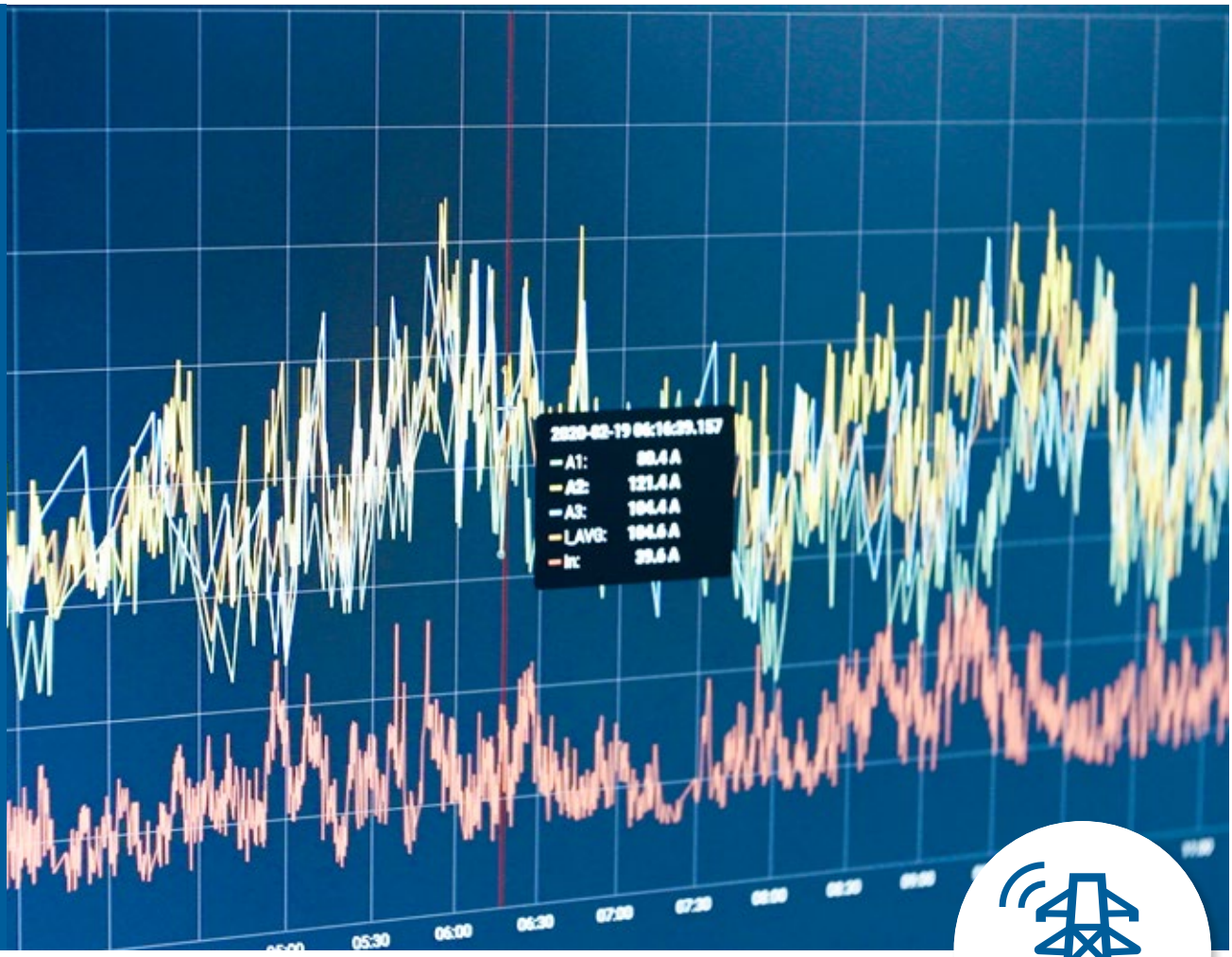
ADDSECURE

Smart Grids



The new smart power grids

With a project that has been financed and specifically selected by the Swedish Energy Agency, AddSecure has, together with Affärsverken in Karlskrona, developed a new solution for smart grids. We are looking at a whole new type of decision-making for operations and investments in the power distribution grid.

