

**BUSINESS
FINLAND**

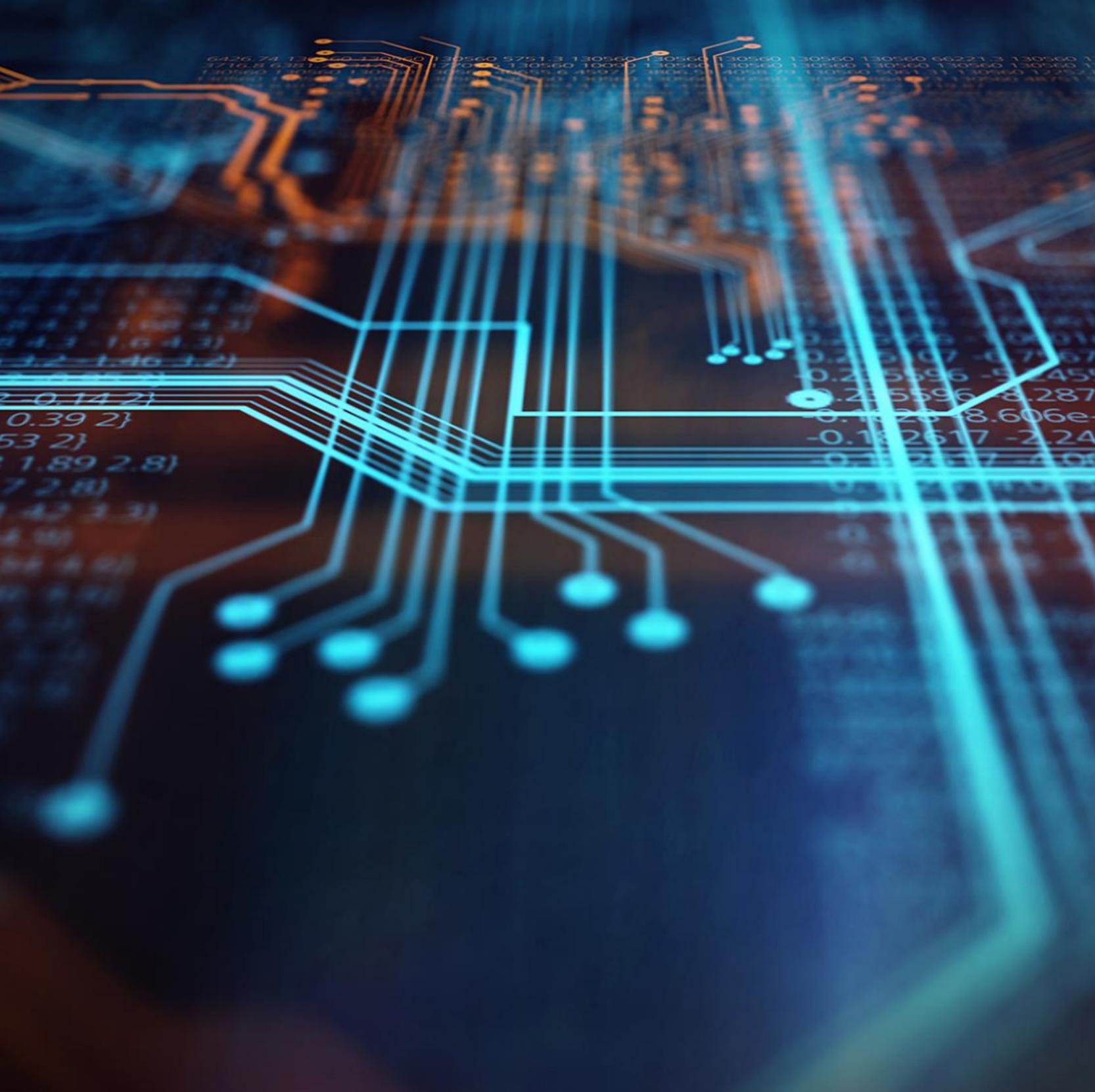
SMART ENERGY

Smart grids

FINLAND

WORLD CLASS EXPERTISE IN ENERGY AND DATA

- Finland has extremely stable electricity grid with minimal losses.
- One of the most advanced smart grid in the world
- Smart grid functionalities such as load profiling, real-time billing, distributed power generation are already in use
- Internationally open Smart Otaniemi and Åland Island test beds for smart grid 2.0
- IoT, connectivity, data analytics and AI piloted at Smart Otaniemi and quickly adopted to power market



5G AND CYBER SECURITY IN ENERGY

- Finnish energy companies have decades of experience and high technical level in protecting from cyber attacks.
- We have common practices in energy industry to restrict cyber threats and to improve cyber safety
- In new digital ecosystem companies, transmission system operators, distribution companies and various service providers are integrating
- Finnish model is field-based approach with joint action groups. The aim is to compile best practices.
- Self-assessment model focused on cybersecurity maturity is currently being piloted among Finnish energy companies, involving Finland's National Emergency Supply Organisation, Traficom and other actors in the sector.

