KONČAR

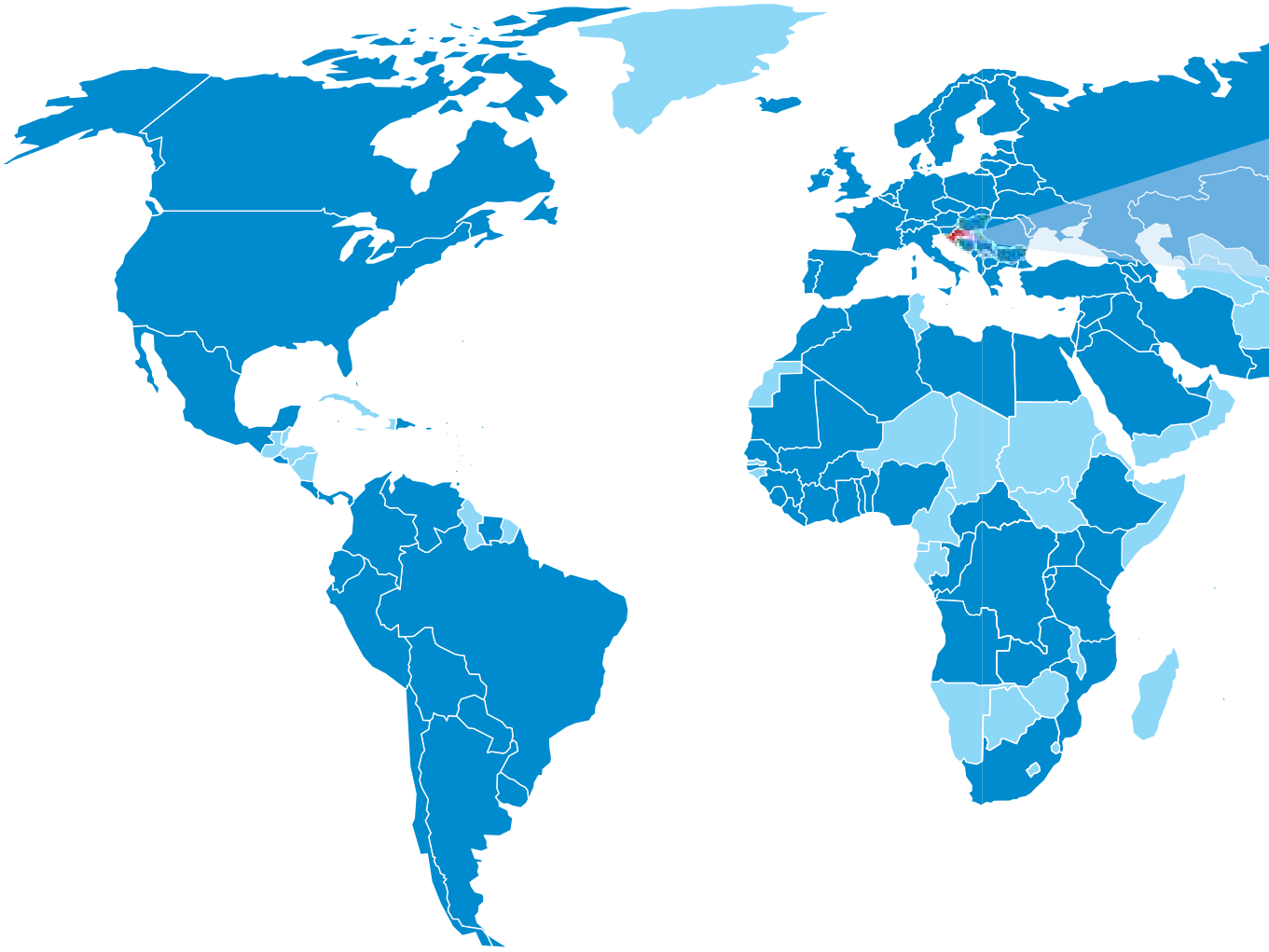
Inspired by challenge

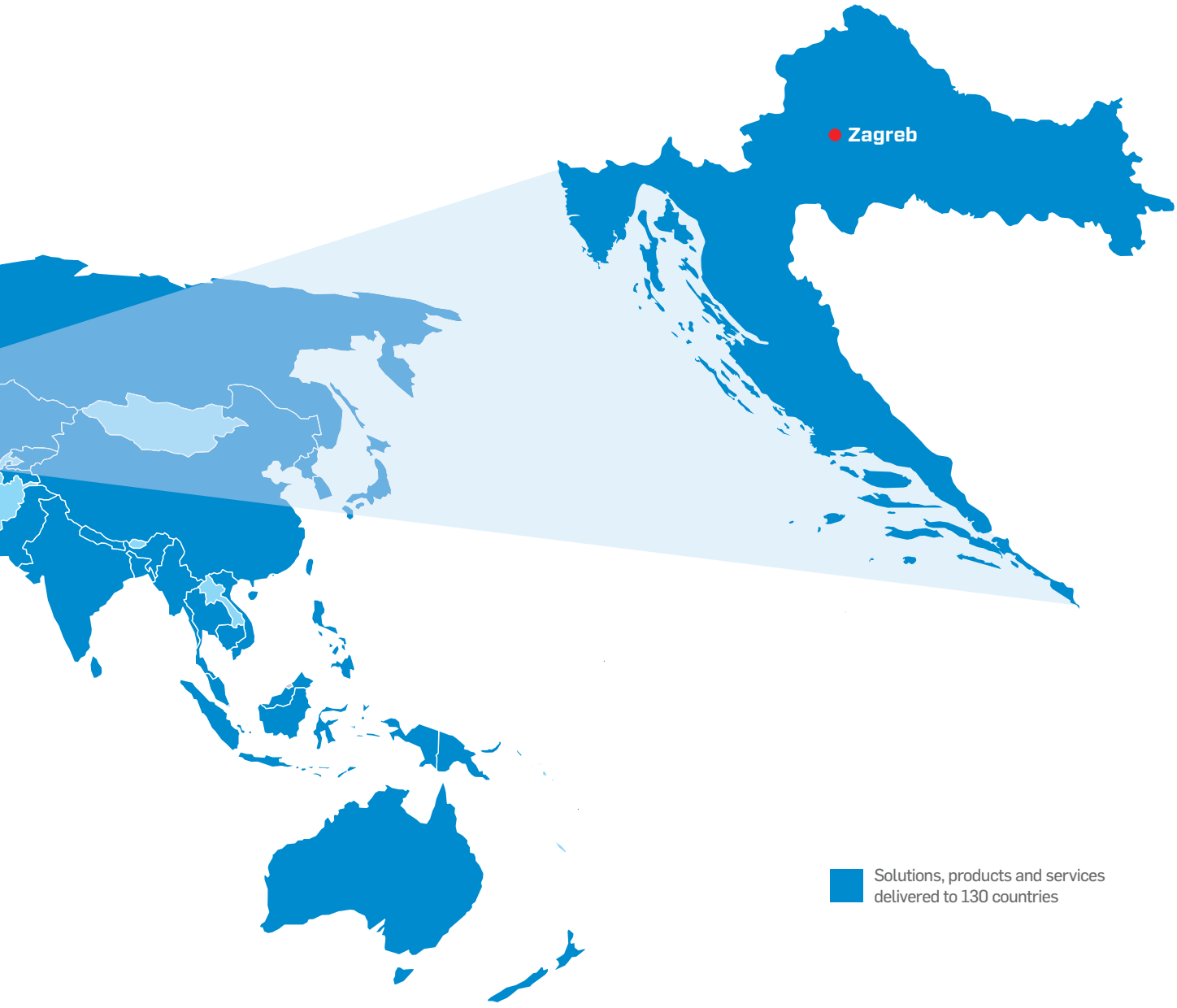
Product Catalogue

Our new century of excellence in delivering global products and services

KONČAR in global markets

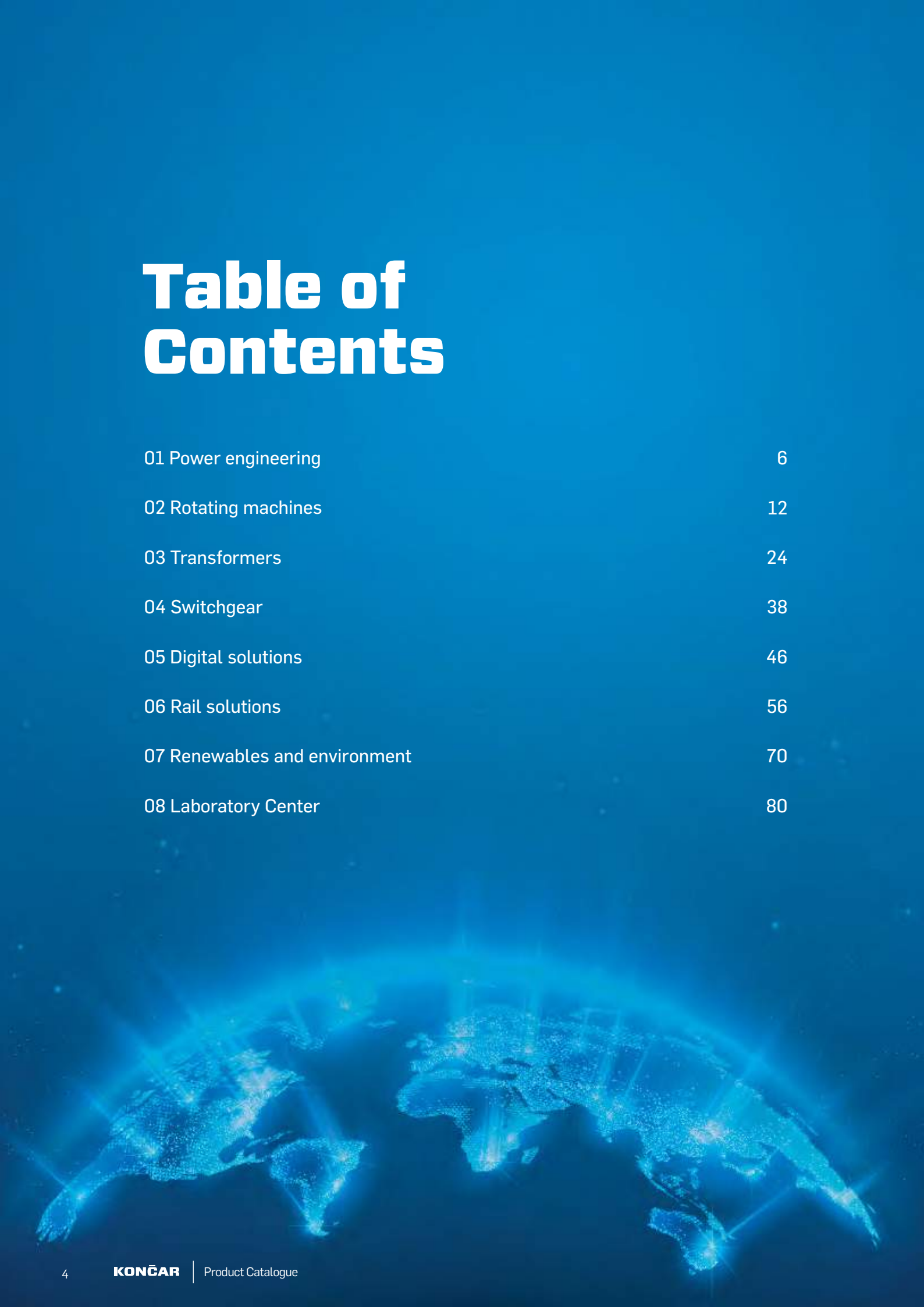
Century of excellence in markets worldwide





Solutions, products and services delivered to 130 countries

Table of Contents



KONČAR Group

In the power engineering sector, the name KONČAR is a global synonym for tradition, trust, expertise, innovation and cutting-edge technology.

In 2021 we celebrated a century of excellence and a century of operations across 130 markets.

Today, KONČAR is well recognized and established in power engineering and rail solutions industry and operates in the fields of power generation, transmission and distribution, rail vehicles and infrastructure, digital solutions and platforms, with an accent on proprietary development and innovation, as well as laboratory testing and certification.

We continuously develop segments which provide the highest added value, with a focus on wind, solar and water energy and we have pivoted to further development of technologies and products that will combine green and smart to enable our partners to keep up with the global initiative and direction in the power engineering field. Based in Zagreb, Croatia, we export to the European Union, Asia, Africa, the USA and Australia, which makes us the largest Croatian net exporter of the decade.

