



# CLEANTECH FROM THE GREENEST COUNTRY IN THE WORLD

FINLAND IS RICH IN NATURAL RESOURCES AS WELL AS EXTREMELY SKILLED CLEANTECH PROFESSIONALS CREATING SUSTAINABLE GROWTH AROUND THE GLOBE

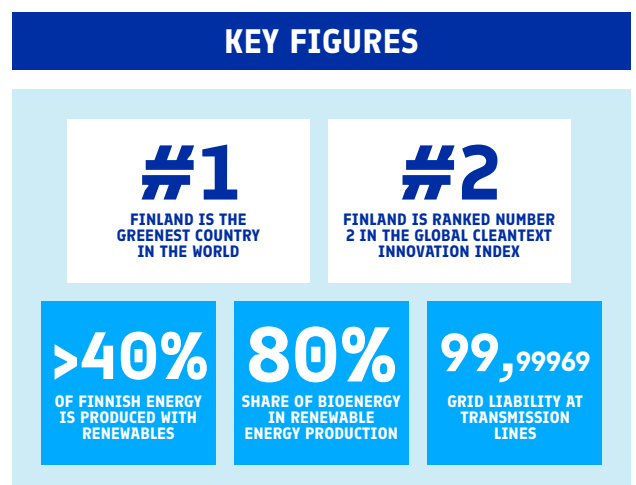
Clean thinking runs in our genes and sustainability is our second nature. Our unique location shapes the way we think, work, and innovate. Persistent long-term efforts, public and private sector collaboration, and cutting edge cleantech expertise, have helped us to succeed in protecting our nature. Reliable energy production and transmission are the backbone of any industry. Finnish companies are already building second generation smart grids that are secure, efficient, and reliable, and offer an excellent testbed to develop advanced solutions for future energy needs.

## RELIABLE AND EFFICIENT ENERGY SOLUTIONS

Today more than 40 percent of the Finnish energy is produced from renewable sources - globally, the share is only 13 percent. Finland is determined to maintain its role as a forerunner. Our strength lies in smart use of resources. Finland ranks among the top countries in efficiency of energy use and energy saving measures. Our companies are known for creating holistic and scalable solutions for specialized conditions. Our knowledge in technology and advanced use of raw materials have made us also world leaders in producing high quality, second generation biofuels.

Smart grids, intelligent power management and waste-to-value solutions are changing the field and energy sector is under huge restructuring where new services, solutions and roles for energy utilities and consumers are being developed. Energy system flexibility, storages, demand response, data management and utilization, EVs, prosumers, recycling as well as AI and blockchain offer interesting possibilities to explore. Finnish companies can help you to design, build, and manage smart high-performance buildings with greater energy efficiency and life-cycle costs, better indoor air quality, and higher levels of comfort. Finland is also working heavily in the field of R&D&I and testbeds together with global partners to co-create solutions for the future.