BEST PRACTICES FROM FINLAND

100%

of Finnish households have
real time energy metering

4%

Grid losses totally in
transmission and
distribution networks

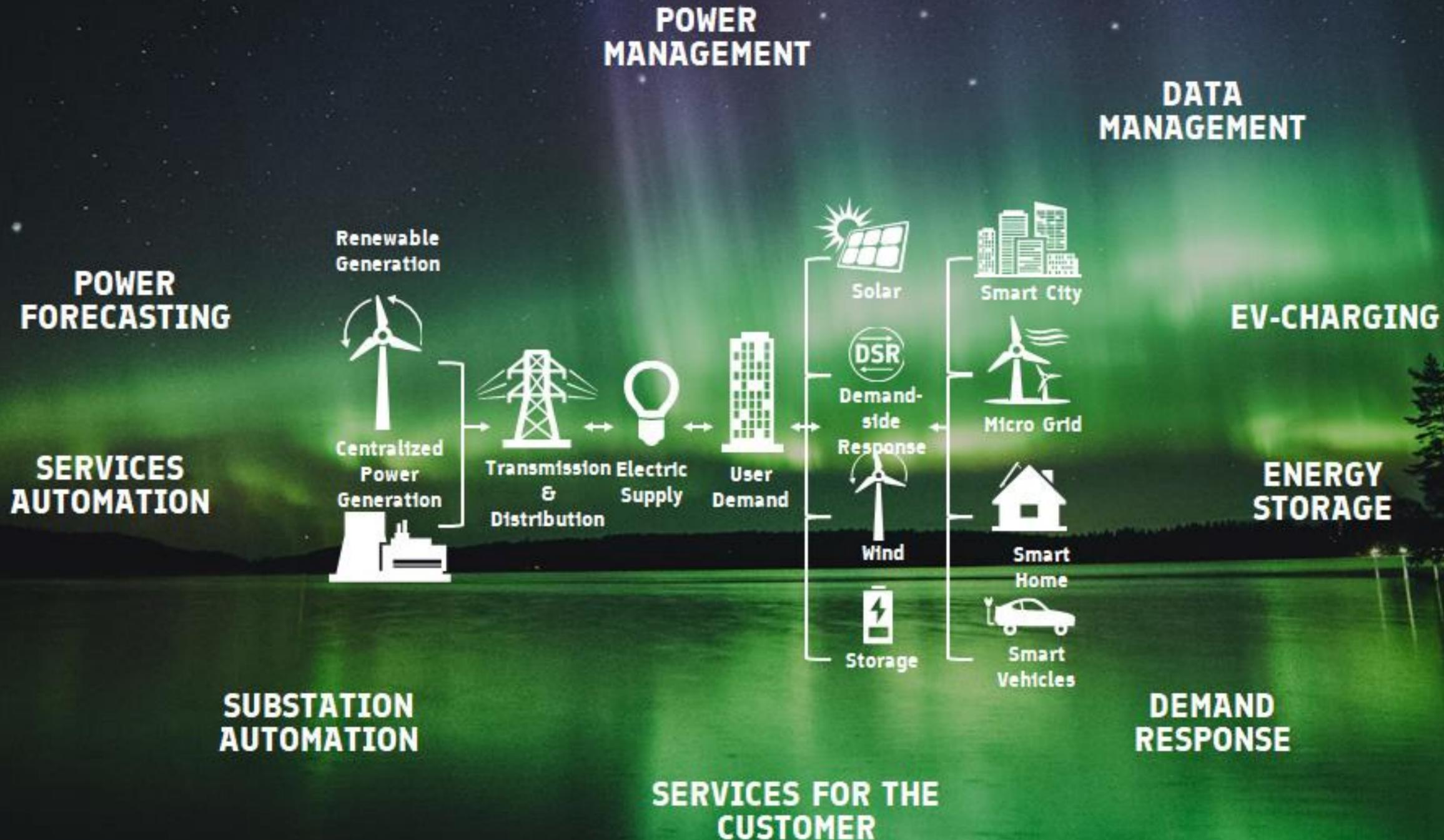
99,9%

99,9998% grid reliability at
transmission lines*

BUSINESS FINLAND

DISTRIBUTION AUTOMATION – ADDING THE FINNISH LAYER TO THE GRID

From traditional to stable, flexible and automated (self learning) grid



POWER FORECASTING

Distributed energy management system, secure data connection.

POWER MANAGEMENT

Power quality management, radio router for secure data connection.

Power Management Hardware

DATA MANAGEMENT

Cloud based infra, reliable and scalable platform for integration of data points in critical infra, full proved back end system for power data, distributed energy resources management system, secure data connection.

SERVICES AUTOMATION

Remote visualisation of maintenance, video feeds between control room and field (security and expert back up), integration of operative applications, physical safety, secure data connection.

EV-CHARGING

Pole connection control, back end system for remote control of poles, measurement of data flow, secure data connection.

High Performance EV-charging

SUBSTATION AUTOMATION

Communication connection to primary substations, monitor and control of secondary substations, secure data connection.

Automation Hardware

ENERGY STORAGE

Connection control, back end system for remote control, measurement of data flow, secure data connection.

Physical energy storage

SERVICES FOR THE CUSTOMER

Create the dashboards and visualisation of the display of the data (from production and consumption) from big customers to the small consumers, tools for data usage and automatic, secure transfer of data for billing dashboards.

DEMAND RESPONSE

Full proved back end system for demand response.

ADDING THE FINNISH LAYER TO THE GRID

RELIABLE DATA & TRANSFER

- Industry leading standards in data transfer
- Utmost reliability in wireless network solutions
- Cyber secure platform for critical functions

POWER QUALITY AND RELIABILITY

- World class hardware to grid harmonization, reliability and balance
- Smart digitalization of substations

OFF-GRID AND MICROGRID

- Automated microgrid solutions
- Intelligent connection and utilization of renewable energy

MODERN AND CLEAN ENERGY PRODUCTION

- Waste to Energy and fuel cell energy production
- Renewable Energy and Back-up Power

MONITORING OF MAINTENANCE AND AUTOMATION SERVICES

- End to end services for digitalized monitoring
- Service digitalization
- Safety and security



RELIABLE DATA & TRANSFER

- Industry leading standards in data transfer
- Utmost reliability in wireless network solutions
- Cyber secure platform for critical functions

BaseN

COMPANY BACKGROUND

BaseN was established in 2001 to provide extremely scalable and fault-tolerant network and service management systems for transmission and distribution operators.

BaseN facilitates the way to enter the IoT world and the Smart Energy realm by digitalizing and connecting existing and modern LV/MV/HV equipment to offer new intelligent services.

PRODUCTS & SERVICES

- A cyber secure platform for critical applications for power transmission and distribution operators to enable smart energy solutions. The security and reliability are key components in every layer of the platform, scalable to serve millions of connected devices.



