EXECUTIVE SUMMARY

PART 1 ELECTRICITY TRANSMISSION TOWERS AND MONOPOLES

Chapter 1 - INSTALLED BASE OF ELECTRICITY TRANSMISSION TOWERS & MONOPOLES

The global installed base of transmission towers and monopoles is analysed in numbers of towers by region and country and forecast from 2016 to 2020.

Chapter 2 - ELECTRICITY TRANSMISSION TOWERS MARKET

The global demand in $ value for towers and monopoles is analysed by region and country and forecast from 2016 to 2020.

Chapter 3 - LONG TERM DEMAND CYCLES FOR ELECTRICITY TOWERS AND MONOPOLES

The growth of transmission line networks is a fundamental driver of the markets for towers and poles, both in line length and voltage. Long term demand is a function of the age of the towers and the expansion of the networks.

Chapter 4 - MONOPOLES vs. LATTICE TOWERS

The March of the Monopoles - long established in the US, EHV monopoles are breaking into new markets with innovative new designs, replacing lattice towers, especially in Europe. This trend is driven by pressure on rights-of-way, visual criticism of lattice towers and public fears of EMF dangers to children.

Chapter 5 - TYPES OF TOWER OR PYLONS

Lattice towers are designed for different functions and stresses and there is wide variation in cost; suspension towers, tension towers, angle suspension towers, dead-end towers, transposition towers. Tower installation is a dangerous and complex procedure and has an impact on costs.

Chapter 6 - ELEMENTS OF LATTICE TOWER DESIGN

Many designs of transmission tower exist and are used in different situations. Some of the basics are discussed here with diagrams of designs and the different elements of a tower.

Chapter 7 - SERVICE LIFE AND MAINTENANCE OF STEEL LATTICE TOWERS AND MONOPOLES

The service life of steel monopoles and lattice towers can be severely curtailed after a period of time without preventive treatment. Deterioration goes through three identifiable stages before the structure collapses, each with cost implications.

Chapter 8 - COMPETITIONS FOR TOWER DESIGN

Increasing public awareness of and resistance to lattice towers is leading to imaginative designs for new poles and towers.
Chapter 9 - MANUFACTURERS OF LATTICE TOWERS AND MONOPOLES

Production capacity of the 34 major producers of lattice towers and monopoles is tabulated with market shares. The leading companies are profiled.

PART 2 ELECTRICITY, TELEPHONE & STREET LIGHTING POLES

Chapter 10 - UTILITY POLES INSTALLED BASE BY COUNTRY AND UTILITY

The installed base of poles – electricity, telegraph and street lights – is analysed by country for 2016, with a split by voltage levels; MV sub-transmission, primary distribution and LV secondary distribution and reticulation. Street lights have been included for the first time.

Chapter 11 - INSTALLED BASE OF POLES BY COUNTRY AND MATERIAL

The installed base of utility poles is analysed by material - wood, steel, concrete, composite – and analysed by country.

Chapter 12 - GROWTH OF THE POLE POPULATION

The total installed base of poles is forecast from 2016 to 2020 by country.

Chapter 13 - DEMAND FOR POLES IN UNITS

Demand for utility poles in units is tabulated by region and country and forecast from 2016 to 2020.

Chapter 14 - DEMAND FOR POLES BY VALUE

Demand for utility poles in $ value is tabulated by region and country and forecast from 2016 to 2020.

Chapter 15 - THE VALUE CHAIN – THE MARGIN STACK

The value chain is a continuous process of adding cost to a product. Depending where you position it, the value changes, the end user’s capex being some five times the cost of original materials. The value chain is analysed with different mark-ups for each of six stages.

Chapter 16 - NATIONAL MARKETS FOR ELECTRICITY AND TELEPHONE DISTRIBUTION POLES

The statistics for utility poles are not very systematic and are variable in extent from country to country. With wide searching a large amount of data has been accumulated and StatPlan has assembled and maintains an ever-increasing databank for this topic.

Chapter 17 - STREET LIGHTING

Street lighting is a hot topic, because of the developments of the smart city and the advent of energy saving LEDs. With urban and transport development, street lighting is a growth sector. This has implications for the pole markets in renewal of old poles and substitution with new materials such as composites.
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Chapter Summaries

Chapter 18 – PARKING
Parking light poles are a small segment of the street lighting stock. Parking is receiving attention from planners as cities expand and urban space becomes more crowded.

Chapter 19 – PASSIVE SAFETY
Passive safety has made strides in the last ten years and is now the subject of regulation in many advanced countries and attracting attention in some developing countries. It is an important driver for street lighting and for electricity and telephone poles built along roads.

Chapter 20 – THE SMART CITY AND SMART UTILITY AND STREET LIGHTING
The smart city concept is fast becoming a reality, with many now functioning around the world. City authorities are tapping into the opportunities created by better technology to make municipal services and operations faster, simpler, and more cost-efficient. The creation of a smart city involves the integration of many services, among them energy delivery including electricity and gas, water supply and lighting.

Chapter 21 - POLE MATERIALS AND SERVICE LIFE
The various materials used for poles – wood, steel, concrete and composite are discussed.

