



## Customers set to benefit from new era in the energy sector



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Energy policy decisions are important choices for the future. Today, the sector is undergoing a great transformation whilst being a compass for a sustainable and safe energy future. Technological leaps, digitalisation and distributed solutions act as forces for change. The customers, i.e. the service sector, the manufacturing industry, transport and rural actors, will reap the greatest benefits of the transformation.

The advancement of energy technology and services has an impact on the operation and energy use of various customer groups. At the same time, the customers influence the energy system through their own choices. The future energy system will be reshaped by smart solutions where the development of production, storage, information and communications technologies will be utilised in a sensible way. Implementation of smart solutions provides added customer choices in steering 2020s energy policy.

It is necessary to engage in a diverse debate on the future of energy while upholding the importance of identifying the correct questions. There is no single truth about the future. However, joint discussion will help us find answers that lead to sustainable energy future that is even better for the customers.

Global climate and environmental issues and worldwide population trends are leading towards problems that are difficult to resolve with the current means. In 2030, more than 60 percent of the world's population will live in cities, which will result in increased population density. In Finland, urbanisation and migration from the provinces into regional population centres continue, and some rural areas in the country are facing challenges with the population becoming sparse. Predictable, long-standing and comprehensive solutions are needed as targets for social decision-making.

## Operating environment in the energy sector is undergoing a drastic shift

The inter-related phenomena that will have the strongest impact on the energy sector in the next few years are the climate change and the rise of renewable energy forms, digitalisation, international competition, and the strengthening of customer roles. The energy sector plays a crucial part in the face of these changes. The shift is servitising the sector, and it may bring even radical changes in the logic of the energy system.



Customers' wishes, needs and safety give a direction to the shift in the energy sector. Currently, most people's energy choices are largely based on price, but the customer categories will become differentiated in the future. Some customers value effortlessness, some prefer a low price, and some want to put their values, such as eco-efficiency or self-sufficiency, into practice.

The increased possibilities for customers to take influence are contributing to the disruption of traditional business models in the energy sector. The energy transition creates new opportunities for Finland and Finnish companies. We blaze the trail in emissions reduction, the increase in renewable energy, district heating, and combined heat and power generation. The security of our energy supply is second to none, and the price is competitive. The integration of transport, heating and electricity requires new services, and Finland is a world leader in their development. Promotion of smart energy solutions provides employment and opens new business opportunities. We are part of the EU and the global markets for products and services, and members of the EU's electricity market. Competition can promote the spreading of new solutions.

The energy sector aims to enable the success and wellbeing of various customer groups and to build a sustainable future together with various actors. Of the future change factors, disruption to the business models in the sector, energy storage and energy self-sufficiency, political guidance and regulation, the price of energy, the development of economy and the economic structure, and smart machines and appliances have been identified as factors of great impact and great uncertainty. On the other hand, electrification and servitisation, urbanisation, integration of electricity, heating and cooling systems, digital transformation, improved energy efficiency, heterogeneity arising from individualism, and the growing significance of information security can be seen as high-impact change factors.

# Determined effort is needed to build a great future

Favourable development in housing, services, industry, mobility and agriculture requires determined measures by both political decision-makers and officials and by energy companies and other service providers.

## 1. Housing forms and lifestyles become more diverse.

Diversification increases the demand for automated energy-related solutions and service packages. Households are constantly increasing the level of technology in their homes, which creates preconditions for better management of energy use. Automation and devices that communicate with each other are becoming a seamless part of homes, and these days new buildings in particular are more like smart machines than traditional houses. Homes take an active and automated part in the electricity and heating market without the residents needing to have a deep understanding of the function of devices or even take any notice of them.

### Measures:

#### Political decision-makers and officials

- Promoting legislation that enables this: legislation sets the targets, but it does not excessively intervene in choices related to various solutions, and it lets the market economy ensure utilisation of best solutions.
- Increasing cooperation and sharing information between various administrative branches and sectors.
- Investing in R&D funding and advisory services to customers concerning the possibilities of demand response.