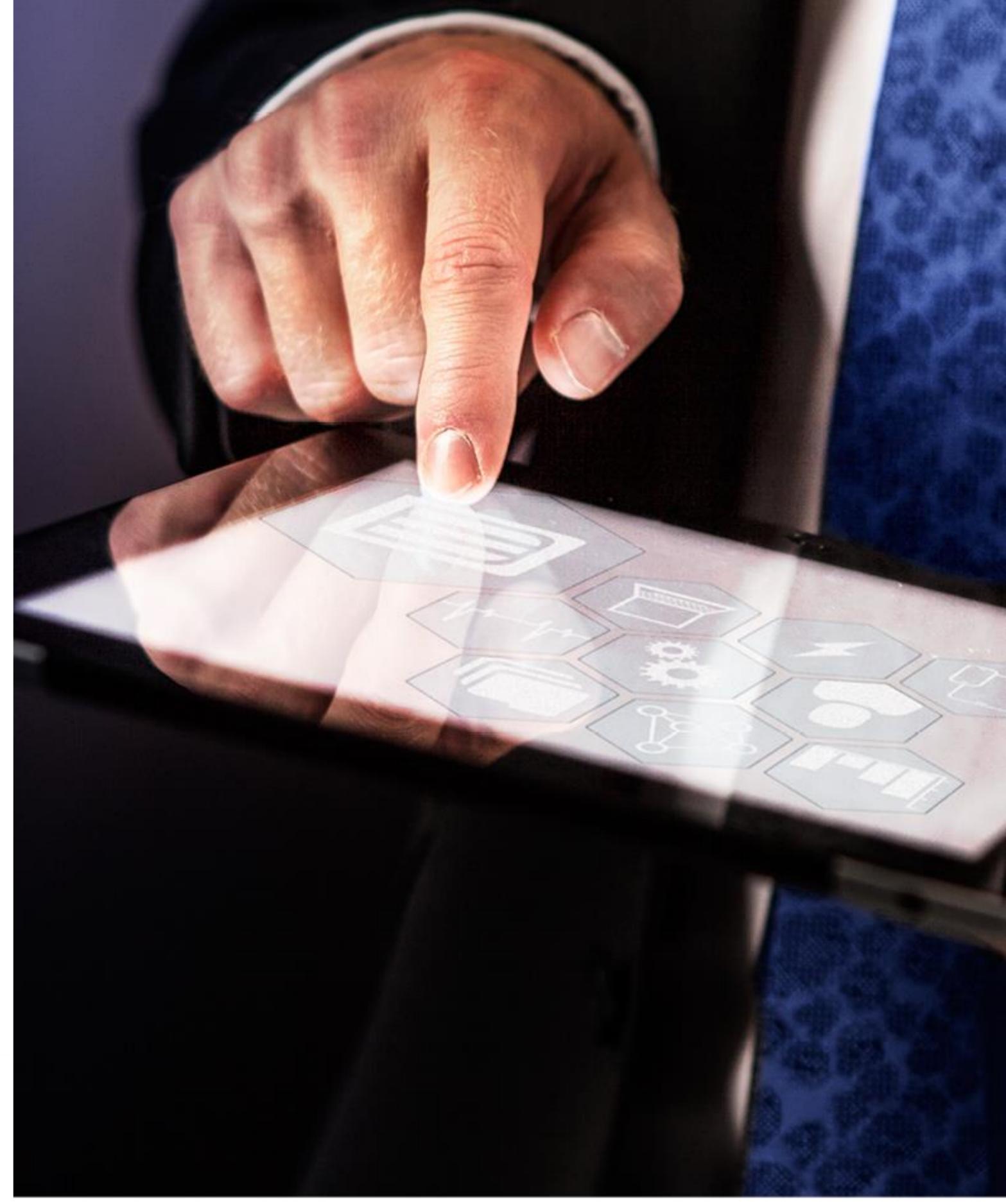
EMTELE

COMPANY BACKGROUND

Emtele offers a diversity of total service solutions for the communication and automatic control of machinery and devices

PRODUCTS & SERVICES

- Fieldcom for critical infrastructure
- Security as a service
- Technology solutions to support virtual care
- Automation and monitoring solutions (e.g. power quality monitoring and fault indication)



SENSOR-TO-CLOUD CONNECTIONS FOR ENERGY & GRID IoT

ionSign designs and provides hardware to aggregate your sensor data to the cloud of your choice.

Smarter, more flexible and less expensive than global brands, we make the applications technically and commercially viable, that you skipped until now.

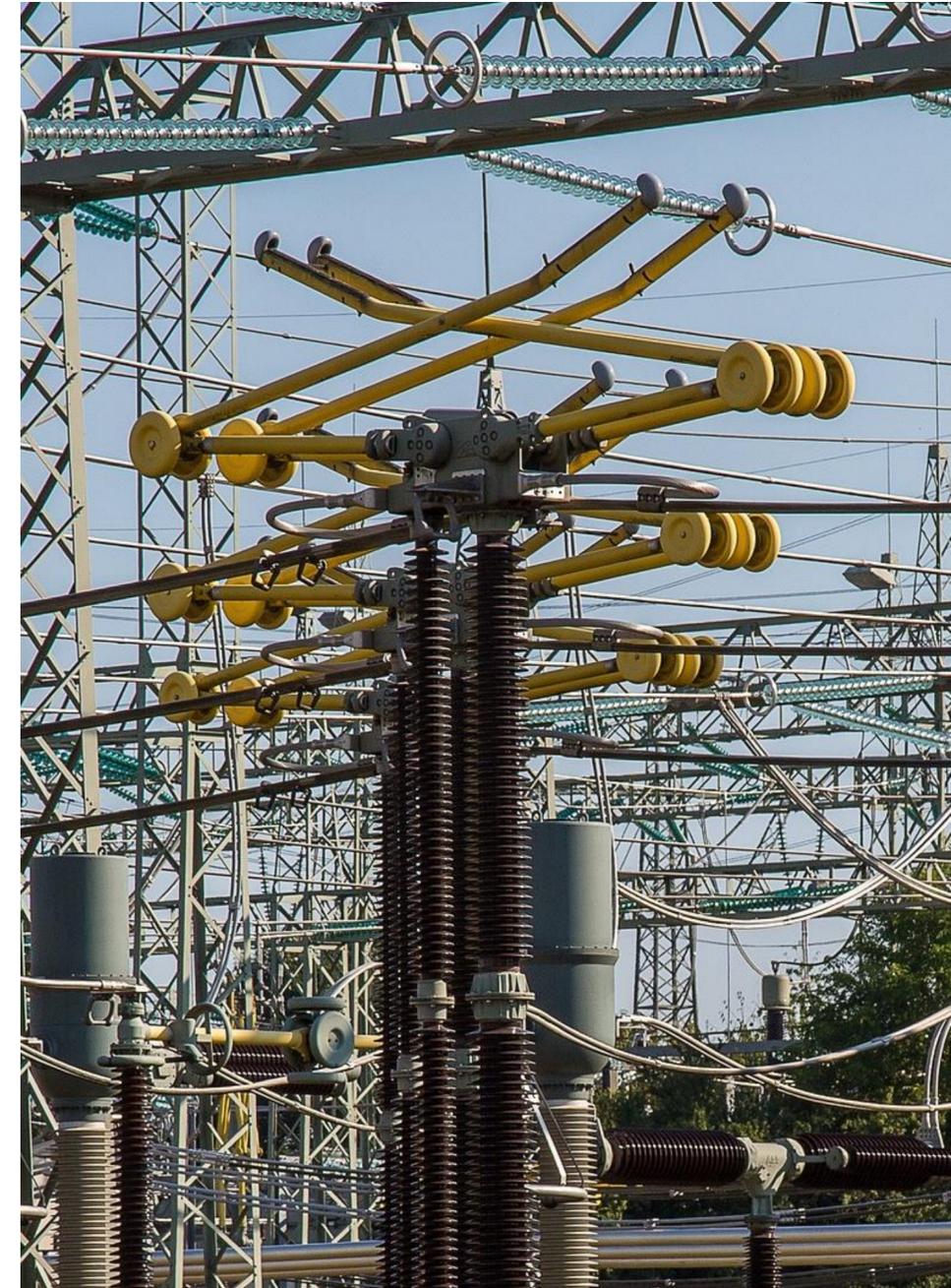
Stop looking for the right data logging hardware. We design it for you!

