



NG Bailey

Freedom
an NG Bailey Group company

POC-MAST™

Q&A

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Overview

What Distribution Network Operators (DNOs) is POC-MAST approved with?

The POC-MAST is approved with the following DNOs:



*Northern
Powergrid
(NPG)*



*Scottish and
Southern
Energy
Networks
(SSEN)*



*UK Power
Networks
(UKPN)*



*National Grid
Distribution
(N-GED)*

What POC-MAST solutions have you installed to date?

POC-MAST connections are currently installed in both UKPN, Northern Powergrid and Scottish and Southern Energy Networks (SSEN).

The first ever POC-MAST was installed in UKPN to facilitate a PV Farm connection to an existing 33kV tower in East Anglia.

Since the first installation, two 132kV Tee-off connections have been made to a 132kV terminal tower in UKPN.

In SSEN a 132kV loop-in loop-out (LiLo) POC-MAST connection has been installed to an L7c suspension tower to facilitate a solar farm connection near Swindon.

In Northern Powergrid a tee off connection has been installed to an existing PL16 Suspension Tower to connect a 80MWDC/50MWAC solar farm that is co-located with a 8MW/16MWh Battery Energy Storage System (BESS).

Is it contestable or non-contestable?

The DNOs consider the POC-MAST to be an overhead line structure and it is therefore at their discretion as to whether it is considered contestable or non-contestable works.

On the different projects completed to date, POC-MAST installation has been undertaken as both contestable and non-contestable works.

Where the POC-MAST installation was offered as contestable works, the mast itself has been assembled and erected under the contestable scope, with the installation of cross-leads to the tower being non-contestable.

Where the POC-MAST was offered as non-contestable works the entire POC-MAST installation was undertaken as non-contestable scope.

Can it be used for a Looped connection as well as a Tee-off?

The POC-MAST provides a permanent method of making a 132kV connection to an existing overhead line tower. A single POC-MAST can be used to provide a tee-off connection or alternatively a twin POC-MAST arrangement can be used to provide a loop-in loop-out connection.

Can the POC-MAST be used on generation and load projects?

The POC-MAST system simply provides a method of making the physical connection to an overhead line tower, irrespective of the end use, generation, or load.

Who can install the POC-MAST?

Currently, only Freedom can install POC-MAST. We are investigating the potential to allow others to install the product through a licensing arrangement.



What awards has POC-MAST won?

- Solar and Storage Networks and Connections Award 2021
- The E&T Innovation Awards 2020 for Outstanding Innovation in Future Power & Energy Award
- Construction News Specialist Award for Business Innovation of the Year 2015

How do I know if my site is suitable for a POC-MAST connection?

Freedom undertakes a three-stage design process for every POC-MAST connection. Stage one is a high-level review offered free of charge to confirm suitability of the tower and site for a POC-MAST connection solution.

All enquiries will be treated in the strictest confidence and if required, we can put a Non-Disclosure Agreement (NDA) in place.

The following information would help with the high-level review, but is not essential:

- DNO point of connection offer
- Full height photo of the tower(s) being considered for connection.
- For double circuit overhead lines, confirmation of the connecting circuit (Physical location i.e. North, East, South, West).