#### Energy companies and other service providers

- Developing demand response services and other systems with a focus on the regulation of price stability.
- Supporting households in an increasingly rapid transition to sustainable energy solutions through productising and by developing services, with an active and open customer dialogue.
- Developing new kinds of services in energy management (e.g. living comfort and indoor conditions, overall solutions in energy management, including devices).

### Key questions to enable favourable development:

- *How to ensure that regulation related to energy management and to the technologies and services built around it is sufficiently sustained while enabling new innovations, and that different guidance measures or regulation do not contradict each other?*
- *Is there sufficient understanding of the combined effect and interoperation of technical solutions connected to properties? Is it possible to achieve overall management instead of sub-optimisation?*
- *How is it ensured that the technology to be used is secure and that the information about the costs and compatibility of various systems and services is correct, transparent and impartial?*
- *Are the energy companies and other service providers capable of responding to the diversifying customer needs?*
- *How are energy communities taken into account in legislation to ensure equal rules for different parties and fair treatment of customers?*

## 2. Finland is increasingly developing into a service economy.

Purchasing energy management or indoor conditions as an integrated service is becoming more common in both the housing sector and in large commercial and office buildings. In addition to energy, these service packages may extend to services in different fields, such as cleaning, security and wellbeing services. Demand response is gaining more importance in the energy system. Especially major actors in the service sector also operate in the production and storage of energy. The service building stock is taking extensive part in demand response.

### Measures:

#### Political decision-makers and officials

- The need and means for a comprehensive reform of energy taxation must be investigated.
- Nordic and EU-wide integration development of the electricity market, which the new services are based on, must be continued.

#### Energy companies and other service providers

- Development of integrated energy services and indoor condition services for customers in the service sector and especially for commercial and office properties.

### Key questions to enable favourable development:

- *Does the servitisation of energy overlook some actors in the service sector? Forerunners reap the benefits, but will the others suffer? Are the prices determined in a fair way?*
- *How can legislation related to data protection and data security be created to safeguard the rights of individuals and enable competitiveness of digital service development?*

### 3. Opportunities for the manufacturing industry to take an active part in the energy market will improve.

The electricity trade will operate in real time, and machines, devices and service providers will communicate with one another in an almost automated way, optimising energy production and consumption. An undisturbed energy supply and operation of the energy network are critical in industrial processes. Electricity generation that has favourable production costs and competitive taxation creates opportunities for the energy-intensive industry.

#### Measures:

##### Political decision-makers and officials

- Developing the electricity market in collaboration across national borders. Influencing in the consistency and long-term nature of EU-level regulation in order to enable sensible investment decisions.
- Safeguarding a competent workforce and predicting employment needs as a joint effort between industry and the education policy.
- Keeping climate and environmental regulation competitive in order to prevent carbon leakage.

##### Energy companies and other service providers

- Continuous development of the security of energy supply. Undisturbed energy supply is critically important in industrial production.
- Developing energy services also for smaller industrial actors.
- Investing in energy efficiency: especially smart machinery and equipment and utilisation of data produced by them in the optimisation of production and regulation of energy use.

### Key questions to enable favourable development:

- *Will Finland be able to make the necessary structural reforms related to the working life and society, strengthen its competitive position and attract new investments?*
- *How to ensure that regulation is consistent with an adequately long time-horizon to enable long-term investments and a sufficiently rapid response to market changes?*

## 4. A smart transport system, servitisation, urban planning, renewing of the vehicle stock, and new driving forces at the heart of transport change.

A networked and smart transport system seeks to increase mobility options, reduce the costs of customers' mobility, raise the utilisation rate of transport modes, reduce the time spent in transport, and cut traffic emissions. The possibility to gain fairer taxation and usage fees based on use and emissions will improve at the same time.

### Measures:

#### Political decision-makers and officials

- Safeguarding a long-term transport policy with a focus especially on the electrification of transport.
- Incentives to renew the vehicle stock and creating a demand for low-emission or emission-free vehicles to kick-start change: promoting taxation of company cars.
- Promoting community and urban planning that support a smart transport system and emission-free transport.

#### Energy companies and other service providers

- Building a domestic market for new transport solutions: developing new kinds of business models.
- Promoting exports of Finnish services and products that reduce emissions: biofuels, charging and refuelling systems and services for the governance of transport systems.
- Utilising electric vehicles and their batteries in energy system management and in demand response.

