

# Safety on the lines



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# Safety on the lines

Fingrid's occupational safety  
publication for service providers  
1/2017

### Editor-in-chief

Karri Koskinen

[karri.koskinen@fingrid.fi](mailto:karri.koskinen@fingrid.fi)

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Matti Immonen

## Contact us!

We are continuously striving to improve our operations concerning occupational safety. Occupational safety affects us all, and we wish to improve safety in cooperation with suppliers. All feedback is important. Please send any ideas for articles, tips for development and feedback on the magazine to

**Karri Koskinen**

Expert, Safety

Tel. +358 40 631 2152

[karri.koskinen@fingrid.fi](mailto:karri.koskinen@fingrid.fi)





EDITORIAL

Photo: Matti Immonen

## Safety management requires persistence

**S**afety management is the kind of work that never ends. Constant change is needed in order to meet stricter requirements and observe the principle of continuous improvement. Instructions and regulations, minimum requirements, risk assessments, personal protection equipment and technical protection systems... When one task has been dealt with, changes are already needed in two or three other areas.

The responsibility of supervisors and project managers could be summed up as follows: “It’s my fault if something happens to someone”. With this approach, the importance of safety management becomes concrete. All responsible persons should keep this idea in mind, because a feeling of responsibility leads to action.

We all have the right to be healthy when we leave work. The employer and client have to ensure that this is the case and provide safe working conditions – safe technology and safe activities. Dealing with technology is the easier of these two, and thinking about technical improvements is generally a pleasant task for us engineers. It’s more difficult to influence and change people’s behaviour and methods. This requires openness and understanding, and lots of persistence.

Ensuring safe working and operating methods means continuously assessing activities, updating instructions, training and influencing attitudes. One, or even two, mistakes or a technical failure cannot cause an accident. Safe working and operating methods are the way to ensure this. They should be defined together and written up as instructions. The instructions should be detailed but still unambiguous and clear. People must know the instructions and have the right attitude, which means the desire to work according to the instructions. Agreeing on things together enhances commitment. And commitment leads to safe activities.

There is always something to improve if an accident or near miss occurs. It’s important to report all observations so that corrections can be made. Fingrid uses the NordSafety system for reporting and processing observations. It reminds the responsible persons to deal with the issue and “forces” people to be systematic.

Let’s work together to create a safe workplace!

**Sampsa Holmberg**, Power Plant Manager, Fingrid Oyj



## LEARNING LESSONS

# Occupational safety remains at last year's level

Text Karri Koskinen  
Photo Marker Creative

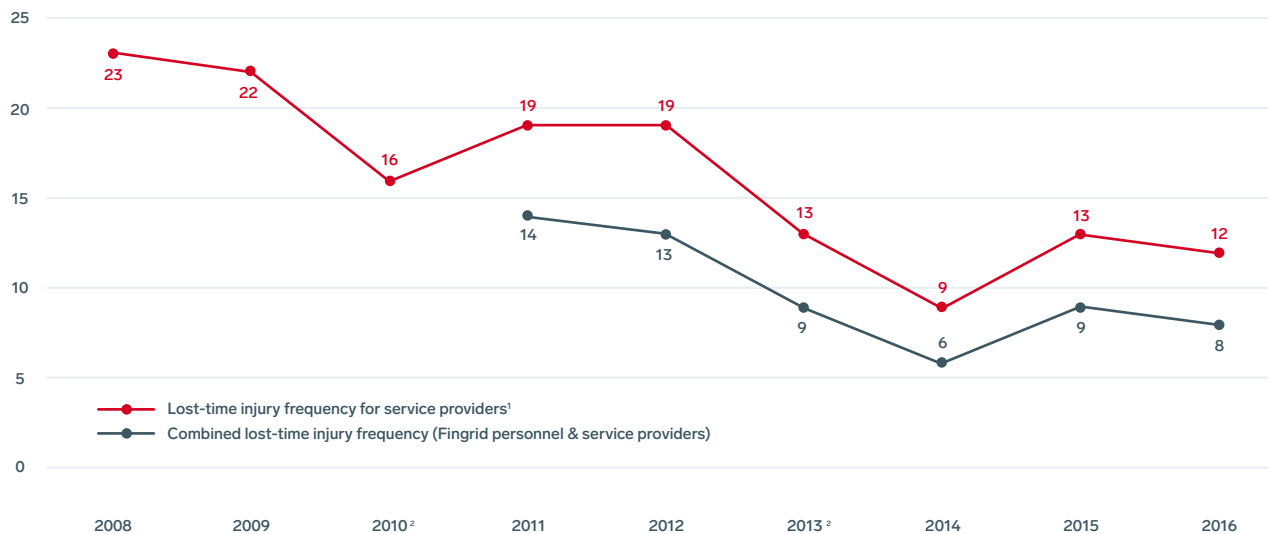
# 2016

The level of occupational safety at Fingrid's work-sites remained at much the same level in 2016 as the previous year. Once again, we put together a summary of the accidents that occurred in order to learn and avoid similar accidents in the future.

