

**BUSINESS
FINLAND**

SMART ENERGY CHINA

1st

THE GREENEST COUNTRY

Finland is the greenest country in the world 2016 according to the environmental performance index (EPI)*

*Yale and Columbia universities along with the World Economic Forum.

1st

IN INNOVATION**

**The World Economic Forum, Global Competitiveness Report 2014–2015.

2nd

IN CLEANTECH

Finland was ranked number 2 in the Global Cleantech Innovation Index

1st

- Qualified engineers
- Information technology skills
- Development and application of technology
- Funding for technological development
- Public and private sector ventures

IMD World Competitiveness Yearbook 2014

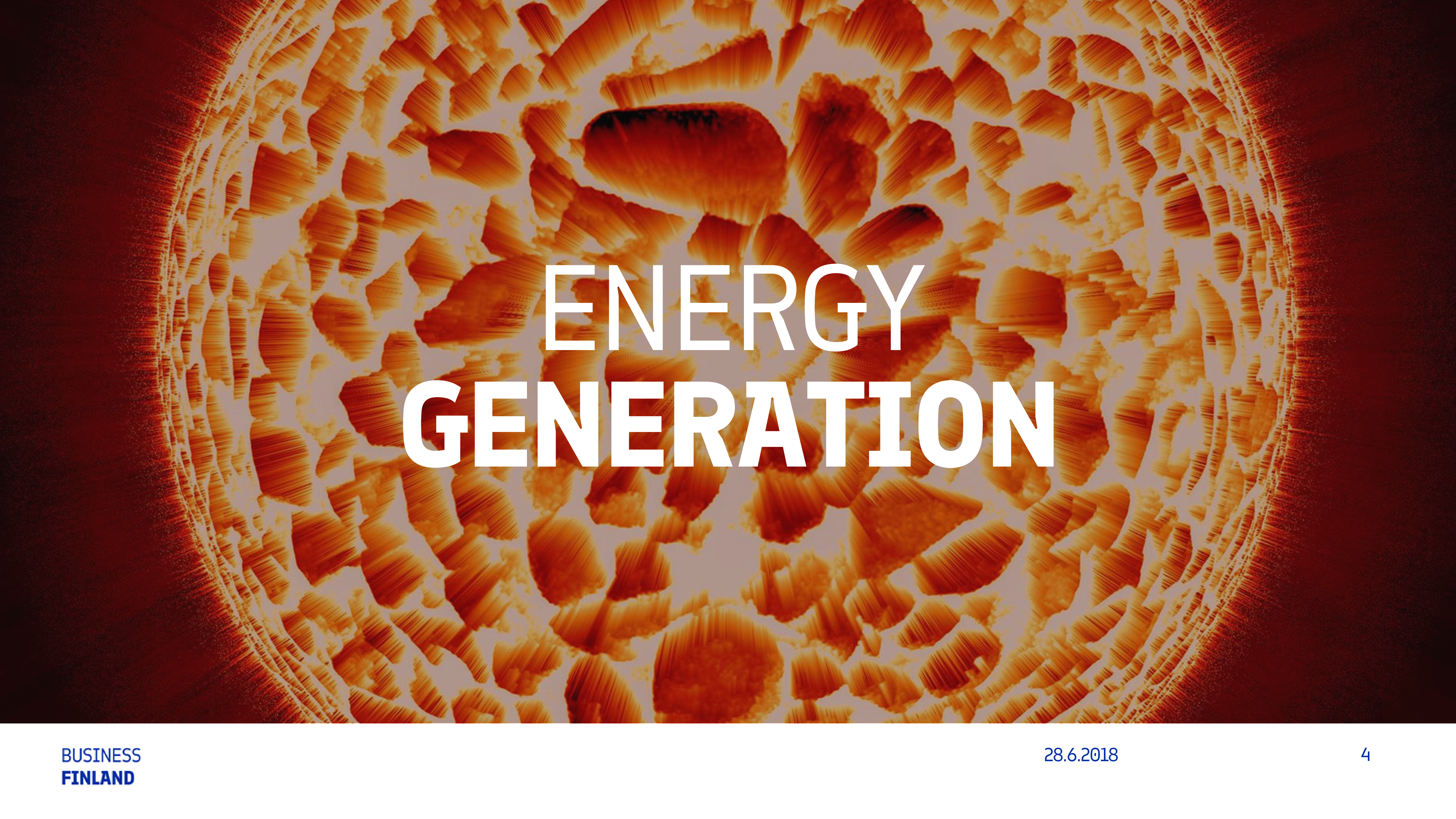
FINLAND OFFERS SOLUTIONS IN

| ENERGY
GENERATION

| DISTRICT HEATING
AND COOLING

| SMART GRIDS

| SMART BUILDING



ENERGY GENERATION

SUPREME OFFERING FOR THE WHOLE VALUE CHAIN

FEEDSTOCK PROCESSING

- Smart forestry and harvesting
- Waste and biomass processing

BIOFUEL PRODUCTION

- Liquid biofuel production
- Biogas production

ENERGY GENERATION

- Bioenergy plants
- Waste to energy plants



SOLUTIONS FOR THE WHOLE VALUE CHAIN

- Decades of experience with woody biomass, forest industry side streams, agro waste, and municipal solid waste
- Full range of services and technologies for heating and energy supply
- World-class equipment and systems that radically increase the efficiency of supplying the raw material without risking the sustainability aspects
- Best solutions for both large-scale and small-scale, decentralized units

MSW MANAGEMENT AND PROCESSING

- Expertise in efficient waste collection, transportation and storage
- Outstanding technology for refining waste into valuable products e.g. alternative fuels
- Solutions for recycling, sorting and management of all kind of waste materials substantially reducing the amount of waste being landfilled
- Turn-key solutions for W2E plants