BENEFITS FOR THE CUSTOMER

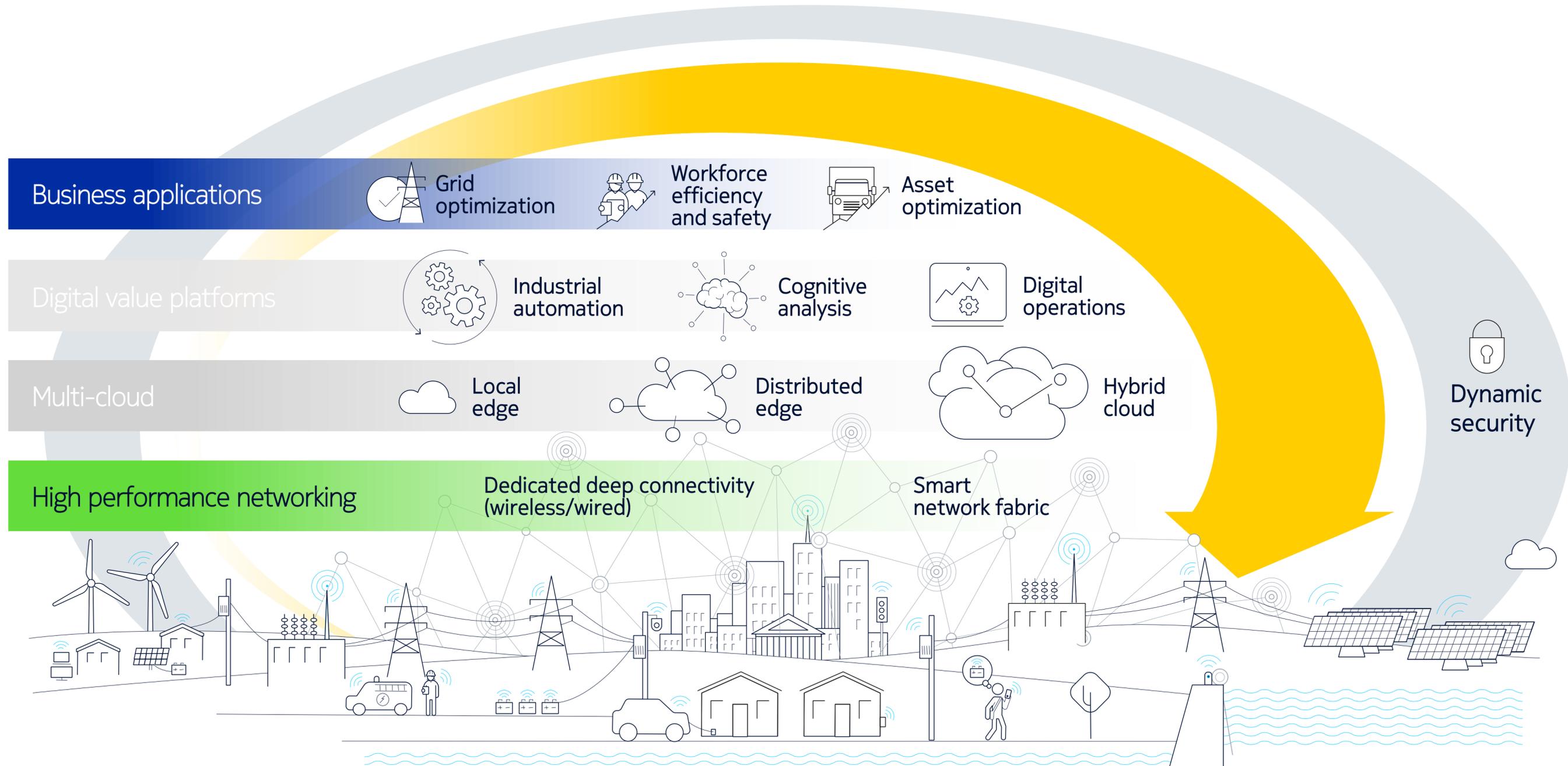
- IoT benefits: leverage data to develop better products & services faster, provide better service, use less to provide more
- With ionSign: get up & running faster, with a perfectly fitting, customised hardware
- No vendor lock-in: use any sensor, send to any cloud

REFERENCES

- FINGRID – The Finnish national grid operator & global pioneer
Monitoring of disconnectors and circuit breakers at unmanned substations for predictive maintenance & grid availability
- Browse to ionsign.fi/en/cases/ for more cases



Nokia - Future X architecture for power utilities



Renewables integration, automation and new business models

ULTRA RELIABLE RADIO TECHNOLOGY SECURING YOUR MISSION-CRITICAL BUSINESS

SATEL is one of the world's leading experts and innovators in independent radio networking technology. We develop and sell high quality private radio technology solutions that enable secure, mission-critical connections.

