Corporate magazine
Fingrid Oyj **2/2014**

FINGRID

Erecting power line towers

p. 10

Grid development

▸This year, Fingrid employed 26 summer interns. Also pictured are some of the employees working on their theses. Read about the summer interns' career plans on page 15.

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Cover photograph: In April, Fingrid invited an audience to Varkaus to witness the erection of a power line tower. Read about the construction of the power line on pages 10–12.
Photograph by: Pentti Vänskä

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In this issue

EDITORIAL

We build the main grid for our customers

The fourth major construction wave of the Finnish main grid is currently undergoing. We are currently making heavy investments: we were one of the Finnish companies making the largest investments last year. Preparations for connecting carbon neutral power generation systems to the grid and renewing the grid's oldest sections are underway. Now that a reserve power plant in Forssa and new sea cables connecting Finland to Estonia and Sweden have been completed, for the next few years we will focus our investments in the Finnish substations and transmission lines. During the next couple of years, most of our construction projects will take place in the west coast and Northern Finland. We will be starting a record number of simultaneous investment projects. In 2016, almost fifty fairly large simultaneously ongoing investment projects will be underway. This will require extra flexibility from Fingrid's own employees and the employees of its service providers.

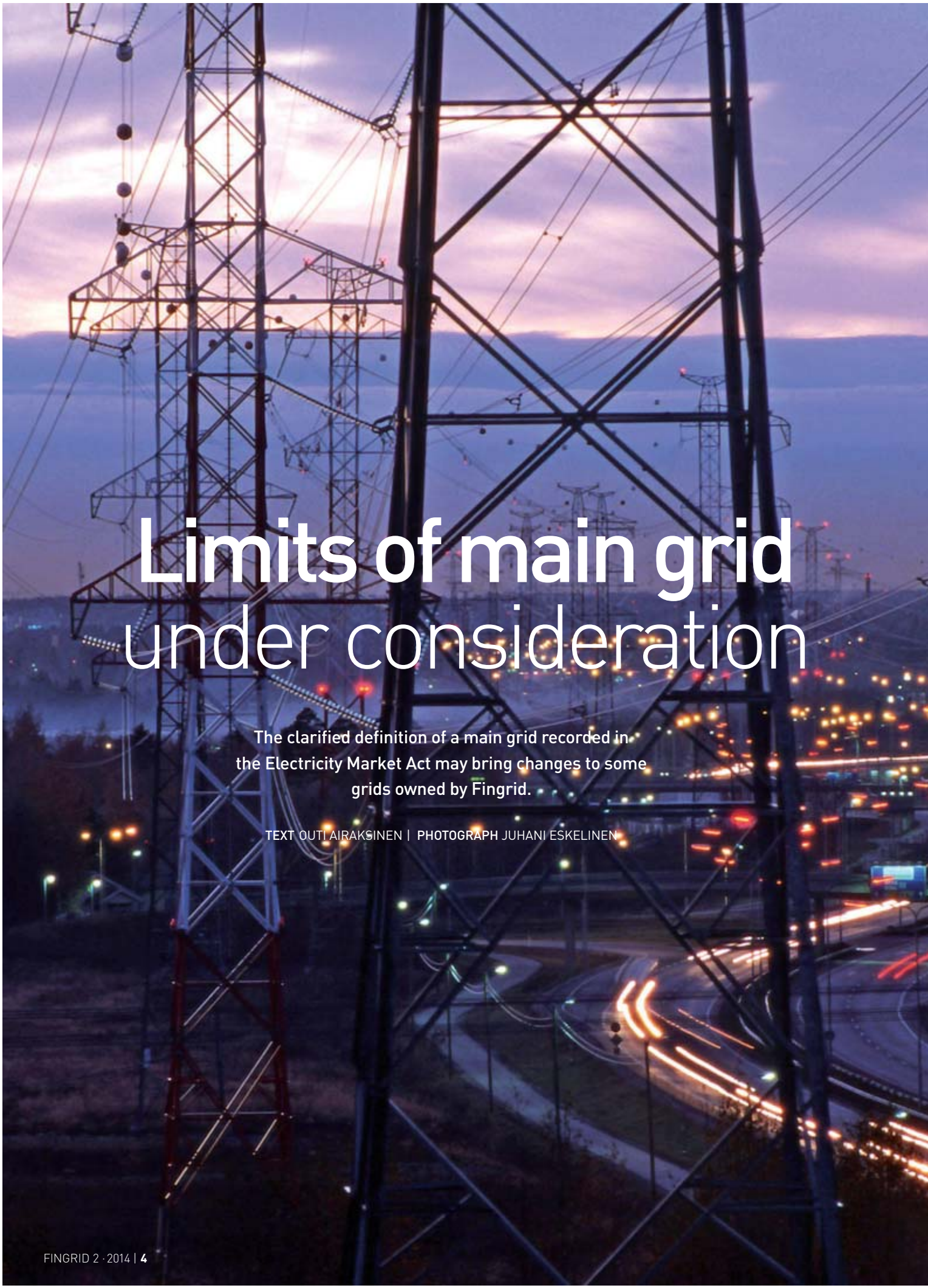
Most of our investments involve connecting new production systems to the grid or renewing old sections of the grid. These investments will ensure an even more reliable main grid in the whole of Finland. Connecting large new consumption sites to the grid will be safe. These investments will also provide us with a new transmission connection between northern and southern Finland.

The downside is poorer operational reliability during construction: some of the old grid sections will have to be decommissioned to make room for the new ones. This is because we will be building most of the transmission lines in the same place or next to the old lines – this is the most sensible solution for the entire society. The simplest way in terms of construction would be expropriating a whole new route, but that would not be efficient from the land use viewpoint. This means that we will only need new routes for around 5–10% of our new line investments.

The construction, especially on the west coast, will be quite a puzzle due to interdependencies between several projects. Each subproject must be completed on time to keep up with the overall schedule. Furthermore, construction to replace old grid sections and transmission lines that are already in use is a major occupational safety challenge: the employees will have to work close to live grid components. We have continuously and purposefully developed our occupational safety procedures, aiming at zero accidents. Occupational safety is also taken into account when planning interruptions and no compromises will be made in this respect, either. We can never be in such a hurry that we would take a chance that could compromise the health and safety of the people working on our construction sites.

Hopefully, our customers understand the necessity of interruptions during construction. We'd like to agree about the interruption times with our customers to ensure that the interruptions will cause as little harm and operational reliability risks as possible. However, we will not be able to take into account the wishes of all of our customers if we are to ensure that new wind power plants are connected to the grid in compliance with the goals set by society. This is why we hope that all possible backup connections and other means to improve operational reliability will be studied and utilised. The new grid sections will serve our customers and ensure proper operational reliability for decades to come. Furthermore, they will enable high-quality power transmission in the whole of Finland and retain the price of electricity the same in all parts of the country also in the future; this is by no means self-evident in the Nordic electricity market.

Kari Kuusela
is Fingrid Oyj's
Executive Vice President.



Limits of main grid under consideration

The clarified definition of a main grid recorded in the Electricity Market Act may bring changes to some grids owned by Fingrid.

TEXT OUTI AIRAKSINEN | **PHOTOGRAPH** JUHANI ESKELINEN

The new Electricity Market Act came into force last year and requires the definition of the main grid, which could leave a small part of the grids owned by Fingrid out of the grid. It appears that approximately 200 kilometres of the 14,000 kilometres Fingrid owns – or less than 2 per cent of Fingrid's current grid – do not meet the main grid criteria set out in the Act.

"A grid owner can own more than just a main grid, but the cost of such a high-voltage distribution network cannot by law be covered by grid tariffs," explains Senior Specialist **Pertti Kuronen** from Fingrid.

Correspondingly, Fingrid customers own some parts of the grid in use by the main grid.

"In such cases ownership arrangements need to be agreed, since the act states that a grid defined as a main grid must be owned by Fingrid based on a nationally selected unbundling alternative," says Kuronen.

Fingrid is currently working on defining the grid, a process which involves defining each grid and line section such that it either belongs to or does not belong to the main grid. Before finalising the definition, Fingrid has requested criteria from the Energy Authority as well as guidelines on interpretation to support the definition process.

"This is mainly about fine-tuning. For example, the act states that the main grid should cover the entire country to a sufficient extent, but nowhere does it say how close to electricity users the main grid should be. The Energy Authority has to interpret what the Act means in practice," says Kuronen.

The Finnish main grid is worth several billion euros and has been fine-tuned into its current state over the years as the grid was built to correspond to changes in Finnish electricity production and consumption.

The grid is still undergoing continuous development as Fingrid invests around two hundred million euros in grid development annually. "I don't think a single cable has ever gone to waste, but the ways in which we use electricity have changed. Some places have begun to use radial lines, which means that the grid will no longer meet the criteria for a main grid," explains Customer Manager **Petri Parviainen**.

Fingrid also requires a statement from authorities as to whether a cable can temporarily be in radial use without losing its main grid status. If not, we could end up in a situation whereby Fingrid is forced to sell grid sections – only to have to buy them back again a year or so later.

Sell grids or introduce new tariff?

As it stands, some 110 kilovolt lines owned by Fingrid and no longer in meshed use will fall outside of the main grid. "If we own substations or power lines which can no longer be defined as part of the main grid, we have to either sell them to those served by the grid or begin to invoice those customers who are connected to such a section of grid for costs," says Parviainen.

He believes that Fingrid might have to discuss these issues with many customers. If the grid users are uninterested in purchasing such non-main grids, they will end up having to pay a high-voltage grid fee which would be a little per megawatt hour in addition to the grid tariff.

"At the same time we would also check whether one of our customers owns a grid which meets main grid criteria. If this is the case, we should begin discussions as to whether Fingrid should purchase that section of the grid in question," says Parviainen.

By law the purchase and sale of grids must be on a voluntary basis. It could undoubtedly be in the interests of a Fingrid customer to consider transferring any parts of grid classified as main grid to Fingrid, since otherwise the customer would have to apply for a main grid licence themselves. "In practice, that would be quite a big undertaking. A company which owns main grid must, among other things, demonstrate to the EU its independence concerning the sale and production of electricity," adds Kuronen.

Last winter and during the spring, Fingrid agreed on the sale of three lines which will clearly remain outside of the main grid to customers, and discussions have begun with others as to the fate of some grid sections.

"Some grid users are interested in purchasing, others are not. We are confident that we can come up with a solution to benefit both parties in the majority of cases," says Parviainen. →

▸ Fingrid wants to hear its interest groups' opinion on the new grid specification, say Petri Parviainen (left) and Pertti Kuronen.

Shaping future investments

The implementation of main grid policies which is currently under way will create the basis for Fingrid's future investments. The definition of a main grid could, for example, impact on whether or not Fingrid constructs a high-voltage cable to the Helsinki city centre in the next few years. The construction of an underground cable to the capital city is estimated to cost several hundred million euros, and if the law were to be interpreted such that the responsibility for grid development lies with the main grid company, Fingrid's customers would be burdened with funding the costs in the form of grid tariffs.

In Helsinki, this is a pressing issue, since the high-voltage cable would be taken into use as soon as 2020 or shortly thereafter. The problem is that it remains unclear as to whether the planned 400 kilovolt grid would meet the definition of main grid or high-voltage distribution grid. The definition also affects the extent to which the grid should be reinforced. If the Helsinki grid has to be constructed to withstand technical faults and to be in meshed use like the rest of the main grid, this could total one hundred million euros in additional costs.

"As long as the new criteria for a main grid does not bring significant changes, the definition of the main grid for the upcoming main grid agreement period will not cause significant change to the grid tariff. The responsibility for the development of the Helsinki grid must be solved during the next main grid definition process, even though its actual cost effects won't be relevant until the following monitoring period. The grid solution must be planned in cooperation and we must look for the most affordable and technically sensible alternative for society," says Kuronen.

