We are building an electricity motorway – in the middle of Stockholm

Ellevio is currently implementing one of its largest electricity network projects ever, which will serve as a vital part of the platform for Stockholm's continued sustainable development.

An important task for Ellevio is to guarantee the electricity supply in the Swedish capital of Stockholm. The capital region is growing as digitalisation and electrification continue to expand. Demand for electricity is increasing in line with this.

"This project is a vital piece of the puzzle in terms of Stockholm's continued development, electrification process and achievement of its climate targets," says Jenny Nilander, project manager at Ellevio.

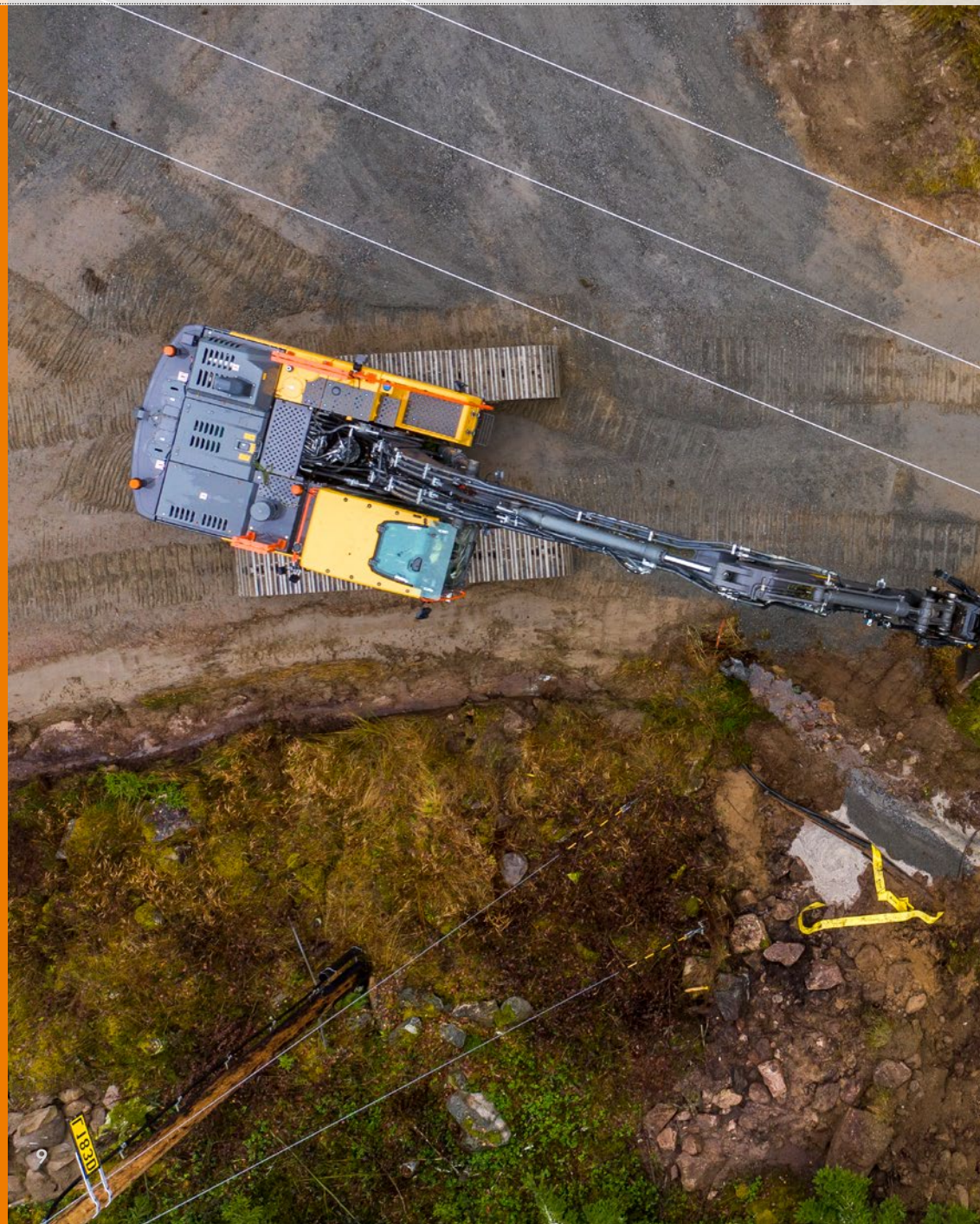
The electricity network project is one of Ellevio's largest ever. For the first time in Sweden, cables are being laid with a voltage level of 400 kilovolts in an urban environment. A 10 kilometre-long overhead line between Beckomberg and Bredäng is being replaced with 12 kilometres of cables, partly buried in the ground and partly placed on the bottom of Lake Mälaren, a challenging project that affects many stakeholders along the way.