Our Group consists of 14 companies and a joint venture with Siemens Energy, employing over 4100 people. To best respond to customer needs and challenges of contemporary global markets, we have built a team of highly educated experts, and we foster lifelong learning and upskilling.

Research, development and innovation drive our business, providing us with expertise, competences and technology required to carry out projects independently or with partners.

Inspired by challenge, we develop cutting-edge solutions, contribute to local manufacturing and energy sustainability of the society.

01

Power engineering

Through several decades of experience, numerous references, and by keeping-up with modern technical and technological development trends, we have become successful and efficient in implementing turnkey projects involving design, construction and refurbishment of the most complex electric power facilities and plants in Croatia and worldwide.

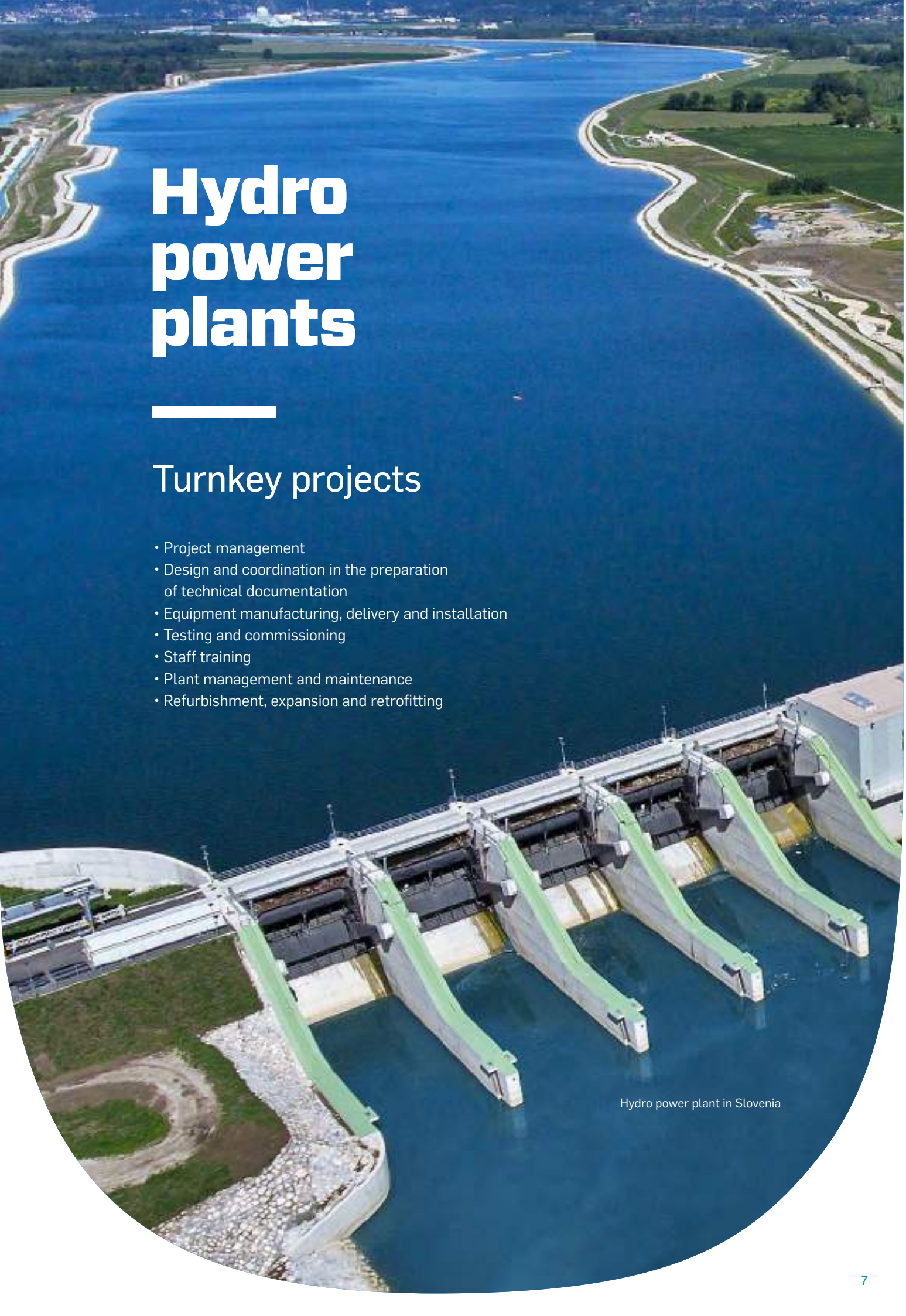
Through proprietary development and business cooperation with domestic and foreign partners, we have mastered all necessary knowledge required to provide comprehenive engineering pertaining to construction of hydro power plants and substations, and to equip thermal power plants, biomass power plants, cogeneration plants and facilities using renewable energy sources.