Tight schedule poses time constraints

For the main grid company, policies and interpretations of the new Electricity Market Act from the Energy Authority cannot come quickly enough since there is a strict schedule for the definition of the main grid. After the definition work, Fingrid must submit the work to the Energy Authority next March for inspection as to whether Fingrid's decision complies with the law. Prior to this, interest groups will be given the opportunity to express their views on the new outlining of the main grid, since the aim is for the process to be as open and transparent as possible.

The main grid should be of an extent compliant with a decision approved by the Energy Authority at the immediate start of the next monitoring period, which is January 2016.

"Our aim is to be able to present customers with a draft this year and then immediately thereafter engage in discussion concerning the impact of the new grid limits," says Petri Parviainen. ■

1.9.2013
The new Electricity Market Act requires the definition of the main grid. Part of the high-voltage grid managed by Fingrid does not meet the main grid criteria set out in the new specification.

January - September 2014
Guidelines to interpreting main grid specification and the bases for grid definitions are expected from the Energy Authority.

Fingrid will examine all its grid sections and define which grid sections belong to the main grid and which do not.

Late 2014
Fingrid's interest groups have around one month to express their opinions on Fingrid's proposal for main grid definition.

By 31 March 2015
Fingrid will submit its definition decision to the Energy Authority, which will confirm the compliance of the decision with law.

By the end of 2015
Fingrid will sell parts of grid it owns which do not belong to the main grid as per the new specification, or – alternatively – will form a separate high-voltage distribution grid from such parts of grid and will begin to collect grid fees from users. Ownership arrangements concerning parts of grid owned by customers but in main grid use will be agreed with customers.

2016–2019
A new monitoring period during which time the main grid must be of the extent set out in the definition decision. Changes to the limits of the main grid during the monitoring period and procedures will be agreed with the Energy Authority.

EUROPEAN COOPERATION

ENTSO-E is the European Network of Transmission System Operators, which carries out tasks assigned to it in legislation and acts as guardian of industry interests in the EU. This column deals with European cooperation in the development of the power system and electricity markets.

Europe-wide grid planning

Grid development is important since Europe is attempting to reduce its energy system's carbon emissions, ensure system security of supply and improve competitive ability by promoting market functionality.

Fingrid operates in ENTSO-E's system development committee, which coordinates and directs grid planning actions at an ENTSO level. In cooperation with one another, transmission system operators have together prepared not only a European-level Ten-Year Network Development Plan (TYNDP), but also six regional plans. Finland is part of the Baltic Sea region which covers the Nordic countries, the Baltic countries, Poland and Germany. The Ten-Year Network Development Plan was the result of two years of close cooperation and is currently with interest groups for comment.

Fingrid participated in the work of the group which prepared the Ten-Year Network Development Plan and in the joint regional development of the grid with the help of several specialists. Grid development is also supported by jointly prepared scenarios and the preparation of common grid models.

The plan is based on four different, alternative visions for system development by 2030. Projects in the plan have been assessed in all four different visions and as such their benefits in various future scenarios have been highlighted.

The Baltic Sea regional group also carried out a few sensitivity analyses. With regard to Finland, for example, the Baltic Sea region's own plan features significantly less thermal energy production capacity than the joint vision. As such, in that vision Finland is cleary underbalanced while in the joint vision, Finland is either balanced or strongly overbalanced.

No more congestion

The cost of required network reinforcements total around 150 billion euros. The largest needs for power transmission on a European level are those sites where population density is highest. Particular bottlenecks occur particularly in areas which are relatively poorly connected to the system, such as the Baltic region, the British Isles, Italy and sections between France and Spain.

In Germany, large projects are planned along a north-south axis with the aim of transferring wind power from the North Sea and coast to Southern Germany's large centres of consumption. In the Baltic Sea region, the largest individual project is the reinforcement of the Swedish internal grid, which will allow for the development of wind power in Northern Sweden.

The increase in renewable forms of production plays a strong role in directing grid development. Renewable energy is produced where preconditions for production are good, and not necessarily in locations where consumption is highest. As such, the distances that transmitted electricity would have to travel could grow to be very large indeed. In addition, renewable energy production varies depending on the wind and sun. Due to its adjustability, Nordic hydropower production has important significance for system management.

In the Baltic Sea region especially, projects between the Nordic countries and continental Europe will benefit national economies across the region, as will the connection of the Baltic States to shared European energy markets. Within the Nordic countries, the projects' benefits to national economies will be smaller, partially due to a more balanced price profile. For Finland, a third connection line to Sweden and north-south grid reinforcements within Finland - known as the P1 section - are planned.

The plan is available for comment until 20.9.2014. Comments can be sent via ENTSO-E's internet website at www.entsoe.eu/consultations/ ■

TEXT MAARIT UUSITALO

▸ There is still bottleneck congestion in the European electricity system, especially in areas marked on the map.

Hard work goes into **operational reliability**

In order to prevent disturbance on the main grid even during storms, the vegetation in power line areas is methodically maintained on a long-term basis. An international study deemed the operational reliability of the Finnish main grid to be top-notch.

TEXT MIRA MUURINEN | **PHOTOGRAPH** VALTTERI KANTANEN

Fingrid owns neither the land under the power lines nor the trees in the line area. Rather, these belong to landowners. Fingrid expropriates a permanent right of use to transmission line areas, based on which the company also has the right to manage the vegetation in the right-of-way and boundary areas and, for example, carry out construction in line areas. Occasionally, trees outside of the line area must be removed if they pose a risk to electrical safety.

Rights-of-way are cleared every 5–8 years

Rights-of-way are maintained according to a clearing cycle, based on which the tree growth in the right-of-way is most often cleared every 5–8 years. Since there are around 35,000 hectares of line area under Fingrid's power lines, it has to maintain around 5,500–6,000 hectares every year. Rights-of-way are cleared mechanically using either manpower or machines.

Clearing cycles are adapted to specific features particular to the local area. Inspections on rights-of-way are also carried out at regular intervals in order to ensure that the vegetation remains at a sufficiently low height.

Clearing is carried out selectively with slower-growing trees, such as junipers, left to liven up the right-of-way. Fingrid has also been involved in many right-of-way diversity studies which have investigated how clearing can be used to help maintain a traditional meadow landscape.

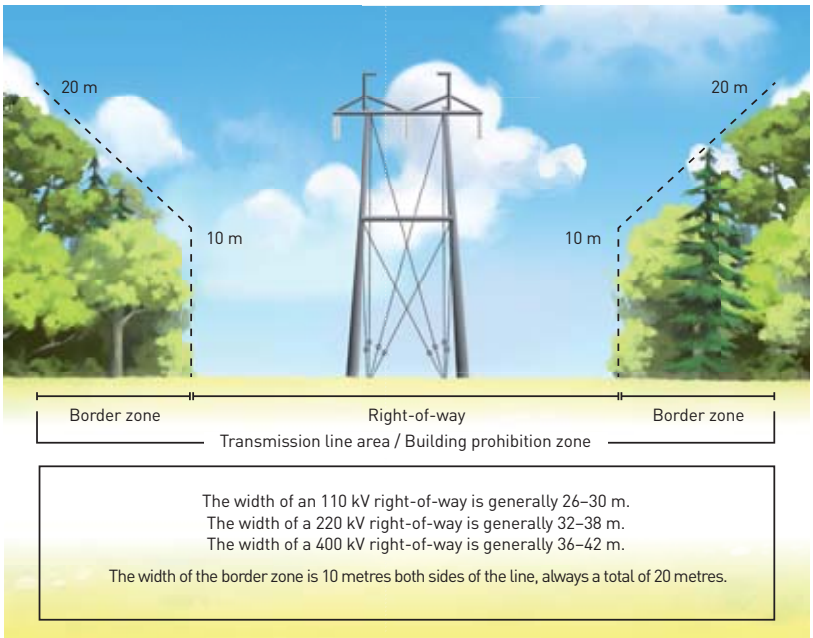
"These studies have also impacted on why we've decided on certain clearing cycles," explains Fingrid's Maintenance Manager **Mikko Jalonen**.

The Electricity Market Act which came into effect last year introduced stricter requirements concerning the treeproofing of the main grid and high-voltage distribution network. For example, a requirement concerning treeproof line routes was written into the Act. According to Jalonen, it is extremely difficult to achieve complete treeproofness.

Trees falling on lines is one of the most common causes of outages in distribution networks. Trees are very rarely the cause of disturbance on the main grid. "On an international scale we have succeeded in keeping operational reliability at a very high level in a cost-efficient way," says Jalonen.

Border zones are maintained through helicopter sawing and logging

Border zones are maintained every 10–25 years either by sawing the treetops by 2–4 metres using a helicopter or by felling the trees completely. When carrying out maintenance on power line area border zones, Fingrid follows a long-term plan which is based on treat-



ment intervals and an evaluation of the state of the border zone.

During the first phase, a landowner may carry out heavy first-thinning which fells the tallest trees. When the border trees next grow too tall, they are trimmed using a helicopter, which achieves a cut which evenly descends as it nears the line.

"Trees which are trimmed in this way are much more resistant to wind. Helicopter sawing achieves good treeproofing quickly and efficiently," Jalonen says.

Once the trees have grown for 10–15 years, the tree growth in the border zone usually contains such tall trees that it's more beneficial to fell all trees in the area. According to Mikko Jalonen, tree growth in many areas is currently in a phase wherein trees are felled across the entire border zone rather than trimmed with a helicopter.

"It wouldn't be a sensible solution for us or for landowners if we trimmed almost all the trees in the area. If the trees are felled all at once, it will take another 25–30 years before they need to be maintained again."

For the last few years, Fingrid has used a model for maintaining border zones wherein a logging contractor takes care of the entire maintenance - including the selling of wood and contact with landowners.

"The model we've used has been very well accepted by landowners," says Jalonen.

700–1,000 kilometres of border zones are maintained every year. Both clearing and the logging and helicopter sawing of border zones are purchased from companies providing clearing services through competitive bidding based on the most affordable overall bid.

"There are currently five service providers per year for border zone maintenance, but there is still enough work for a couple of new providers," Jalonen hints.

Landowners permitted to maintain border zones

Fingrid has the right to fell excessively tall trees in border zones, but the preemptive maintenance of all tree growth in the border zone requires permission from landowners. The easiest and most affordable way for landowners to maintain border zones is joint logging.

→

Joint logging requires the landowner to provide a power of attorney for logging and shared sales. The trees are sold to the highest bidding wood company and landowners receive the entire procurement price for the wood. Fingrid pays for the logging costs.

The joint logging option does not however mean that landowners are not permitted to maintain border forest themselves. It's often mistakenly thought that this is the case, explains wood production specialist **Arto Koistinen** from Forestry Development Centre TAPIO.