There are nine cables as thick as tree trunks being buried, which is why they are buried deep down and wide apart. Furthermore, the work is being undertaken in places where space is limited due to other types of pipes and lines – for example for water, fibre and district heating. This work in a densely populated and busy area can be trying for residents and for those who typically use the streets now being dug up.

"We have a close dialogue with the City of Stockholm, among others, to find solutions relating to noise and route closures and compromises to meet different needs," explains Nilander. "However, it will not be possible to avoid disturbing some people in this project, which is why we are making big efforts to inform those who live and work in the affected areas. The aim is to try and help people understand why this work is needed. We are building a new motorway for the city's electricity."

The project planning began as far back as 2013, and aims to ensure a long-term and robust electricity network for an expanding Stockholm. Ellevio's work on the area began in 2019 and is our largest cable project ever, involving investments of more than SEK 1 billion.

When the work is complete, the lines will form part of the Swedish national grid. With their voltage level of 400 kilovolts, they will make a considerable difference compared to the current overhead line of 220 kilovolts. In addition to greater capacity, the buried power lines will also free up valuable land for housing, offices, parks and green areas, for example.



More extreme climate placing new demands on the network

Forest fires, torrential downpours and more storms – these are just some examples of the climate phenomena to which we will have to become accust-omed in the future. As electricity network owners, this has created a new situation for us.

Erik Kjellström, Professor of Climatology at the Swedish Meteorological and Hydrological Institute, believes we will have to get used to more extreme weather phenomena in the future.

"Temperature increases will continue, meaning warmer summers and milder winters. Low pressure bands which have a major influence on our weather, will likely follow a more northerly route.

On a global scale there will be fewer low pressure bands, but they will be more intense. In the future, we in Sweden will likely be struck by more tornadoes and intense hailstorms than we are today. Many aspects connected to extreme weather and how it may change in a warmer -climate remains uncertain, but intensive research is being conducted into this area," Kjellström explains.

Fires

The summer of 2018 went down in history as the hottest ever. Major forest fires raged across Sweden, homes were destroyed and valuable forest was incinerated. The electricity network was also affected. On 17 July three of Ellevio's power lines in Hälsingland were destroyed. The flames engulfed several poles that began to burn and break away; the power lines collapsed. No household customers were affected, but several hydropower plants along the Ljusnan river became disconnected from Ellevio's network. In total, eighty kilometres of Ellevio's power lines were knocked out as the fires spread.

"The situation was very different to normal circumstances when a power line breaks. In those cases we are able to quickly investigate the fault and immediately deploy the right teams to repair the line. In this case, however, it took several weeks before we even knew what was wrong," explains Anders Ekberg, Head of Ellevio's operational organisation.

The fires heightened Ellevio's awareness of the risk of fires. Since then, the company has been undertaking methodical work aiming to prepare for the future. Ellevio assessed all of its power lines based on the likelihood and risk of being knocked out during a major fire.

"We also examined which steps we can take when planning expansions and updates of our power lines to reduce the risk of these kinds of major fires damaging our electricity network," adds Ekberg.