### Key questions to enable favourable development:

- *Can Finnish actors become involved in the growing Mobility as a Service market or will major global companies take over the Finnish transport system?*
- *How will the economy respond to the erosion of the fiscal base as a result of a decrease in fossil fuels?*

## 5. Energy entrepreneurship in rural areas will become more common, increasing the need for services built around distributed microgeneration.

Farms will be able to utilise their energy self-sufficiency and reduce the amount of purchased energy in demand spikes and sell their own production to the network during price spikes. More services will be needed for holiday homes, and the demand for higher standards of living will rise. Microgeneration solutions will become effortless turnkey services with technology that is easy for everyone to understand.

### Measures:

Political decision-makers and officials	Energy companies and other service providers
<ul style="list-style-type: none"><li>• Ensuring the acceptability of biomass use: focusing advocacy work on EU-level lobbying.</li><li>• Promoting the emissions trade: property-specific heating to be included in the emissions trading scheme and energy taxation outside emissions trade.</li><li>• Increasing the R&amp;D budget for developing farm-scale energy production plants, as well as for energy storage facilities.</li></ul>	<ul style="list-style-type: none"><li>• Packaging of distributed micro-generation solutions to fit the farm size: consulting, site analysis, definition of measures, technical implementation, management of project entity.</li><li>• Improving the availability of technologies related to the management of energy use.</li><li>• Taking second homes and changes in leisure-time living into account in the development of energy services.</li></ul>

### Key questions to enable favourable development:

- *What form will the integrated services in the energy production management of farms take?*
- *How quickly can outside service providers in distributed energy production management react to any disturbances?*
- *Will the maintenance of the current type of electricity network become unreasonably burdensome in the financial sense for customers in sparsely populated areas? Will the development at its height result in a rise in electricity distribution fees and in a steep increase in regional differences in distribution prices?*



## Customers will benefit from their stronger market position

Urbanisation, electrification, integration of electricity, heating and cooling systems, digitalisation, and the servitisation of the energy sector will increase choices and improve the opportunities of energy efficiency and energy management. They will drive change in the field of actors, the development of new services, and possibly create a new service level maintained by third parties in the interface between traditional actors and customers.

The shift will break down boundaries between industry and services. The services will become rapidly digitalised, enabling new business models. The old idea about services will no longer be valid in the future. Customer behaviour in a digital service economy will change, increasing expectations towards service concepts.

A stronger level of data security needs to be developed for the purpose of increased electrification, digitalisation and automation in residential services. Intelligence will create better energy management and that way boost comfort, ease and savings in living for ordinary people, not just for professionals. At the same time, it will be necessary to ensure that legislation will keep up with the changes.

## Electrification enhances the significance of price stability and security of supply

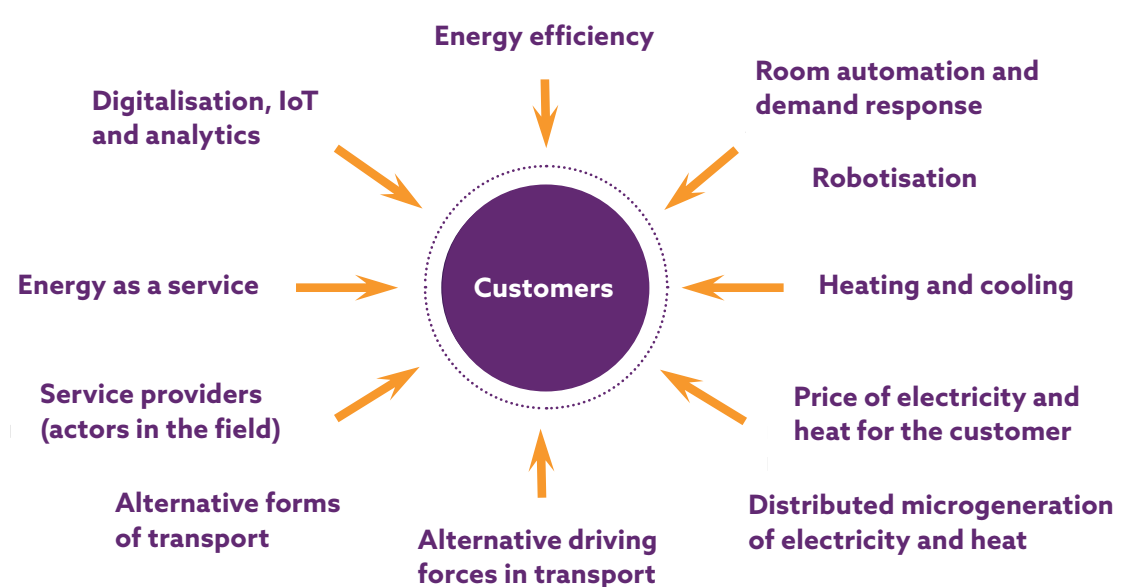
Total energy consumption at the Finnish level will fall although technologisation, the rising number of devices, and the growing amount of electricity used in transport and heating will push up the share of electricity in total energy consumption.