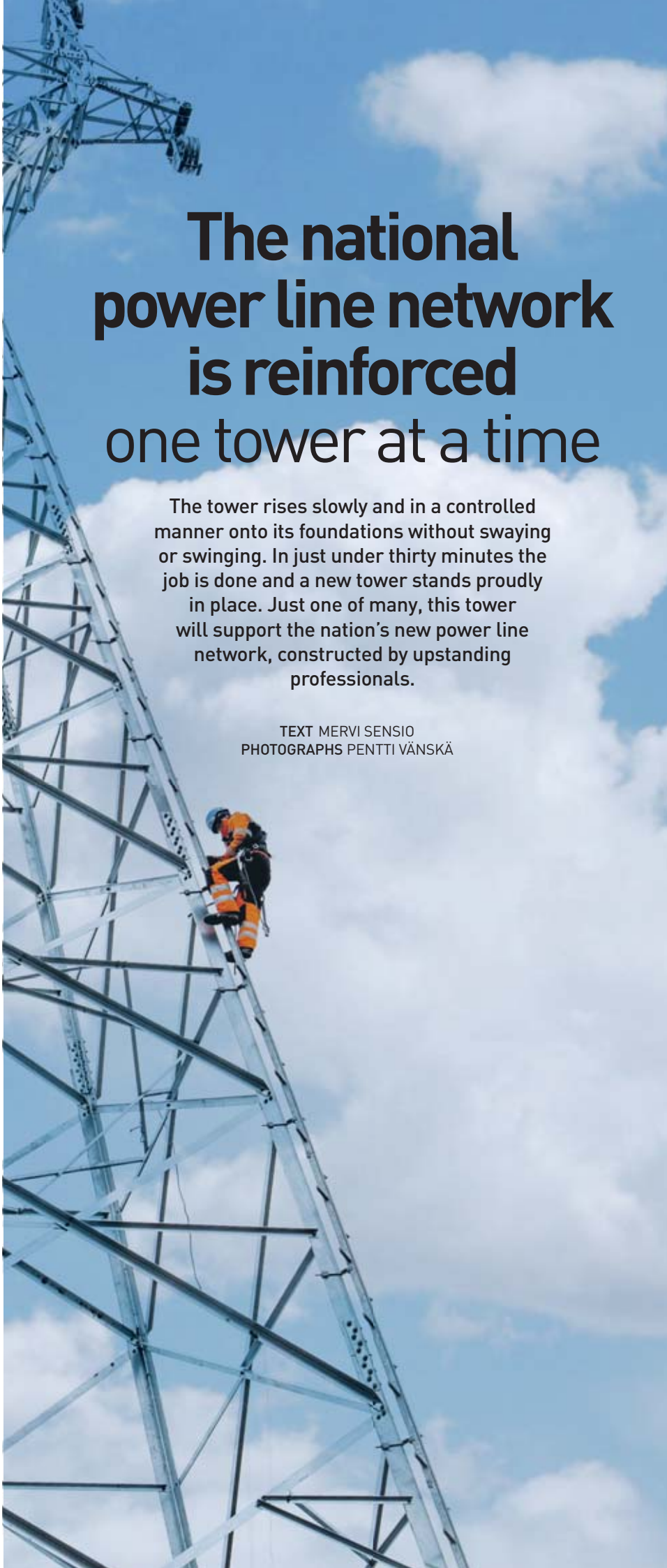
"Some forest owners are wary of maintaining border trees because they think it's prohibited. The border zone is a restricted use area, but there are no obstacles to maintaining trees in the border zone," says Koistinen.

"The most problematic situation is when a landowner maintains the forest behind the border zone but leaves the trees in the border zone untouched. This makes the trees very vulnerable to wind. The border zone must always be taken into account when maintaining forest bordering on a power line," says Mikko Jalonen.

Additional pressure is added to tree maintenance not only by operational reliability but also by safety concerns if there are residential areas near power lines. "If electricity flows via a tree to the ground, there's a high chance of personal injury," explains Jalonen. "Trees in yards near power lines should be felled entirely rather than trimmed, and replaced with low-growing vegetation. This entirely rules out the possibility that trees will grow too tall."

Fingrid regularly monitors trees in yards nearby power line areas and offers advice and help with logging free of charge. If you have any doubt at all that a tree could come into contact with a line if it falls, you should not fell it yourself. Instead, leave it up to a professional.

Forestry Development Centre TAPIO has drawn up a list of forest maintenance recommendations for border zones. A brochure named "Suurjännitejohtojen reunametsien hoito" is available for download in Finnish on Fingrid's website by clicking on Verkkohankkeet -> Verkon kunnossapito ja rakenne -> Puuston käsittely. ■



The national power line network is reinforced one tower at a time

The tower rises slowly and in a controlled manner onto its foundations without swaying or swinging. In just under thirty minutes the job is done and a new tower stands proudly in place. Just one of many, this tower will support the nation's new power line network, constructed by upstanding professionals.

TEXT MERVI SENSIO
PHOTOGRAPHS PENTTI VÄNSKÄ

There are around 14,000 kilometres of power lines in the Finnish main grid, 2,500 kilometres of which Fingrid will renew within ten years. The future grid will be able to utilise all current energy sources, transport more electricity, be reliable and have respect for nature.

"Projects are under way all over Finland. For example, 120 kilometres of 110 kilovolt line are under construction between Varkaus and Kontiolahti. The project is part of the grid development plan in the Savo-Karelia region, which will bring more transmission capacity to the area and significantly improve the operational reliability of electricity transmission," explains **Ritva Hauvonen**, project manager for the line project between Varkaus and Kontiolahti.

"The old power lines constructed in the 1950s have come to the end of the line, so to speak. Their capacity is no longer sufficient for electricity transmission and their age and condition makes them somewhat of a safety risk."

Projects span years

From planning to completion, work on a line can take 5–8 years. Nothing is carried out without prior consideration.

"The construction of power lines begins with an environmental impact assessment report. We investigate the natural values in the area and in the vicinity of the prospective line as well as the environmental impacts our project will have," Hauvonen says.

In the Varkaus region there are many sites of natural value and waterway crossings, which need to be carefully taken into account during construction. Environmental Specialist **Maija Nurmi** from Fingrid explains that the statutory environmental impact assessments (EIA) are used to investigate environmental impacts for line projects which involve at least 220 kilovolts and 15 kilometres, but the law also obligates an environmental assessment for smaller, 110 kilovolt lines.

"After the assessment we draw up maps and instructions for contractors so that they are able to take valuable sites into consideration out in the field. This line has no sites that we need to go around, but there are some tower transfers to be made. We also take care to ensure that construction on vulnerable natural sites, such as swamps, takes place during the winter when the ground is frozen and protected by snow cover," explains Nurmi.

After the environmental assessment, actual construction can begin. The long process requires the investment of time and effort into many issues. Phases relating to general planning and redemption as well as many other reports and investigations are required before the planning of practical implementation can begin. Terrain is examined, tower sites are selected and the various phases, disadvantages and challenges relating to line construction are investigated. One important phase is competitive bidding for the contract.

Eltel Networks Oy and TLT Building Oy are responsible for the construction of the Varkaus–Kontiolahti line.

Eltel Networks Oy's Project Manager **Teemu Palosaari** says the line is due for completion in May 2015.

"This is a long line and very varied terrain. We prefer to carry out construction during the winter, since there are many swamps and fields in the area," Palosaari explains.

Waterways and islands also pose challenges to construction.

Tower power

A total of 515 old towers will be removed and 384 new towers will be constructed between Varkaus and Kontiolahti. The new towers' structure and better cables will result in longer spans. The new towers are steel-structured and mostly stay-cabled. Their height ranges between 15 and 33 metres. The ground conditions at the tower site affect the choice of foundation.

"This free-standing tower has a 9x9 metre base with sixteen 28 metre-long concrete piles underneath it. The foundation height is three metres and around 45 cubic metres of concrete were used. The tower itself weighs approximately 11 tonnes," Palosaari tells us about the tower erected in the Varkaus lifting event.

Towers are usually transported in components to the site using forest machinery, since there are rarely roads along lines.

The tower is then assembled and erected onto its foundation on site. Sometimes a tower has to be erected in two parts.

"Once the tower is firmly attached, a crew member climbs to the top and detaches the lifting chains. →

Fingrid invited an audience to Varkaus to witness the erection of a power line tower. The tower erected along Luttilantie in April is a four-legged free-standing power line tower. It consists of over 600 components and its assembly took four engineers four days to complete. The tower weighs almost 11,000 kilograms and is over 30 metres tall. The lifting of the tower onto its foundations took thirty minutes.

The most commonly used power line tower is a two-legged stay-cabled portal tower. It is lighter and often easier and quicker to erect. It remains upright thanks to tight stay cables firmly anchored into the ground.

Compulsory safety gear for employees working on power lines include high-visibility clothing, a helmet and safety shoes. Depending on the task at hand, more gear may be needed.

Falling is avoided using the "Always attached" method for safety harnesses. A trained worker climbs using a safety harness with two hooks. One of the hooks is always attached.

Occupational safety is top priority

Before lifting, many issues have to be dealt with, since the erection of a tower poses numerous dangers. The crane could fall, the load could become unbalanced, there are large, moving machines in the vicinity and some work is carried out at a height.

"We could be facing terrain-related difficulties. We have to think about how we can get the machines to the site, how we can keep the crane in place to lift. In winter, slippery terrain and high winds can be a problem," says Palosaari.

Usually a new line is built over or alongside an existing one, so it's not often that work encroaches on new areas. The proximity of existing lines however poses a voltage threat to the work site.

"Machines have to be earthed and kept as far away from the existing line as possible. Taking care of occupational safety is a crucial part of the job."

Fingrid's Safety Adviser **Karri Koskinen** knows that the most important guarantee of occupational safety is attitude.

"You have to have the right attitude. Each employee has to keep safety a priority. Work must always be carried out safely. Not as quickly as possible, or as easily as possible, but safely," he emphasises.

"All workers have to be committed to this idea. We have to keep safety a topic of conversation and we have to continuously undergo safety training."

If work is dangerous, it is not carried out

Fingrid has many requirements in place to ensure occupational safety. In addition to requiring professional skills and an occupational safety card, it also requires that there is a sufficient number of individuals on a work site who have undergone first aid training. Individuals working at height must also be mentally and physically suitable for the job. There are separate occupational health and physical condition inspections in place for these employees, as well as separate training concerning rescuing an injured colleague from height.

An essential part of safety is familiarisation with the work site and work phase in question.

"Every employee should know which tasks belong to whom, what the dangers posed by the work are and how these dangers can be avoided. You have to know how to move around the area and how to call for help. In addition, matters are discussed personally in order to ensure that everyone has understood what's going on," Karri Koskinen says.

In many cases, conditions at a work site can require changes. These changes are examined and the original plan will be modified as necessary.

"Work must be stopped if it is unsafe. It proves real professional skills if you know when to down tools for safety, and are ready to do so. Our aim is zero accidents," says Koskinen.

The most common accidents involve slipping and tripping. It is rare that anything more serious occurs. If something serious does occur, however, the case is thoroughly examined and we learn from our mistakes.

Teemu Palosaari agrees and knows that working in the field requires a lot from people. "The work is almost 100 per cent travel. In the winter it's cold and in the summer it's hot. The work is also physically demanding."

Around 20–25 people, including subcontractors and specialists in various fields are needed to erect a single tower. "It's quite a motley crew," Palosaari says with a smile.

In addition to paydays, the work pays itself back upon completion at the latest. "It could be the end of a project which has spanned years, and each worker can see their own contribution in it." ■

"Working in the field and natural conditions does cause headaches, but that cannot be an excuse for working in an unsafe manner. If work is dangerous, it must not be carried out," says Fingrid's Safety Adviser Karri Koskinen.

Varkaus–Kontiolahti power line progressing well despite challenges

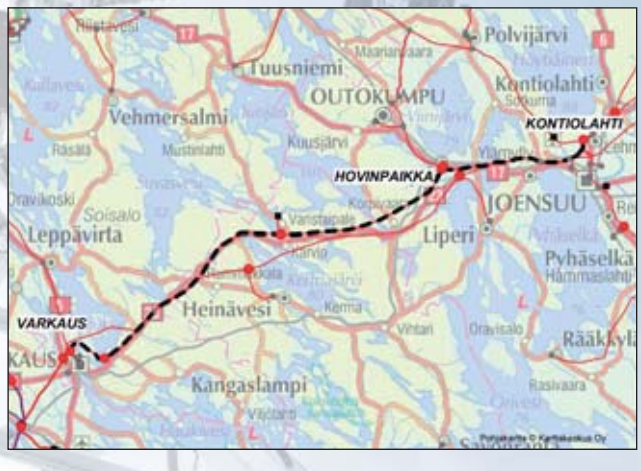
Fingrid is currently renovating a power line between Varkaus and Kontiolahti in Joensuu. The project will be completed next May. "The power line is progressing on schedule," says Project Manager Ritva Hauvonen, who is satisfied with the project despite the challenges it has faced.

