

A photograph of two young women in a sunny outdoor setting. The woman in the foreground has long blonde hair, wears glasses, and a dark top with a floral patterned scarf. She is smiling broadly and making a peace sign with her right hand. Behind her, another woman with dark hair and glasses is also smiling and making a peace sign. The background is bright and slightly blurred, suggesting an outdoor urban or park environment. The overall mood is positive and optimistic.

Sustainable energy future for customers



Energiateollisuus

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The challenge: unprecedented change is underway

- +** Finland has a historic opportunity to become a clean energy superpower and attract major industrial investment. Technological development, such as falling solar panel prices, automation and data management, will open up new opportunities for customers to benefit from the energy transition.
- However, the rapid growth in the share of variable renewable energy is shaking the foundations of the energy system: the ability to balancing is shrinking as more energy is no longer available from burning fossil fuels.

Electricity prices in particular have fluctuated dramatically, and managing a changing energy system requires new solutions

Customers as an active part of solutions

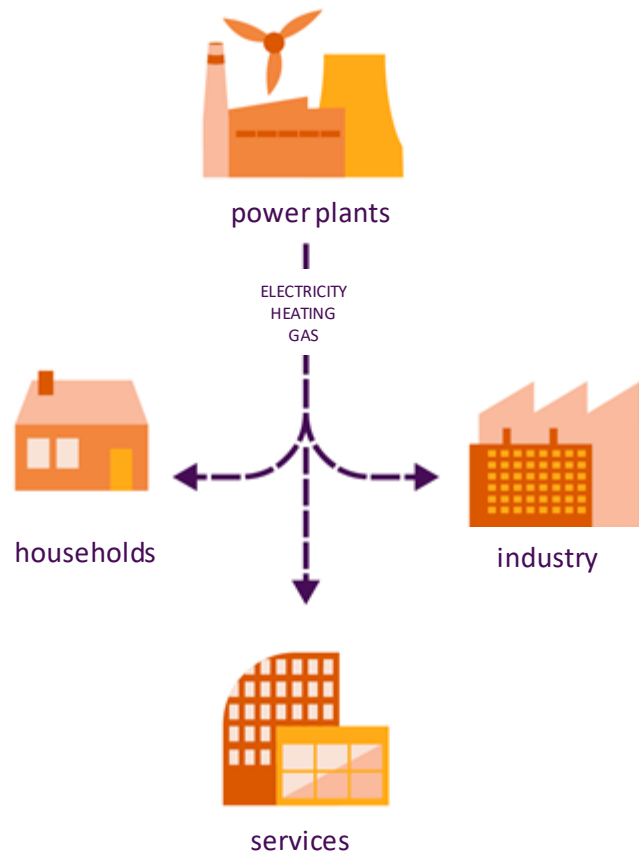
- In the future, business and household customers will also be producers, storers and, if they wish, sellers of energy.
- Already, many shopping centres use the energy they produce, customers can sell waste heat to district heating companies and tens of thousands of Finns have installed solar panels in their homes.
- The more active the customer is, the more they will benefit from the change. On the other hand, new services and automation work for customers and meet a wide range of needs.
- By making use of electricity and heat price fluctuations flexibly and intelligently, a cycle is created that feeds a sustainable energy system. At the same time, risks are managed.

Finland can be the first in the world to create a sustainable, cost-effective and modern energy system. It creates work, livelihood and strengthens the role of customers.