Torrential rain

In mid-August 2019 a typical year's worth of rain fell on Åsa in Halland municipality over the course of three days. Many houses were flooded and the emergency services worked flat out to help stranded inhabitants. The enormous quantities of water also created problems for the electricity network.

Ellevio pumped 30 cubic metres of water out of a protective pit over just a few days, compared with 40 cubic metres throughout all of 2018.

There are protective barriers under the transformers in switchgears in the form of cavities that can collect any oil leakage from the facilities, should a disaster occur. Due to the violent rainfall, there was a risk that the cavities would flood and polluted water would leak out. However, using new smart technology, Ellevio was able to react quickly as the rain was falling.

Ellevio is testing different types of equipment, including automatic pumps with sensors that can detect oil present in the water. The water then stops being pumped out and we are alerted by an alarm. Another equipment being tested is a level gauge that emits an alarm if the water in the cavity exceeds a certain level. It can also detect any leakage within the cavity.

Storms

There are several historical examples of storms that have knocked out the electricity supply in large parts of the country. Storm Gudrun in 2005 had unprecedented consequences and in more recent years storms such as Dagmar, Egon, Helga and Alfrida have left tens of thousands of households without power over long periods. There is, however, a clear pattern: the consequences of storms are not as destructive now as they once were. The main explanation for this is that thousands of kilometres of power lines have bene buried in the earth, so called cabling, thus safeguarding them against the forces of the weather.

Since 2005 Ellevio has in the modernisation and reinforcement of the electricity network increased the degree of cables in the ground from 63 percent in 2005 to 83 percent in 2020. In total, approximately 59,400 kilometres of Ellevio's local network is today cablified and older lines have been demolished. In addition to this, all 6,600 km of regional grids are weather-proofed in the form of major power line corridors precenting trees from falling onto the lines.

We will continue to weather-proof the grids over the coming years, while smart technology is introduced into many key hubs of the network. This gives us the opportunity to see faults more quickly and restore power to the power lines that have not been affected.

Ellevio is launching comprehensive solutions for charging electric vehicles

The electrification of the transport sector is one of several important steps Sweden needs to take to achieve its climate targets. Well-developed charging infrastructure is required to manage the transition towards electrified traffic, which is why Ellevio launched an extensive investment into electric-vehicle charging in 2020.

"We want to drive the transition towards more electric vehicles while using smart technology to manage the electricity network's capacity shortages. We are now making it easier for customers throughout the whole process, from ordering to installation. We are also using modern technology and smart services to enable customers to control the charging process and thus contribute to a lighter load on the network when levels are peaking," says Kristofer Fröjd, Head of Strategy and Business development at Ellevio.

Adapted solutions for private individuals

Together with OneCo, Ellevio is offering charging for electric vehicles to detached home owners. The package includes a preparatory home visit, charging wall box with load balancing function and installation by a qualified electrician. The load balancing function optmises charging based on the household's needs and capacity, and ensures the charging is safe.

"We are currently in the process of installing the next generation of smart electricity meters in our customers' homes. The new meters and wall boxes will enable them to control and monitor the charging in a very efficient way, directly via the meter as well as in an app," explains Fröjd.

Ellevio offers a comprehensive solution to companies and associations; from the analysis of needs and conditions to the installation of wall boxes. This makes Ellevio a natural partner in terms of electric-vehicle charging.

Ellevio is also collaborating with the City of Stockholm to increase the number of public charging stations by 4,000 by 2022.

More people can charge despite capacity constraints

Thanks to smart services and modern technology, Ellevio's electric charging solutions contribute to a reduced burden on the electricity networks around our major cities. Through the flexible Sthlmflexmarket and other technologies that can be used to make existing power lines more efficient, our customers will be able – despite the current capacity shortages – to help ensure a greater flexibility on the networks as we expand the charging infrastructure in a sustainable way.