General planning for the Varkaus–Kontiolahti power line began in autumn 2011. Ritva Hauvonen has led the project from the start, and knows that when working on power lines, the team leader has to prepare not only for routine matters but also for changes, of which there have been a few. Contractors' questions, rapidly changing situations and construction challenges have kept Hauvonen on her toes.

"At first, it was a real challenge figuring out how to carry out the two parts of the same contract in a way that allowed two contractors to work independently of one another. But we succeeded. Construction was divided into two sections also to ensure the availability of electricity to local distribution networks and industrial plants and other customers. This also leaves more space for construction while minimising the outage periods, and if faults were to occur it is easier to make sure that electricity can be distributed," says Hauvonen.

"It's impossible to plan this kind of project entirely in advance, since you have to be able to react to changing situations," Hauvonen says. "Just when you think construction will run smoothly until completion, a surprise crops up. So then we have to think how to solve the problem." Similarly, Highway 23 has also posed challenges since the construction of the highway and the power line are simultaneously under way in the same area.

The power line is being constructed by Eltel Networks Oy and TLT Building Oy. Eltel's section between Varkaus and Hovinpaikka is 88 kilometres long and is divided into three sections, of which the first section, Karvio-Hovinpaikka, was taken into use in April. The second section of line between the Kinnari substation and Varkaus was completed in July. At the moment, Eltel is constructing the third section from the Kinnari substation to Karvio, which will be ready on May 2015 at the latest. TLT Building is currently working on a 30 kilometre long section of line running from Hovinpaikka to Kontiolahti.



"Summer construction is a quieter period during which time sites are tidied and prepared for upcoming work. In the winter we will be able to carry out work on the difficult, soft foundation sites in the terrain and then we will be able to build the line," says Hauvonen.

A grid is always a future grid

The new power line will primarily be built over an existing line. The old line was constructed in the 1950s. Fingrid's Planning Manager **Aki Laurila** explains that the company plans the power transmission network over a timeline spanning decades.

"We use scenarios to anticipate transmission needs. Scenario work aims to model the future 25 years in advance. The aim is to create various developmental paths which differ from one another with regard to e.g. the electricity production methods which may be used in the future. Calculation models are then compiled based on the scenarios and are used to simulate transmission needs," says Laurila.

In addition to examining scenarios, assessments from Fingrid's customers concerning the development of electricity production and consumption are also used to anticipate need. More precise computer simulations are then carried out based on the predictions and the simulations are used to evaluate whether the planned grid reinforcements are technically sufficient.

"We aim to predict future electricity transmission needs as best as possible and then select a power line voltage level which is both financially and technically suitable for the purpose," says Laurila.

The voltage levels used in Finland's main grid are 110, 220 and 400 kilovolts. The aging line between Varkaus and Joensuu will be replaced with a 110 kilovolt power line which Fingrid has deemed suitable from both a financial and technical perspective.

The power line between Varkaus and Kontiolahti is part of the development of the grid in the Savo and Karelia region. The entire contract is due for completion in May 2015. ■

TEXT MERVI SENSIO

It all began with **a summer job**

Specialist **Jonni Laine**'s career at Fingrid began with a summer internship in the balance services unit in 2008. Now Laine is involved in a new kind of European-level project: establishing a joint-Nordic balance services company.

TEXT MIRA MUURINEN | **PHOTOGRAPHS** MATTI IMMONEN

"It's difficult to describe a typical working day, since I might have something on the agenda today which won't be current in a month," explains Specialist Jonni Laine from Fingrid.

Laine works in the NBS (Nordic Balance Settlement) project, thanks to which the joint-Nordic balance settlement company eSett was established together with the Swedish grid company Svenska Kraftnät and Norway's Stattnet. The new company is a pioneer; no company like it has ever been seen in Europe.

From Lappeenranta to Helsinki

Jonni Laine graduated with a Master of Sciences (Engineering) in the electricity markets from the Lappeenranta University of Technology in 2011. The student town of Lappeenranta was a natural choice for Laine, who is originally from nearby Savitaipale.

He enjoyed his first summer at Fingrid in 2008 so much that he returned to Helsinki and his team the following summer, too. In 2011 he completed his thesis "The development of balance management on the Finnish electricity markets" for Fingrid's balance services unit.

"It was great to write my thesis at Fingrid. I received lots of help and support from the specialists here. I found the topic to be interesting and my supervising professor from Lappeenranta appreciated my choice of topic and research process."

After completing his thesis, Laine first continued working in the balance services unit, where his job description included balance settlement, balance management development tasks and tasks relating to financial reporting. In 2013 he transitioned smoothly to the NBS project, where he is now employed full-time.

"I was left with such a good impression of Fingrid as an employer after my first summer there that I was immediately interested in working for the company. The working atmosphere is very good with close working relationships with other units, and everyone is so nice," says Laine.

Laine has also pulled his own weight in maintaining a great atmosphere at work. From 2012 to 2014 he was a member of the board in the personnel association Kehys, which organises benefits and events for Fingrid employees. "We arrange various cultural and exercise-related benefits, games and other such things for employees," explains Laine.

Nowadays Laine is part of the steering group for personnel and competence. The steering group's task is to develop a strategy and practices from a personnel and competence perspective in line with personnel needs.

A wide range of tasks

The purpose of the NBS project is to standardise practices between Finland,

JONNI LAINE

Age: 29

Home and family: Lives with his partner in Ullanlinna, Helsinki.

Education: M.Sc. (Eng) in electricity markets

Career: Summer internships at Fingrid's balance management unit in 2008 and 2009; wrote his thesis for Fingrid in 2010, now has a permanent position in the balance services unit. Has worked as a design specialist in the NBS project since 2013.

In his free time: Plays tennis, badminton, floorball and cycling. Enjoys travelling when his work allows. Fishes at his summer cabin on the shore of Kuolimojärvi in Savitaipale.

Motto: It's a bit of a carpentry-related one: "Measure twice and you only have to saw once."

Sweden and Norway. The aim is for balance settlement to be carried out by a company jointly owned by the grid companies in Finland, Sweden and Norway during 2015. The standardisation of practices will take the joint-Nordic electricity markets one step further. As a result of the joint-Nordic balance settlement, bureaucracy in the grid companies will decrease, the entrance threshold for actors on the electricity markets will become lower and, in the long-term, costs will decrease.

Jonni Laine's primary tasks currently relate to the NBS information systems project: a new balance settlement system is needed for the eSett company, and Laine is involved in its specification and procurement. Contact with partner countries is an essential part of his work. "I'm in contact with our partners in Sweden and Norway on a daily basis, as well as with the Czech Republic, from whom we're ordering our company's information system.

Laine's work only requires him to travel occasionally, since Finland was chosen as the location for the eSett company due to Fingrid's effective operating model.

The rest of Laine's working year holds in store the testing of new information systems and the finalising of business models. He enjoys working in the NBS project, where every day is different. "The best thing about my job is that there isn't really any routine. I can engage in all kinds of tasks and challenges in cooperation with specialists from different industries."

He hopes that his career will continue to offer more of the same. "It would be great if I could work with a wide range of challenges and varying tasks. Routine isn't really my thing."

Laine has some advice for students interested in the same kind of work: "Personally I've benefitted greatly from studying a diverse range of subjects in addition to the core studies of my own industry. For example, I minored in industrial engineering and economics. It's well worth adding some economics studies to your degree," he adds. ■

A GREAT PLACE TO WORK

Fingrid came 25th in the general series of the Great Place to Work in Finland survey, carried out in late 2013. Fingrid was the only state-owned industrial company to be rewarded. Fingrid first participated in the survey in 2012 and in 2013 improved its ranking by three. Results improved across the board and pride in the workplace and the employees' own work, as well as community spirit and working atmosphere all improved. The Finnish survey was carried out by the Great Place to Work® Institute. A total of 138 organisations participated in the survey, with the 50 best companies published.

Future promise

We asked three summer interns at Fingrid how their work is going this summer and what their dreams are for their careers.

JUHANI LEPISTÖ, 27
Studies electricity networks and high-voltage technology at Aalto University. Works in network planning at Fingrid.

"Previously I studied power engineering at the Metropolia University of Applied Sciences, and before that I trained as an electrical engineer in vocational college. When I started at the vocational college I hadn't yet planned what I would go on to do, but whenever I've graduated, I've always wanted to find out more about the industry. After graduating, I'd like to continue working with networks - everything about electricity networks interests me.

I applied to work at Fingrid because Fingrid looks at things from a wider perspective. There's a really great working atmosphere here. It's always nice to come to work in the morning."

MIKKO PORANEN, 22
Studies electrical engineering at Aalto University. Works with the Elvis asset management program at Fingrid.

"I think that Fingrid is the best place in Finland to work for someone studying electricity networks: it's a large company with a concrete task in society. The working community is also really tight-knit. It's a pleasure to solve problems with nice people who have a good sense of humour.

It's also great to be involved in developing Elvis, which will become a new point of reference in main grid asset management. In the future, I'd like to be able to make use of the competence I've gained at work and from my studies – preferably in an international setting."

HEIDI UIMONEN, 24
Studies power engineering at the Tampere University of Technology. Works with electricity markets at Fingrid and will begin her thesis work on the topic in autumn.

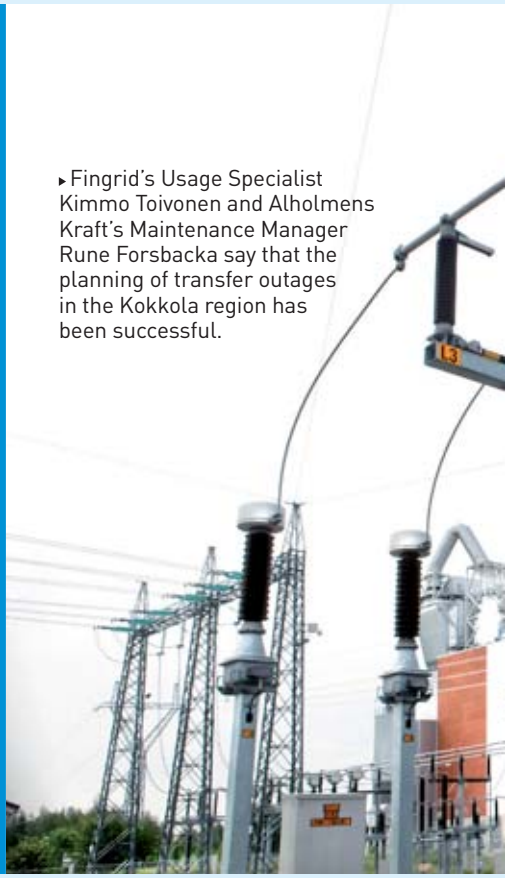
"I applied to work at Fingrid because I don't think any other company would have provided me with the opportunity to carry out the same kind of international market development work. Fingrid has a good reputation and the working atmosphere has lived up to that reputation.

My summer internship has consisted of updating reports, studying how electricity markets function, learning about development projects and following discussions in the industry. In the future I hope I will be able to continue working with these areas and learn more about international operations."

GOOD PLANNING KEEPS US POWERED

Fingrid's major investment project concerning the renewal of the main grid in Ostrobothnia, requires careful planning, a strict schedule and good cooperation.

TEXT ANNE KYTÖLÄ | **PHOTOGRAPH** ULLA NIKULA



▸ Fingrid's Usage Specialist Kimmo Toivonen and Alholmens Kraft's Maintenance Manager Rune Forsbacka say that the planning of transfer outages in the Kokkola region has been successful.

The main grid in Ostrobothnia has grown old and its capacity has become insufficient, and it will be replaced entirely with a new kind of grid. By 2017, a 400 kilovolt grid from Pori to Oulu will span Ostrobothnia with 5 new electricity distribution substations and a total of 350 kilometres of new 400 kilovolt lines.