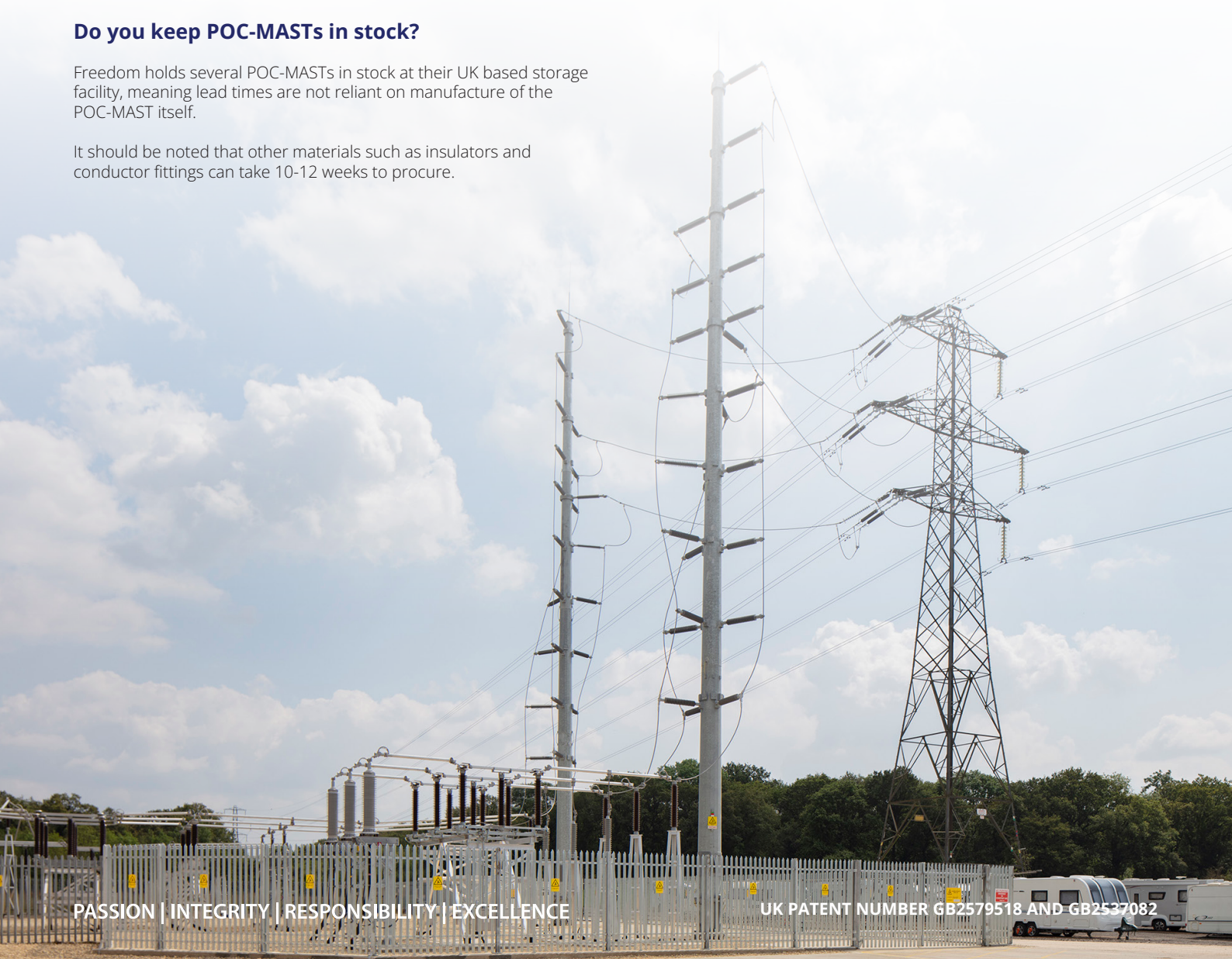
Is POC-MAST patented?

The POC-MAST holds two patents: UK PATENT NUMBER GB2579518 and GB2537082

Do you keep POC-MASTs in stock?

Freedom holds several POC-MASTs in stock at their UK based storage facility, meaning lead times are not reliant on manufacture of the POC-MAST itself.

It should be noted that other materials such as insulators and conductor fittings can take 10-12 weeks to procure.



Technical



What voltages can it be used on?

POC-MAST has been used to connect to 33kV and 132kV towers.

The generic POC-MAST is designed for connecting to 132kV towers. The 132kV POC-MAST geometry is based on the most common 132kV distribution towers. Tower geometry is driven by both statutory ground clearance and electrical clearance requirements. As such all 132kV towers have a similar bottom cross-arm height and cross-arm separation, meaning most 132kV tower specifications would be suitable for connection using the generic POC-MAST.

33kV towers can be connected using POC-MAST but may require a bespoke POC-MAST design.

Sometimes 132kV towers are utilised for 33kV lines. Where this is the case the generic 132kV POC-MAST can be utilised but with 33kV insulators.

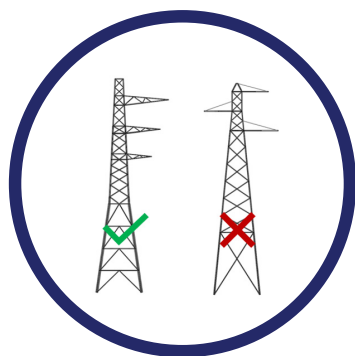
What towers can I use a POC-MAST on?

Stage one of the POC-MAST design process is a high-level review to confirm tower suitability and is offered by Freedom free of charge. All enquiries will be treated in the strictest confidence and if required, we can put a Non-Disclosure Agreement (NDA) in place.

The generic POC-MAST can be used to connect to 132kV double circuit tension and suspension towers providing these are no taller than plus 3m over the standard tower height.

Can POC-MAST be used on single circuit towers?

Single circuit towers can be connected to, providing all three cross-arms (or attachment points) are on the same side of the tower.



What standards is POC-MAST designed to?

