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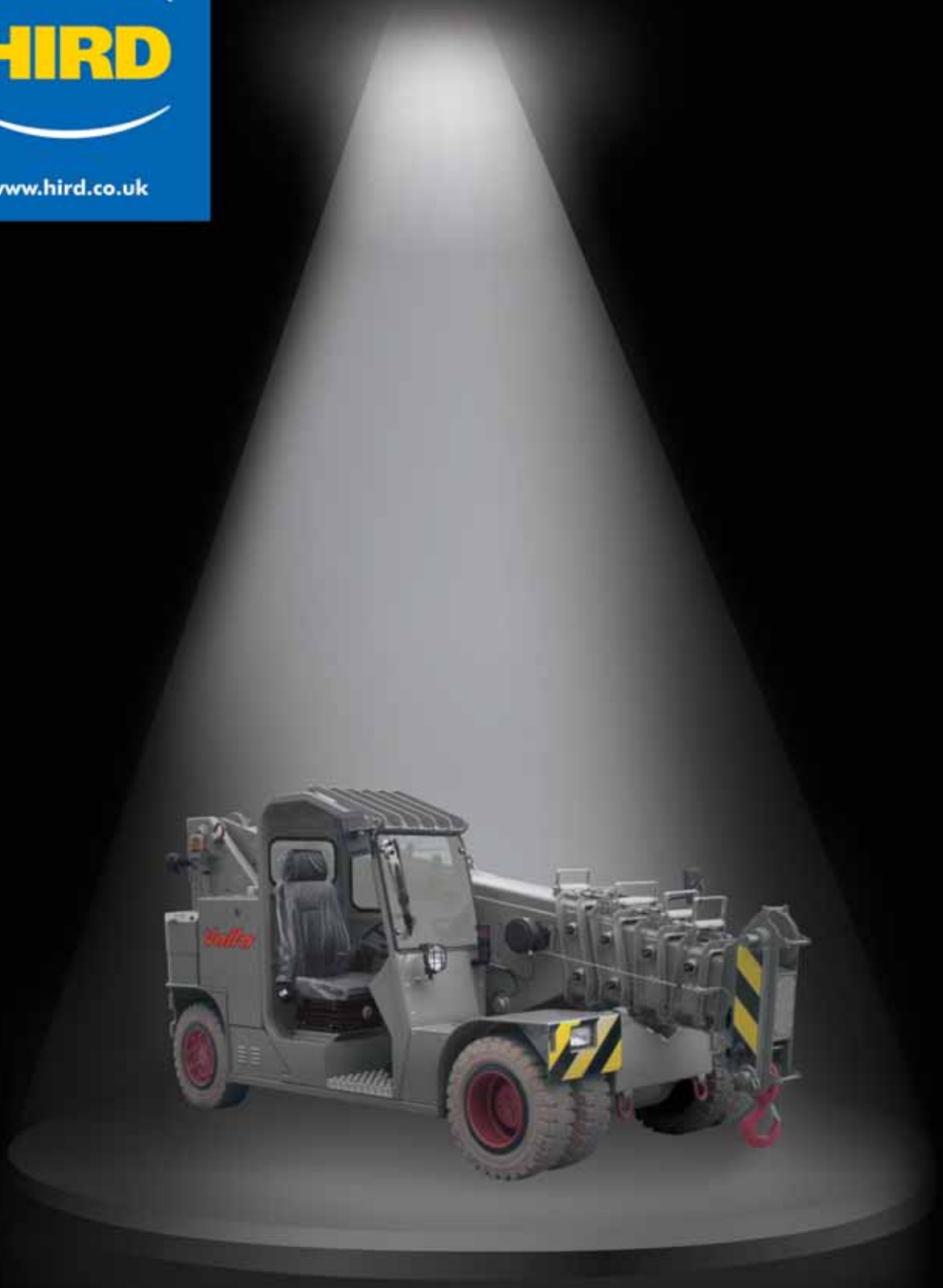

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Supply and demand

The electricity industry in each country varies in the way it generates, distributes and supplies to the consumer. In the UK for example it is split into three key areas - the generators responsible for generating the energy which then flows into the National Transmission network - the National Grid - through to regional distribution networks run by companies such as Scottish & Southern Energy, Scottish Power, Northern Powergrid, Electricity North West, Western Power Distribution and UK Power Networks.

They own and operate the network of towers and cables that transmit the electricity from the National Transmission Network to homes and businesses. Finally the suppliers – such as EDF and British Gas - supply and sell electricity to the consumer. Each of the three areas are significant users of access and lifting equipment.