We are facing a major shift, where the entire electricity-based energy system is changing. The distribution grid will be highly affected by the phasing out of large-scale production that is dependent on fossil fuels – and with time even nuclear power.

The power grid of the future must be able to manage an increased share of wind and solar power and a large-scale infrastructure for charging electric vehicles. The power grid also has to be able to meet the needs of customers who expect guaranteed operations and require new smart services to control their own consumption. Through connected devices and smart IoT solutions, AddSecure Smart Grids will provide access to a completely new type of knowledge support for decision-making. With Smart Grids, the customer will be able to improve delivery reliability and optimize the use of power grids.

New consumer behavior
Smart City Centers, Smart homes, electric vehicles and the advent of local microgrids are examples of new consumer behavior that is reinforcing this inevitable shift.

"We are transitioning from the classic operations center to the control room. There is an enormous amount of connections and in a Smart City Center you have everything from battery sensors in paving stones reporting where there are free parking spaces, to information about which conference room in the office has the best oxygen levels. IoT solutions and new consumer needs place completely new demands on us", says Anders Savetun, Distribution Manager at Affärsverken in Karlskrona. They supply central Karlskrona with electricity and have started a journey define what future operations need to look like. Classical power distribution has involved large production units, such as hydropower stations and nuclear power plants. From backbone networks, regional networks, down to the local networks. Wind and solar power are becoming increasingly important and now even micro-production. Where it used to be enough to keep track of the input points, they now need to look more closely at what it really looks like in the city they are supplying with electricity. How have things changed due to emerging solar panels? And what will happen if the system goes in reverse and households send electricity into the grid. Can they, and do they want to control this?

Anders Savetun, Distribution Manager at Affärsverken in Karlskrona:

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Transition to a dynamic distribution grid
It is impossible to predict the speed of this transition and what new conditions may emerge along the way. The only thing we can be sure of is that it will be quick. But standing still, treating the power grid as a passive carrier of energy from plant to consumer, would be a mistake. Affärsverken in Karlskrona has taken a first and important step towards a dynamic distribution grid. Fully aware that demands come from changes in consumer behaviour, as well as demands from the government.

Time for yet another meter reform
"Historically, we have worked with one reading per year and preliminary invoices," Anders explains. "Originally, consumption was measured for the sake of money. Then meter reforms were introduced with requirements for monthly readings and for read values in order to be able to charge the customer. Today more and more deliveries are calculated on an hourly basis."

Meaning that the industry has gone from 1 to twelve values per year – to 8,760 values read per year, per measurement point, per customer. These reforms mean new technical requirements on the meter, essentially meaning that the whole country will have to change meters. And this will be implemented gradually when the new requirement comes into force on 1 January 2025.

"We are talking about 15-minute periods," says Anders. "35,000 15-minute periods per meter per year. But those 15-minute periods will not help you with the question «what does it look like today?». We need to answer that question to avoid unpleasant surprises."

A solution for smarter power grids
Generally speaking, the distribution manager will need to know more about what is happening in the grid right now, preferably in real time. To acquire this knowledge about the status and quality of the grid, there will be need for more measurements and parameters, from more points and occasions. In some cases continuously.

This is why Affärsverken turned to Addsecure for help. And with their help, they have developed a new solution for smart power grids that enables a basis for decision-making for operations and investments in the distribution grid. The power grid will be optimized through energy measurement, data acquisition and analysis.

"The aim of this project is to manage the power grid in a way where actions and desicions are based on current and validated measurements data. preferably in real time, with all the systematic calculations presented in an educational and visually accessible manner." says Erling Gustafsson, Business developer at AddSecure.

A proactive operation
Quick fault detection, fault localizing and finding a solution to the problem is of course essential. Using equipment that makes sure

Anders Savetun, Distribution Manager at Affärsverken in Karlskrona:

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that the number of customers affected by disruptions are as few as possible, is incredibly important.