In the third phase of the electricity transmission network construction project, the new Hirvisuo distribution substation will be constructed in Kokkola and the grid running from Hirvisuo to the Pyhänselkä transformer substation in Muhos will be replaced.

Seventy-nine kilometres of grid will be constructed from Hirvisuo to Kalajoki this year and next year. The construction of the Hirvisuo distribution substation south of Kokkola began in August.

Parties come together

The construction of the Hirvisuo distribution substation has an impact on a large group of energy producers and users in the Kokkola and Jakobstad area, including the power plant company Alholmens Kraft, the nearby UPM Jakobstad plant and the energy company Herrfors which supplies its customers with electricity in the Ostrobothnia and Central Ostrobothnia regions.

Fingrid's Usage Specialist **Kimmo Toivonen** has been proactive well ahead of time. He began to inform partners in cooperation of upcoming projects approximately one year in advance. In addition to telephone calls and e-mail messaging, parties came together around the same table to talk face-to-face about project impacts and scheduling.

"We held four meetings with this group and Fingrid also organised a customer event at the end of April which explained the upcoming projects to energy companies in the area," says Toivonen.

Plenty of planning time

Alholmens Kraft's power plant Maintenance Manager **Rune Forsbacka** commends Kimmo Toivonen and Fingrid for their early action. Forsbacka remembers that he first heard of the matter last summer when he told Toivonen of Alholmens Kraft's summer 2014 annual maintenance over the phone.

"We didn't experience any rush or panic since we had a year to prepare," says Forsbacka.

When constructing a new main grid, the flow of electricity through existing power lines must be stopped for the duration of work. Since customers cannot be left without electricity, a new route must be sought for the electricity for the transfer outage period. Indeed, topics discussed at the negotiating table include back-up routes and the scheduling of work and transfer outages.

"The planning of transfer outages first begins with finding a period of time during which the outage will be carried out. Then, several calculations are made as to how the grid can withstand load and how we can provide sufficient electricity for everyone. Finally, we will decide on an order of work and scheduling with precise times," explains Toivonen.

Calculations prepare for the worst-case scenario

Kimmo Toivonen and Rune Forsbacka study a drawing of electricity transmission lines. Two Fingrid power lines

run over the Hirvisuo substation. One line will still be in use even if power is cut from the other line for the duration of work. But what if something stops the flow of electricity?

"In addition to normal situations, we also try to keep electricity routes intact during exceptional circumstances and related disruption," Toivonen points out.

Transfer outage calculations are always carried out according to the worst-case scenario. The calculations prepare for cases wherein the grid would have to withstand a fault caused by e.g. a thunderstorm or some other problem during already exceptional arrangements.

Alternatives and parallel lines must also be sought if calculations show that the grid is unable to withstand the coming load.

Many players, many goals

Alholmens Kraft, UPM and Herrfors are ready to help Fingrid to ensure the undisrupted flow of electricity through power lines, but their support may not conflict with the companies' own interests.

Negotiations have aimed to make sure, for example, that Alholmens Kraft would not have to restrict its power plant's production in order to support Fingrid.

"The good thing about this is that we have an understanding and flexible partner in negotiations," says Forsbacka, nodding appreciatively at Toivonen.

Toivonen thinks the same of Fingrid's negotiating partners: cooperation has been a success since all parties have been willing to negotiate and work together.

"That's how we've found the best middle road," says Toivonen.

Even though the companies' aims differ from one another to some extent, ultimately the most important thing for all parties is that power lines transfer electricity on regardless of whose lines the electricity flows through.

"We all want to get things done well and we've seen good results by being honest and open with each other," says Forsbacka.

Construction immediately after summer holidays

The first plans saw work set to begin in May, but after grid calculation results and stoppages at Alholmens Kraft and UPM for annual maintenance, the parties agreed that it's better to start work straight after the summer holidays in the beginning of August.

When work begins on the substation, Fingrid's power lines will be moved aside away from the work site. The flow of electricity will be stopped altogether in one power line, and electricity will be transmitted to customers via Fingrid's second line and via a back-up route constructed from the Herrfors network.

"If we were to rely solely on Fingrid's second line and it encountered a fault, Jakobstad as a unit would be entirely detached from the main grid," says Toivonen, describing the importance of the back-up route.

Availability of electricity to improve in Kokkola

For the Kokkola region, the renewal of Fingrid's power lines means a significant improvement to the current situation.

"The renewed main grid will stabilise the area: disruption will decrease and transfer capacity will increase," says Toivonen of the importance of the construction work.

Fingrid's investments on the western coast are also necessary in order to connect capacity to the main grid from nuclear power and from a windfarm to be constructed in the area. ■

WHAT ARE WE BUILDING?

Fingrid will have invested EUR 110 million in the renewal of the Ostrobothnian electricity transmission grid by 2017. In August 2014, construction began on the Hirvisuo transformer substation and series capacitor station as well as on the 79 kilometre-long power line from Hirvisuo to Kalajoki.

SAME COMPANY, NEW NAME

Caruna, an electricity transmission company which separated from the Fortum group, takes its name from the village of Karuna in south-western Finland, where its operations began over 100 years ago. Now Caruna is Finland's largest electricity transmission company and it wants to share its positive energy.

TEXT SUVI ARTTI | **PHOTOGRAPH** MATTI IMMONEN

▸ Henrik Suomi showed us around the Keilaniemi electricity substation, which will be constructed next to the Caruna headquarters. The substation will be complete at the end of the year and will feed electricity to power, for example, the Helsinki–Espoo länsimetro (west metro), currently under construction.

One of Fingrid's newest members of the grid committee is **Henrik Suomi,** whose career in Caruna has been action-packed. He began work at Fortum Sähkönsiirto as a regional network manager in March 2012 and just a few months later Fortum launched an investigation into the future of its electricity transmission operations. In December 2013, the company announced a deal with Suomi Power Networks Oy and in March 2014 the new company, Caruna, began operations.

"It's been interesting to be involved in this period of change. Lots has happened over the last eighteen months. We have created a new company and to some extent, new operating methods," says Suomi, who has acted as Caruna's Head of Asset Management for a year.

"The change has not required any action from our customers; in fact, customer relations will remain as they are. We are now our own, independent brand and we have clarified our message. Our main target is to make everyday life run more smoothly."

Significant investments to improve electricity grid reliability

In his current task as leader of the asset management team, Henrik Suomi is responsible for investments in regional and distribution grids. Caruna's investment volume is around one hundred million euros annually.

"We have a total of approximately 80,000 kilometres of electricity grid all over Finland, built mainly during the 1970s and 1980s. As such, replacement investments are called for. In addition to projects to renovate the aging grid, we also invest in grids' weather-related reliability and in critical sections of grid."

The next major project will begin in south-western Finland and Satakunta, where Caruna will improve the general and weather-related reliability of the medium and high-voltage grid in dispersed settlement areas. The project will total 60 million euros and will be carried out by Eltel Networks Oy and Voimatel Oy.

Cooperation with Fingrid is important

Henrik Suomi has been a member of Fingrid's grid committee since the start of the year. He expects active discussion and impact from members. Some of the most important current affairs from Caruna's perspective are the outlining of the main grid, connectivity of wind power and management of reactive power.

"I've participated in two meetings and they generated just the kind of discussion they should. The committee is a body which takes a stand on the industry's development and broadens its members' perspectives on issues. At the same time it's a good place to network with others in the industry."

"It's our hope that Fingrid listens carefully to its customers and explains its plans well in advance. We have many connection points to the main grid, so main grid solutions affect us and possibly our customers, too."

Contractors are important partners for Caruna. "We indirectly employ 1,500 people. We have developed our operations by explaining our visions for the future and investment plans to our contractors more actively than we used to. We have a shared interest and wish to convey what we're doing as well as what we expect concerning construction quality and occupational safety," says Henrik Suomi.

There is strictly no compromising on occupational safety. The "Home safe and sound" campaign is currently under way at Caruna and rewards contractor teams with recreational vouchers if no occupational accidents occur.

The company is now more active in distributing information about its investments and other activities in various media, especially social media. "Landowners are one important interest group. In July we were at the OKRA - The Real Farm Fair in Oripää explaining about Caruna in the area and about major investment projects which are under way."

Henrik Suomi got to know Fingrid, and especially Customer Manager **Petri Parviainen**, when he worked as regional network manager at Fortum Sähkönsiirto.

Suomi believes that close cooperation is important. "It's our hope that Fingrid listens carefully to its customers and explains its plans well in advance. We have many connection points to the main grid, so main grid solutions affect us and possibly our customers, too," he says.

According to Suomi, cooperation works well. "We exchange information on outage needs, for example. Meetings are held regularly. We've noticed that Fingrid invests in customer service."

Fingrid also has a good understanding of Caruna, since **Niklas Löf**, who used to work as a project manager in Henrik Suomi's team, transferred to Fingrid last autumn to work as a customer connections specialist. "When he left, we joked that from now on hopefully Fingrid will understand our needs even better," Suomi smiles. ■

ACTIVE DISCUSSION AND DIRECT FEEDBACK

Fingrid's grid committee has recently discussed issues such as main grid outlining and the additional construction of wind power. Discussion is lively since electricity producers, grid companies and major consumers of electricity are all having their say.

TEXT SUVI ARTTI
PHOTOGRAPH MATTI IMMONEN

▸The Fingrid grid committee as it was last year: Jaakko Tuomisto (left), Raimo Härmä (no longer in the committee), Jarkko Kohtala (no longer in the committee), Petri Parviainen, Antti Timonen, Jorma Heikkilä, Kari Kuusela, Seppo Tupeli and Markku Hyvärinen. New members from the beginning of 2014 are Jyrki Havukainen, Matti Ryhänen and Henrik Suomi, as well as Suvi Lokkinen who is acting as secretary.

The grid committee's task is to act as a grid development-related cooperative body between Fingrid and its customers. Fingrid's executive vice president **Kari Kuusela** acts as Chair of the grid committee. He believes that the grid committee is a great tool for testing out new plans in the early stages.

"We've sent many things for comment early on, in the development stages. This allows us to receive direct feedback from the entire group rapidly, without numerous iteration rounds. Group discussions refine opinions, since other parties need to be taken into account," explains Kuusela.

The committee also acts as an information channel between Fingrid and its customers. The material for meetings, held four times a year, is available to everyone on Fingrid's website.

A miniature of Fingrid's customer base

The grid committee features representatives from all Fingrid's customer groups: electricity producers, industry and grid companies. It also aims at geographical equality. Oulu, Savo, Western Finland, Ostrobothnia, Helsinki and Uusimaa are currently represented.

"We have active members who give feedback and ideas. Spontaneous discussion occurs on almost any topic," says Kuusela in praise of the committee.

He believes that discussion in the committee gives members a broader perspectives on the matters they deal with. "Different customers see things from different perspectives. You could say that everyone is right from their own point of view. Perhaps everyone will better understand solutions once they've heard others' perspectives."

Two to three members change every year, as veteran members make way for new faces. Kuusela believes that turnover is important in order for different customers to have their say. This year, **Matti Ryhänen** from Savon Voima Verkko Oy, **Jyrki Havukainen** from Porvoon Alueverkko Oy and **Henrik Suomi** from Caruna Oy all joined the committee as new members.

At the start of the year, unit manager **Suvi Lokkinen** from Fingrid started work as the committee's secretary and the previous secretary, Customer Manager **Petri Parviainen** became a full member of the committee.

Information and ideas

The grid committee convenes four times a year. Recently the committee has dealt with main grid outlining and the structure of the grid tariff. For several years, standard themes have included Fingrid's investment programme and the impact of additional wind power construction. Each meeting also examines current affairs such as maintenance management, grid construction projects and ENTSO-E news.