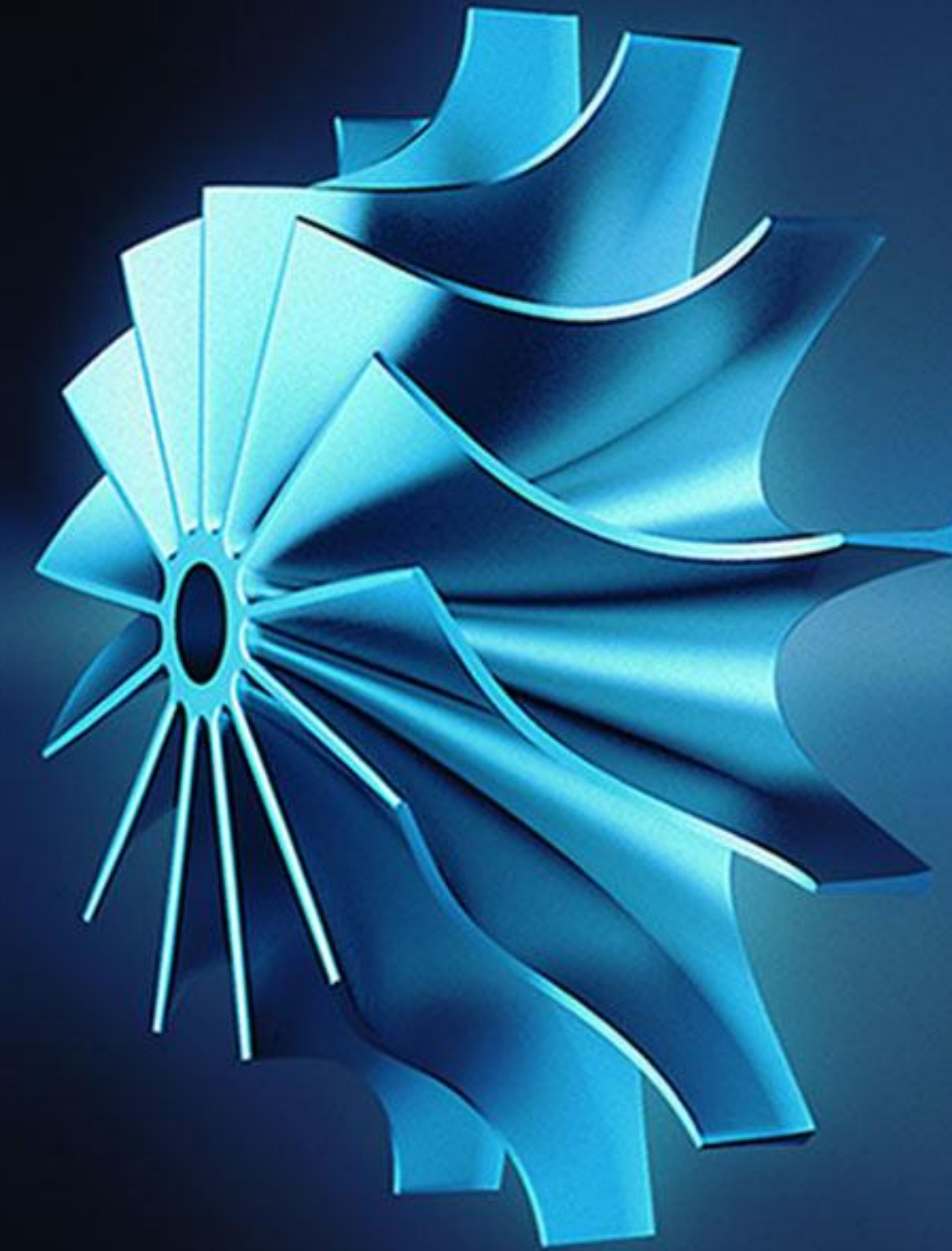
AURELIA TURBINES

Company background

Aurelia Turbines is a manufacturer of highly efficient small gas turbines for distributed power generation in industrial and commercial CHP (combined heat and power) applications.

Products

Aurelia™ A400 is a 2-stage, 2-shaft, intercooled and recuperated gas turbine with nominal output of 400 kW_e. The turbine can utilise a wide variety of fuels, including non-standard and biofuels.



BIOGTS® LTD

- Designing, building and operating utility-scale biogas and biodiesel plants.
- Complete next generation waste management solution.
- Turn-key installation.
- Solid background in the research and development of biogas and biodiesel process technologies.

What can we offer for the target country/industry sector?

- Biogas plants
- Landfill gas recovery and utilization
- Remediation of contaminated soil with in-situ and on site technologies

Customer benefits

- Completely new way of building biogas and biodiesel power plants: Standardized industrial production, modular structures, easy to scale and retrofit.
- Quick “plug-in” installation and start-up
- Lowest Capex in the market with low annual Opex. High energy efficiency. Highest energy yield per reactor and fastest breakeven period.



BMH TECHNOLOGY

Company background

BMH Technology specializes in turnkey deliveries of SRF (Solid Recovered Fuel) production plants and solid fuel handling systems for power plants and cement kilns.

Products & services

- Turn solid waste into high-quality, homogeneous fuel, and meanwhile recycle metal and other valuable substances.
- SRF, as a substitute for traditional fossil fuels, such as coal, gas, oil etc. to be used in CFB boiler and cement plant
- Increase electricity efficiency and boiler operation hours
- Low emissions, such as CO₂, NO_x, etc.



DORANOVA

Company background

Doranova is environmental engineering company transforming waste to profitable business in two main business areas :

- Renewable Energy
- Remediation of Contaminated Soil

Products & services

- We help our clients in transforming what has previously been considered as environmental problems, to rational, profitable and sustainable business.
- Our experts design and deliver solutions for renewable energy and soil remediation:
 - Biogas plants
 - Landfill gas recovery and utilization
 - Remediation of contaminated soil with in-situ and on site technologies