BENEFITS FOR THE CUSTOMER

SATEL radio technology and expertise ensure reliable, secure and independent data connectivity in monitoring and controlling the condition of the SCADA – utility system. The solutions are comprehensive and easy to implement and expand. We offer smart communication for smart grids. For example, if you are looking for a solution for wireless IEC101 or IEC104 communication needs, SATEL has the solution for you.

EXAMPLE REFERENCES BELOW

over 0,5M radios delivered

<https://www.satel.com/references/tornionlaakson-sahko-oy/>

<https://www.satel.com/references/smartradionet/>

<https://www.satel.com/references/tigem/>

<https://www.satel.com/references/stockholm-vatten/>



WIREPAS

COMPANY BACKGROUND

Wirepas is focused on providing the most reliable, optimized and scalable device connectivity to its customers. With our help customers can digitalize their current business processes and innovate for new disruptive models.

PRODUCTS & SERVICES

- Decentralized network management.
- Synchronized time and frequency division multiple access (TDMA & FDMA)
- Adaptive multi-hop mesh topology
- Homogeneous device management
- Flexible hardware-independent architecture





POWER QUALITY AND RELIABILITY

- World class hardware to grid harmonization, reliability and balancing
- Smart digitalization of substations
- Energy storage for power availability stabilization

WE OFFER

- Full range of protection relays and IEDs for distribution, transmission and generation.
- Arc flash protection relays for low –and medium voltage
- Arc quenching systems for low –and medium voltage systems.

BENEFITS FOR THE CUSTOMER

- The most accurate protection relays in the world
- Arc flash protection for ultimate personnel and switchgear safety and reduced outage times.
- Resuable and testable arc quenching devices.

REFERENCES

- Global presence in more than 50 countries
- Reference base in utilities, heavy industries, infrastructure, marine and offshore use world-wide in all continents



Creation by Creators of eChargie

OFFERING

- eChargie platform enables anyone to sell electricity ...
 - for any kind of electric vehicle
 - from any standard wall socket
 - to anyone with just the app on their phone
- Platform includes device, cloud based sales management tool and a mobile application for buyer

BENEFITS FOR THE CUSTOMER

- Building owners can make money selling electricity to charge any EV
- Set up an EV charging station in a few minutes
- Plug n play, no rewiring needed
- Freedom for seller to set price, availability, location and at any time.
- Utilizes existing power infrastructure in a safe way

REFERENCES

- The city of Tampere (2nd biggest city region in Finland)
- Salo IoT Campus (Daimler EV battery factory)
- Takk - Tampere Adult Education Center
- Sasky – Municipal Education and Training Consortium



eChargie

- Anyone can sell electricity to anyone -

BRINGING INTELLIGENCE TO INDUSTRIAL BATTERY FLEETS

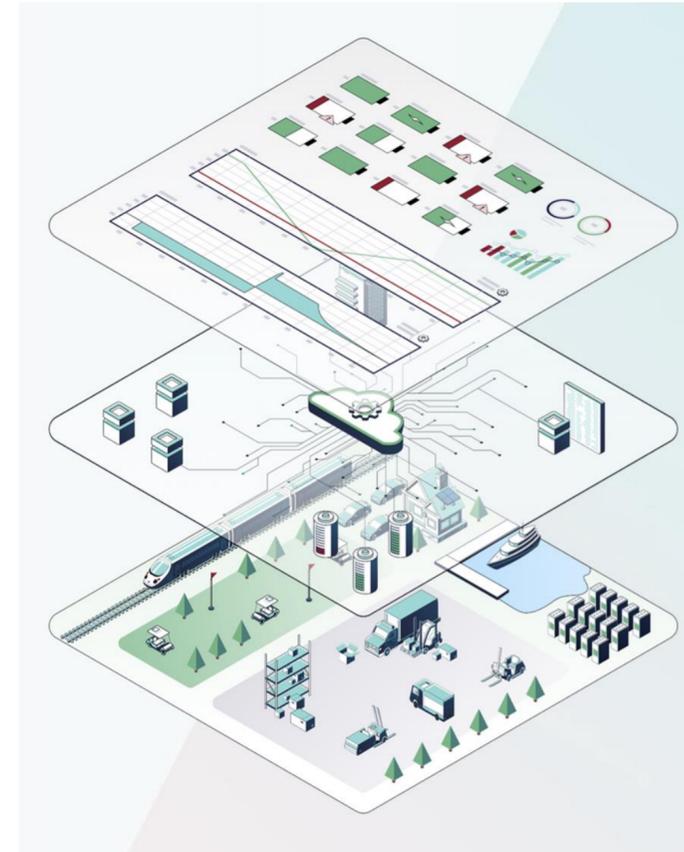
- Bamomas™ offers "Battery Monitoring Service" (BMS) solutions, bringing intelligence and analytics to industrial battery fleets.
- "A platform for remote battery fleet monitoring, optimal and responsible battery use, and predictive maintenance"

BENEFITS FOR THE CUSTOMER

- reduce maintenance time, efforts and service hours
- minimize on operational downtime
- reduce replacement and operational costs
- maximize battery lifespan
- reduce energy costs and enhance sustainability

REFERENCES

- Over +75 years of combined experience in industrial solutions
- Current ongoing pilot programs include the following:
 - Finnish Rocla forklifts (part of Mitsubishi Heavy Industries)
 - The Russian Railways (RZD) locomotives (RZD has ~20.000 locomotives in Russia)
 - Dutch Handicart golf carts (Handicart operates a total of 700 golf carts)



COMPANY BACKGROUND

Ensto is an international and family owned company specializing in the development, manufacture and marketing of electrical systems and supplies for the distribution of electrical power and electrical applications.

