



# Evolving transmission grid

## Field tower – economical transmission of electricity



The design of the field tower intends to render the arable landscape airy and hence reduce the landscape drawbacks of an electricity transmission line.

## New tower for fields

### to facilitate cultivation

**Fingrid has devised** a new type of transmission line tower, which is based on landowners' and farmers' needs and wishes.

**The tower referred to as a field tower** makes more arable land available for cultivation and facilitates the tillage of soil. The most noticeable difference between the traditional tower types and the field tower is that the field tower has no guy wires; the tower is self-supporting. When working on the field, it is no longer necessary to go around the guys and look out for them.

## One tower

### – two transmission lines

**In a field tower**, a 400 kilovolt transmission line runs at the top and a 110 kilovolt line beneath it. There is a safety distance of 11 metres between the conductors.

**The height of the tower** is in the same range as that of a conventional 400 kilovolt tower, where the upper crossarm is at a height of 31, 33 or 35 metres. The tower spacing is 300 to 450 metres.

**The field towers are primarily used** in the construction of new transmission lines. They can also be erected on existing lines in conjunction with the replacement of a line or some its towers. The field towers are made of galvanised steel. They can be painted with a desired colour. The service life of the towers is 80 to 100 years.

The new field tower stands firmly on four legs, without guy wires which impede farming work.