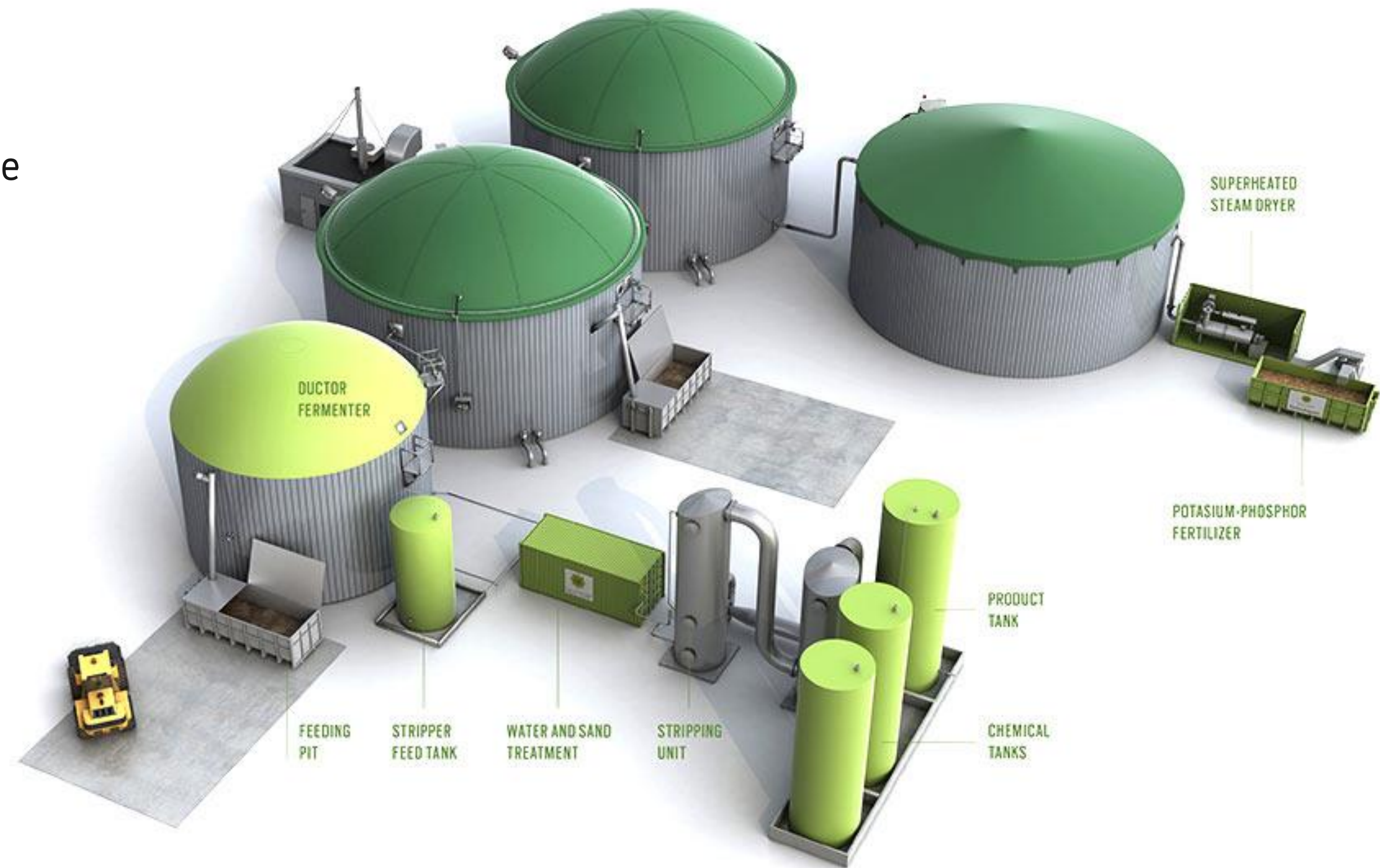
DUCTOR

Company background

Ductor's ground-breaking biotech innovation changes the world! From Waste to Profits, the patented Ductor fermentation technology moves a controlled amount of nitrogen from the substrate prior to the anaerobic digestion process

Products & services

- Biogas plants as turn key deliveries. Feedstock, chicken manure, fishery waste, organic waste from MSW, slaughter house waste etc.
- Ductor fermentation technology Add On to the existing biogas plants.



ENVIROBURNERS

Company background

Enviroburners designs and manufactures advanced industrial burner systems for energy production and environment protection.

Products & services

- Our products utilize most of the traditional fuels such as fuel oils and combustible gases or waste streams that need to be oxidized in order to comply with emission standards.
- Start-up and load burners, waste fuel burners, burners for metallurgical processes, wood dust burners, biofuel burners, special burners



ENVOR PROTECH

Company background

Envor Protech turns biowaste to biogas and valuable fertilizers and solid biofuels: high-class specialist services in technology, design, project management and industrial economics.

Products & services

- Proven and efficient EPAD biogas technology
- EPAD anaerobic digestion process applications for:
 - Forest / pulp&paper industry
 - Municipal waste treatment
 - WWTTP-sludges and other organic materials
- Full range of biogas treatment and utilization equipment
- Technology deliveries, turn-key projects, BOO-projects



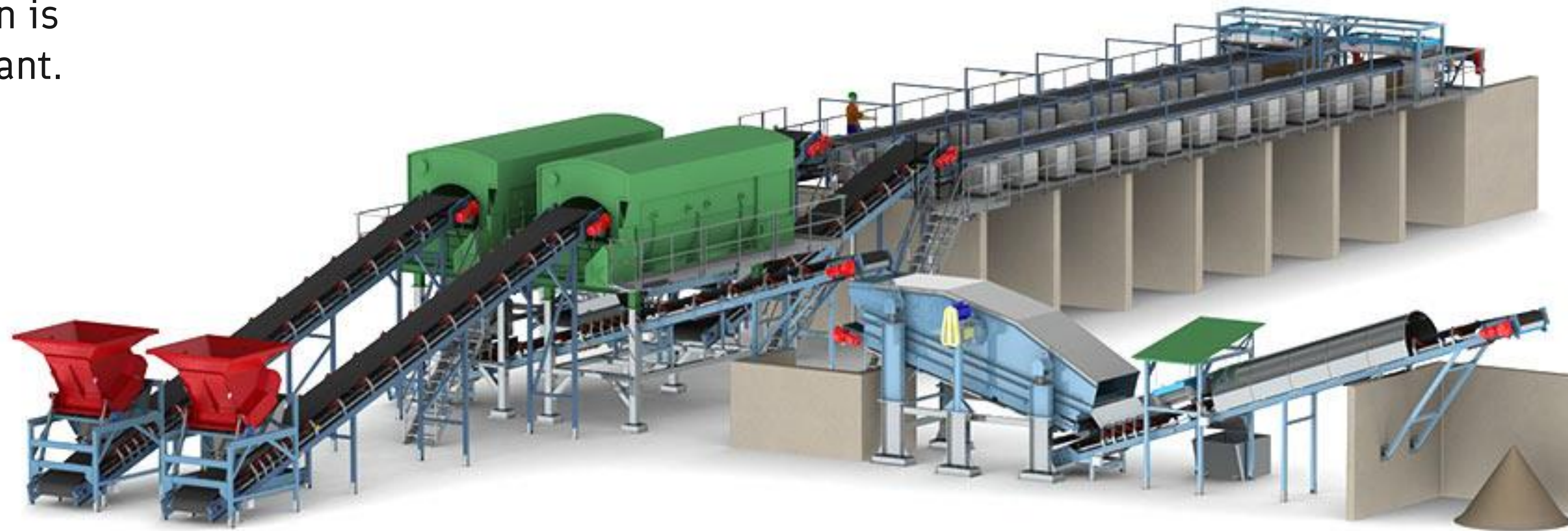
FERROPLAN

Company background

Ferroplan provides the best available technology for sorting/recycling municipal solid waste, fuel producing for biogas and waste-to-energy plants. Ferroplan is proudly presenting it's new multi-fuel energy plant.

Products & services

- Waste sorting and treatment
- Waste to energy solutions



FORTUM

Company background

Fortum Power Solutions is part of Fortum Group, a power utility. Fortum is providing innovative energy solutions for energy systems, electricity, heat and cooling production and for cities, industry and project developers.

Products & services

- Digital tools to monitor and simulate complex energy systems
- Performance improvement services: Feasibility studies, environmental upgrades, combustion & low-NOx technology
- Hazardous Waste treatment
- Charge & Drive
- Smart Living



KPA UNICON

Business idea

KPA Unicon provides responsible energy solutions. We work together with our customers in energy, process and mineral industry. Our modular solutions utilize efficiently biomass, recycled fuel as well as conventional fuels. We take care of the energy production from financing to the operation and maintenance.

Vision

We are forerunners in the energy industry and work closely as a part of our customers production.

Solutions





- Bio Boiler Plants
- Bio Power Plant
- Oil & Gas Boiler Plants
- Service
- O&M
- PlantSys
- Financing



OUTOTEC

Outotec's strong market position and technology leadership are based on the knowledge and experience derived from the past 150 years of operations.