"We can see that interest and demand is increasing dramatically as more and more people opt to buy electric vehicles. We want to contribute with solutions so that more people can make that choice, despite the shortage of capacity," adds Fröjd.

Energy-smart innovators awarded in new competition

Smart innovations that help society make the transition towards becoming fossil-free. This is what Ellevio and GodEl were looking for – and found – in the new innovation competition **Startup 4 Climate**.

Sweden's ambition is to be at the forefront of climate efforts, and a greater degree of electrification is vital in terms of managing the energy transition. As one of the country's largest electricity network owners, we are committed to efforts to find solutions that help us succeed in this challenge. This is why Ellevio joined up with GodEl to launch an innovation competition promoting new, exciting solutions that drive Sweden's climate efforts forward.

On 1 October 2020, the first winners of the Startup 4 Climate competition were announced:

- **Enjay**, which develops energy-recycling ventilation units for the restaurant sector
- **Peafowl Solar Power**, which produces transparent, printable solar panels that can be integrated into existing buildings

The prize consists of a total of SEK 2 million and personal coaching from a jury member of their choice to support the companies in their continued efforts.

"It has been incredibly inspiring to see so many innovative solutions, and we are looking forward to working together with the winners in the future. We hope the competition can give both the nominated companies and the winners a boost for the future," says Johan Lindehag, CEO of Ellevio, who was one of the jury members.

"We view this initiative as an important step in a more extensive collaboration with smaller companies in the energy sector. We would love to see new ideas and innovations that enhance the pace and stability of the energy transition, and we offer our expertise and experience for these development efforts," adds Kristofer Fröjd, business development manager at Ellevio.

Continuing in 2021

The competition promotes innovations across the energy sector and offers start-ups an opportunity to further develop solutions to the challenges we are facing. Together with GodEl, Ellevio will develop the concept further in 2021 with an even larger prize and more winners.

Read more at https://startup4climate.se/

One million smart electricity meters – a prerequisite for a smarter electricity network

In 2020 Ellevio began the installation of the next generation of smart electricity meters among all of its customers – nearly one million households and companies throughout Sweden. The new electricity meters will make it possible to develop new, smart energy services that help customers live more climate-smart lives. The meters will also contribute to a more reliable electricity network which both fewer and shorter outages. Last but not least, they represent an important aspect of the smart electricity networks of the future and thus also the transition to an electrified, fossil-free and climate-smart society.

Ellevio implemented a pilot project in spring 2020 together with 4,500 customers in Älvsjö in Stockholm to test the installation of the new smart meters and the functionality of the whole meter system. Following successful tests, customers in Enskede, the remaining parts of Älvsjö and in Södermalm in central Stockholm also received new meters. A wider roll-out is now underway, and in late 2020 some 50,000 Ellevio customers had received their new smart meters. The installations will continue throughout 2021 and through 2023.