"But you can't just have hundreds of graphs on your hands," says Anders. "And a system that just tells you you've got a problem simply isn't enough. You need to have a system that warns you when you are about to have a problem. That is one of our major objectives. The entire operational organization must be proactive. With experience, you can sometimes make a guess. However, the large amount of information means you have to find another way to deal with it today. The industry needs to be able to rely on data-driven decisions.

Smart Grids from AddSecure means access to a completely new base for decision-making for operations and investments in the distribution grid. There is currently no corresponding overall solution on the market today. The solution means increased energy efficiency and a reduced number of customers affected by disruptions. And on top of that - reduced energy costs.

"With the correct data and analysis, we can act proactively so that one day we can tell you that your coffee maker will break down next week," says Anders.

But, as a power distributor, how can you be relevant in five, or ten years?

"We are relevant today and we were relevant yesterday," says Anders. "But what will be our role more than just being a facilitator if your neighbourhood already produces the electricity you need? We won't have to send it all the way from Norrland and down to you. However, you may produce electricity, while your neighbour needs to buy it. You still need send it over a power grid – and we will be there."
Not to mention that there needs to be a check on the quality of the electricity sent to consumers. Something that is currently perhaps more crucial for business customers with very specific needs. But we can't really know often things break down in households today, for no evident reason – where the answer actually is electricity with low quality. And how sensitive will consumers' electric products be in the future?

Facilitators of the UN Climate Goals
But are we sure our future consumption of electricity will be greater than today? Anders thinks so. Many of the sustainable solutions

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Smart communities demand smart grids.
Smart Homes and Smart Cities bring many benefits to both consumers and the government. Upgrading to smart connected homes is becoming easier. But it also places higher demands on the power grid. If homes become smart, so must the electricity grids also.

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are based on some form of electricity. When we look at the UN climate goals, we may not directly have the solutions to them – but we are clearly facilitators for the majority of them.

However, a modern sustainable society is also about choices. We need to be proactive and make smart decisions.

"If we find out our weak spots and our future problems, we will have some leeway at the next stage. Then we can choose to solve problems in multiple ways. Maybe we don´t need to change the cables. Maybe we should just redirect the load instead? Can we help with energy storage? What is the smartest solution to future problems? If we do nothing, we won't have a choice." The most important thing for Anders when looking for a solution for Affärsverken was to achieve better and more frequent control of the actual status of the power grid. It was also crucial to find a solution that could show what their own grid looked like.

"There has actually been a health index for large transformers - the large facilities - where a breakdown would be extremely costly. But we need health data from all the facilities. If we know how a facility is doing, we can carry out scheduled maintenance before something breaks".

"So we started with an idea in the form of a vision of where we needed to go to. Then we had a discussion with AddSecure based on our main challenges: fault detection, health index at the facilities and bases for decisions for operation and investment. We have taken the first steps but the journey is far from over. We take a look at it every year and ask the question: What else do we want to know? Because we know for sure that the more we know - the more we will want to know. It never ends. It's a journey... all of it!"

20 000 GRID CUSTOMERS

The power grid will be optimized through energy measurement, data acquisition and analysis.

- **Increased grid utilization rate**
- **Reduced costs for energy losses and reactive effect.**
- **Increased energy efficiency**
- **Proven reduced number of outages and affected customers**
- **Knowledge on status and quality of the grid in real time**
- **Better decision-making basis for future investments (data, calculations and presentations)**

In brief

Customer: Affärsverken i Karlskrona Elnät AB

Background: Smart Homes and Smart Cities means new demands on the power grid.

Requirement: A smarter power grid with more knowledge on status and quality of the grid in real time.

Solution: The power grid is optimized through energy measurement, data acquisition and analysis.

Results: A completely new type of decision basis for operations and investments in the distribution grid.

Quick facts

Affärsverken i Karlskrona Elnät AB *owns and maintains the power grid in central Karlskrona with approximately 20,000 customers.They offer sustainable products and services to companies and private individuals and has been part of Karlskrona's infrastructure since 1907.*

AddSecure's solution - Smart Grids *offer standard equipment for fault detection, measurement and communication in the grid - System solutions for analysis and presentation of data, calculations and presentation.*