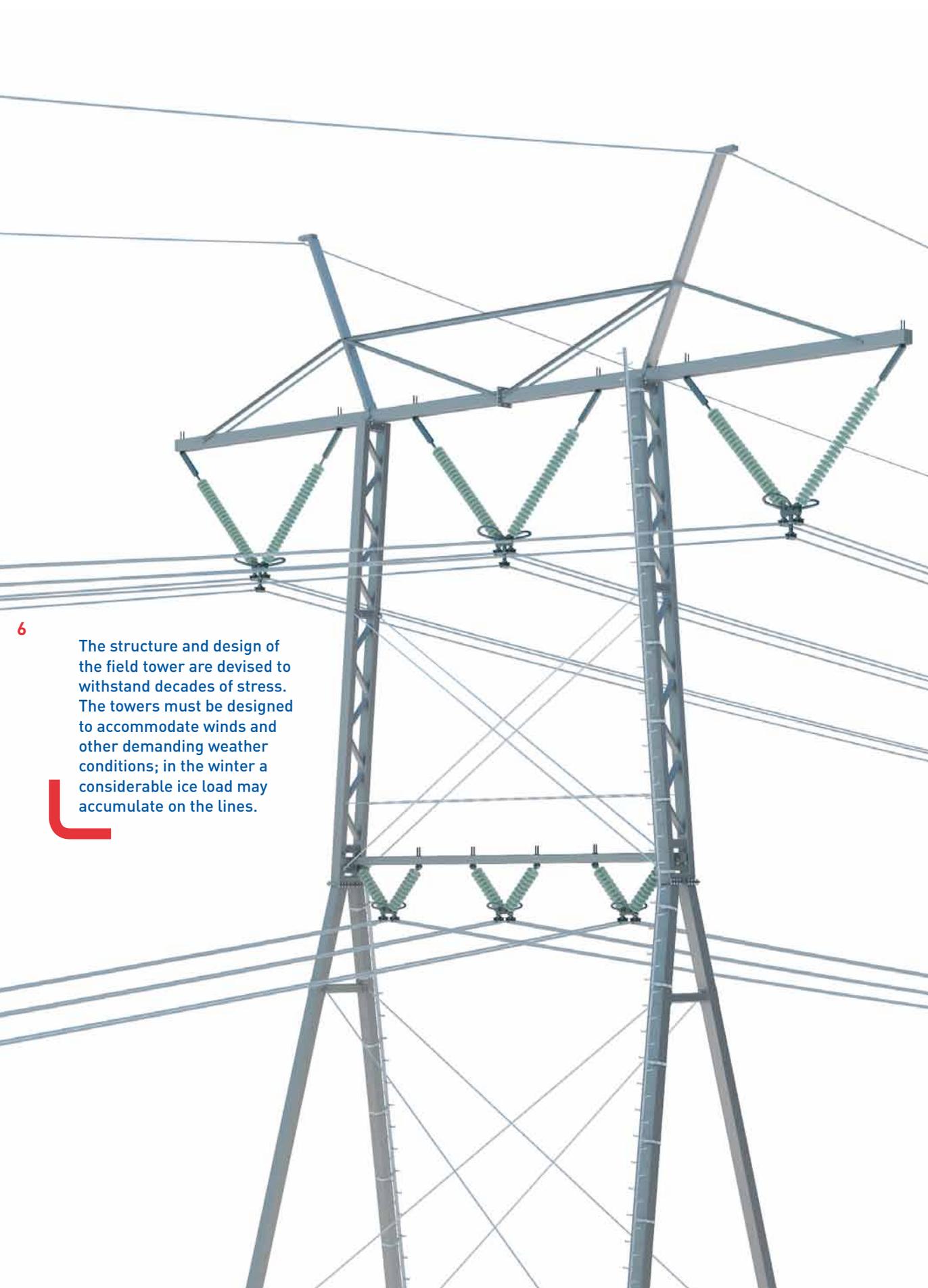
## Accessibility and safety

**Agricultural machinery** can be operated more freely near the new tower than in the vicinity of conventional guyed towers. The most common harrows, plant protection equipment and combine harvesters can run under the tower, since the space under the tower is 7 metres in the longitudinal direction and 14 metres in the cross direction of the transmission line.

**Protective structures** surrounding the legs of the tower prevent potential collisions with the legs. In this way, soil can be worked quite close to the tower. The lower structures of the new field tower are much more visible than the guys in the conventional towers. This also reduces the risk of collisions when operating machines.

**Since the new towers have no guys**, weeding problems in the surroundings are also significantly reduced.





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The structure and design of the field tower are devised to withstand decades of stress. The towers must be designed to accommodate winds and other demanding weather conditions; in the winter a considerable ice load may accumulate on the lines.



## Strength of steel on a concrete base

**The field tower stands** firmly on four legs. The foundations of the tower are composed of two prefabricated concrete sections joined together. This stabilises the tower structure. Separate concreting work is not required, but the entire foundation is built as prefabricated constructions.

**Each part of the foundation** weighs 3 tonnes. In other words, the four-legged tower is anchored to the ground using concrete foundations of 24 tonnes.

**The tower is fastened** to the four pillar elements by means of anchor bolts. The mounting to the foundations and the loading of the tower have been tested by the Tampere University of Technology. The tower with its base weighs almost 40 tonnes. There are a total of 17 conductors on the tower: 9 phase conductors in the 400 kilovolt line and 6 in the 110 kilovolt line. There also 2 overhead ground wires. The heaviest of these is the 400 kilovolt conductor, which weighs 2 kilos per metre.

**The material efficiency** of the foundations and steel structure is also an environmental asset. The work stages related to the erection and maintenance of the towers have been minimised, and the goal is to schedule them at times when they cause least harm to the farmer.

**The functioning, durability and safety of the field tower have been secured through a variety of tests. The test assembly of the tower revealed that the details certainly fit into place.**



## Harmony of shape in the landscape

**Fingrid is an international trailblazer** in combining high-quality industrial design and technical constructions. Special-design towers intended for built-up areas and delicate landscapes are prominent examples of the company's approach which respects the environment. The oldest of these so-called landscape towers date from the 1990s.

**The field tower carries on** the same open-minded approach which has also attained international acclaim.

**The new tower** is transparent and airy. It has a lesser impact on the landscape than the traditional lattice design. This is of importance when there are many towers in an arable landscape.

**Fingrid's partners** in the design of the new tower type have comprised the design agency Muotohiomo Oy, Empower Oy which specialises in consulting services in the energy industry, and the concrete producer Betroc Oy.

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