**976,650**  
hours

**575**  
person-years

**12**  
lost-time injuries



<sup>1</sup> Lost-time injury frequency = The number of workplace accidents leading to at least one day of absence / one million work hours

<sup>2</sup> 2010 and 2013: Fatal accident

**F**ingrid's personnel achieved the zero accidents target in 2016. Service providers, on the other hand, experienced 12 lost-time injuries, 3 of which were serious (more than 30 days of sick leave). The corresponding numbers for the previous year were 13 lost-time injuries for service providers and 1 for Fingrid's personnel. The combined lost-time injury frequency dropped from 9 to 8 this year. Service providers in main grid maintenance and construction activities worked a total of 976,650 hours in 2016, which is equivalent to 575 person-years.

**Half of all lost-time injuries occurred in transmission line projects.** Two of these involved fingers being crushed by moving objects. The cause of one was shifting of a tower component being loaded while the other occurred when a tree trunk hit an employee's finger during removal of a conductor from the tree. Dust in an employee's eye that occurred while cutting a foundation pillar caused a short absence at a transmission line worksite. One occupational accident occurred when an employee slipped on an icy surface.

Two serious occupational accidents occurred at transmission line worksites, one of which involved a subcontractor. In this case, the employee suffered a back fracture while tightening bolts on a tower. The employee slipped and fell about half a metre onto a diagonal beam. The employee was wearing fall protection at the time. When working on a tower, fall protection should be attached so that it prevents falling immediately. Movement on the tower should also be planned in advance.

The other transmission line worksite accident occurred when a subcontractor's worker, who was tightening bolts, got his legs trapped under a cross arm while a work group was assembling a new transmission line tower. The cross arm was installed on a wooden bed at a height of about half a metre. The employees were bolting the cross arm to the tower leg when the bed under the cross arm gave way and the cross arm slipped out of place and onto the employee's leg.

There were several reasons for this accident: The ground was soft and the work group didn't have enough wood to

build proper support. The supervisor didn't stop the work even after noticing that the support was unstable. The injured employee was working elsewhere for a year and returned to tower assembly about a week before the accident. The lesson to be learned from the accident is that work must be stopped immediately if a hazard is detected. Tower support and the materials used for it must be described in the safety plan. Induction must be performed again when an employee's work duties change.

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**Work must be stopped immediately if a hazard is detected.**

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**Four lost-time injuries occurred in substation projects, three of which involved subcontractors.** An employee received an electric shock to the wrist from a terminal block located on the side of a cabinet while connecting a relay cable. The screws of the terminal block were loose, live and extended nearly to the surface of the protective wall. Accidents in substation projects were also caused by a cable pulling block falling on an employee's heel and by an employee slipping when exiting a wheel loader.

A demolition subcontractor's employee suffered a serious occupational accident while performing disassembly work. A round steel beam of some six metres in length pierced the cabin window of the machine and hit the driver in the chest. The accident occurred while the demolition machine grapple was used to lift the beam from the transformer that was being disassembled. The beam contained a bar of approximately 6 metres in length and a diameter of 35–40 mm. The piece slipped out of the grapple and the bar swung through the windscreen and hit the driver in the chest.

The accident was the result of an unidentified risk. The beam material was so hard that the nose shears couldn't get a proper grip on it. The 6-metre bar was also attached to

→

the beam being moved and thus able to reach the cabin. Waste must be handled farther from the cabin so that the pieces being disassembled cannot reach the cabin. The disassembly plan must state how to prepare for this situation.

**One lost-time injury occurred in transmission line maintenance**, and this was caused by climbing irons slipping on the earth wire peak. The employee suffered a hand injury in the accident. An employee at a reserve power plant worksite was also injured after being hit on the head by a falling board. The employee was wearing a helmet at the time of the accident. The zero accidents target was achieved in vegetation management and substation maintenance.

**The number of dangerous situation notifications has increased a lot** over the past few years. This is a great performance – thanks to everyone who submitted a notification! Some 400 dangerous situation notifications were made in 2016: about 230 hazard observations and 150 notifications of near misses.

About 100 of the hazard observations were made at substations, and a little more than half of these were related to maintenance and the rest to investment projects. About 30 observations were submitted about transmission lines, the majority of which were associated with investment projects. Some 90 hazard observations were made at reserve power plants.