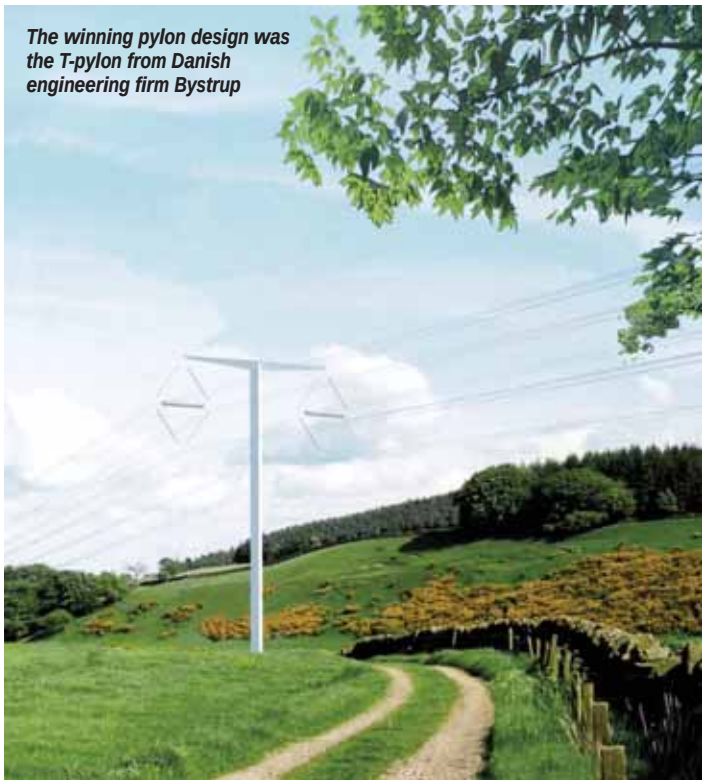
A new pylon

In the UK there are more than 88,000 pylons, including 21,500 on National Grid's main transmission network in England and Wales. These main transmission lines – which carry power cables of 275kV and 400kV – have been carried by the familiar steel lattice tower designed in 1927 by Sir Reginald Blomfield for the launch of the National Grid in 1933. However a recent competition run by the Royal Institute of British Architects for the Department of Energy and Climate Change and National Grid called for designs for a new generation of pylon, one that "could cope with future electricity needs that are also aesthetically pleasing to communities and preserve the beauty of the countryside"

The two main reasons for the competition was that by 2020, a quarter of the UK's current generating capacity will need replacing, much of it with renewable sources such as onshore and offshore wind farms, tidal and wave power etc… much of the existing 'grid' is in the wrong place for many of these new power sources. The second reason is that many regard the National Grid and existing pylon design as a desecration of the countryside. But surely the simple answer to these 'blots on the landscape' is to bury the cables underground? Currently only 950km of the total 13,000km of high voltage cables in the UK are

Aldercote have produced this 17 metre platform mounted on a Marooka chassis

Terex Utilities latest insulated boom platform on a 3.5 tonne chassis


The winning pylon design was the T-pylon from Danish engineering firm Bystrup

The largest insulated boom in Bronto's SI range is the 60 metre Bronto SI196

underground. However sinking cables has its problems, not to mention its cost - between 12 to17 times more expensive than overhead cables - and a cost that would have to be paid by consumers through their electricity bills! Also once installed no planting, digging or building is allowed anywhere near the buried cables.

The winning pylon design was the T-pylon from Danish engineering firm Bystrup. It is a 32 metre high, 20 tonne slender, compact tower – with a diamond cross-section - with the conductors arranged in a triangular configuration that minimises the extent of the circuits and the magnetic fields. To adapt to the changing character and colours of the landscape as well as the aggressiveness of the local atmosphere the pylon is available painted, hot dip galvanised in weather-resistant Corten or even in stainless steel. Energy and Climate Change secretary Chris Huhne said: "We are going to need a lot more pylons over the next few years to connect new energy to our homes and businesses, and it is important that we do this is in the most beautiful way possible."

Although more like a pole than a pylon the T-pylon has one major maintenance problem that will be a blessing to the powered access community – it cannot be climbed, forcing maintenance and installation contractors to finally comply with the latest guidance from the Health & Safety Executive to stop climbing and use powered access. If parts of the network can be shut down then this can be carried out by any 35 to 40 metre working height platform, including tracked spider lifts or truck mounted platforms mounted on off-road chassis. However if the network cannot be isolated – then live line work is required and an insulated boom mounted on an off-road chassis is required.