- Minerals Processing
- Metals, Energy & Water, including:
 - Innovative waste-to-energy solutions for biomass, sludge, agricultural and industrial by-products as well as sorted waste
 - Solutions for oil winning from oil shale and phosphorus recycling from sewage sludge ashes
- Services, covering full plant lifecycle from supplying an individual spare part to comprehensive maintenance and operations solutions

	Technology package, (EPS)	Plant package, (EPC)
Sludge Incineration (SIP)		
Waste-to-Energy (WtE)		
	Sludge Incineration (SIP) <ul style="list-style-type: none"> • Municipal sludge at >20% solids • Self-sustained combustion (>95% FB) • Incineration to generate low energy steam & recover phosphorous from ash 	Waste-to-Energy (WtE) <ul style="list-style-type: none"> • Solid waste & biomass at 60 - 80% solids • Material & output efficient combustion • Incineration to generate GREEN steam, heat and electricity at high availability

PROTACON

Company background

Protacon's services encompass consulting, design and engineering, implementation, turn-key deliveries and maintenance & upkeep.

Products & services

- ONCE: Customers have reported less than 2-month payback time
- STC (Steam Turbine Control): A new control and protection system allows to use higher pressure in steam turbine
- Protacon Grid Stabilization ensures grid frequency and an uninterruptible power supply to critical places



RAUMASTER

Raumaster is a global leader in material handling systems

Solid fuel and biomass handling

- Fuel receiving, screening, crushing, storage, reclaiming & conveying systems
- Fuel feeding and ash handling systems
- Recovery boiler, lime kiln and smelting plant conveyor systems

Service

- Retrofits, service audits, field services, maintenance, repairs, overhauls



RECOMILL

Profitable and ecological animal by-product recycling

Honkajoki and WOIMA have established RECOMILL, a joint venture delivering circular economy solutions.

RECOMILL brings together decades of know-how in

- rendering technology
- international project deliveries (EPC or EEQ) world-wide

Products & services

RECOMILL renders animal by-products into valuable commodities with world market prices and demand in

- fertilizer industry
- animal feed industry
- biofuel industry
- cosmetics industry



VALMET

Valmet's energy solutions

- Valmet is a **reliable technology partner** in changing energy markets. We know how to combine energy solutions based on biomass, waste and fossil fuels. We enable you to make the most out of them for energy generation.
- Together we can develop **innovative solutions** based on our decades of experience and wide technology, services and automation offering.
- Our offering covers process technologies – combustion and gasification - for biomass, waste (RDF, SRF) and multifuel solutions
- **A multifuel boiler** gives the flexibility to choose the most economic fuel based on availability and price. Valmet's HYBEX and CYMIC boilers, CFB gasifiers and air emission control systems ensure high efficiency and reliability with low emissions – even with the most challenging fuel combinations. Our advanced services and automation solutions improve the reliability and performance of your processes.



VOLTER

Company background

Volter is a Finnish manufacturer of small-scale wood fuelled **combined heat and power plants, CHPs**. With Volter 40 CHP our customers can increase their **energy independence** and develop **new business** from **renewable energy** sales. Our solution supports **local economy** by using local biomass for fuel and bringing jobs to the communities. Volter power plants provide renewable **heat and electricity all-year-around**, regardless of weather conditions.

Products & services

Volter 40 CHP provides an easy way to produce energy independently, in a cost-effective way. High quality, modern technology and local support system guarantee long running hours and energy security. Compact design, simple installation and advanced automation give extra comfort for producing own, renewable energy. Volter 40 CHP is modularly scalable. For example, 10 CHPs form an energy park with 400 kW electricity and 1 MW thermal output.



WOIMA

Turning your waste into wellbeing

WOIMA is a Finnish modular waste-to-energy power plant supplier with the aim to mitigate waste-related problems in developing countries. We offer a turn-key solution that simultaneously

- Significantly reduces waste landfilling
- Delivers a variety of energy commodities
- Cuts down waste logistics costs


Our containerized wasteWOIMA® power plant

- Can handle a wide variety of fuels
- Offers excellent energy efficiency
- Fits perfectly in off-grid solutions
- Has a quick roll-out time
- Is scalable and easy to relocate
- Has excellent ROI



A wide-angle, high-angle aerial photograph of a city at night. The city is densely packed with buildings, many of which are illuminated with various colors of light, creating a vibrant, glowing effect. The lights from the buildings and streets reflect on the surfaces of the structures. The sky is dark blue, and the overall atmosphere is one of a bustling, modern urban environment.

DISTRICT HEATING AND COOLING



WORLD #1 IN COMBINED HEAT AND POWER

- Boilers ranging from small to large scale, including fluidized bed boilers (FBB) and bubbling fluidized bed boilers (BFB)
- Leading combustion and gasification technologies
- Off-grid solutions

WORLD #1 DISTRICT HEATING AND COOLING

- International Energy Agency: Finland is the model of the world
- District heating generation efficiency in Finland is 93%
- Reliability is 99,98%