Our engineering activities in the field of power engineering rely on primary (generators, transformers, switchgear) and secondary electrical equipment products (excitation systems, metering, protection and control devices, automatic control systems) not only from KONČAR Group manufacturing programme, but also from other globally renowned manufacturers.

Hydro power plants

Turnkey projects

- Project management
- Design and coordination in the preparation of technical documentation
- Equipment manufacturing, delivery and installation
- Testing and commissioning
- Staff training
- Plant management and maintenance
- Refurbishment, expansion and retrofitting



Hydro power plant in Slovenia

Substations

Transmission and distribution system operators are facing a variety of diverse challenges arising from continuous growth of the energy industry and increasing demand for renewable energy sources. We are specialized in complex market and industry-specific solutions and deliver turnkey projects to meet the needs of the global energy industry.

We offer customer-specific solutions, construction, reconstruction, refurbishment and retrofitting of transmission and distribution power facilities within voltage ranges up to 400 kV for AIS and 220 kV for GIS.

Our solutions include:

- Equipment manufacturing
- Secondary control and protection systems
- Metering
- Telecommunications
- Proprietary programming solutions for supervision, control and diagnostics

Substation in the south of Croatia

Electric power plant services

Engineering

Expertise and experience in turnkey project management.

Maintenance

Continuous plant maintenance and servicing in order to extend the useful life of equipment.

Training

Workshops designed to provide in-depth theoretical and practical understanding of the plant and installed systems.

Technical support

Technical on-site support with 24/7 maintenance service upon project completion.

02

Rotating machines

Synchronous machines

Hydro generators

- Rated output ranging from 300 kVA to 300 MVA, rated voltage up to 18.5 kV
- Large generators
- VPI, Global VPI and RR insulation systems
- Generators for Francis, Kaplan, Pelton and Saxo turbines
- Bulb-type generators
- Reversible motor–generators
- Compact generators for small hydro power plants
- Overhaul, servicing and current state assessment for all generator types
- Power upgrade and refurbishment of all hydro generator types

HPP Binga, 4x41.2 MVA (power upgrade from 27.8 MVA), Philippines

HPP Brežice, 3x21.5 MVA, Slovenia

New compact generator for HPP Haunoldmühle in Austria

Turbo generators

- Major overhaul
- Maintenance
- Service and delivery of replacement parts
- Available for turbo generators manufactured by KONČAR or by other manufacturers

Wind turbine generators

- Rated output of 1 MVA and 2.6 MVA

Special synchronous generators

- Diesel engine-driven generators for nuclear power plants, shipbuilding industry and other
- Motor-generators for transformer testing stations

Excitation systems and voltage regulators for synchronous machines

- Digital regulator (AVR)
- Excitation converter - with natural or forced cooling (air or water)
- Excitation transformer
- De-excitation circuit and overvoltage protection
- Field flashing
- Electrical braking (HPP) equipment