The POC-MAST is designed in accordance with BS EN 50341-1:2012 and associated NNA BS EN 50341-2-9:2017, the standards governing overhead line design in the UK.

POC-MAST underwent full scale structural testing in 2019 as part of the DNO approval process for SSEN. The mast was tested in accordance with BS EN 60652:2004 - loading tests on overhead line structures.

The mast sections are galvanised in accordance with BS EN ISO 14713:1999 Table1, to provide a 40 year life span.

Has POC-MAST been tested?

POC-MAST underwent full scale structural testing in 2019 as part of the DNO approval process for SSEN. The mast was tested in accordance with BS EN 60652:2004 - Loading tests on overhead line structures.

As part of the structural tests the POC-MAST deflection was measured at each load increment to ensure that mast deflections were as predicted in the design software. This enabled Freedom to confirm the cross-leads would not become taut under high wind and impose an unnecessary load on the tower.

How tall is a POC-MAST?

There are four different height POC-MAST to facilitate connection to the different tower types and heights.

Please see Table below for POC-MAST heights:

POC-MAST Type	Overall Height (m)	
	Mast	Mast + Lighting Rod
Tension STD	23.40	26.40
Tension E3	26.45	29.45
Suspension STD	25.85	28.85
Suspension E3	28.90	31.90

Is the design generic?

The POC-MAST is made up of five folded steel tapered tubes which fit together to form a single member. The mast is generic with the exception of the 'Riser' section which comes in four lengths and is used to vary the overall height of the mast.

Additional 'Riser' mast sections are held in stock at our UK depot to ensure we can connect to any of the four tower types and heights for which the generic POC-MAST is suitable.

What equipment needs to be at the base of the POC-MAST?

The ideal scenario for a POC-MAST connection is to position the point of supply substation adjacent to the point of connection tower on the overhead line. The POC-MAST can then sit within the substation boundary and connect to the substation plant via overhead jumpers, so no requirement for underground cabling and expensive cable terminations.

If the point of connection tower is not near the site, a small compound is required at the base of the tower which houses the POC-MAST, surge arrestors and cable sealing end (CSE) structures. Underground cables can then be run from the CSE compound to the point of supply substation.

What foundations does POC-MAST use?

The preferred POC-MAST foundation is screw-anchor piles. A group of four piles are installed using a 20-tonne excavator with rotating drive head. Once installed a steel grillage is bolted to each pile connecting the group together and providing the base plate for the POC-MAST.

Screw-anchors are preferred as they are quicker and safer to install than traditional mass concrete foundations.

It's quicker as there is no requirement for deep excavations, formwork, or concrete curing time.

It's safer because there is no requirement to work in deep excavations.

They are also more environmentally friendly as there is limited soil disturbance and no requirement for large volumes of concrete. Screw-anchor piles can also be removed at end of life by reversing the installation process.

Where can the POC-MAST be used (geographically)?

The generic POC-MAST is designed in accordance with BS EN 50341-1:2012 and associated National Normative Aspects (NNA) BS EN 50341-2-9:2017, the standards governing overhead line design in the UK.

BS EN 50341-2-9:2017 gives values for wind speed and ice thickness across the UK to be considered in the structural design of an overhead line support.

Due to the significant increase in wind velocity experienced by Scotland and Ireland in comparison to England and Wales, it was necessary to rationalise the structural capacity of the generic POC-MAST by limiting the geographical area in which it could be used to save it from being over designed in the south of England.

The generic POC-MAST design is therefore limited to use in the geographical area depicted by the 24.5m/s 10-Minute mean wind speed contour given in Figure NA.1 of BS EN 50341-2-9:2017. This covers all of England, Wales, and a small portion of southern Scotland.

What is the maximum electrical capacity of the POC-MAST?

In terms of electrical capacity, POC-MAST has been designed for conductor sizes up to 700mm² AAAC (Araucaria).

Araucaria conductor was chosen as it has an electrical capacity equivalent to the largest likely conductor system on the 132kV overhead distribution network in the UK. Therefore, if a connection is being offered on the 132kV overhead distribution network then the POC-MAST solution will not be a limiting factor in terms of electrical capacity.

What is the design life of the POC-MAST?

The POC-MAST and screw-anchor foundations are galvanised to a standard thickness of 85µm to give a 40-year design life in accordance with BS EN ISO 14713:1999 Table one Category C3. This can be increased where necessary to cover areas in Category C5.



Planning

What are the planning requirements?