Chapter 22 - COMPOSITE POLES
Composites are analysed in a detailed section discussing this technology, applications, advantages and disadvantages, market status and manufacturers. Factors such as safety, pricing, the production processes of filament winding and pultrusion are outlined. The launch market in the United States is reviewed, with the increasing use of composite cross arms on wooden or concrete poles, and the beginning of a move from niche market status to wider take-up. Composites are gaining acceptance in the desert climates of the Middle East. After being spearheaded in Scandinavia, composites are being trialed in other European countries.

Chapter 23 – MANUFACTURERS OF COMPOSITE POLES AND HARDWARE
32 companies listed, with profiles of the majors.

Chapter 24 - TYPES OF POLES
The different types of pole are described, with their functions, characteristics and service lives.

Chapter 25 – POLE SPAN
The span between poles is a function of the weight of lines they bear and the density of population beneath them. The design of a network involves a trade-off between longer poles which are more expensive but need fewer accessories, or shorter poles which are cheaper but need more cross-arms and other equipment.

Chapter 26 - SPACE ALLOCATION ON JOINT USE UTILITY POLES
Utility poles are used by more than one line or service in many cases. Conventions exist for the allocation of space on the pole; for transmission lines, sub-transmission lines, distribution lines and telephone lines.

Chapter 27 - MANUFACTURERS OF WOOD, STEEL, ALUMINIUM AND CONCRETE POLES

39 companies listed, with profiles of the majors.

Chapter 28 – CIRCUITS, PHASES AND CONDUCTORS

The basics of circuits and phases are outlined. These have a vital effect on the design and mechanics for towers and poles as well as overhead lines.

Chapter 29 - RIGHTS OF WAY

ROW – Rights of Way are increasingly scarce and expensive. They are discussed with various alternative schemes outlined.

Chapter 30 – DANGER to AND FROM BIRDS

The danger from birds nesting on or colliding with lines and towers can cause not only harm to the birds but outages to the network. The extent of the problem is analysed, with mitigation and prevention methods outlined.
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PART 1 - TRANSMISSION TOWERS & MONOPOLES

Global installed base of towers and monopoles

There are an estimated XXX million high voltage electricity transmission towers and monopoles installed in the world in 2018, growing at a cagr of XXX% to XXX million in 2025. High voltage transmission towers and poles are defined in general as those supporting lines ≥ 100 kV but include some sub-transmission and inter-regional HV distribution lines and some below 100 kV. There are XXX million telecoms towers which are not included in this total and are covered in the StatPlan Telecom Network Report.

Figure 1: Global installed electricity transmission towers, 2017-2025

The largest base of towers is in Asia Pacific with XXX million in 2018, dominated by China with XXX million, India with XXX million and Japan with almost XXX million. North America has XXX million towers and Europe XXX million. Next comes Russia with XXX million and Brazil with XXX million. Note that the Russian figure includes inter-regional 110 kV distribution towers. The fastest growing region will be Sub-Saharan Africa, which will grow at XXX% and next the Middle East at XXX%. China will grow with a cagr of XXX% and India at XXX%, Europe XXX% and North America at XXX%. 

18
Europe

Europe is a mature market place but is currently on a rising demand trend, as the consequence of a peak in new build in the 1960s and a lack of investment in the previous two decades, together with new build to accommodate grid capacity for renewables.

Table 1: Sales of electricity transmission towers, Europe, nominal $, 2018-2025

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MONOPOLES vs. LATTICE TOWERS

There is a clear trend towards the increased use of monopoles for higher voltage transmission but this trend is variable around the world. These will not totally replace lattice towers but where they are chosen they will be installed in new lines and as replacements when lattice towers are due for renewal. A large share of the market for lattice towers will continue..............................................

Netherlands

In the Netherlands, the transmission operator, Tennet, has started to install monopoles instead of lattice towers. The project was initiated in 2007 and new pylons have been designed by engineers at Tennet, in collaboration with KEMA, the Dutch research company and unusually, in conjunction with appointed architects. Instead of a single lattice tower, the cables are supported by two steel poles up to 65 metres high.

The electromagnetic footprint has been a powerful driver of change in the Netherlands. Based on epidemiological studies of people living near power lines in Sweden and the US, Dutch authorities advise avoiding long-term exposure of children to magnetic fields higher than 0.4 microTesla. To meet such stringent requirements, power line corridors for traditional HV transmission projects would normally have to be some 300 metres wide, meaning major obstacles given the dense infrastructure and public perception of overhead lines and the small area of the Netherlands.

Figure 2: New 400 kV monopole designs in the Netherlands

Source: Tennet
PART 2- ELECTRICITY, TELEPHONE & STREET LIGHTING POLES

In the 4th edition of the Towers and Poles Report we expanded coverage in the Poles Sections to include street lighting, although utility poles owned by electricity distribution utilities and telephone utilities constitute the bulk of the pole population. The report now covers electricity poles, telephone poles (for landline telephone, not telecoms towers) and street lighting poles, with a new section for poles used for parking lighting. The drive to replace sodium, fluorescent and other traditional light sources with LEDs has sparked a great deal of interest and research into street lighting, with more statistics of the installed base of street lights becoming available. These form a significant share of the fleet of poles and one where there may be considerable replacement with installation of LEDs. Composites have also been used for street lights more frequently than for electricity distribution or telephone poles, especially with decorative poles in urban areas.