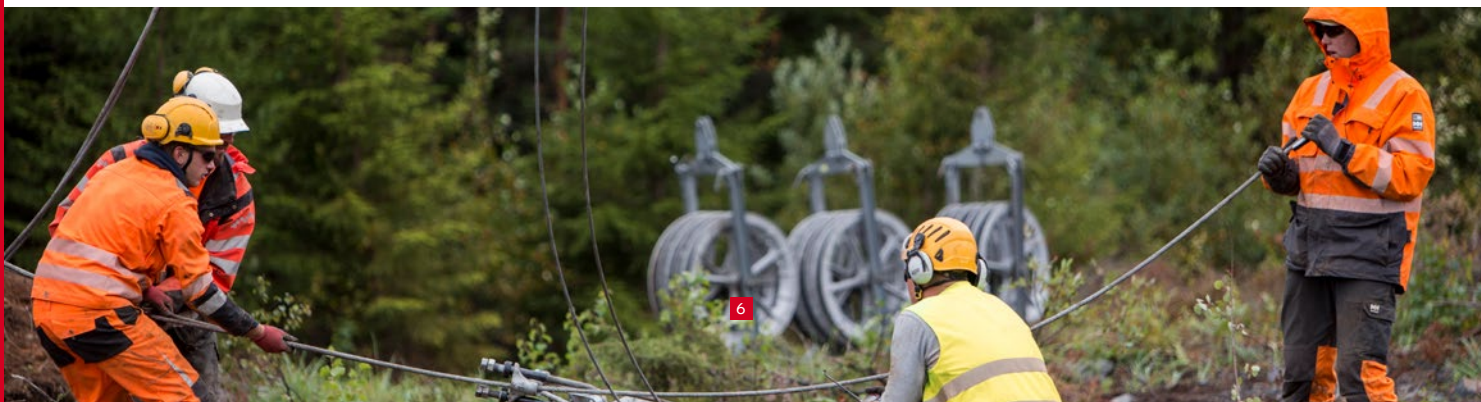
The dangerous situation notification form was used to report 18 accidents involving outside parties or damage caused by outside parties. It is positive that some suppliers have made toolbox talks part of the worksite routine. A total of 268 toolbox talks were reported to the NordSafety reporting system during the year.

**Five of the near misses were classified in the most serious A category:**

- Additional earthing was not in place when an employee removed a primary pipe at a substation worksite.
- Oil-soaked cardboard caught fire in conjunction with disassembly of a transformer.
- A short-circuit occurred when an employee cut a cable (which had already been cut earlier) inside the relay room where the electricity was on.
- Two spare gas cylinders were overfilled at a reserve power plant. The overfilled cylinders and increased pressure caused a risk of explosion.
- A tower fell to the ground while being raised in one of Fingrid's customer's transmission line projects, which also involved the construction of two 110 kilovolt shared tower lines that will be owned by Fingrid.

Accidents and dangerous situations in 2015 and 2016 were caused by, in particular, induced voltages and the dangers of electricity, risk taking, inadequate plans and risk assessments, slipping and tripping, and crushing between heavy objects

Fingrid's target for 2017 is to bring the lost-time injury frequency below 6. This will require everyone's commitment to occupational safety. Plans and instructions must be up to date and they must indicate how work can be performed safely. Each employee must take responsibility for their own safety and that of their co-workers. The worksite management must promote the safety culture by effectively communicating about safety, setting a good example and intervening in all safety deficiencies immediately. Everyone has the right and obligation to intervene in unsafe activities. Safety starts with each of us! ■





## LEARNING LESSONS

# Accidents and dangerous situations at reserve power plants

Text **Harri Ollikainen**

Photo **Matti Immonen**

Fingrid's reserve power plants have been using the NordSafety system for reporting dangerous situations and accidents since the beginning of 2016. All safety-related observations are processed on a monthly basis and, for example, many improvements have been made to safety devices at the plants on the basis of the reported proposals.

**T**he NordSafety system is used by reserve power plants' service providers that have a long-term contract: Quant Finland Oy, Maintpartner Oy, TVO Nuclear Service Oy and Patria Aviation Oy as well as the larger project subcontractors. A service provider with a long-term contract makes entries on behalf of suppliers and subcontractors that only work at the reserve power plants occasionally.

**A total of 280 entries were made in the NordSafety system, and they were divided as follows:**

- Site diaries 61
- Work hours entry 51
- Feedback/initiative 17
- Environmental accident 5
- MVR 9
- Dangerous situation notification 135
- Accident notification 2

## ACCIDENT NOTIFICATIONS

Both of the accident notifications required a visit to the doctor. One accident occurred during maintenance work on power turbine slide rails when a  $\frac{3}{4}$  inch wrench and casing slipped off a nut and an employee's finger was caught between the wrench and a steel bar on the floor. The finger swelled and the employee went to the doctor.