As energy efficiency improves, the customers' energy bills will fall once the price fluctuations in electricity and heat can be utilised. This creates a cycle that enables customers to invest in new equipment and energy solutions.

The fourth industrial revolution will change production methods, business models and the nature of work. Technological development will enable industrial companies to take on a more active role in the energy markets in the future, for example, by producing or storing electricity or heat and as participants in demand response. The change will increase the need for overall solutions and services in energy management and optimisation.

# How can we make sure that Finland will maintain its position as a forerunner in the energy sector also in the future?

In the future, energy management will become increasingly automated and effortless when intelligent devices, properties, information systems, residents and service providers communicate seamlessly with one another. The energy efficiency of properties and devices will improve especially as a result of technological advances, renewal of building stock and political guidance. Intelligence will provide new possibilities in regulating indoor conditions with innovative heating and cooling solutions.



Political guidance, increased provision of energy products and services, technological advances and the customers' own interests will probably provoke more interest towards energy and the distributed microgeneration of electricity and heat. Growing self-sufficiency will create opportunities for improving demand response and that way, at best, balancing the entire energy system. When the regulatability of energy production decreases and the share of variable renewable production increases, the significance of regulation taking place in consumption will also grow.

Finland's constantly developing energy system is among the best in the world on a number of counts. Low-cost, reliable and climate-neutral energy creates a basis for future wellbeing. We must offer our tried and tested solutions as a basis for EU-level development in the way the Nordic model has been an example in the electricity wholesale market.

# Our energy future

Is defined by digital technology, climate change and urbanization

## Six key points to climate neutral Europe

- 2050 target to the 1.5 degrees pathway agreed in Paris
- Well-functioning, fully integrated power market
- Free and fair competition - Same rules for all
- No subsidies for mature technologies and no regulatory barriers for any technology
- Customers are empowered to make choices
- Clear pathway to transport and heating decarbonization

## Energy is a new opportunity for agriculture

**Energy becomes an important production sector.** Woodchips, pellets, biogas, combined heat and energy plants enable energy self-sufficiency.

**Machinery will be diversified.** Automatic forest and field machinery using electricity, biogas and liquid biofuels become more common.

## Home and living automation

**Self-sufficiency increases.** Decentralized small-scale production, for example residential solar panels, increases energy self-sufficiency.

**Storage solutions are evolving.** Energy storage solutions enable demand-side response: consumption can adapt to the cost and supply of power.

**Intelligent energy systems.** Households participate automatically in the energy market; household intelligence optimizes energy consumption itself.