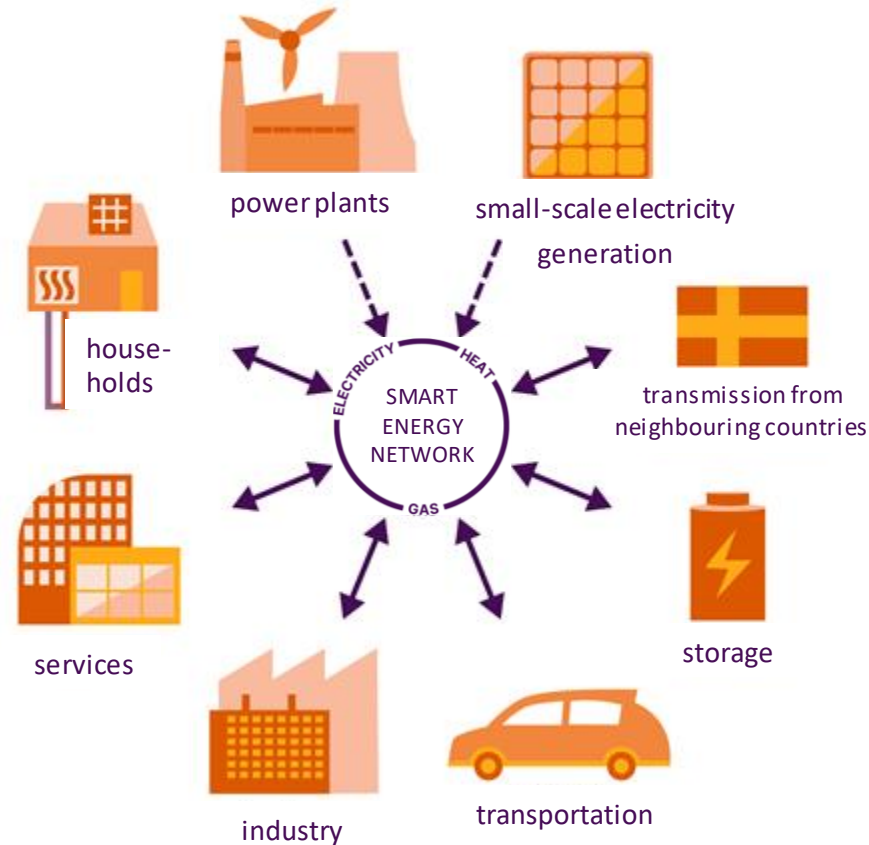


Towards a smart and flexible energy system

Traditional energy system



Smart and flexible energy system



Electricity, heat, transport and gas will be combined in a mutually supportive new energy system, with clean electricity playing an increasingly important role. In the future, energy will increasingly be purchased as a complete service.

New players in the energy market

- Large service sector companies in particular are also energy producers and storers, not just energy users.
- In the future, companies and the infrastructure they build will play a major role in balancing energy supply and demand.
- Energy companies will enable change and new players to enter the market through services and cooperation.

EXAMPLE

Telecom operator **Elisa** has built an intelligently controlled distributed virtual power plant of 150 MWh from the batteries of its base stations. It will provide backup power, for example, when the electricity grid needs to be balanced because the actual wind power production does not match the forecast or when there is a sudden increase in electricity consumption.

EXAMPLE

Geothermal heating, solar panels, condensation heat recovery, forecasting and optimisation make the energy efficiency of **the Lippulaiva shopping centre** in Espoo excellent. This benefits all electricity users by stabilising the grid and ensuring reliability: the shopping centre's energy storage has been able to supply 600 MWh of electricity per month to Fingrid's balancing market. This is equivalent to the monthly electricity consumption of around 1,000 private houses.



Buildings and households as heat storages

- The 2022-2023 heating periods during the energy crisis showed the potential of households and the building stock in general to balance energy production and demand.
- Already now, households can benefit from the timing of their energy consumption in the form of lower bills. In the future, consumption management will become more diversified.

EXAMPLE

More than 100,000 electric heaters in the network area of **Caruna**, the electricity network operator, can start heating their property and domestic hot water after midnight with the help of the electricity load management service. At that time, exchange electricity is usually cheapest. For a family of four, for example, automated heating scheduling can save hundreds of euros a year.