The other case occurred in conjunction with installation of a system formwork. When casting a protective wall, a 50 x 100 mm board used in the upper part of the formwork fell on a carpenter from a height of about 2 metres. The board fell when it was hit by a hook that was being used in the lifting work. The carpenter was wearing a helmet but still suffered a slight concussion from the impact.

Both cases were investigated by the service provider's foreman and by Fingrid's plant coordinator. The events were also processed at worksite and monthly meetings and at the monthly reserve power plant meeting. Both accidents could have been avoided by means of caution, better work planning and anticipation. →

## DANGEROUS SITUATION NOTIFICATIONS

A total of 135 dangerous situation notifications were recorded. Some of the notifications involved dangerous situations that happened on the way to work and some occurred at the workplace. The notifications were distributed evenly among the 10 reserve power plants.

Ten dangerous situation notifications were submitted for events occurring on the way to work. Some of the service provider personnel at reserve power plants drive a lot between the plants, and the majority of notifications involving events occurring on the way to work were related to animals moving near a car.

Quant Finland Oy has organised a defensive driving course for its employees who drive a lot.

**A total of 121 dangerous situation notifications were submitted at the workplace. The notifications were divided into 12 different categories:**

• Serious deficiencies in plant systems	4
• Slight deficiencies in plant systems	18
• Incorrect connections or installations	5
• Small oil leaks in indoor facilities	4
• Loose or unterminated cables	7
• Poor cleaning or untidiness	11
• Slippery yard or floor	7
• Deficiencies or improvement proposals concerning safety devices	29
• Broken safety devices	15
• Minor near miss situations	14
• Disturbance caused by external parties	4
• Good practices	3

All of the new dangerous situation notifications were processed on a monthly basis in meetings held with the service providers. At the same time, the group considered whether the potential deficiency could be corrected immediately or whether it required further planning.

Nearly all of the improvement proposals related to safety devices have been approved. Many improvements were made to stairs and railing structures at plants last year. Some of the larger improvements related to stairs and working platforms have been budgeted for 2017.

A total of 119 dangerous situation notifications have been acknowledged as processed and completed, and 16 are still in progress, planned or waiting for implementation.







## SERIOUS DEFICIENCIES IN SYSTEMS

A total of 4 serious system deficiencies were recorded: A circuit breaker in a KT1 generator at the Naantali reserve power plant closed on an idle machine. Exciter set diodes on the generator were broken. The circuit breaker control cables were old and damaged.

At the Forssa reserve power plant, someone noticed that the fuel pipes on a pipe bridge moved too much during operation. The reason for this was deficient fuel pipe support resulting from poor planning and project supervision.

During a basic renovation project at the Huutokoski reserve power plant, an excavator cut the cables running to the fire water pump room twice. The cause was poor supervision of work.

## SERIOUS DANGEROUS SITUATION IN THE IGNITION GAS SYSTEM

The most serious deficiency was found in the ignition gas system at the Forssa reserve power plant. A dangerous situation occurred in the system on 2 March 2016 when, in conjunction with changing the cylinders, a spare gas cylinder (12 bar, 190 kg) was overfilled and the excess gas was discharged from the protective equipment into the room.

In the worst case, the cylinders could have exploded. An explosion could have caused human injury and a fire.

The investigation revealed that the ignition gas system was poorly planned and built. The system is missing important protection and control devices. The system also lacked a risk assessment, which must be used as the basis for planning.

Planning work is now in progress and some of the deficiencies have already been corrected. The remainder of the corrections will be implemented during 2017.

## EXPERIENCES OF THE NORDSAFETY SYSTEM

The NordSafety system is actively used at reserve power plants. The system supports the development of safe operations because all observations are reviewed every month with the service provider's personnel.

The system is easy to use, but there is still room for improvement in terms of finding and filtering information.

Although some of the hazard observations could be dealt with using only the Maximo maintenance system, it is useful to record them in Nord-Safety first because this ensures that they are processed together. This highlights safety issues and helps make safety thinking part of the daily routine. ■



# Making safe working habits a daily routine

Text **Karri Koskinen**  
Photo **Marker Creative**

In 2016, the occupational safety development project focused on implementing occupational safety operating models and tools. Plans for this year include establishing an occupational safety group that also includes service providers.

The target of the occupational safety project in 2016 was to improve the occupational safety knowledge and attitudes of Fingrid employees, and that of service providers' project and worksite management and employees.