PRODUCTS & SERVICES

- Solutions for electrification, electricity distribution, lightning and electric vehicle charging.
- 1500 V DC microgrid (off and on grid) for rural area electrification to avoid non-technical losses



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.



Noiseless Acoustics

TURNING SOUND INTO VALUE

We provide smart solution that solve our customers' maintenance problems in a convenient and non-intrusive way.

BENEFITS FOR THE CUSTOMER

- Our energy saving solutions save typical factories with pneumatic / compressed air solutions tens of thousands of euros per year, even up to hundreds of thousands.
- Our non-intrusive maintenance solutions provide smart deviation detection for existing assets, with automatic detection of early fault indicators.

REFERENCES

- Leak detection solutions used by for example:
Atlas Copco, Airbus, Procter & Gamble, UPM
- Partial discharge detection:
RTE France, Gazprom, Fingrid
- Predictive maintenance solutions:
Wärtsilä, Webasto



SEAM

ENERGY OPTIMIZATION SYSTEMS

- Smart grid platform, for smarter energy decisions - reduce electricity usage and shift it to inexpensive off-peak hours.
- Coal-fired power plant, defining the optimal operation - reduction in coal consumption by optimizing the process values.

BENEFITS FOR THE CUSTOMER

- Direct economic benefit with less cost in electricity usages or fuel consumption.
- Better energy efficiency and improved operation reliability by eliminating system defects.
- Environmental benefit with less emissions.
- Huge values in carbon emission trading with the expectation China to be the largest carbon market.

REFERENCES

- Strong support from parent company Synchron Tech with over 25 years in delivering industrial IT systems and services.
- Best software and expertise in energy market.
- Provider of smart grid platform to the biggest solar power plant in Finland.
- Top level cyber security with secured data center from reliable business partners located in China.
- Achieved 5% improvement in fuel efficiency of Chinese coal-powered combustion power plant.



VTT – Energy efficiency solutions



EXPERTISE ON GRID MANAGEMENT AND LOAD FORECASTING

- Peak load shaving and grid optimisation
- IoT Sensor and AI based Energy efficiency solutions
- Electricity consumption forecasts
- Automated demand-response platform development
- Positive energy district planning
- Zero Energy Block and off grid solutions

BENEFITS FOR THE CUSTOMER

- Maximising the grid throughput
- Maximised electricity quality
- Avoiding black outs
- End-user cost save by reduced electricity bill

REFERENCES

NordPool – Nordic Energy Market SW development

Weekly energy consumption forecasting for Finland

Development of the most energy efficient Supermarket in the world

Over 10 M€ research program portfolio with European partners



FLEXIBLE GRIDS

- Off-grid solutions
- Automated microgrid solutions
- Intelligent connection and utilizations of renewable energy
- Stabilization of generated power
- Demand driven power production

CONVION

BACKGROUND

Convion Ltd. is a leading fuel cell system developer committed to commercializing solid oxide fuel cell systems in range of 50–300kW for distributed power generation.

PRODUCTS & SERVICES

Convion provides a complete power generation solution based on SOFC technology. Products will be distributed to global markets in cooperation with key partners and customers.