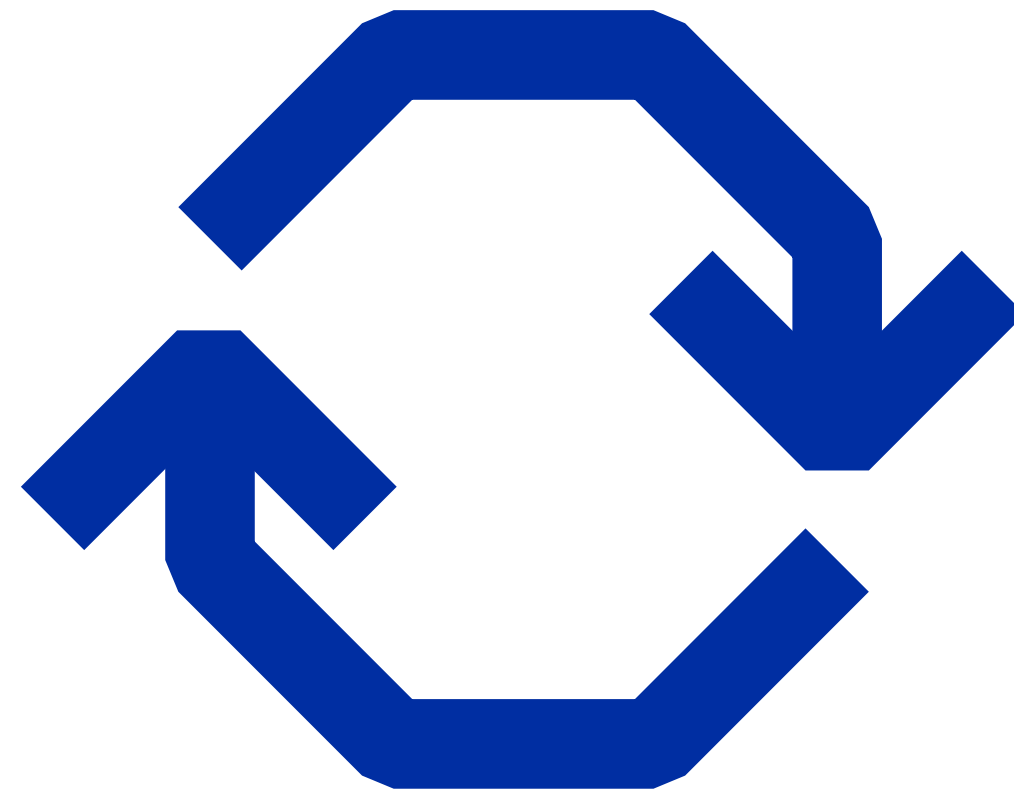
THE BEST DHC SYSTEM IN THE WORLD

EFFICIENT NETWORK

- MINIMAL HEAT LOSS
- MINIMAL NEED FOR WATER REPLENISHMENT
- MAXIMAL RELIABILITY

ENVIRONMENTAL SUSTAINABILITY

- HIGH USAGE OF RES IN HEAT PRODUCTION
- LOW EMISSIONS
- HIGH SHARE OF CHP



EFFICIENT PRODUCTION

- THREE QUARTERS OF HEAT IS PRODUCED BY CHP
- HIGH GENERATION EFFICIENCY

FINANCIAL SUSTAINABILITY

- LOW HEAT TARIFFS
- HIGH PROFITS
- NO SUBSIDIES

EXCELLENT KEY PERFORMANCE INDICATORS

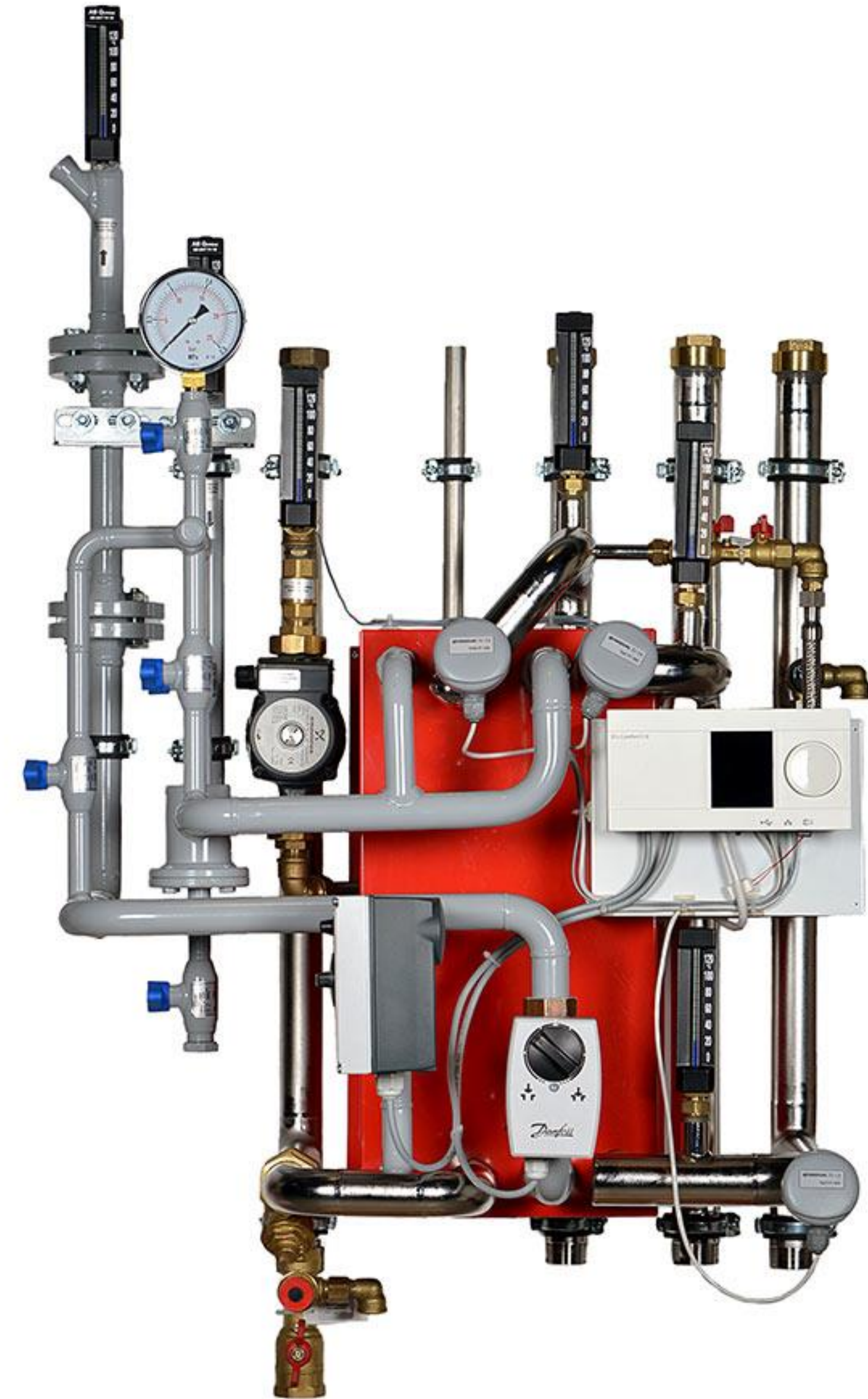
Key Performance Indicators	Finland (200 companies on average)	China
Network heat losses of production	6-9 %	15-25 %
Make-up water replenishment need per year	1	20-50
Reliability	99,98 %	99 % or lower
CHP share of DH production	76 %	0-100 %
DH generation efficiency	93 %	65-95 %
RES and Carbon neutral shares of DH production	34% and 42%	0% and 40%
Staff productivity (GWh/employee)	20	1-4
Profitability % of turnover	10-20 %	Low or negative

GEBWELL

Company background

Gebwell is specialised in environmentally friendly heating and cooling systems. The wide product selection includes heat pumps, district heating and cooling substations, energy accumulators, exhaust air heat recovery systems and hot water heaters. All products are designed and produced in Leppävirta, Finland.

Gebwell is biggest building level substation producer in Nordic Europe



HÖGFORS

Company background

- Högfors is a 90 years old and the most experienced valve manufacturer from Finland.
- Högfors has delivered close to 30000 valves to District Energy applications around the world.

Products & services

- District heating & District cooling valves in sizes DN200 – 1600 for critical applications
- Robust and maintainable construction for lowest total cost of ownership
- Partnership for products life cycle, from project design support to after sales services
- Local office in Beijing with highly trained technical service and maintenance personnell



KOLMEKS

Kolmeks is a family owned company and a world's leading manufacturer of pumps and components. Our mission is to provide the best solutions with state-of-the-art products and services. Specialized in centrifugal pumps used in heating and air-conditioning systems.

The pumps are well designed and simple to use, carefree in maintenance, silent, durable and best of all, very energy friendly. Our driving philosophy to provide efficient reliability is manifested especially around our pumps.

Kolmeks pumps are typically used in district heating, industrial, heating- and cooling systems, as well as other clean water and other clean liquids circulating, pressure-boosting and similar applications.

All pumps are available with fixed and variable speed, either separate or integrated frequency converter.

Due to the use of many different materials and sealing solutions the pumps are increasingly used in different processes in the industry in general.



Combustion and Heat Pump Technology

- Beijing has the lowest emission requirements for gas combustion in the world. $30\text{mg}/\text{Nm}^3$
- Oilon is specialized in low emission gas combustion and can reach the lowest emission requirements in the world. Only few companies in the world can do the same at this moment.
- Oilon has over 20 years experience in China and more than 10 000 burners delivered to China only.
- Emission requirements in Beijing are strict and pressure to clean the air is high. Oilon will help Beijing to solve the issue together!!
- Oilon has also solution and references for District cooling with heat pump technology.
- Oilon heat pump can also be used in many applications, e.g. food industry, process industry, sports arenas, heat recovery etc.