During the year, Fingrid held nine training events on contract terms concerning safety and safety management, five of which targeted service providers and four for Fingrid personnel. The target group for the training events related to contract terms was the service providers' project and worksite management, occupational safety personnel and Fingrid specialists working with investments and maintenance. The training was intended to give the participants information about Fingrid's occupational safety requirements, tools and the promotion of occupational safety.

As part of the occupational safety development project, Fingrid organised a hazard observation campaign, which resulted in some 60 observations during September. A summary of the campaign has been shared via the NordSafety reporting system. Fingrid's online school was launched in early 2016, and has already had more than 2,000 users. Approved completion of the online school is a requirement for all people working at Fingrid's worksites.

## ROAD SHOW PROVIDES INFORMATION AND WORKSITE TOURS

During the occupational safety “road show” held in 2016, we visited the majority of the ongoing investment projects and maintenance areas on transmission lines and at substations. The goal was to reach the majority of our service providers’ employees and talk to them about occupational safety, preventing accidents and the zero accidents target.

The road show included employee training, as well as a worksite tour of investment projects either in free format or as an MVR measurement. Discussion was lively during the training sessions and the employees were genuinely interested in occupational safety issues. It was also a pleasure to notice that achieving the zero accidents target is considered realistic at the worksites.

Nearly every worksite visit revealed employees without eye protection and employees who left the chin strap of their helmets open. We also met people at the worksites who were not wearing their picture ID. It’s important to intervene immediately whenever you notice people at a worksite without the required equipment. For the most part, the worksites were in good condition and no serious safety deficiencies were observed. This year, we’ll be focusing on cleanliness and tidiness at worksites because slipping and stumbling cause most of the accidents at Fingrid worksites.

## MAKING OCCUPATIONAL SAFETY A DAILY ROUTINE

The theme for this year’s occupational safety development project is “Making occupational safety a daily routine”. Many new tools, operating models and boundary conditions have been created for occupational safety in recent years. Fingrid’s personnel and our service providers’ employees and project and worksite management have received training related to the requirements. Everyone should now have the basic prerequisites to work safely at Fingrid worksites.

In order to reach the zero accidents target, each person has to take responsibility for their own occupational safety and that of co-workers. Achieving this target will require a strict approach from the employees of both the client and the service providers. Occupational safety work should be proactive, deficiencies that are observed must be corrected

immediately and risk-taking eliminated without delay.

The contract terms related to safety will be updated during 2017 as part of the project. The greatest number of changes comes from Fingrid’s definition of a shared construction worksite and shared workplace. We will also update the safety management system of the

asset management function on the basis of a gap analysis performed in 2016, continue developing the NordSafety reporting system and start an examination of preliminary selection of service providers. We will also hold an occupational safety seminar in autumn 2017.

## ALSO COMING: AN OCCUPATIONAL SAFETY GROUP AND SAFETY CLIMATE SURVEY

This year, we will be establishing an occupational safety group, to which we invite our service providers to appoint representatives. Preparations will begin this spring and the first meeting of the group is scheduled for autumn 2017. The goal of this group is to deal with issues that affect occupational safety on a general level, such as contract terms concerning safety, and to share good occupational safety practices. The group’s targets and meeting frequency will be specified in more detail in conjunction with its establishment.

A safety climate survey for Fingrid and service provider personnel is also planned for 2017. The objective is to determine the respondents’ perceptions of how management and employees handle occupational safety matters. The results of the survey will be used to examine the safety climate with regard to service providers and Fingrid and to find development targets. ■

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**This year, we'll be focusing on cleanliness and tidiness at worksites.**

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# Audits develop safety at reserve power plants

Text **Maria Joki-Pesola**

Photos **Matti Immonen**

Fingrid has started to assess overall safety at its reserve power plants with plant-specific audits performed annually. These audits look for critical and long-term development areas.

**T**he concept of safety is very broad in nature. In this connection, overall safety at reserve power plants refers to implementing occupational safety and chemical safety (environmental safety) in all processes related to power plant operation and maintenance. All these areas of safety are linked to each other and, for example, when a chemical accident occurs, it means that process safety has failed and caused a risk to the environment and personal safety.

## **AUDITORS ARE EXTERNAL EXPERTS**

Legislation sets certain boundary conditions and requirements for managing safety risks. However, safety can and must be managed in a way that goes beyond legal requirements. This is why Fingrid has implemented annual, plant-specific audits at reserve power plants in order to assess their overall safety. An external auditor checks the plant's operations with consideration to work, environmental and process safety.

An external expert sees the day-to-day routines and operational management of a reserve power plant differently than a service provider who is handling service processes or Fingrid as it manages the whole entity. Another advantage of an external audit is that good practices are transferred from other areas of industry to Fingrid and vice versa.