Buildings and households as heat storages

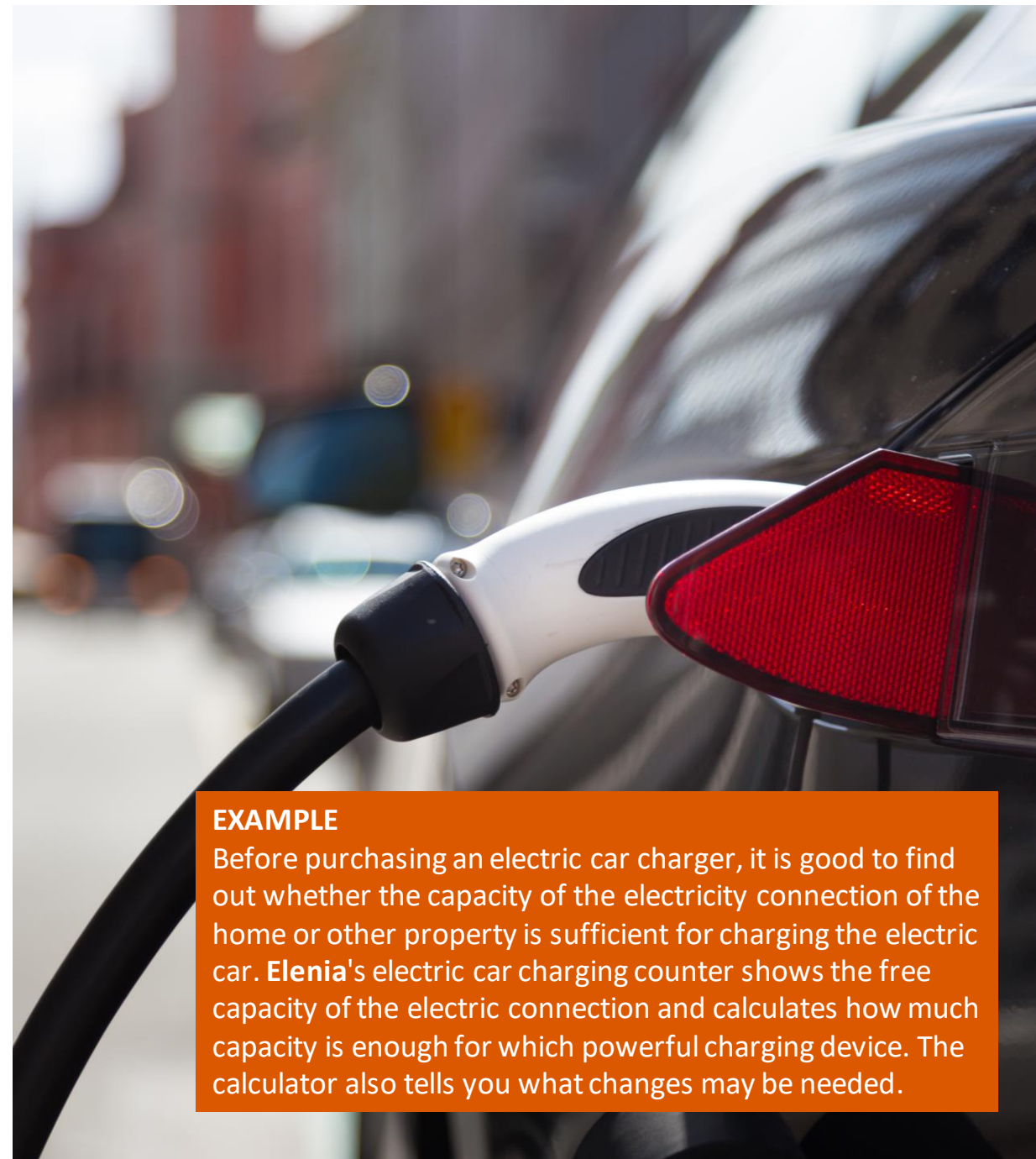
- In the future, intelligent and automatic remote control of heating in buildings will increasingly turn building stock into virtual storages that balance energy demand without compromising living comfort or requiring occupants to do anything.
- Thanks to new flexibility services, it will even be possible for households and other customers to earn money by not using energy at certain peak consumption times.

EXAMPLE

Talin Puistotie 9 is an apartment building company located in Pitäjänmäki, Helsinki. A few years ago, the housing company, which had district heating, realised that the heating system was reaching the end of its life and that the building automation system needed to be renewed. The company decided to start an energy renovation project together with **Helen**. The district heating was replaced by a geothermal solution from Helen with heat recovery. In addition, electric car charging points were installed in the building.