Once a year, the meeting is held on a member's premises and we get to know more about the member in question. "This year we went to Olkiluoto and last year we visited Oulu."

Information is shared and lessons learnt. When Fingrid began a project to improve occupational safety some years ago, it turned to the grid committee.

"It turned out that Outokumpu has a functioning occupational safety system. So we went to visit their factory in Tornio to find information for Fingrid's own project," explains Kuusela. ■

Grid tariff is developed in close cooperation with grid users

The structure of the grid tariff is under consideration for the monitoring period due to begin in 2016. Fingrid has already begun to investigate the possible overhaul of the structure well in advance. The aim is to come up with a tariff which is clear, predictable and which treats all customer groups fairly.

TEXT SUVI ARTTI | **PHOTOGRAPH** RISTO JUTILA

Customer feedback on the current tariff has shown its simplicity, clarity and predictability to be appreciated. The distribution of the tariffs amongst various types of customers on the other hand, require further investigation.

"Production's share of the accumulated income from the tariff is currently 10 per cent while consumption makes up 90 per cent. Now, at customers' request, we're investigating as to whether it's possible to increase the share of production to bring the tariff more in line with the matching principle," says **Jussi Jyrinsalo**, Senior Vice President in charge of Fingrid's grid services and planning.

Should the share of production increase?

Tariff reform was sent to an advisory committee consisting of Fingrid customers for consideration in spring 2014. Based on initial discussion, two major questions were taken into further investigation: could production's share of tariff fees be increased, and should the tariff be based on power as well as energy?

"In May we proposed four different alternatives to the current tariff to the advisory committee. We also provided example calculations as to how the different alternatives would affect different types of customers. These include industrial consumer, industrial consumer/producer, wind power producer, base load power producer, urban distribution company, regional distribution company and fossil fuel power producer," says Jyrinsalo.

Production's share of the tariff has been increased somewhat from its current level in all four models. In the alternatives, reserve, loss and grid investment costs are targeted at production in various ways based on production facilities' energy and/or power.

Power or energy?

Jyrinsalo believes that taking connected power into account in the tariff alongside energy could be well-founded.

"Large changes in power consumption and new production facilities to be constructed all impact on what kind of grid investments are needed. For example, if production facilities with high power output are constructed, we have to carry out investments to connect that power to the grid, even though energy-wise there would not be as much electricity flowing through it."

Bringing the power component into the tariff poses challenges of its own. For a start, the power component affects various forms of production in different ways. "A nuclear power plant and a wind farm, for example, could both have a power of 1,000 megawatts. The wind farm, however, produces only some 30 per cent of the energy put out by the nuclear power plant," explains Jyrinsalo. The same applies for power plants which are electricity price driven.

The specification of a power fee for consumption is also causing a few headaches. The most rational alternative seems to be imitating the power component with a higher energy fee on winter business days than at other times. There is already some energy fee differentation in the current tariff but it should be further developed.

Discussion and compromise

Jussi Jyrinsalo emphasises that changes to the tariff structure are under investigation due to feedback from customers. "We have no ulterior motives here. If it so happens that none of the proposed alternatives are accepted, we can of course retain the current model."

"As a monopoly, we could even send a simple notice to our customers informing them of a new tariff. But we wanted to involve our customers in the process, since the tariff is one of the most important factors in customer satisfaction."

Jyrinsalo believes it's important for broad discussion to allow all participants to understand others' views and why the selected tariff structure is chosen. That's why the reform process has been initiated well in advance. "We'll have to make compromises in any case. As the process progresses, we aim to examine and discuss how the tariff change would affect customers on a customer-by-customer basis." ■

New Act aims at **improving operational reliability**

New electricity market legislation came into effect on 1 September 2013. The new Electricity Market Act centres on the improvement of operational reliability and the prevention of disruption. How will the change in legislation affect grid companies in practice?

TEXT MIRA MUURINEN | **PHOTOGRAPHS** OLLI HÄKÄMIES

The aim of the new act is to improve the operational reliability of electricity networks. Section 19 of the Act includes a statute on the general obligation to development, according to which a grid company is obligated to develop its grid, within reason, in line with its customers' needs. According to the Act, electricity distribution network companies must within two years compile a development plan for their distribution networks and submit it to the Energy Authority.

The electricity network must meet operational quality requirements and the operation of the network should be reliable and secure concerning climate-related, mechanical and other external disruption which can be expected under normal conditions. The network should function as reliably as possible under exceptional circumstances.

Operational reliability must be improved

"Obligations pertaining to an improvement in operational reliability are probably the most significant change brought about by the new Electricity Market Act," says **Arto Pahkin**, Control Room Manager at Fingrid's Main Grid Control Centre. Concerning distribution networks, the Electricity Market Act contains a concrete target level and operational requirements to ensure the distribution of electricity in rural and dispersed settlement areas.

According to the new Electricity Market Act, the distribution network must be planned, built and maintained so that the failure of the network as a result of a storm or snow does not cause a power outage of more than 6 hours to customers in urban areas and more than 36 hours to those in other areas.

The transition period for the operational reliability requirements is 15 years. The transfer will go ahead in stages: the aim is for 50 per cent of customers (excluding leisure homes) to be covered by the new requirements by 2020, and 75 per cent by 2024.

A requirement relating to the treeproofness of line routes was also written into the act concerning the main grid and high-voltage distribution network. Technical solutions to carry out treeproofing are to be decided upon by the network company – in practice, the act requires an increase in the number of underground cables compared to the current situation, as well as a number of other procedures.

Preparedness plans to become statutory

The changes brought about by the new Electricity Market Act were discussed in early February at a national preparedness seminar held in Vantaa. At the event, organised by the National Emergency Supply Agency and Power and District Heat Pool, it became clear that preparedness for disruption was, in practice, not a new issue for electricity companies. "There is a strong background to voluntary preparedness by grid companies, and on a Nordic level, preparedness cooperation has already been carried out for 20 years," pointed out the National Emergency Supply Agency's CEO **Ilkka Kananen** in his opening speech.

Thanks to the new Electricity Market Act, preparedness will become statutory. Section 28 of the Act contains an obligation concerning the compilation and submission of a preparedness plan to the National Emergency Supply Agency. According to the Act, the preparedness plan must be updated twice a year and whenever significant changes to conditions occur.

The new Electricity Market Act also obligates grid companies to improve the distribution of information concerning disruption. "We aim to improve how we distribute information on any possible outages in electricity distribution before and during disruption," Pahkin explains. Section 58 of the Act obligates grid companies to guide their customers in preparing for disruption and to offer information concerning the level of security of supply and plans which may effect that security at the connection point in connection contracts. Should disruption occur, users must be informed without delay on any possible outages, their duration and extent.

"Another significant change concerns cooperation with authorities in exceptional circumstances. Section 29 of the Act obligates grid companies to carry out cooperation with other infranetworks and authorities in order to resolve disruption. In order to do so, we

have to come up with shared rules and technical methods of implementing this in cooperation with other players all over Finland," says Pahkin.

Monitoring at the National Emergency Supply Agency

In practice, preparedness for disruption means that grid owners will submit two plans to the National Emergency Supply Agency: a preparedness plan and a preparedness development programme. The preparedness plan should describe the preparedness practices already in place at the company. The development programme on the other hand, should be based on approximately 70 questions relating to energy-industry preparedness added to the HUOVI portal's maturity analysis. The deadline for plan submission was 30 June 2014.

Although there are lots of new obligations, Energy Supply Department Manager **Risto Leukkunen** from the National Emergency Supply Agency explains that companies can utilise existing models and mechanisms in the future. "Each company has been allowed to draw up the plan from their own points of departure," he says. He points out that monitoring concentrates on the entire preparedness planning process – not on individual preparedness plans.

According to section 106 of the Electricity Market Act, the National Emergency Supply Agency is obligated to monitor grid owners' preparedness planning and has the right to require changes if a preparedness plan does not meet the legislated requirements. Should a grid owner breach or neglect the obligations set out in section 28, the National Emergency Supply Agency must require the grid owner to resolve its violation.

According to Leukkunen, in practice a preparedness plan is "just the same as the ones which have been prepared for years on a voluntary basis in relation to pool activities." It includes the electricity company's existing operating models for disruption under normal circumstances and for exceptional circumstances – with regard to a time-frame, it aims to cover actions right from the prevention of disruption to the permanent restoration of operations.

The preparedness development programme questions map things such as the basic information of companies' preparedness planning and the management of disruption, preparedness for disruption and procedures during disruption.

As yet there are no more detailed stipulations concerning the content of plans. Leukkunen highlights the significance of discussion and cooperation when conceptualising the guidance and monitoring method of planning. "This is an entirely new task for the National Emergency Supply Agency. Using plans made this year, the aim is to map industry-specific needs and then compile suitable instructions together with pools if there appears to be a need to do so." ■

Extra work for grid companies

We asked some participants from the national preparedness seminar what their thoughts are on the changes brought about by the Electricity Market Act.

1. Has the change in legislation caused you lots of additional work?
2. Did you receive sufficient guidance on how to draw up a preparedness plan and preparedness development programme?
3. Were you able to utilise existing plans when drawing up new plans?

Pentti Kalliomäki
Usage Manager
Tampereen Sähköverkko Oy

1. Making a new preparedness plan and preparedness development programme have certainly given us some extra work.

2. At this stage, we've received enough guidance. Last year and at the turn of the year we still felt as though we were lacking in guidance slightly.

3. All of the new work we're carrying out is based on existing plans which are now undergoing critical inspection. The work was more to do with compiling existing information than starting from scratch.

Erkki Näätsaari
Engineer
Kemin Energia Oy

1.It has undoubtedly caused us extra work. We've had to put lots of unwritten information into writing, whereas previously everyone simply remembered it.

2. Our plans are being compiled by the director of the electricity department **Petri Gylldén**. He says that there has been sufficient guidance given.

3. For example, we already had a preparedness plan in place for our own use. We've relied heavily on existing plans when drawing up new plans.

Tapio Pesu
Administrative Manager
Seinäjoen Energia Oy

1. To some extent, yes. The team in charge of making the plans came up with a schedule to make sure that everything gets done in time.

2. We've been given plenty of guidance, we have no complaints. I am involved in the Power and District Heat Pool's Western Finland power area's regional committee, so I also receive information through that channel.

3. Of course there are plenty of facts we can make use of in existing plans, but we mainly started from scratch when making the new plans.

Stormy times still to come

It's estimated that climate change will increase the destructive effects of storms and other extreme weather. Though no major fault has occurred in the Finnish main grid since the 1970s, the significance of preparation for faults remains high.

TEXT MIRA MUURINEN | **PHOTOGRAPHS** VASTAVALO

The operational reliability of Finland's main grid is top-notch, and no nation-wide or extensive faults have occurred since the mid-1970s. According to statistics, widespread faults experienced by electricity users in Finland have decreased and their duration has clearly shortened in comparison to the 1970s. Over the years, the grid has been reinforced and individual faults are no longer able to cause outages in the grid on even a regional scale.

In recent years, powerful storms have demonstrated however, that significant disruption can still occur – storms during the 26th and 27th of December 2011 left extensive areas of Southern Finland without electricity for several days. Main grid lines are more treeproof than lines in the distribution network, and are not usually affected by falling trees. The disruption caused by the storms in the regional and distribution network nevertheless caused interruptions to supply along main grid branch lines. It is important to prepare for unlikely disruption since the availability of electricity is crucial from a societal point of view.

Storms may become more powerful

The National Emergency Supply Agency had research carried out to map the effects of extreme weather and space weather phenomena on crucial societal functions, or critical infrastructures. The research, carried out by Gaia Consulting Oy and the Finnish Meteorological Institute, indicated that winds may increase in intensity as a result of global warming in Western and Northern Europe, even within the next hundred years.