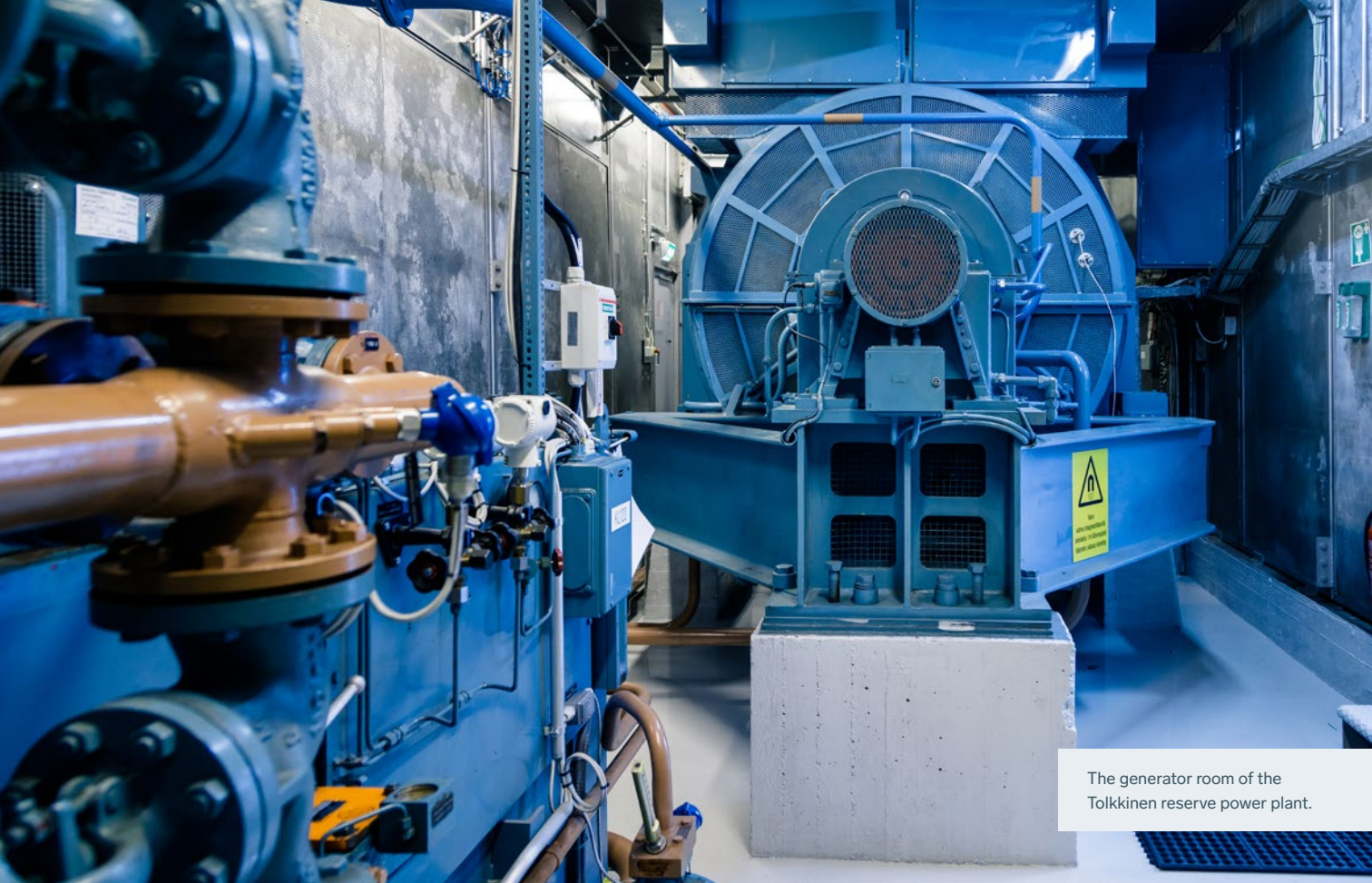
## **KRISTIINANKAUPUNKI AND VANAJA ARE NEXT IN LINE**

The observations made during an audit can be classified into four different categories based on their urgency. The most urgent actions at the plants have been associated with, for example, work phase-specific instructions for dealing with dangerous situations during activities that involve significant risks, managing chemical risks, and identifying work phase-specific risks. The audits also identify long-term targets set for the future that may become more relevant in conjunction with renovation projects or other change work.

Actions for yearly and long-term development are derived from the auditing results. An environmental system that meets the requirements of the standards will be developed for the reserve power plants at the same time as overall safety is developed. The audits also serve this purpose, and continuous improvement of safety and environmental matters will be carried out simultaneously.