FORTUM

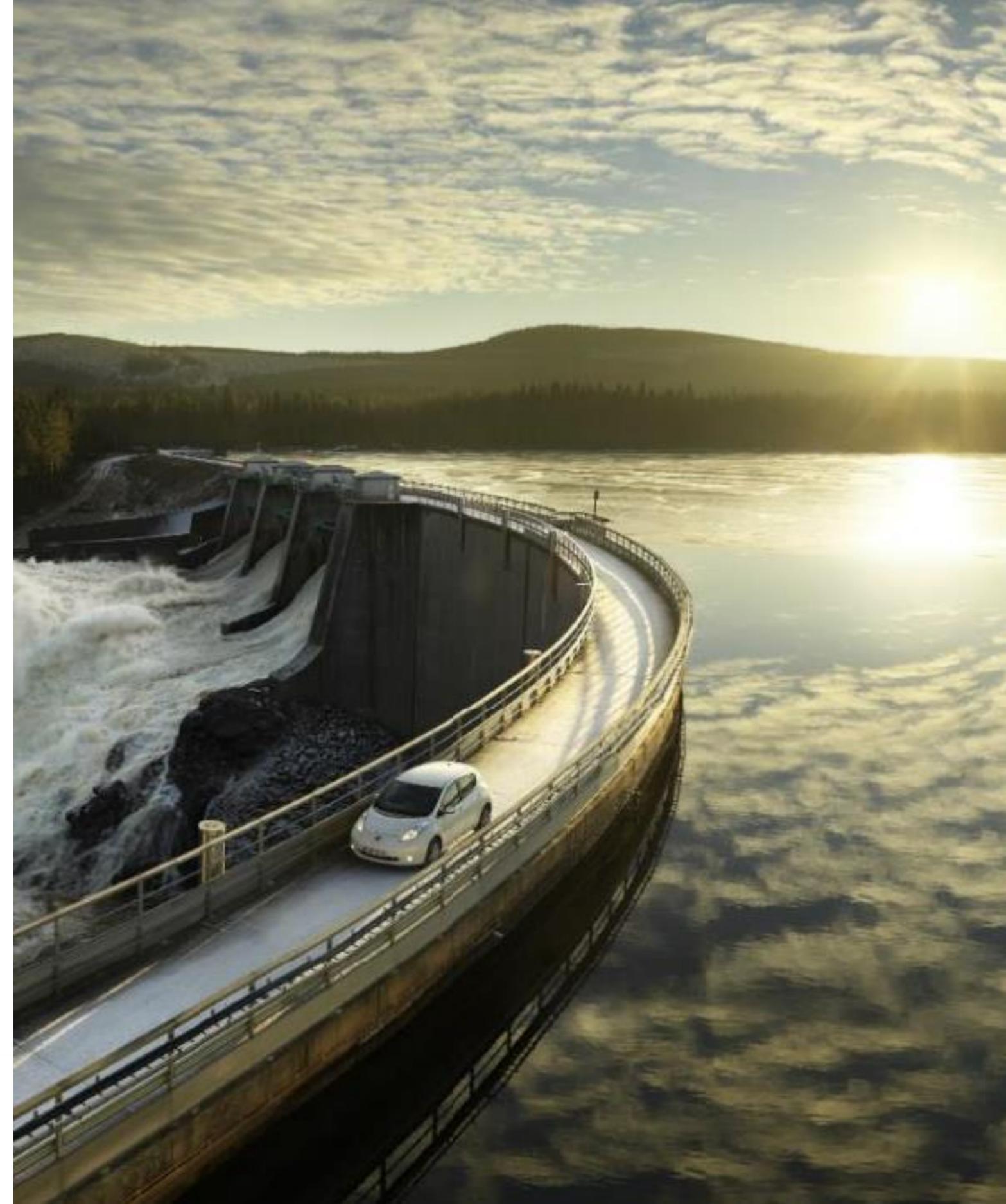
COMPANY BACKGROUND

Fortum is the largest energy retailer in Nordics. The divisions include energy production, circular economy, energy related products and expert services

PRODUCTS & SERVICES

In India Fortum is strong in

- Energy Production
- EV charging ecosystems with it's division Charge&Drive



GENESET POWERPLANTS

Innovation for Sustainable Power & Energy

HYBRID SMART OFF-GRID SYSTEM

- Core system - biomass gasification solution, integrated with solar, wind to be independent off-grid CHP
- Power an island network with grid quality electricity from renewable sources
- Possible to inject to national grid as IPP
- Standard and scalable system generates 150kWe and 250kWh, cooling as optional

ATTRIBUTES:

- Efficiency - waste to power and energy output
- Reliability - even short or long periods without sun and wind power
- Energy cost - effective, reduce remarkably traditional fuel dependency and emission

APPLICATION:

- Industries, agricultures, communities, hospitals, schools, smart cities etc



KIWATTI

TURNKEY SOLUTIONS FOR RENEWABLE ENERGY PRODUCTION

- Kiwatti provides solar energy, wind energy and hybrid solutions for companies, utilities and public sector.
- Kiwatti's scope covers energy harvesting analysis, feasibility evaluation of different renewable energy production technologies, planning, sourcing, erection and installation of PV, wind energy and hybrid power plants and energy storages.

BENEFITS FOR THE CUSTOMER

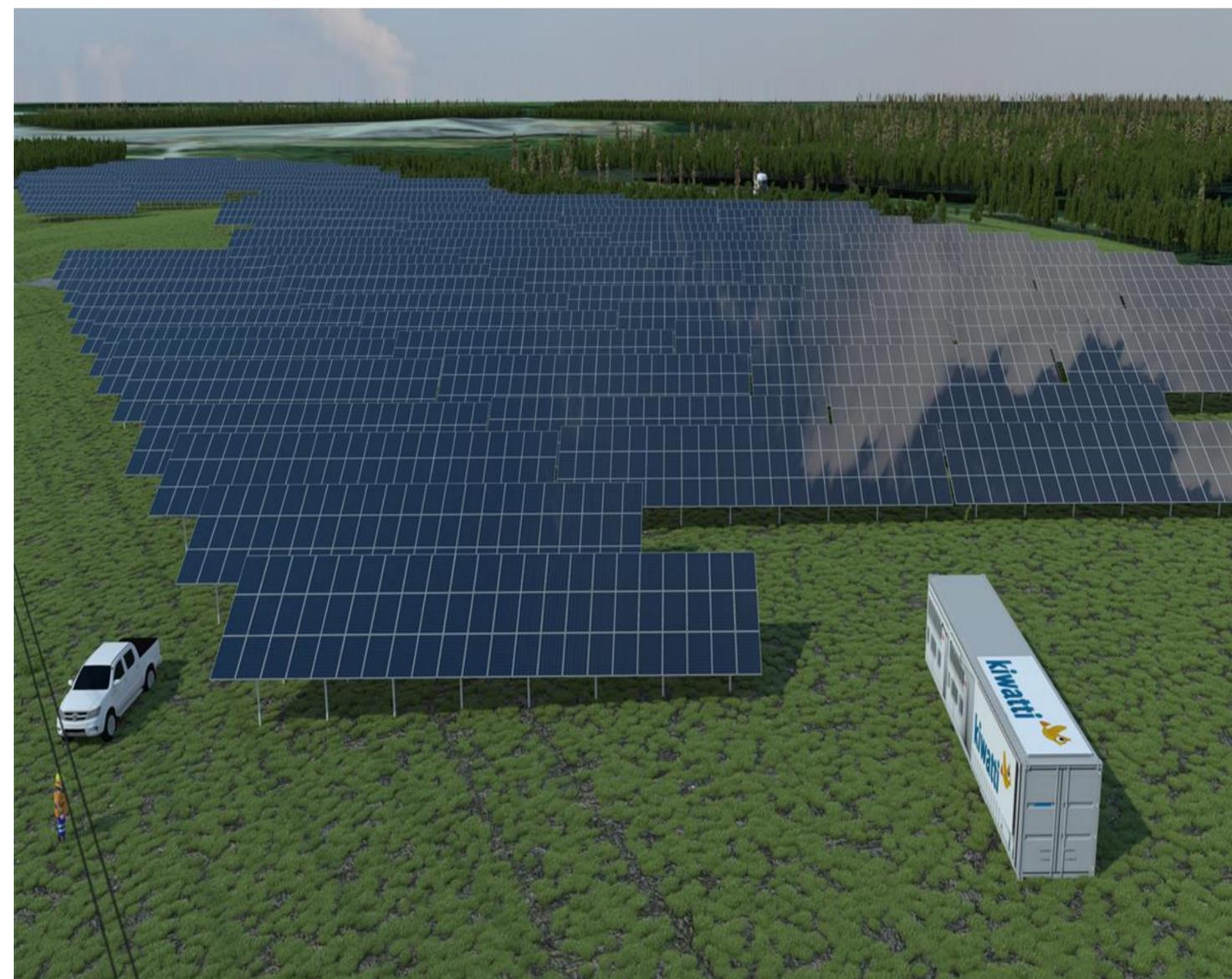
- Kiwatti is an independent EPC contractor that co-operates with classified Tier 1 PV, wind generator, inverter and mounting system manufacturers around the world
- Kiwatti selects together with client the most feasible components and technology suppliers for each and every business case separately
- Kiwatti provides cloud based energy production monitoring, analysis, remote controlling and malfunction alarm system as a part of the turnkey delivery
- Kiwatti provides thorough training at commission stage for the client are they smaller or larger
- Kiwatti provides preventive maintenance schemes and recommendations for preferable spare parts selection for each plant
- Kiwatti can provide extended warranty schemes if considered necessary