It is also possible that we will experience extreme or powerful storms more frequently. Global warming may also reduce or postpone ground freezing, which weakens trees' ability to withstand winter storms.

"A climate change study carried out at the Finnish Meteorological Institute (FMI) found that storms hitting Finland will become more powerful. This increase in intensity is fairly low, however, around 2–3 per cent," says Head of Unit **Hilppa Gregow** from FMI. The Institute defines a storm as wind with an average speed of 21–32 metres per second over 10 minutes in Finnish maritime regions. Wind more powerful than this is classified as a hurricane. Until now, the average wind speed of the most powerful storms to hit Finland has been 31 metres per second out to sea.

"An FMI wind warning for inland areas is given when there are widespread gusts of wind exceeding 20 metres per second. In cases of severe thunderstorms, however, a warning is given when there are gusts of wind exceeding 15 metres per second. A good rule of thumb is that gusts in excess of 17 metres per second over land can cause destruction, regardless of the type of storm," says Gregow.

As a result of climate change, variations in weather will also change from what we're used to. "The dry, hot periods during summer may be longer in duration and manifest as extreme weather, as in the current climate. On the other hand, research suggests that long periods of rainy weather and floods during any season could become more common. In such cases, the soggy ground adds to the risk of trees falling. In the winters, heavy snow loads and possibly icy precipitation in Eastern and Northern Finland could also bend trees onto lines," Gregow explains.

Predicting disruption

Severe weather sets challenges for the security of energy supply. Fingrid closely monitors the weather and in doing so, aims to predict disruption. "The Main Grid Control Centre monitors changes in the weather all the time. Storms' arrival in Finland and their subsequent development is closely monitored – storms which originate from Sweden often dissipate or weaken before they make it to Finland," explains Control Room Manager **Arto Pahkin**, from Fingrid's Main Grid Control Centre.

Fingrid has taken note of recent, exceptional weather conditions. "Weather conditions in late autumn and early winter have clearly changed. The storms are different from before, and since the ground has no time to freeze due to mild weather, there is an increased risk that storms will cause trees to fall," says Pahkin. He points out that although the main grid is more tree-proof than the distribution network, trees have been known to fall on the main grid. "A powerful storm may be able to rip a tree out of the ground by the trunk and onto a line even outside of the precautionary area."

On a practical level, Fingrid prepares for storms by raising its level of preparedness if strong winds are forecast. "As a rule of thumb, we prepare for possible damage when winds of or in excess of 20 metres per second are forecast," Pahkin explains.

"That means that we make sure that enough of our own personnel and our service providers' personnel are available. The personnel then make sure that their tools and vehicles are in good condition so that they are ready to go if anything happens."

Preparedness is required by law

The new Electricity Market Act which came into effect last September set a general obligation of preparedness for grid owners in case of disturbances and emergencies. "The new Electricity Market Act has caused lots of changes. The largest single change is probably that the law now obligates grid companies to significantly improve their security of supply. In order to achieve this, either the underground cables' share of the grid has to be increased, or we have to fell a considerably larger amount of trees along lines," Arto Pahkin says. However, with the current technology cabling is not a sensible option for securing electricity transmission in the main grid; other methods are used to prepare for storms.

Preparation for exceptional situations is important, since disruption in the main grid can affect all of society. "If the entire main grid were to be hit by an outage, the costs arising from the interruption to electricity distribution alone would be estimated at 100 million euros per hour. Of course, we would also have to add other problems brought about by the disruption, such as disruption to water distribution, fuel distribution and transportation, food supply, etc. That's why it's important for us to have several alternatives and operating models in place as to how to restore electricity supply," Pahkin sums up.

The new Electricity Market Act also obligates network companies to improve the distribution of information concerning disruption. "We aim to improve how we distribute information on any possible outages in electricity distribution before and during disruption," Pahkin explains.

Everyone can get involved

Hilppa Gregow states that there is good reason to prepare for and expect the kind of weather phenomena we've seen in recent years. "Currently it seems that the extreme weather phenomena we've seen recently such as heatwaves, storms, severe weather, heavy rain and floods are here to stay. They will still occur, but their duration and effects will vary. It's also worth remembering that the better we are able to keep climate change in check on a global scale, the better we will be able to prepare."

Arto Pahkin also points out that it's not just grid companies who can participate in preparation for challenging weather conditions. "It's important for companies to let their local grid company know if their company's electricity consumption point is of critical importance. Attempts are made to prioritise the restoration of electricity supply to critical sites, but grid companies must be informed by the companies themselves. Grid companies could also give companies tips on how they themselves could improve the security of supply of electricity and prepare for electricity outages."

In addition, we can all independently improve how we prepare for disruption. "I recommend that everyone, especially those living in rural areas, think about how to prepare for situations wherein outages could last for an extended period. Sufficient household goods and food, a torch and a battery-powered radio all make for a very good start," Pahkin adds. You can test how prepared you are using the National Emergency Supply Agency's Kotivarax game. "I did the test myself and I noticed that there was room for improvement in my preparations," Pahkin says.

You can find the Kotivarax game at http://huoltovarmuus.fi/kotivarax/.

You can read the entire study which the National Emergency Supply Agency had carried out by Gaia Consulting Oy and the Finnish Meteorological Institute at http://huoltovarmuus.fi/static/pdf/637.pdf. ■

IN BRIEF

Empower Oy to construct Hirvisuo–Kalajoki transmission line

On 1 April 2014, Fingrid and Empower Oy signed a contract agreement on construction of a 400 kV transmission line between Hirvisuo and Kalajoki.

The contract is the first part of a 400 kV grid investment programme between Hirvisuo and Pyhänselkä, which is the largest alternating current connection investment in Fingrid's history. All in all, more than 350 km of new transmission lines will be built in the Ostrobothnian region of Western Finland as a result of Fingrid's investments. The new transmission line will be completed at the same time as major energy projects in the region, and the line connection will provide a flexible opportunity to connect wind power to the grid.

The contract agreement signed by Fingrid and Empower covers about 79 km of 400 kV transmission line between Hirvisuo and Kalajoki. Of this about 31 km will be 400/110 kV (between Hirvisuo and Houraatinkangas). In this section, the new transmission line will be built in place of a 220 kV transmission line, which will be dismantled. The line between Houraatinkangas and Kalajoki will be built in place of a 110 kV line, which will be dismantled, and the 220 kV line will be converted into a 110 kV line. The contract agreement also includes substantial line arrangements for the new Hirvisuo substation in Kokkola.

Work on the first section begun in summer 2014. Commissioning of the Hirvisuo-Kalajoki line will take place in two stages, so that the 110 kV part will be commissioned in autumn 2015 and the 400 kV part in 2016. The Ostrobothnian 400 kV grid development project will be fully completed in 2017.

Pöyröot – Lines over Ostrobothnia

Main grid experts rewarded on asset management day

Fingrid rewarded representatives of its service providers during an asset management day.

A Life Work Award was given for the first time this year, to Eltel Networks Oy Sales Manager **Matti Seppälä**. Seppälä was praised as an excellent role model for anybody working with the main grid. During his career of several decades, Seppälä has meritoriously worked in several positions involving the main grid. He has also participated in a variety of R&D projects.

Seppälä's career started with power company Imatran Voima Oy. He has been employed by Eltel Networks Oy since its establishment. When Seppälä was starting his career in the 1970s, many transmission lines were being built in Finland. Seppälä was involved in their construction and maintenance. He has also been extensively involved in a variety of R&D projects.

"Working with diverse clients has been very rewarding. Regardless of the company, I have always had the opportunity to work with nice people. The relationship with Fingrid has always been good, and many of my friends and acquaintances work there. I'm truly happy to have been able to do this work," Seppälä says.

The Constructor of the Year award went to Site Manager **Tomi Salonen** of Empower Oy. Salonen has been working in key positions in several of Fingrid's substation projects.

▸ Markku Kiiskinen (left), Matti Seppälä and Tomi Salonen.

He was praised as a flexible, fair and responsible site manager, a capable organiser as well as an encouraging example for both the company's own engineers and partners.

Head Engineer **Markku Kiiskinen** of Voimatel Oy received the Maintenance Worker of the Year award. He installs substations in Southeast Finland. He was described as a long-standing equipment maintenance and local operation expert, as well as an especially astute observer and a person who dares to question established practices.

Selecting the Constructor of the Year and the Maintenance Worker of the Year from among the employees of Fingrid's service providers has become a tradition. The Life Work Award was given for the first time this year, however.

Pirttikoski substation contract agreement signed in June

Fingrid has made a procurement decision concerning the renovation of the Pirttikoski switchgear.

The renovation work will see a second 400/220 kV main transformer brought to Pirttikoski, which is located in the rural municipality of Rovaniemi. The project is part of the grid development plan for Lapland which will improve operational reliability in the area. Siemens Osakeyhtiö was chosen as the main contractor for the project, which totals almost EUR 10 million. The contract agreement, worth approximately five million euros, was signed at the start of June. Renovation work will begin this autumn with construction work on the foundations for the main transformer. The renovated 400 kilovolt switchgear and the new 400/220 kilovolt main transformer will be taken into use in December 2015. Fingrid's **Juha Pikkupeura** is acting as project manager.

Major disruption exercise in Rovaniemi

Electricity companies and authorities are organising a VALVE 2014 disruption exercise on 23 September 2014. The exercise will test the restoration of electricity after a nationwide electricity outage.

The exercise will require brief outages in electricity distribution in the Rovaniemi–Tervola area in the evening of Tuesday 23 September. The electricity outages are expected to last from anywhere between 15–45 minutes, after which time electricity will be restored to the area in phases in a controlled manner. Lapin keskussairaala hospital, the Suosiola power plant and the health centres in Rovaniemi on Sairaalakatu and in Tervola will all be exempted from the outages.

The exercise will be organised to develop cooperation between electricity companies and authorities in preparing for disruption. The aim is to test overall management and cooperation between the parties, as well as the capacity to act in crisis situations. The exercise will provide the City of Rovaniemi and the region's authorities with important information as to what capacity actors in the region have to prepare for major disruption to electricity distribution.

The National Emergency Supply Agency, Power and District Heat Pool, Fingrid Oyj, Fortum Power & Heat Oy, Kemijoki Oy, Rovakaira Oy, Rovaniemen Energia Oy, Rovaniemen Verkko Oy and Tenergia Oy will all participate in the exercise. The exercise will be organised by the Power and District Heat Pool. Follow updates relating to the exercise on the organisers' websites.

New kind of landscape tower along Ring III

This year an entirely new kind of landscape tower will be erected along Ring III at Vaarala in Vantaa. The tower was developed in cooperation between Fingrid, Vantaan Energia and design agency Muotohiomo Oy.

The landscape towers represent Fingrid's method of combining technical thinking with respect for the environment. The towers will be located in places where power line structures run through scenically sensitive environments. Such environments include residential areas, waterway crossings and locations where power lines cross busy traffic routes.

The new landscape tower along Ring III, for example, will be seen by all vehicles driving towards Helsinki from the east.

"In Vaarala, the visibility of the towers is significant. It's great that the area's environmental value and aesthetic qualities were taken into account since the power line runs through a central place," explains **Pekka Toivanen**, CEO at Muotohiomo Oy.

Picture: Muotohiomo

Planning work has taken not only the environment and traffic into account, but also existing structures in the area, such as an earlier power line tower erected by Vantaan Energia. Toivanen describes the design of the new tower as timeless and dignified. "It attracts interest, but also blends in well with the environment. The tower is also extremely cost and material-efficient."

Fingrid is an international pioneer in combining design with technical structures. Its landscape towers, designed in cooperation with various designers and architects, are in use all over Finland. In 2012, Fingrid and Muotohiomo Oy developed a new kind of field tower model which was presented with a Fennia Prize 2012 Grand Prix award.