Transport becomes part of the energy system

- The networked and intelligent transport system of the future increases customers' choice, improves the utilization rate of means of transport and reduces the time spent on movement as well as traffic emissions.
- Electric vehicles in particular are already balancing the electricity system. For example, most home chargers automatically charge batteries when prices are low and other demand is low.
- The future proliferation of vehicle-to-grid (V2G) features, i.e. batteries and chargers that work in two directions, can turn vehicles into a large energy storage, from which, with the customer's permission, energy can also be sold to the grid during times of high demand.



EXAMPLE

Before purchasing an electric car charger, it is good to find out whether the capacity of the electricity connection of the home or other property is sufficient for charging the electric car. **Elenia's** electric car charging counter shows the free capacity of the electric connection and calculates how much capacity is enough for which powerful charging device. The calculator also tells you what changes may be needed.



The number of prosumers is growing

- Small-scale energy solutions will become an everyman's technology and a hassle-free "turnkey" service. This will provide households and other customers with freedom and opportunities in energy choices.
- Interest in decentralised small-scale electricity and heat production is likely to grow, and not just among single-family households.
- Farms, for example, will be able to take advantage of energy self-sufficiency and reduce the amount of purchased energy during demand peaks, as well as sell their own production to the grid.
- The number of energy communities will also grow as housing associations install solar panels on carports, for example. Residents can use the energy they produce themselves or sell it on.

EXAMPLE

Savon Voima has been involved in implementing an energy solution for a new energy community in Iisalmi's Peltosalmi. The 24-apartment townhouse condominium produces energy from the sun both for sale and for its own use. The solution enables the housing company to minimise costs and support the green transition.

Strong energy networks enable change

- Bidirectional and smart energy networks will allow customers to play a greater role and create a sustainable energy system.
- Strong electricity grids and investment in them will also enable electric transport, electrification of heating and industry, as well as numerous customers to become electricity producers in different parts of Finland.

EXAMPLE

Telia Helsinki Data Center is the largest open data centre in the Nordic countries, and from the very beginning, its main objective has been to make efficient use of waste heat. The waste heat from the data centre's high electricity consumption is collected and utilised by **Helen's** heat recovery system in Helsinki's district heating network. At best, the heat fed into the district heating network heats more than 20 000 homes in Helsinki.

Strong energy networks enable change

- In the future, different actors will be able to import a large amount of waste heat from their own operations into the district heating network. In general, district heating is a flexibility tool, as cheap electricity can be used for heating or cooling.
- The district heating network also becomes a means of "storing" summer heat for winter frosts: seasonal energy storage is heated with renewable energy in summer and discharged into the district heating network in winter.

EXAMPLE

Seasonal energy storage is an important part of the energy system in the new Kruunuvuorenranta district, which makes new use of seawater heated by the sun and recycled heat from residential buildings. The energy storage facility in Kallioluola will help to reduce the carbon footprint of the residential area to almost zero during its lifetime.

Data security and security of supply can be relied on

- In the future, energy management will become increasingly automated and effortless as smart appliances, buildings, information systems, customers and service providers communicate seamlessly with each other.
- At the same time, security and reliability will become even more important. But these are things that have always been in the energy sector's DNA.
- Customer data and critical operations will remain secure in the age of digitalisation. The energy sector works constantly on information security.
- This work is done in cooperation with partners such as the National Cyber Security Centre and the National Emergency Supply Agency.





Change in a nutshell

- The importance of the customer will grow enormously in the new energy system, where the production and use of zero-emission energy will increase. Increasingly, customers are also producers, storers and, if they wish, sellers of energy.
- Data and automation will bring new opportunities, for example to control indoor conditions with innovative heating and cooling solutions. In the future, energy solutions will be purchased as an overall service.
- The change is rapid and market-driven.
- Electricity, heat, transport and gas are integrated into a new kind of smart system where they support each other. Strong energy networks and investment in them will enable this change.
- Increasing the role of customers alone will not solve the need to balance the new energy system, but it will help considerably.