and a much greater turbulence which affects their performance. It is hoped that many of these problems may be overcome by changes to turbine design. There is significant interest in vertical axis wind turbines, for example.

### DID YOU KNOW?

While the majority of wind farms are not community-owned, local communities will benefit from the job opportunities they create, and land-owners will receive an income – this can be a lifeline for struggling farmers.

Wind developers can make significant financial contributions to local facilities. See Toolkit contacts on p19.

Find out more about other renewable energy sources (such as solar, tidal, wave) and renewables being developed in your area by looking at [www.foe.co.uk](http://www.foe.co.uk)



## What is community ownership?

Community ownership is one way in which we can maximise the local benefits of renewable energy projects. By buying shares in part or all of a project local people directly benefit from the revenues raised. Community-owned wind farms are much more common in countries such as Germany and Denmark, and have contributed to a greater public acceptance of wind farms in parts of Europe. Well-known community projects in the UK include Westmill wind farm in Oxfordshire, which has five 81-metre-high turbines and was the brainchild of organic farmer Adam Twine. Read more about it at [www.foe.co.uk](http://www.foe.co.uk). Westmill is 100 per cent community owned, began generating in March 2008, and is set to power the equivalent of 2,500 homes.

## Why do we hear so much about opposition to wind farms?

Wind developments have their critics, and some of their concerns over early schemes were well-founded. However, many of the criticisms made about wind energy today are exaggerated or untrue, and reflect attempts by particular groups to discredit the technology, worry local communities and turn them against renewable energy schemes. Anti-wind groups have been particularly effective at using local media, and have been able to create emotive and divisive reaction in local communities, where sensible discussion of the issues is forgotten.

Country Guardian, the national campaign to oppose wind turbines is one of the most outspoken of anti-wind groups. As part of its argument against the need for wind power, the group questions whether action is needed to stop climate change.

### DID YOU KNOW?

In Cumbria some anti-wind groups claim that even wind farms sited offshore will deter tourists. You might think that BNFL's Sellafield site would hardly be a visitor draw, but it even has a visitor centre.

In Denmark around seven out of 10 wind turbines are owned locally.

## Wind power: clean, green energy

Friends of the Earth supports sensitively planned wind power developments. Without them we'll continue to rely on fossil fuels and nuclear power, which carry the threats of radioactive pollution, acid rain and global warming for both this and future generations. With careful planning and consultation with local people, potentially negative wind farm effects such as noise and visual intrusion can be minimised for people who don't find wind farms attractive.

Friends of the Earth is campaigning for a sustainable energy policy for the UK. This is a policy which moves away from nuclear power and fossil fuels, encourages higher levels of energy efficiency and promotes the increased use of a wide range of renewable technologies.

**Wind developments both on- and offshore have an important part to play in delivering such a policy. They will help to achieve the key objectives of environmental protection, sustainable management of our natural resources and long-term energy security.**



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## Wind power directory

The contacts below will help you find out more about wind power, or enable you to develop a community wind project. Wind is just part of the solution as we move towards an energy revolution. We will also need to develop other renewable energy sources, increase energy efficiency, and reduce our energy use...

### Support renewable energy projects in your area

You can make a big difference to local renewables projects' chances of success by lending your support. See Friends of the Earth's materials – from campaign advice to renewables projects where you live – at <http://community.foe.co.uk>

For an invaluable myth-busting guide to many commonly heard objections to wind power, see [www.foe.co.uk/resource/briefing\\_notes/wind\\_myths\\_summary.pdf](http://www.foe.co.uk/resource/briefing_notes/wind_myths_summary.pdf)

More on nuclear power on Friends of the Earth's website [www.foe.co.uk](http://www.foe.co.uk)

**RenewableUK**  
[www.bwea.com](http://www.bwea.com)

### Warwick wind trials

Independent study of performance of a number of micro wind turbines at [www.warwickwindtrials.org.uk](http://www.warwickwindtrials.org.uk)

### Community wind Energy4all Steps

Energy4all is keen to help communities establish their own wind farm projects, and has developed guidance to help you assess whether your potential project is viable: [www.energysteps.coop](http://www.energysteps.coop) [www.energy4all.co.uk](http://www.energy4all.co.uk)

### Westmill Wind Farm Co-op

This is the first onshore wind farm to be built in the south-east of England and is 100 per cent community owned. See more at [www.westmill.coop](http://www.westmill.coop)

### Partnerships for Renewables

Works with public sector bodies, to develop and manage on-site renewable energy projects. See [www.pfr.co.uk](http://www.pfr.co.uk)

### BERR toolkit

Practical advice from Delivering Community Benefits from Wind Energy Development: A Toolkit (Department for Business Enterprise and Regulatory Reform, 2009), downloadable from [www.decc.gov.uk](http://www.decc.gov.uk)

### GO VISIT

Centre for Alternative Technology, Wales. [www.cat.org.uk](http://www.cat.org.uk)

Swaffham wind turbine based in Norfolk [www.ecotricity.co.uk](http://www.ecotricity.co.uk)

Scroby Sands Visitor Centre, Great Yarmouth <http://www.eon-uk.com/generation/scrobysands.aspx>



### Save Cash & Save the Planet How Can I Stop Climate Change?

Use Friends of the Earth's favourite books to get up to speed or to explore all the ways to make a difference. Find them at [www.foeshop.co.uk](http://www.foeshop.co.uk)

**Wind power is a key tool in the effort to provide energy we can all afford. But it's often surrounded by controversy and misinformation. This booklet answers some of the most frequently asked questions about wind power – to give you the facts at your fingertips.**

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[www.foe.co.uk](http://www.foe.co.uk)