## KEY FIGURES

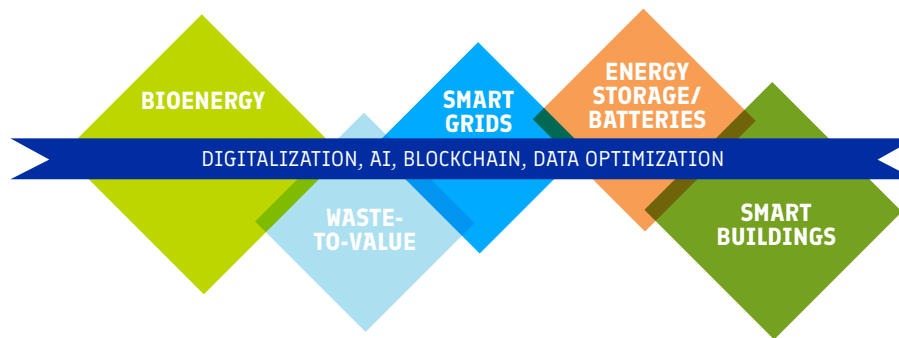


\*Sources: Environmental Performance Index 2016, Fingrid 2017

ALMOST ALL OF MSW IN FINLAND IS RECOVERED EITHER AS ENERGY OR BY MATERIAL RECYCLING, AND ONLY 1% END UP IN LANDFILLS



## THE MAIN CLEANTECH INDUSTRY SEGMENTS



As the world's population continues to grow, the global need for energy, food and water will increase significantly in the upcoming decades. Concerns about energy security, climate change and urbanization further emphasize the need for developing renewable energy, such as **Bioenergy**. Finland has been stated as the "model for the world" by IEA (The International Energy Agency) in its combined heat and power electricity, and the high knowledge in bioenergy is a solid base for the Finnish expertise. Finland is also a pioneer in developing new technologies to turn various biomasses into biofuels.

Finland has decades of experience with woody biomass, agro waste and municipal solid waste (MSW). Almost all of MSW in Finland is recovered either as energy or by material recycling, and only 1 % end up in landfills. World-class equipment and systems that radically increase the efficiency of supplying raw materials without risking the sustainability aspect are at the core of Finnish **Waste-To-Value** expertise.

In the energy distribution, new business can be generated from energy data optimization. Finland's Smart Grid 2.0 offers a unique R&D ecosystem that combines experienced ICT talent, a liberal energy market and a strong energy cluster. We have internationally open Otaniemi and Åland island testbeds for **Smart grids**. In Finland, many smart grid functionalities, ie. load profiling, real-time billing and distributed power generation, are already implemented in the system.

**Smart digitalized buildings** have smaller impact on the environment, and they provide healthier, customizable, and more comfortable surroundings for the occupants. Our focus is on smart high-performance buildings with greater energy efficiency, lower life cycle costs, better indoor climate, and higher levels of comfort. Smart buildings also increase the long-term value of investments.

Finland has the key raw materials and high-quality chemicals required for **Battery** production and offers an excellent location for battery component and cell manufacturing. Finnish companies offer competitive concepts and know-how across the whole battery production value chain, with world-class expertise in mining, mineral processing, chemistry, engineering and energy. As one of the most innovative countries in the world, Finland is also great place for testing and piloting the new generation of electric and electrified vehicles and machines that will be running on battery power. The recycling of batteries is an integral part of this value-chain, and Finland plays a leading role in the EU.

### EXAMPLES OF COMPANIES IN THE INDUSTRY CATEGORIZED BY THEIR FIELD

**Bioenergy:** Doranova, Farmi Forest, Indufor, Neste Oil, Raumaster, Saalasti, ST1 Biofuels, UPM, Watrec

**Waste-To-Value:** BMH Technology, Cross Wrap, Ecomond, Ferroplan, Fortum, Molok, Outotec, Valmet, WOIMA

**Smart Grids:** BaseN, Emtele, Ensto, Merus Power, Nokia, Satel, SEAM Group, Wirepas

**Smart Buildings:** Fourdeg, Infrakit, Leanheat, Leasegreen, Nuuka Solutions, Optiwatti, Smartvatten, Smartwatcher, Sova 3D, TPI Control, Tridify, Verto

**Energy Storage/Batteries:** Akkurate, Fortum, Outotec, Tracegrow, Valmet Automotive, Wärtsilä

### MORE INFORMATION

#### BUSINESS FINLAND: SMART ENERGY

<https://www.businessfinland.fi/en/for-finnish-customers/services/build-your-network/bioeconomy-and-cleantech/smart-energy/>

#### BUSINESS FINLAND: CLEANTECH

<https://www.businessfinland.fi/en/do-business-with-finland/explore-finland/cleantech/>

## FUNDING FOR OPEN INNOVATION AND CO-CREATION

Finland's national target for renewables is 50 percent by 2030 and Finland is committed to stop using coal in energy production by 2029. With this ambitious goal, there is room for international companies specializing in renewable energy production and distribution as well as products and services. Cooperation between public and private sector in Finland is among the best in the world. Open innovation and joint programs between research institutes, universities and companies are common and can receive part of their funding from the government. Finland is ranked number 1 country in funding for technological development and has the most qualified engineers in the world to operate the projects. Annually around 40 percent of all government funding is directed to projects that promote sustainable growth and seek to decrease the use of natural resources.