New services for customers

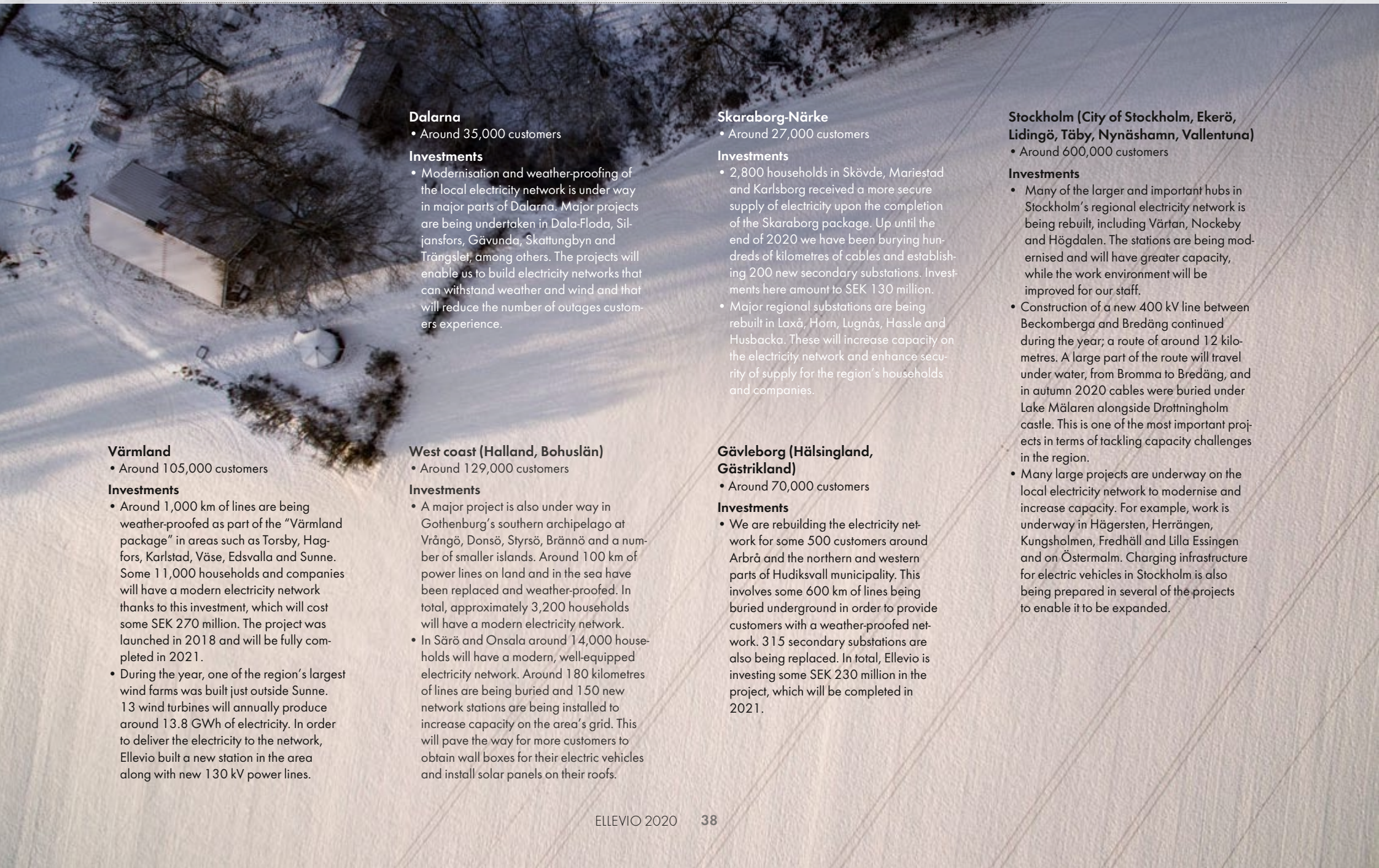
The new smart electricity meters will give Ellevio's customers better conditions for monitoring and comparing their electricity consumption, meaning they will be able to consume electricity in a more climate-smart and cost-efficient way. Thanks to their standardised interface, the new meters also pave the way for new services from third-party operators, including in the areas of energy efficiency enhancement and governance.

In 2020, Ellevio worked to complete its own customer app that will be available in spring 2021. The app will give Ellevio's private customers a good overview of their electricity consumption and climate impact, as well as the ability to compare their own consumption with others and use their increased knowledge to influence their consumption and help reduce their climate impact. It will also be possible to connect the app to other smart devices at home, such as solar panels, electric vehicle chargers and heat pumps.

The smart electricity networks of the future

The new meters contribute to a modern, digitalised and more efficient monitoring and operation of Ellevio's electricity network. This means we will get a better overview of the electricity network in the future and will be able to predict faults that could lead to power outages. In turn, this will enable us to remedy the faults quicker, even before they occur. For customers, this means fewer and shorter outages, which is vital in an increasingly electrified and digitalised society.