## Energy management as a service

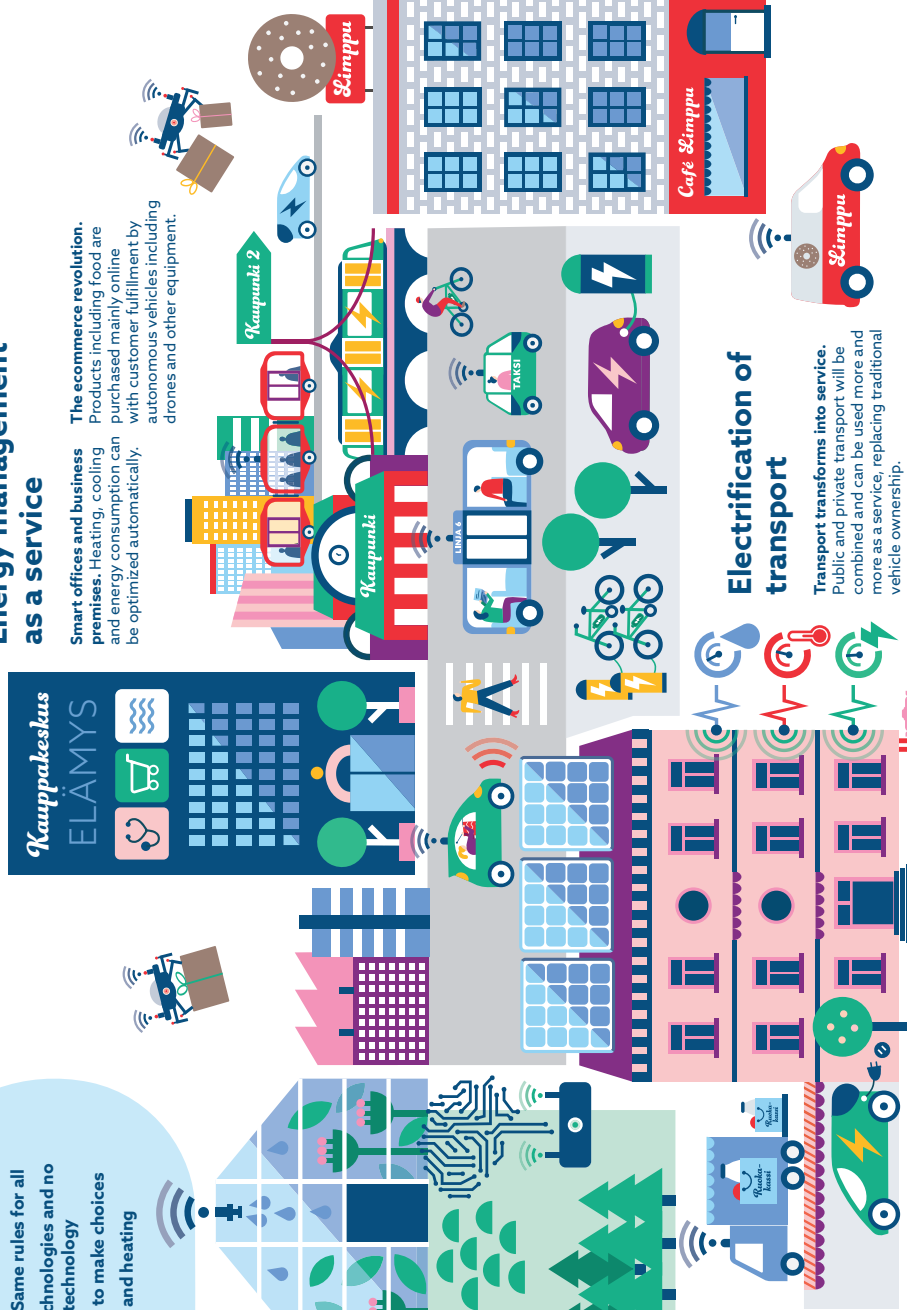
**Smart offices and business premises:** Heating, cooling and energy consumption can be optimized automatically.

**The ecommerce revolution.** Products including food are purchased mainly online with customer fulfillment by autonomous vehicles including drones and other equipment.

## As IoT improves our daily lives, we are more dependent on reliable power

Industrial production is more digital, more dependent on robots. Customers will insist on high quality power from highly reliable networks.

Energy is purchased as a service with different important features. User friendly agreements, predictable pricing, low-emission options and fixed-price contracts become commonplace.



## Electrification of transport

**Transport transforms into service.** Public and private transport will be combined and can be used more and more as a service, replacing traditional vehicle ownership.

**Electric and self-driving cars become common.** This will decrease particulate emissions and noise pollution.

**Densification increases in cities.** When car ownership drops, traffic jams will be reduced and parking lots can be used for other purposes.