The reserve power plants in Kristiinankaupunki and Vanaja are the auditing targets for 2017. The auditing sites are selected on the basis of possible future renovation projects, legislative obligations and plant-specific permit regulations, and observed accident and dangerous situations, so that all 10 power plants will be audited at certain intervals.

There is no such thing as complete safety, and the elimination of all risks is not possible. However, good risk identification, the right attitude and management that aims for continuous improvement can take us close to perfection. ■



The generator room of the Tolkinen reserve power plant.



The Kilpilahti reserve power plant is located in a cave 30 metres below ground level.



FROM THE SERVICE PROVIDER

# Occupational safety risks during fuel unloading at reserve power plants

Text Arto Rosendahl, Service Manager, Quant Finland Oy  
Photos Matti Immonen

Quant is responsible for the operation, control and maintenance of Fingrid's reserve power plants, and occupational safety is the starting point for all of its activities.

**Q**uant Finland Oy is responsible for the operation, control and maintenance of Fingrid's reserve power plants in Forssa, Hämeenlinna (Vanaja), Porvoo (Tolkkinen and Kilpilahti), Naantali, Pori (Tahkoluoto), Vaasa and Kristiinankaupunki. The work is handled by 10 people with responsibility for the plants.

Safety is extremely important to Quant. The personal goals of each Quant employee include the target of making 24 hazard observations during each year, because these are known to decrease the number of accidents. Quant employees in Finland recorded approximately 2,000 hazard observations in 2016.



The unloading of fuel is monitored on the plant's automation display.

## CARE IS REQUIRED WHEN HANDLING FUEL OIL

One of the risky phases of reserve power plant maintenance involves unloading fuel. Fuel must always be unloaded according to detailed instructions and checklists.

The fuel tanks at Fingrid's reserve power plants contain light fuel oil, which must be sufficient to operate the plant for 36 hours. Each plant has an automatic system to monitor the amount, pressure and temperature of the fuel. Fuel consumption is measured with an annually calibrated flow meter. Quant's responsible persons monitor the sufficiency of the fuel and order additional fuel when necessary in accordance with contracts.

Storing and handling light fuel involves many risks that must be taken into account, such as flammable fluid and fumes. These are hazardous when inhaled, irritate the skin and can be fatal if they are swallowed or enter the respiratory tract. From the environmental perspective, oil is hazardous to the water system and organisms.

The safety data sheet and regulations in the safety instructions specify how people must protect themselves from these risks. Smoking and open fire are prohibited in the vicinity of the fuel facilities and tanks and when filling the tanks. Foam, powder, water spray or carbon dioxide are used as extinguishers in fire fighting.

## FUEL UNLOADING PROCEEDS ACCORDING TO A CHECKLIST

Certain safety and operation tasks must be taken into consideration during a fuel unloading event. According to the checklist, these tasks include:

- ✓ Submit a safety declaration to the Fingrid system
- ✓ Wear well-fitting safety glasses / a face mask if necessary
- ✓ Check the fire extinguishing equipment
- ✓ Inform the power plant
- ✓ Wear protective gloves (nitrile rubber, neoprene, PVC plastic or fluoro rubber).
- ✓ Use earthing to prevent sparks caused by static electricity
- ✓ Avoid inhaling fumes
- ✓ Check the vehicle's ADR equipment
- ✓ Perform process device measures

The checklist must be completed with the driver prior to granting permission to unload the vehicle. This ensures that all the required safety and operation measures have been performed. The fuel is transferred using a vehicle or plant pump. Prior to transferring the fuel, it's important to check the vehicle's consignment note to verify that all of the fuel complies with the order in terms of quality.