REFETENCES

- Lemene 2000kW ground based solar power plant in Lempäälä, Finland
- Laurea collage 120kW roof top solar power plant in Vantaa, Finland
- Ahlman vocational school 110kW roof top solar power plant in Tampere, Finland
- Jubilee Group 100kW roof top solar power plant in Helsinki, Finland
- Several wind turbine deliveries to weather stations, tele links around EU

KIWATTI

Energy. It's in the Air.



TERALOOP

Teraloop is developing scalable and sustainable electrical energy storage for the daily markets.

With a grid-connected prototype operational since June 2018, Teraloop is now commercializing its kinetic energy technology in order to meet the strong demand for effective storage to ensure flexibility and resilience in tomorrow's energy system.

Our advantages includes: low cost of throughput; configurable for energy or power applications; highly recyclable; low embodied energy; optimal carbon usage.

CUSTOMER BENEFITS

INDUSTRIAL STORAGE (>1MW FROM 2021)

Energy Intensive Industries; Wayside Energy Storage; Critical Processes

- Cost avoidance: imbalance & peak charges, fluctuation damage, upgrade deferral
- Stacked revenue opportunities: ancillary services - e.g. primary & secondary frequency containment
- Low cost of ownership for high-cycling applications

CUSTOMER BENEFITS

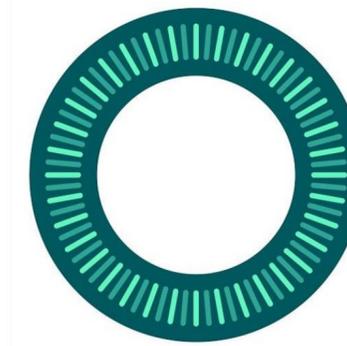
UTILITY SCALE (>5MW from 2023)

Utilities; Independent Power Producers; Service Aggregators; Distribution Networks

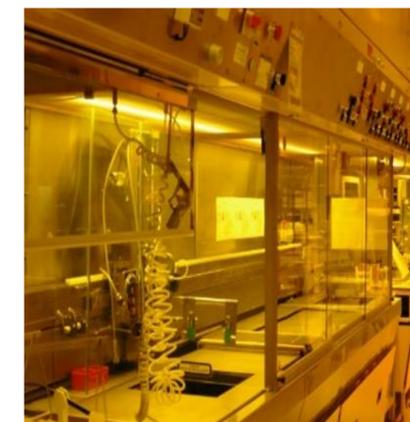
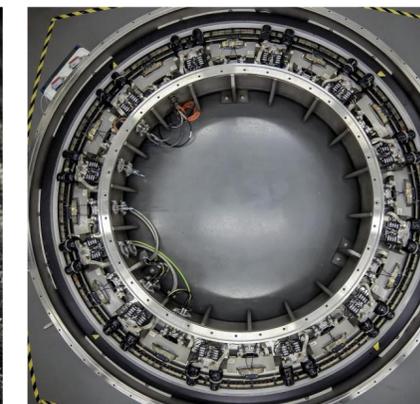
- Capacity & flexibility firming
- Renewables integration
- Circular economy driven sustainability in design and implementation

CALL TO ACTION

Teraloop is currently seeking commercial pilot opportunities with industrial users, independent power producers, utilities and other service operators.



TERA
LOOP



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



SAFETY AND SECURITY

- End to end services for digitalized monitoring
- Service digitalization
- Fault indicator combined with secondary substation monitoring
- Telecom infra and services

MIRASYS

COMPANY BACKGROUND

Mirasys is one of the leading providers of open platform Video Management Systems (VMS) for IP and analog camera surveillance applications and systems

PRODUCTS & SERVICES

We develop and offer comprehensive solutions, which help organizations manage, analyze and utilize video image data as extensively as possible



Marioff

WATER MIST FIRE PROTECTION SYSTEMS

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.

Typical applications to protect are turbines, cable infrastructure, power transformers, machinery spaces and electrical rooms.

BENEFITS FOR THE CUSTOMER

Safe for people, equipment and climate

Less requirements on building infrastructure (water feed, drainage, space, etc,)

High performance fire suppression

REFERENCES

HI-FOG® water mist fire suppression technology safeguards hundreds of gas turbines, power plants and substations globally.

<https://www.marioff.com/references/>



SOFTABILITY OY

VIESTI -REMOTE SUPPORT WITH VIDEO

VIESTI is a SmARt Remote Support Solution to connect remote workers and experts with on-line video, audio and chat anywhere in real-time.

VIESTI is designed for industrial and service companies, whose workers operate in several locations and benefit from the remote support in their work e.g. in maintenance, field service, installation, repair, manufacturing, training or inspections.

VIESTI enables companies to provide their technicians and experts with a live on-line video remote support with smart request handling to ease the work on various locations.

BENEFITS FOR THE CUSTOMER

With VIESTI companies can scale the expertise and solve issues faster.

VIESTI improves productivity, brings time and cost savings and reduces errors and downtime.

VIESTI is a scalable and flexible solution that can be integrated to customer's other IT -systems.

REFERENCES

18 years experience in R&D services, industrial software solutions and IoT

Strong service offering in Augmented Reality, Virtual Reality and Smart Glass Solutions

Key global customer references: Fortum, ABB Group, GE, KONE, Konecranes, Patria, Vaisala, Thermo Fisher Scientific, Planmecca, GreenEnergy Finland,..