VEXVE

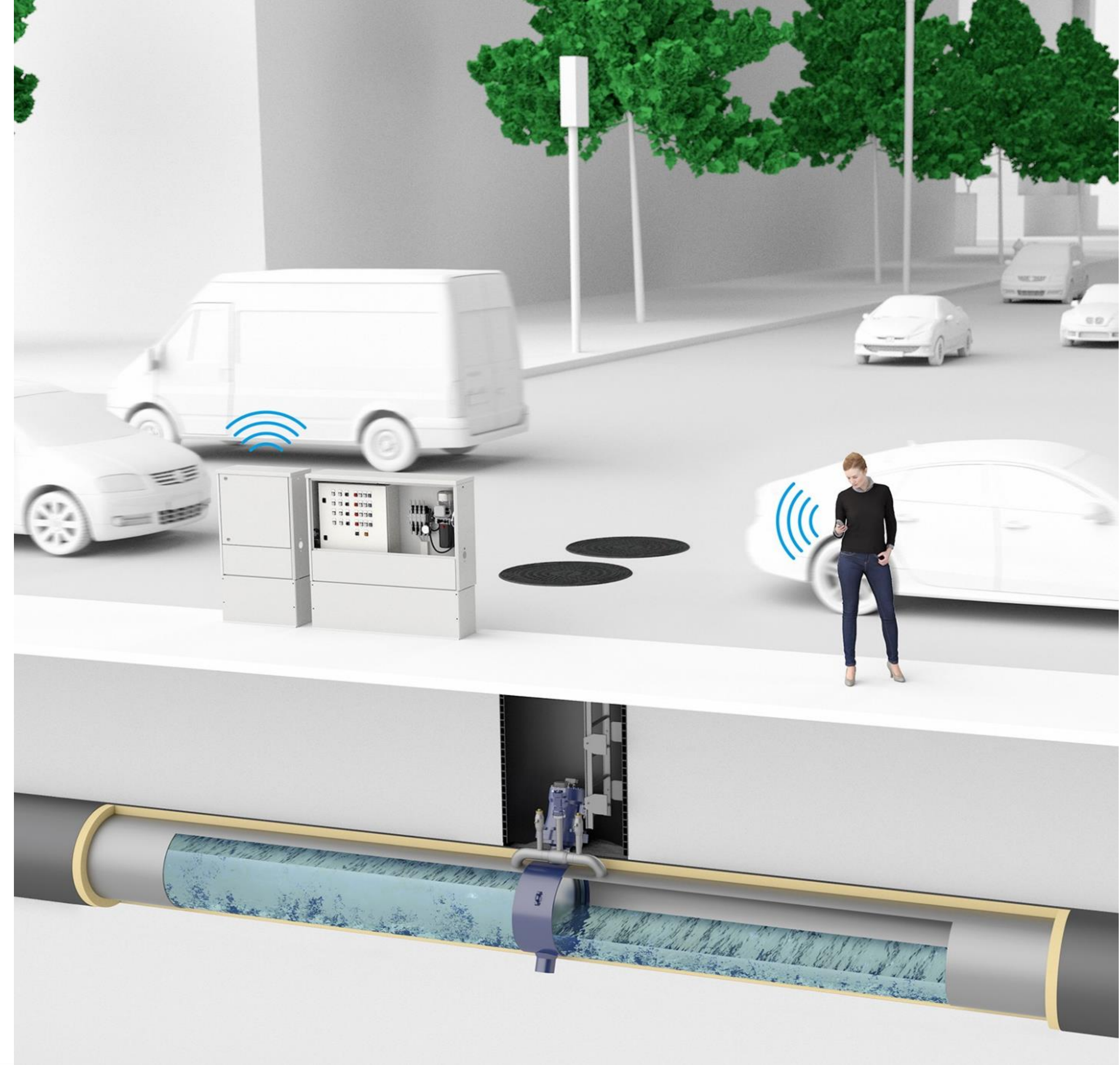
Company background

Vexve is the globally leading provider of valve solutions for the heating and cooling needs of cities and industry.

Products & services

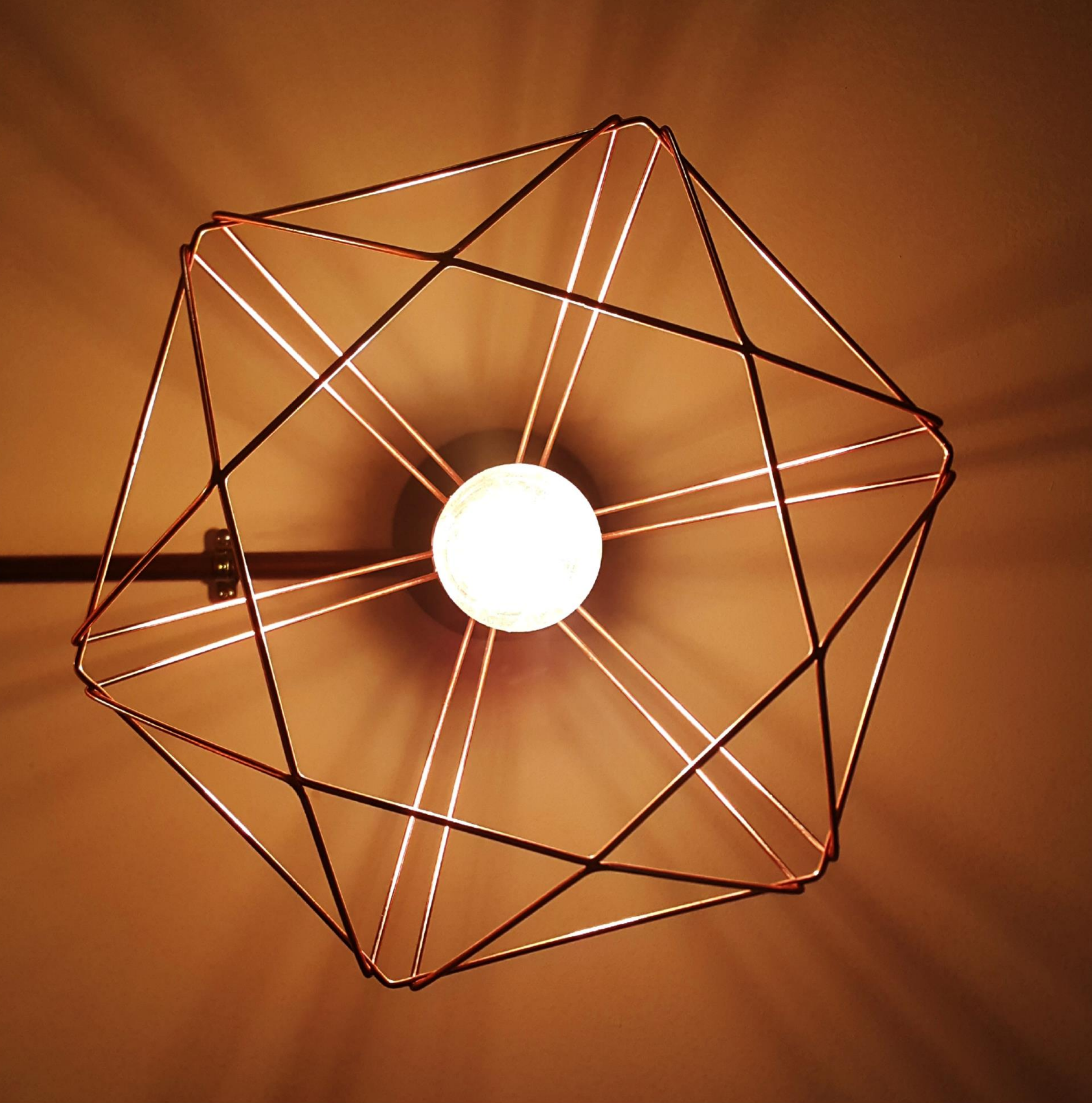
Developed for demanding applications, Vexve valve and control products and hydraulic control solutions are used in:

- district energy networks
- power plants
- internal heating and cooling systems of buildings





SMART GRIDS



WORKING WITH FINNISH COMPANIES ENSURE YOU THE BEST AVAILABLE WORLD CLASS EXPERTISE AND USE OF ENERGY AND DATA.

- Finland has an extremely stable electricity grid with minimal losses.
- Internationally open Otaniemi and Åland island test beds for smart grid 2.0
- In Finland, many smart grid functionalities (e.g. load profiling, real-time billing, distributed power generation) are already implemented in the system.

MERUS POWER

Company background

Merus Power designs and manufactures a wide range of world leading **power quality solutions** for dynamic reactive power compensation, active harmonic filtering and power protection.

Products & services

- Our solutions portfolio includes active harmonic filters, STATCOMs, SVCs and UPQ energy storage solutions.



NOKIA

Company background

Nokia is a global leader in the technologies that connect people and things. In the utilities industry, Nokia provides communications infrastructure to global energy utility providers.

Products & services

Nokia provides world leading applications in smart grid architecture, including solutions in communications network transformation, transmission and distribution automation, distributed generation, network security and advanced metering infrastructure. Products in Energy ICT transformation:

- a) High Reliable network and security
- b) Cloud and datacenter
- c) Application intelligence: IOT and big data



SEAM GROUP

Company background

SEAM enables intelligent and sustainable energy solutions. We provide large energy consumers the risk-free ability to substantially reduce their electricity usage and shift it to inexpensive off-peak hours.

Products & services

SEAM SHIFT

- When the market price of electricity is high, consumption is decreased

SEAM RAPID RESERVE

- Rapid adjustment of energy consumption

SEAM CUTTING EDGE

- Cutting consumption at peak hours



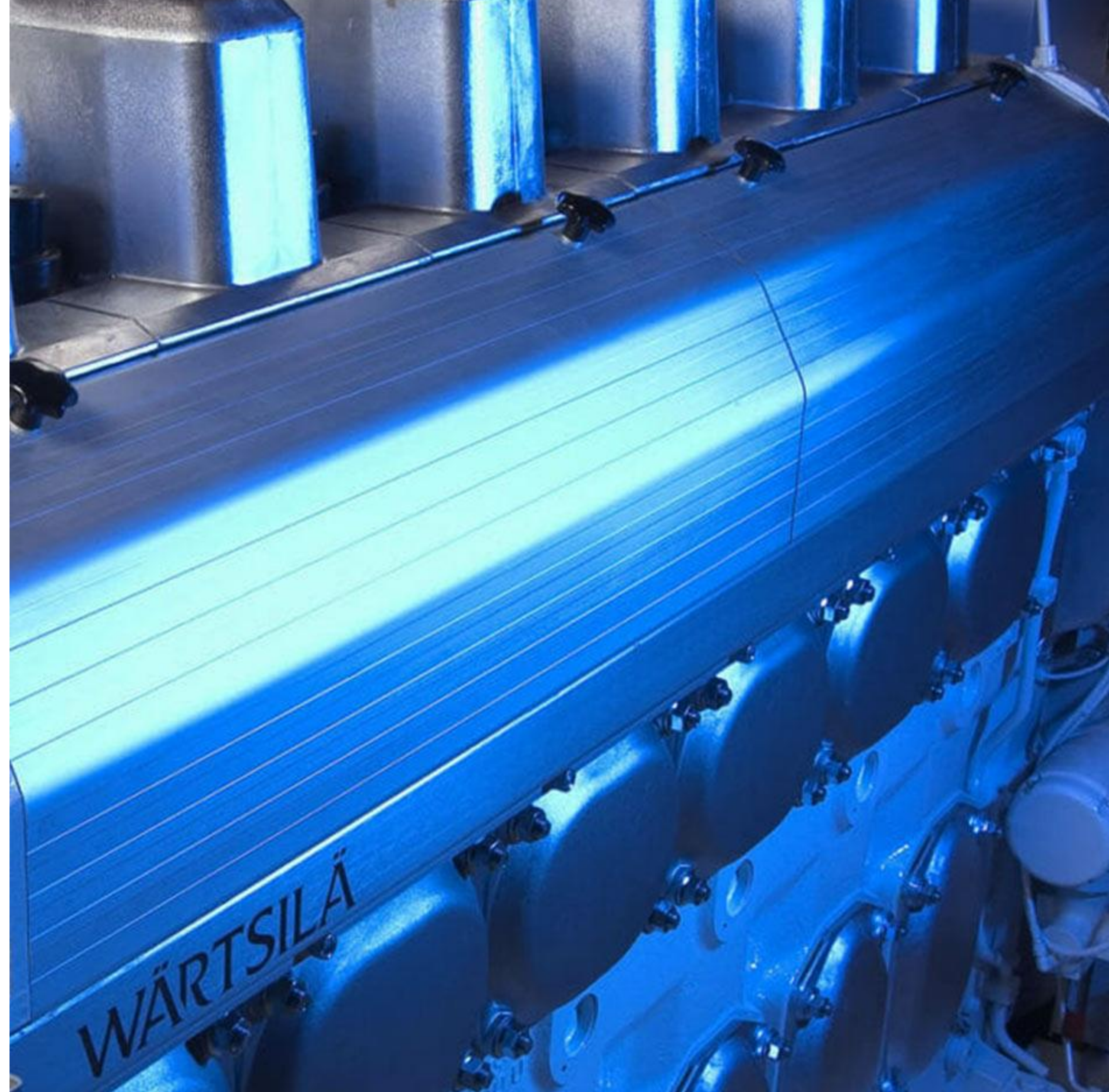
WÄRTSILÄ

Company background

We are a leading global systems integrator offering a broad range of environmentally sound solutions. Our flexible and efficient solutions provide superior value to customers and enable a transition to a more sustainable and modern energy system

Products & services

- Flexible baseload power plants
- Capacity for grid stability, peaking and load-following generation, and back-up power for integrating wind and solar energy
- Multi-fuel solutions enabling use of any gas or liquid fuels
- Utility-scale solar PV power plants and solar-engine hybrid solutions
- Energy system integration capabilities
- Small and medium scale LNG liquefaction plants, LNG terminals and distribution systems
- Project development and EPC capability



An aerial photograph of a city skyline at dusk, featuring several prominent skyscrapers and a river in the foreground. The text "SMART BUILDING SOLUTIONS" is overlaid in large, white, sans-serif capital letters across the center of the image.