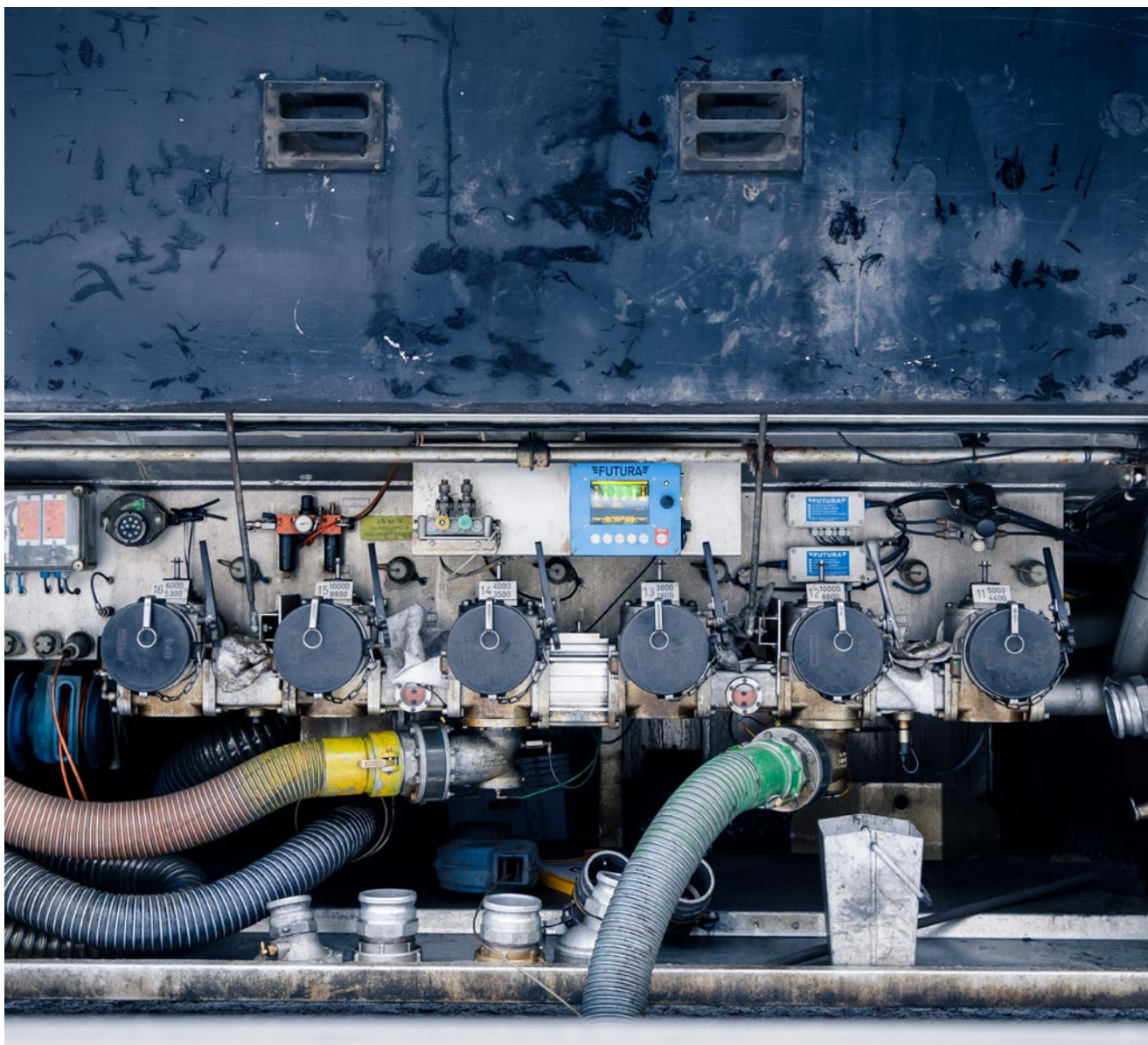
Quant's responsible person checks that all actions have been completed and the process proceeds from phase to phase according to the checklist. The fuel unloading site has a display to monitor that all actions have been completed and permission to unload has been granted. After this, unloading begins, and the unloading event is monitored from the plant's automated screen. Monitoring surface measurements makes it possible to verify that the amount recorded in the consignment note corresponds to the amount transferred to the plant.

After the fuel has been unloaded, Quant's responsible person completes the checklist tasks in reverse order and ensures that no leaks occurred. Consignment notes are stored at the plant and saved in electronic format.

Safety matters always involve cooperation with the customer and competence is maintained by means of training. ■

**Quant has a target of zero accidents. We do our best to prevent damage to employees, subcontractors, local communities and the environment.**

**We want every one of our people to go home healthy after the work day!**



# FINGRID



## Helsinki

Läkkisepäntie 21  
FI-00620 Helsinki  
Finland

Tel. +358 30 395 5000  
Fax +358 30 395 5196

## Hämeenlinna

Valvomotie 11  
FI-13110 Hämeenlinna  
Finland

Tel. +358 30 395 5000  
Fax +358 30 395 5336

## Oulu

Lentokatu 2  
FI-90460 Oulunsalo  
Finland

Tel. +358 30 395 5000  
Fax +358 30 395 5711

## Petäjävesi

Sähkötie 24  
FI-41900 Petäjävesi  
Finland

Tel. +358 30 395 5000  
Fax +358 30 395 5524

## Rovaniemi

Teknotie 14  
FI-96930 Rovaniemi  
Finland

Tel. +358 30 395 5000  
Fax +358 30 395 5196

## Varkaus

Wredenkatu 2  
FI-78250 Varkaus  
Finland

Tel. +358 30 395 5000  
Fax +358 30 395 5611