AT36M-Unimog-U400 caption The Altec AT36-M insulated access platform fitted with material handling for the general maintenance of overhead power lines rated to (Category C) 46kV working voltage for working on live lines.

Designing a 50 metre narrow track machine

Maintenance on current pylons is still being carried out by climbing or with large - 50 metre plus - platforms. However as maintenance is generally completed within a day or so, the main expense is the laying of large amounts of temporary trackway from the road to the pylon, in order for the truck mounted lifts to cross soft ground. The National Grid also uses helicopters (it owns two and is looking to add a third to its fleet) but it also sees the benefits of large tracked platforms with a decent travel speed. With the height of the existing pylons, they would have to be in the order of 60 metres and ideally mounted on a tracked chassis. At the moment the only such machines available tend to be specialist units built for the North America market, usually with an overall width of around 3.5 metres - too wide for Europe's narrow rural roads which need to be used to reach remote pylons.

The National Grid has in recent years worked with large spider lifts and big truck mounts, but the there is a growing demand for a 60 metre go-anywhere insulated boom lift. So it is currently working with specialist vehicle manufacturer Aldercote to create a narrow width, tracked vehicle using a two metre wide Caterpillar excavator undercarriage. When travelling or being transported on minor roads this width is ideal, however when off road, the tracks extend to 3.5 metres for additional stability.

Sourcing large insulated booms to mount on tracked chassis is also a challenge, the only product currently satisfying the required specifications is the largest insulated boom in Bronto's SI range - the 60 metre Bronto SI196. Designed to work on live transmission lines up to 500kV or 765kV they allow bare-hand maintenance of live lines as well as heavy repair work, thanks to the 860kg platform capacity and good winch payloads.

Live-line working capability is enabled through a fibre optic control system running inside the filament wound fiberglass boom.
A sealed design prevents internal contamination, while desiccants inside the boom control internal atmospheric humidity.
A sharp-edge corona ring around the boom provides a consistent voltage gradient along its length and acts as an electrical stress relief device at the upper section by preventing potentiallydamaging positive corona activity on or near the boom

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A Bronto SI156HDT mounted on a crawler chassis

surface. A separate fibre optic intercom system provides audio communications between the platform and turntable control station.

Features of the SI range include a Boom Leakage Detector which indicates the actual current experienced by the platform personnel and boom. Although ANSI and IEC standards allow up to 1.0µA/kV line-to-ground current leakage, the SI units typically exhibit a maximum current leakage of less than 0.2 µA/kV.

Future demand

The current UK peak demand for electricity is around 60GW but this is predicted to rise by about 32GW over the next five years. With a number of power stations scheduled to close it will be a major challenge to meet projected energy needs while at the same time tackling climate change. According to the 2011 National Electricity Transmission System (NETS) Seven Year Statement this net increase will be mainly made up by:

- an increase of 16.2GW in CCGT (combined cycle gas turbine)
- an increase of 22.4GW in wind capacity
- an increase of 2.0GW in nuclear capacity
- an increase of 2.GW in other renewables capacity (mainly biomass, biopower and woodchip generation)
- a decrease of 3.6GW in oil capacity;
- a decrease of 7.5GW in coal capacity

For the crane and access industry it is interesting to note that the majority of this increase – 22.4 GW – is currently planned to be made up by wind capacity. It is also interesting to note that the whole power generation and supply system has to be continually balanced between supply and demand to manage bottlenecks in the network.

The National Grid has to plan ahead to make sure there is enough back-up power available to cover any potential shortfall, whether that's due to a power station breakdown or an unexpected event. For instance, in very high winds, many wind farms will shut down their turbines for their own protection, often automatically. When that happens, back-up generation is used to balance the

Bronto SI178HDT

system. There can also be too much power generated. In early January 2012, some wind farms in Scotland stopped generating for a few days. This was for two reasons. First, the very high winds were affecting the transmission network, causing constraints. Also, demand in Scotland was low because of the New Year Bank Holidays, so that additional energy wasn't needed. The overall cost for balancing the network in 2010/11 was £708 million, which makes up around one percent of consumer bills.

Sagging cables

An unexpected power outage problem occurred in parts of Northern Europe this summer, when for a short time temperatures reach more than 30 degrees. The heat resulted in the expansion of main power lines, in some cases causing them to sag by as much as two metres between pylons.
If sagging cables are close to trees they can result in boiling the sap in the tree and combusting resulting in fire which then damages the power line, causing a power failure.