Correction

In contrast to what was written in the "Squirrels crossing" article in the 1/2014 issue, flying squirrels are found in Europe not only in Finland and Estonia, but also in Russia. Within the European Union, flying squirrels are found only in Finland and Estonia.

Fingrid continues to top ITOMS study

Last year, Fingrid topped the ITOMS study, an international grid-industry study which has been held ten times. The ITOMS (International Transmission Operations and Maintenance Study) examines the reliability of main grid operations and the efficacy of maintenance.

▸ Daniel Kuosa.

The study is carried out once every two years. Fingrid and its predecessor IVO Voimansiirto have participated in the study – with excellent results – since 1995.

The study is not a competition regarding grid operation superiority; rather, the aim is to search for the best operating methods and procedures, and to learn from other companies. "Fingrid is a natural monopoly, so we're missing information obtained through competition as to how cost-effective our operations are. The ITOMS study provides us with valuable information about the quality of our operations," says **Daniel Kuosa**, a specialist with Fingrid's grid maintenance unit.

Kuosa has been involved in four ITOMS studies. He believes that the latest result is exceptionally good, even given Fingrid's successful ITOMS history.

Kuosa explains that long-term life-cycle thinking is behind Fingrid's success. "Maintenance works at Fingrid because the main grid has been constructed and maintained in a sensible manner right from the start. We live by life-cycle thinking, which means we're able to see the big picture. In maintenance work, we aim to carry out targeted procedures at reasonable costs, while at the same time achieving a high level of reliability."

This year, 28 grid companies participated in the ITOMS study. Of the companies, 11 were European, 6 were from North or South America, 6 were from Australia or New Zealand and 5 were from Asia, the Middle East or Africa.

"The study community is a wonderful forum through which to share information concerning technologies and methods. The study highlighted perseverance: companies do not participate in the study as a one-off. Instead, they use it as a long-term point of comparison for their own operations," Kuosa says.

The international study is facilitated by UMS Group Inc. The ITOMS study is considered one of the most esteemed studies in the industry.

GRID ABC

This article series deals with the main operating principles, equipment units and components in the main grid. The articles published in the series previously can be viewed on our website at www.fingrid.fi.

SUBSTATIONS

A substation is a node in the grid where the transmission of electricity is distributed to different power lines. Fingrid owns approximately one hundred substations. Some of these are switchgears which connect lines with the same voltage level, whereas others are transformer substations which connect lines which have different voltage levels.

TEXT SUVI ARTTI

The most visible part of a substation is the **switchyard**, where the lines and transformers are connected to busbars via disconnectors and circuit breakers. The switchgear's task is to direct the flow of energy, limit and disconnect a faulty section of network and to act as a disconnect point between various grid sections during maintenance and construction work.

Transformer substations contain one or more **power transformers** which transform a 400 kilovolt voltage level into a 110 kilovolt voltage level, for example. Transformers are located outdoors and may be surrounded by protective walls.

In addition to switchgears, **instrument transformers** are also needed. They are used to measure the voltages and currents at the substation. **Protective devices** or protection relays find the locations of faults in the grid using current and voltage information. When protection relays work as intended, the faulty section of grid is automatically disconnected from the rest of the grid rapidly and selectively, keeping damage minor and preventing the fault from spreading throughout the entire grid.

A substation may also contain **compensation devices** such as series capacitors, shunt capacitors, shunt reactors and SVC equipment. These are necessary for reducing losses and for voltage control.

For decades, substations have been unmanned. In Fingrid's control room, or the Main Grid Control Centre, operators monitor the connection status of substations round the clock. Operators manage substations remotely.

Planning prepares for the future

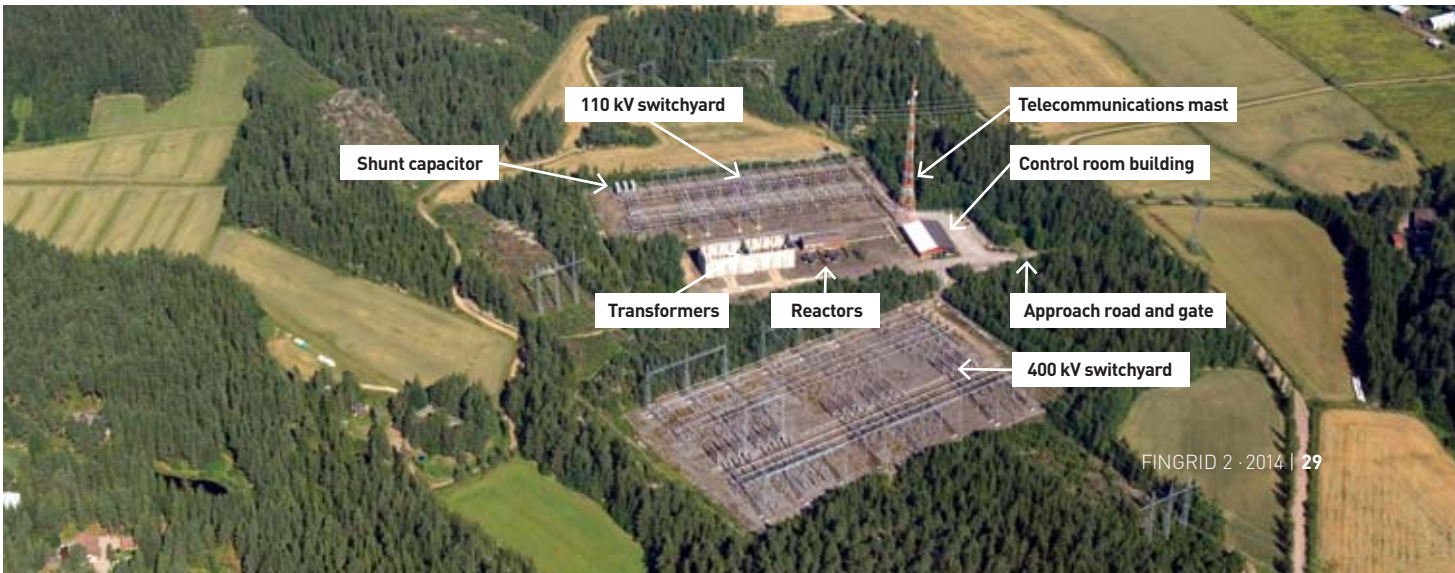
Sometimes Fingrid is asked why the plots for its substations are so large. The most important reasons are safety and the voltage distances required by air-insulated technology. Substations located outdoors are air-insulated, and as such there must be a sufficient amount of free space around the live components.

When planning substations, we must think decades in advance. When procuring plots, preparations are made for future extensions. The planning process for substations, as for the entire grid, is dynamic and changes according to upcoming power plant projects, for example.

Many factors can have an impact on the location of a substation, such as the location of power plants and electricity users, as well as existing power lines. The location of transformer substations also has to allow for the transportation of the transformer, which can weigh up to 300 tonnes, to the site.

There are also smaller substations which use SF_6 gas as insulation, and these take up less space. These are known as GIS, or gas-insulated switchgears. Gas-insulated switchgear is a good solution when a substation has to be built near residential areas or if there is insufficient space for a large outdoor station.

In addition to switchgear and transformer substations, the main grid also contains four converter stations in Porvoo, Espoo and Rauma. They convert the direct current from Fenno-Skan and EstLink connections to alternating current for the main grid and vice versa. ■



MONITORING RESPONSIBILITY

In this column, representatives of Fingrid's interest group companies write about responsibility.

How can the energy sector create **sustainable growth and wellbeing?**

Both the corporate world and citizens have recently accepted that environmental and social needs must also be taken into account when aiming at economic growth. For us here in the North, the availability of energy at a reasonable price is vital. Alternatives must be sought if the fuel or material used for energy production is limited, or its use is otherwise hindered in some way. Availability is also affected by the efficiency of production, transmission and use. As the energy sector is responsible for 80 per cent of Finland's greenhouse emissions, the pressure to reduce them is very high.

MIKKO ROUTTI
The author is the executive director of Corporate Responsibility Network FIBS.

The energy sector is also required not to harm and to preserve natural biodiversity. For example, using the origin of electricity system, buyers can ensure that the electricity their buy comes from hydropower or check the fulfilment of some eco-energy criteria. Everybody in the industry should already be familiar with the assessment of environmental impacts. It also makes sense to use the principle of compensation: necessary constructions can be made if new areas and conditions for endangered species are created nearby.

What kinds of sustainability requirements do corporate buyers require from the energy industry? According to FIBS' newest 2014 corporate responsibility survey, the significance of sustainability criteria in corporate procurement and purchasing decisions is on the increase: 77 per cent of companies apply such criteria (68% in 2013). Management's most fundamental sustainability concern relates to environmental issues; 78 per cent of respondents found it significant. Energy saving, waste recycling, investment in clean technology and product creation were considered some of the most important actions. Other significant themes were competition issues, tax compliance, human rights and occupational safety. Nowadays, companies will find it worthwhile to also assess risks related to those areas since it's very easy to lose reputation through social media.

Companies operating especially on the consumer market need to listen closely to citizens' opinions. A recent TNS Gallup research studied Finns' opinions of companies' roles and their impact on consumer purchasing behaviour. Over half felt that sustainability issues impact their consumption and purchasing behaviour. Consumers are attracted to cleanliness, safety, the environment and sustainable development. One out of three Finns believe that it would be extremely important for a company to take an active role in a wider societal context.

How can companies act sustainably in practice? First, you need clear corporate responsibility principles. One good practice is the general precautionary principle: before initiating a project, carefully analyse a site's possible natural values and the social impact of the project, and weigh them up against benefits and profits. A mutual understanding gained through advance discussions is always more worthwhile than judicial proceedings. Locals, customers and organisations must be approached – not forgetting our own employees and owners. Their opinions can help to catch possible problems in the early stages and to manage them in time. It is also crucial to remember the importance of continuing dialogue: it should not be drowned out by the noise of rapidly approaching construction machines.

Once environmental and other sustainability issues are under control, it's possible for a company also to brand itself more positively. The availability of necessary funding in investment-intensive industry is also often linked to a credible sustainability process. A good history and good reputation can mean better availability of finance and a great way to access new business areas. ■

GRID QUIZ

Answer the questions below and send your reply by fax (number +358 (0)30 395 5196) or mail to Fingrid no later than 30 September 2014. Address: Fingrid Oyj, PL 530, 00101 HELSINKI, FINLAND. Mark the envelope with "Grid Quiz". Participants have the chance to win three Pläkkilyhty lights representing Nordic design by Loftet. Answers to the questions can be found in this issue.

1. According to plans, how many major investment plans will Fingrid have simultaneously under way in 2016?

- Almost 30
- Almost 40
- Almost 50

2. How wide is the right-of-way for a 400 kilovolt power line?

- 26–30 metres
- 32–38 metres
- 36–42 metres

3. For what task was the eSett company established?

- Joint-Nordic balance management
- Management of the Elvis asset management program
- Coordination of preparedness plans brought about by the new Electricity Market Act

4. The new Electricity Market Act requires the main grid to be defined. This means that

- name plates will be attached to grid towers.
- Fingrid must specify for each grid and line section whether or not it belongs to the main grid.
- grid lines with different voltages will be given their own ID numbers.

5. How often are trees cleared from Fingrid's rights-of-way?

- Every 3–5 years
- Every 5–8 years
- Every 10–15 years

6. How are operations at distribution substations managed?

- Distribution stations are manned 24/7.
- An inspector visits each station once a day.
- The control room manages substations remotely.

7. Where will a pair of new landscape towers be erected this year?

- In Vaarala, Vantaa
- In Kontiolahti
- In Keilaniemi, Espoo

Prizes for the previous Grid Quiz (1/2014) have been sent to the following winners who answered correctly: Jarmo Henriksson, Renko; Kari Linnamäki, Rovaniemi; Jussi Pietikäinen, Kontiolahti.

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