SMART BUILDING SOLUTIONS



CHALLENGES IN CONSTRUCTION AND LIVING NEED WORLD- CLASS SOLUTIONS.

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

SMART SOLUTIONS FOR...

RESIDENTIAL BUILDINGS,
COMMERCIAL BUILDINGS AND
PUBLIC BUILDINGS.

WATER &
SANITATION

DISTRIBUTED
ENERGY
GENERATION

LIGHTING

MATERIALS &
STRUCTURES

BUILDING
AUTOMATION

HEATING

AIR QUALITY

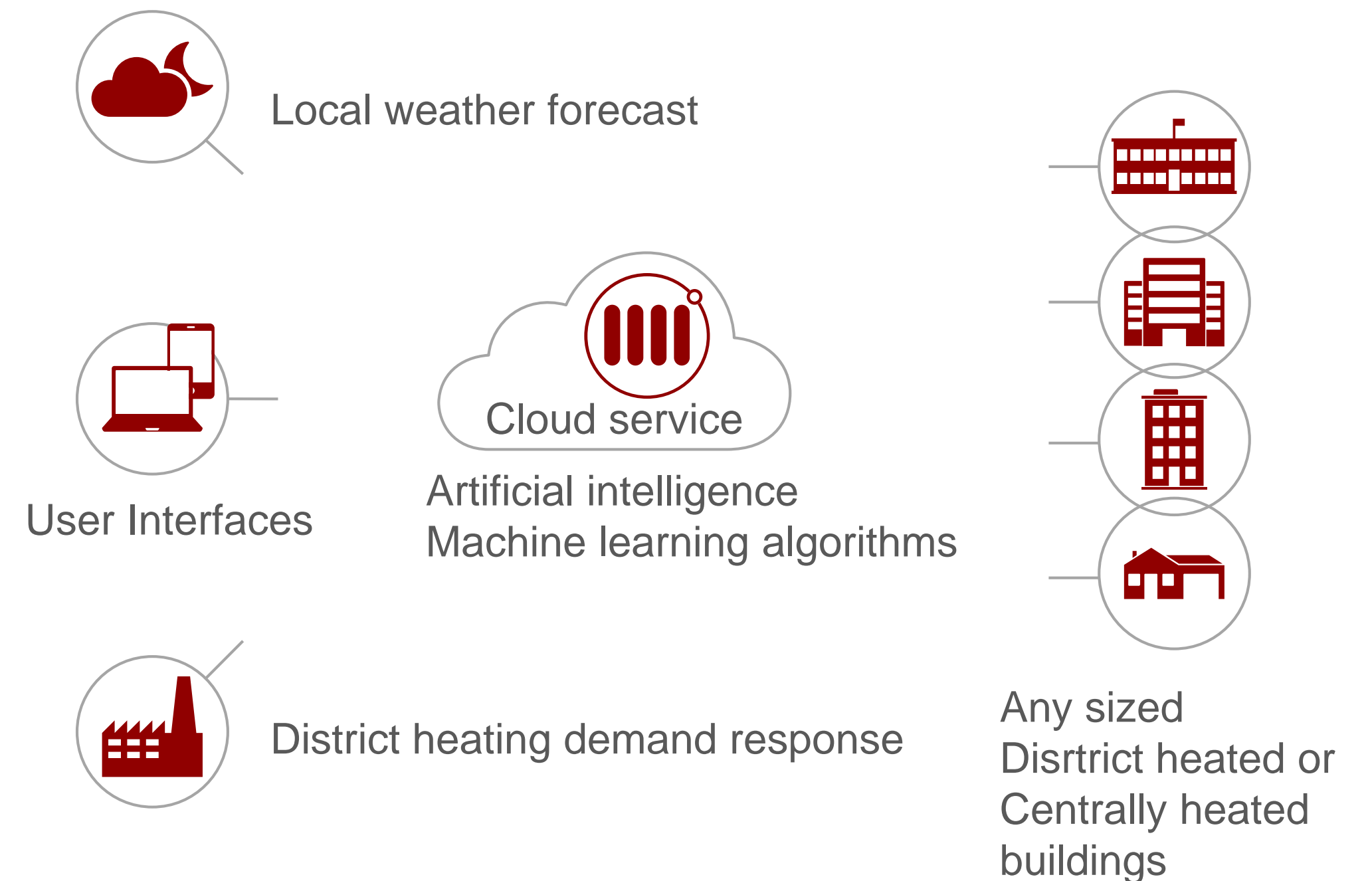
FOURDEG

Company background

Fourdeg is a heating services provider for buildings and district heating networks. The services improve the indoor comfort of each room and save heating energy by lowering the consumption and performing the Demand Response. Technically the services are based on providing predictive heating targets per room to electronic wireless Radiator Thermostats in centrally or district heated buildings.

Products & services

- Fourdeg Smart Energy®: Automatic heating monitoring and controlling service at room level accuracy in any size of building, including commercial and residential.
- Fourdeg Smart Energy™: Digitalization of district heating.
- Services benefits all parties in the value chain from energy provider to end user.



FORTUM

Company background

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Products & services

- Digital tools to monitor and simulate complex energy systems
- Performance improvement services: Feasibility studies, environmental upgrades, combustion & low-NOx technology
- Hazardous Waste treatment
- Charge & Drive
- Smart Living



LEANHEAT

Smart heating solution powered by AI and IoT

A pioneering artificial intelligence solution for centrally heated buildings/

- Leanheat AI automatically analyzes indoor temperature and substation data
- Heating is controlled to reach desired indoor conditions in the most energy efficient way possible

Leanheat-controlled heating area almost 2.5M m² by January, 2018. In total, more than 1000 substations.

Leanheat provides smart building maintenance for building owners and/or district heating companies

- Thermal comfort and energy efficiency
- Lower maintenance costs by predictive maintenance



MARIOFF

Company background

Marioff is a leading developer of water mist fire protection technology and supplies system solutions worldwide.

Products & services

- The company's innovative HI-FOG® water mist fire protection system safely suppresses fires using significantly less water than conventional sprinkler systems, reducing water damage, operational downtime and building infrastructure requirements.
- HI-FOG® water mist fire suppression technology safeguards hundreds of substations, gas turbines and power plants globally.



NUUKA SOLUTIONS

Company background

Nuuka Solutions is a Finnish software company, which develops Nuuka SaaS service, a building process and operational data management platform to improve energy efficiency, indoor air condition, sustainability and maintenance processes.

Products & services

Nuuka Solutions has strong expertise in energy-efficiency solutions for buildings, modern business intelligence and reporting systems, as well as building automation and telecommunication solutions. Suitably combining these competencies, we have been able to develop a new BIG DATA type of information system for commercial, public and residential buildings.



THANK YOU