The danger can be spotted from helicopters, showing up as brown discolouration of the trees. Once identified contractors were rapidly deployed to reduce the height of the trees to prevent fire and power outages. Keeping trees and other foliage clear of power lines is an increasing source of work for truck mounted lifts, and given the risks of working close to power lines there is a trend for units with insulated booms, with this increased demand we can expect to see more competition in this sector.
Last year we saw Italian spider lift manufacturer Platform Basket adopt a dealer designed insulated boom section on an 18 metre unit. Competitors have yet to follow this lead, but we are likely to see insulated booms become a little more commonplace in the years ahead.

Smaller tracked access vehicles are available such as this Skyking 140TJV

Danger - live overhead cables!

If you look into crane and aerial lift accidents it is quickly apparent that the two major causes of fatal incidents are poor ground conditions and outrigger set up – which we covered in the last issue of the magazine - and electrocution due to the boom inadvertently coming into contact with overhead power lines. While the type of people and equipment affected is quite diverse it is not a major issue among linesmen specifically working on high voltage power lines – they tend to be fully trained in how to work with live or dead power lines and have almost invariably have the relevant equipment to do so safely.

Countries such as Brazil have far more overhead cables and power lines than in Europe.

The people that get caught most often are tradesmen carrying out tree work and getting too close to a power line, telephone engineers working on telephone cables that are in close proximity to power lines and other trades that seem unaware of the dangers associated with getting too close to overhead power lines.

There is also a geographic factor at play here with countries like the USA and Australia seeing far more occurrences than Europe. This is less to do with the equipment and the calibre of the operators than the fact that far more power lines in those countries are both overhead and in the street while Europe has a higher proportion underground or across fields. Too many fatalities occur in every country and yet in spite of the grim statistics little seems to be done about it.

The new IPAF accident statistics highlight the fact that electrocution is right at the top of the chart while crush incidents are at the bottom. And yet…. The aerial lift industry looks set over the next few years to adopt the wide range of crush protection devices that are now available, while there is almost no discussion or pressure for machines to be fitted with high voltage warning indicators, in spite of the fact that there well proven products are available.

We spoke with Sigalarm, which this year celebrated its 50th anniversary, while it has a steady business for its power line warning indicators and proximity detectors it says that business tends to be limited to a narrow band of the market and largely on larger equipment such as cranes, fire fighting equipment and larger aerial lifts owned by utilities. The company now has a range of installations to suit the sophistication required, but most cover the entire length of the boom and can be set up with a wide range of sensibility. As with most warning devices these days it can be set up to log and transmit data, so that a

The Sigalarm unit installed showing the control unit on top of the control panel and the sensor unit (white box) on the front of the cage

record is kept or sent every time the system is activated/tripped. Warning of proximity to a live line can be a horn/siren, synthesised voice message and flashing lights tailored to suit the application an auto shut down when the machine strays into the range of a power line is also included.

While the full systems cost around $4,000 the company says that it can easily produce a simpler version and if demand existed for a standard product the price would come down substantially, possibly breaking the $1,000 barrier. The company also now makes a completely wireless system for easier installation.

In Australia Proxy Volt produces a range of products that have been developed over a number of years and proven to be very effective where used. While it is entirely likely that there are many more mainstream manufacturers of power line warning systems a search on the internet and other sources yields very little. Perhaps indicating the lack of interest in the subject?

The Proxy Volt

Procedure to follow in the event of mobile equipment contacting power lines

The following actions are recommended should contact be made with a live overhead power line or a flash-over occurs between a live verhead power line and a crane or other item of mobile plant.

- Stop all work in the vicinity of the incident and summon help to have the power line isolated.
- Keep all personnel away from the mobile plant, ropes and load, as the equipment and ground around the machine could be energised. Be aware that any fallen conductors could also whip around unexpectedly.
- If assistance is unavailable, attempt to break the machinery's contact with the live overhead power line by moving the jib or driving the machine clear.
- Jumping from affected plant while the power line is still energised is not recommended and can result in serious injury. However, where there is a risk of imminent danger, such as fire, jumping may be a necessary option. Leap clear of the plant and specifically avoid simultaneous physical contact between the plant and ground.
- Report the incident to management, any network authority and Resources Safety.

Source: Bulletin from the Western Australia department of mines and petroleum