The drivers for each of these sectors are different and in one respect street lighting is the odd one out...........

In 2018, the total installed base of poles was XXX billion, of which nearly XXX million were electricity, XXX million were telephone with an unknown number of electricity and telephone being multi-utility, and XXX million were street lights.

Table 2: Numbers of electricity poles, telephone poles and streetlights, 2018

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Three countries have almost half the poles in the world; China with XXX%, the United States with XXX% and India with XXX%. The top twelve countries have just under two third, 63%.
Table 3: Demand for electricity MV/LV poles, telephone poles, street lights by country, CIS, 2017-2025

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Table 4: Demand for electricity MV/LV poles, telephone poles, street lights by country, Middle East, 2017-2025

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NATIONAL MARKETS FOR ELECTRICITY AND TELEPHONE DISTRIBUTION POLES

United States
The United States is one of the largest single markets for utility poles with an installed base estimated at XXX million. XX% are owned by electrical utilities, XX% by telecoms companies and XX% by railways.........................

Europe
Around 2,400 electricity distribution companies distribute electricity to customers in the EU. Eurelectric, the association for the European electrical industries is a strong proponent of wooden utility poles. The use of wooden poles in distribution networks has kept its position within electricity networks. These have come under fire in recent years for environmental reasons because of preservatives, creosote in particular. The European impregnation industry has for over 60 years been producing creosote poles according to industry guidelines and national standards, the WEI specifications but wood preservatives..............

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France
In France electricity distribution poles are mainly wood or concrete. Out of XXX wooden poles installed each year, XX% are treated with creosote (source: ERDF). Other DSOs still using wooden poles (in particular in rural areas). A number of local authorities require the use of wooden poles. France Telecom owns XXX million wood telecoms poles.

Various experiments for constructing reinforced concrete poles were made in Europe, and the first known experiment was made in 1896 by a French engineer

Germany
XX% of electricity poles installed, of which over are wooden, XX% concrete and XX% steel. There are reported to be XXXmillion wooden utility poles in service. Wooden poles, concrete poles, tubular steel poles and steel lattice towers are used for medium-voltage overhead power systems. Concrete pylons are used in Germany normally only for lines with operating voltages below 30kV. In exceptional cases concrete pylons are used also for 110 kV lines, as well as for the public grid or for the railway traction current grid.

Greece
About XX million wooden poles installed in the Greek electricity distribution networks. About XX% of overhead distribution networks’ poles are creosote impregnated wooden poles. Every year, about XXX
new wooden poles are installed in the distribution networks, in new lines or for replacement of damaged poles.

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Japan

There are some XXX million utility poles in Japan, XX million owned by the EPCOs, the electrical utilities and XX million by NTT the telecoms utility. In Japan, the wood pole market has been shrinking because concrete poles now dominate the utility pole market. Japanese wood poles are limited to use for broadcasting wires in the countryside and as supporting poles for trees. A service life of 15 years is quoted in Japan for wood utility poles. A feature of Japan, and one which surprises many visitors to such an advanced country is the plethora of overhead lines in cities. Unlike most developed cities around the world, where various kinds of cables are kept underground, most Japanese cities have them above ground. The reason for this is that after World War II Japan wanted to bring electricity as quickly as possible to as many people as possible and it was easier and much less expensive and obstructive to do this by putting up utility poles.

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THE VALUE CHAIN – THE MARGIN STACK

The cost of any product such as towers and poles, can be measured at a number of stages in the value chain, at the start when it is no more than a piece of unworked ore, to its final installation in working order and finally as a constituent of capital expenditure. At each level in the value chain, value is added and profit margin is ‘stacked’. The ‘cost of doing business’ (CODB) refers to all the expenses incurred by a firm or a sole proprietor in producing and selling goods or services. The ‘margin stack’ is the total amount of profit charged by the suppliers of materials, transport, sales and any other processes which are part of the final CODB plus the final profit margin. The point of interest in the chain depends on the business of the person who is assessing the value. The value chain starts with the input of raw materials. These inputs, in this case steel, typically constitute from 50-80% of the manufacturing cost of a finished product.

The value chain at 6 levels

1. **BOM, bill of materials** - Metal producers and refiners are concerned about the prices they can get for their output in its basic form, ingots, rods, plates etc. For the equipment manufacturers this price translates into the BOM (bill of materials) as a cost of production. CODB + margin.

2. **Manufactured CODB** - Adding the cost of fabricating the materials into finished products produces the manufactured cost.

3. **Factory gate price (MSP)** - The addition of non-manufacturing costs such as sales and finance costs brings it up to the factory gate price or manufacturer’s selling price. This does not include any transport cost. (Note: factory gate price is sometimes quoted with manufacturer’s profit margin and sometimes not.) CODB + margin.