The smart electricity networks of the future also create the conditions for a sustainable energy system in which a mixture of large and small-scale electricity production will become increasingly common. The smart electricity network will collect data from electricity producers and consumers, ensure that the electricity system is in balance and that the renewable electricity is being used efficiently. The smart electricity meters are an important part of these developments, and when almost one million households contribute to the little things, Ellevio can make a difference to the big things.



Värmland
• Around 105,000 customers

Investments
- Around 1,000 km of lines are being weather-proofed as part of the "Värmland package" in areas such as Torsby, Hagfors, Karlstad, Väse, Edsvalla and Sunne. Some 11,000 households and companies will have a modern electricity network thanks to this investment, which will cost some SEK 270 million. The project was launched in 2018 and will be fully completed in 2021.
- During the year, one of the region's largest wind farms was built just outside Sunne. 13 wind turbines will annually produce around 13.8 GWh of electricity. In order to deliver the electricity to the network, Ellevio built a new station in the area along with new 130 kV power lines.

Dalarna
• Around 35,000 customers

Investments
- Modernisation and weather-proofing of the local electricity network is under way in major parts of Dalarna. Major projects are being undertaken in Dala-Floda, Siljansfors, Gävunda, Skattungbyn and Trängslet, among others. The projects will enable us to build electricity networks that can withstand weather and wind and that will reduce the number of outages customers experience.

West coast (Halland, Bohuslän)
• Around 129,000 customers

Investments
- A major project is also under way in Gothenburg's southern archipelago at Vrångö, Donsö, Styrsö, Brännö and a number of smaller islands. Around 100 km of power lines on land and in the sea have been replaced and weather-proofed. In total, approximately 3,200 households will have a modern electricity network.
- In Särö and Onsala around 14,000 households will have a modern, well-equipped electricity network. Around 180 kilometres of lines are being buried and 150 new network stations are being installed to increase capacity on the area's grid. This will pave the way for more customers to obtain wall boxes for their electric vehicles and install solar panels on their roofs.

Skaraborg-Närke
• Around 27,000 customers

Investments
- 2,800 households in Skövde, Mariestad and Karlsborg received a more secure supply of electricity upon the completion of the Skaraborg package. Up until the end of 2020 we have been burying hundreds of kilometres of cables and establishing 200 new secondary substations. Investments here amount to SEK 130 million.
- Major regional substations are being rebuilt in Laxå, Horn, Lugnås, Hassle and Husbacka. These will increase capacity on the electricity network and enhance security of supply for the region's households and companies.

Gävleborg (Hälsingland, Gästrikland)
• Around 70,000 customers

Investments
- We are rebuilding the electricity network for some 500 customers around Arbrå and the northern and western parts of Hudiksvall municipality. This involves some 600 km of lines being buried underground in order to provide customers with a weather-proofed network. 315 secondary substations are also being replaced. In total, Ellevio is investing some SEK 230 million in the project, which will be completed in 2021.

Stockholm (City of Stockholm, Ekerö, Lidingö, Täby, Nynäshamn, Vallentuna)
• Around 600,000 customers

Investments
- Many of the larger and important hubs in Stockholm's regional electricity network is being rebuilt, including Värtan, Nockeby and Högdalen. The stations are being modernised and will have greater capacity, while the work environment will be improved for our staff.
- Construction of a new 400 kV line between Beckomberga and Bredäng continued during the year; a route of around 12 kilometres. A large part of the route will travel under water, from Bromma to Bredäng, and in autumn 2020 cables were buried under Lake Mälaren alongside Drottningholm castle. This is one of the most important projects in terms of tackling capacity challenges in the region.
- Many large projects are underway on the local electricity network to modernise and increase capacity. For example, work is underway in Hägersten, Herrängen, Kungsholmen, Fredhäll and Lilla Essingen and on Östermalm. Charging infrastructure for electric vehicles in Stockholm is also being prepared in several of the projects to enable it to be expanded.