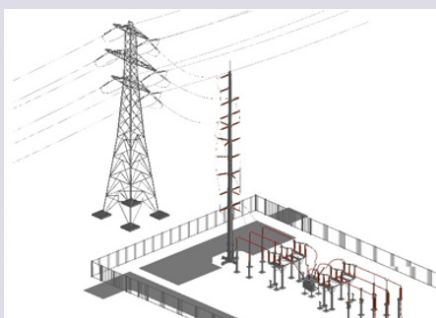
A planning application must be made to the Local Planning Authority (LPA) as the POC-MAST is not classed as permitted development due to the height of the structure.

Does POC-MAST need a section 37?

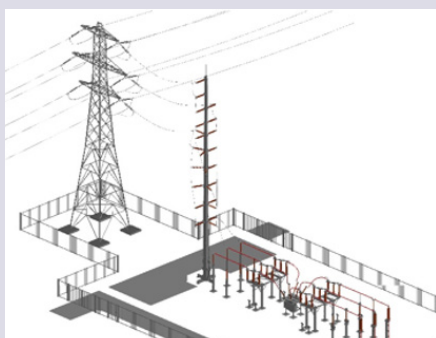
A section 37 application under the Electricity Act 1989 is required if the overhead line connection from the POC-MAST to the adjacent tower extends over third-party land, i.e., outside of the curtilage of the 'operational land' within the substation compound.

If the overhead line connection only passes over 'operational land' then a section 37 is not required.

The images below explain this further:



*Cross-leads to tower outside of operation land
- Section 37 required*



*Cross-leads to tower within operational land
- Planning Application required*

How tall is a POC-MAST?

There are four different height POC-MAST to facilitate connection to the different tower types and heights.

Please see Table below for POC-MAST heights:

POC-MAST Type	Overall Height (m)	
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Tension STD	23.40	26.40
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Suspension E3	28.90	31.90



Pricing

How much is a POC-MAST?

We look at each project independently however, high-level figures could be considered at £450k for a Tee-off solution (one POC-MAST) and a Looped connection £800k (two POC-MASTs). These prices cover design, supply, and installation of the mast/masts.

How much will I save by using a POC-MAST?

Every site is different based on the POC offer provided by the DNO, however we have seen like for like savings of 50% on a Looped POC-MAST connection when compared to traditional solutions.

As well as considering the financial saving, time can be saved too as we hold POC-MASTs in stock and the installation process is significantly shorter than when installing a new tower.



Timescales

How long does it take to install?

The time it takes to install a POC-MAST connection depends on both the connection type (Tee-off/Looped) and tower type (suspension/tension).

When connecting to suspension towers the main line tower insulation must be altered to suspended tension insulators, so connection takes slightly longer than for tension towers.

Installation times may vary depending on outage restrictions and other site operations.

Please see table below for typical POC-MAST installation times:

Tower Type	Connection Time (Days)	
	Tee-off	Looped
Tension	6	9
Suspension	9	12

What length of outage is required for installation?

The outage time required to install a POC-MAST connection depends on both the connection type (Tee-off/Looped) and tower type (suspension/tension).

When connecting to suspension towers the main line tower insulation must be altered to suspended tension insulators, which increases the scope of work under outage and thus outage length requirement.

Outage requirements may vary depending on network constraints and emergency return to service times imposed by the DNO.

Please see table below for typical single outage requirements:

Tower Type	Outage Requirement (Days)	
	Tee-off	Looped
Tension	3	4
Suspension	6	7

Note - If preferred it may be possible to have two shorter outages resulting in a reduced overall outage period.

What is the lead in time for a POC-MAST connection from point of order?

Freedom holds several POC-MAST in stock at their UK storage facility, meaning lead in times are not reliant on manufacture of the POC-MAST itself.

We would always recommend at least six to nine months is allowed for the site survey, design, DNO design approval and procurement of insulators and other overhead line fittings.



Installation

Who can install POC-MAST?

Currently only Freedom can install POC-MAST. We are investigating the potential to allow others to install the product through a design/manufacture and supply agreement.

How is it installed?

POC-MAST installation commences with the screw-anchor foundations. A group of four piles are installed using a 20-tonne excavator with rotating drive head. A steel grillage is bolted to each pile connecting the group together and providing the base plate for the mast.

The POC-MAST sections are jacked together at ground level to form a single member. This is then lifted vertically using the POC-MAST hinge mechanism and a hydraulic cylinder.

Post insulators and vertical conductor runs are fixed to the mast using a mobile elevated work platform (MEWP) and the mast is ready for the final cross-lead connection to the tower.



Further information

How do I get further information?

For further information:

Contact: **Claire Briody** on **07827 306475**

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Visit: www.ngbailey.com/FreedomInnovation