Static excitation system for large generators

Condition monitoring systems for rotating machines

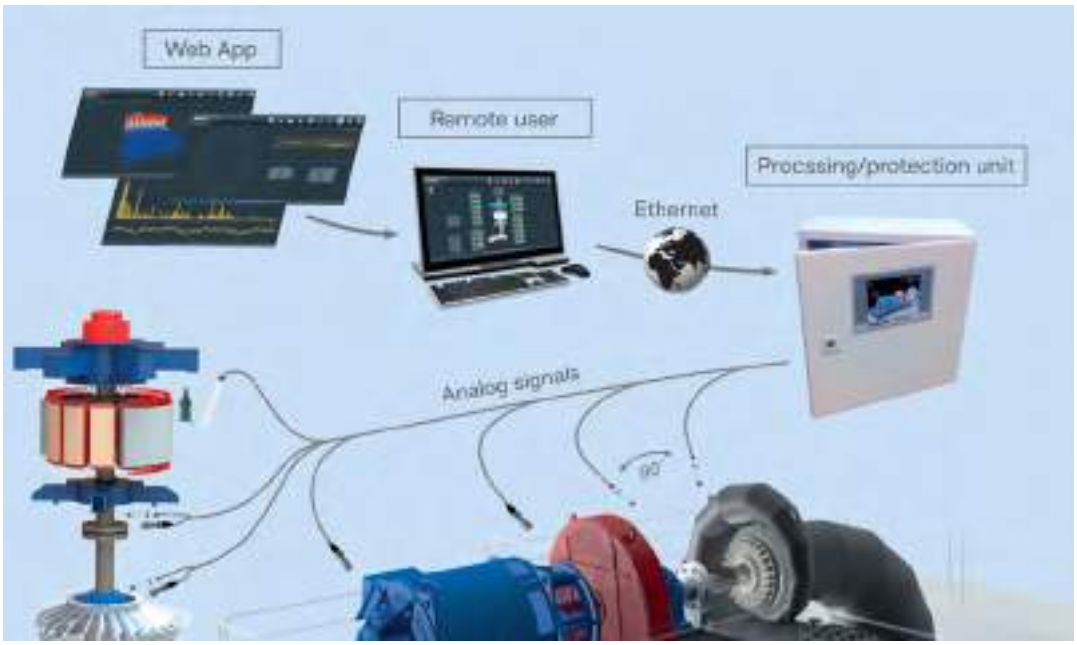
- Online condition monitoring systems for all types of rotating machines
- Real-time protection based on international standard (ISO 20816 – Mechanical vibration)
- Modular and customized solution for new or existing machine
- Early fault detection and failure prevention

Synchronous motors

- Constant rotational speed and torque
- Reactive power compensation
- Electric motor drives for rolling mills and compressors
- Rated power from 500 kW up to 10 MW

Welded and machined generator components

- Welded and machined generator and high-voltage electrical motor components (generator stator frames, brake rings, fans, pole wheels, rotor spiders, bearing supports, brackets)
- Welded generator and motor steel components for nuclear power plants



Machine Condition Monitoring – MCM


Pole wheel


Hydro-generator – stator frame

Asynchronous machines

Explosion-proof motors

- Designed for oil and gas industry and mining
- ATEX motors with Ex protection “d”, “e”, “p”, “n”

Motors with special water cooling

- Designed for application in speed-regulated drives (ship propulsion, winches, pumps)
- Rated power from 315 kW to 3800 kW; rated voltage from 400 V to 690 V

Asynchronous motors and generators

- HV and LV squirrel-cage and slip-ring motors for pumps, fans, compressors, crushers, conveyers, propulsion, thrusters, winches and traction
- Asynchronous generators for small HPPs
- Rated power from 160 kW to 10 MW; rated voltage up to 13.8 kV

Shaftless motors

- Motors for compressors
- Rated power from 160 kW to 550 kW; rated voltage up to 6 kV

High-voltage squirrel-cage motor

High-voltage squirrel-cage water cooled motor

Low-voltage motors and fans

Asynchronous motors

- Three-phase asynchronous induction motor, power up to 200 kW (efficiency IE1/IE2/IE3/IE4)
- Single-phase asynchronous induction motor, power up to 2.5 kW
- Other versions: multispeed motors, motors with brake, winch motors
- Special design – stainless steel housing three-phase asynchronous induction motors up to 1.5 kW
- Synchro reluctance motors (efficiency IE4/IE5)
- Electric motors for marine application (with type certificate: CRS, BUREAU VERITAS, RMRS)

Explosion-proof motor for oil and gas industry and chemical industry

Winch motor

Explosion-proof motors

- Explosion protected motors, power up to 200 kW (efficiency IE1/IE2/IE3/ IE4) in protection type:''db'',''eb'', ''ec'',''tb'',''tc''
- Certificate: ATEX, IECEx, TR CU (EAC)
- Explosion protected motors for marine application (type certificate: CRS, BUREAU VERITAS, RMRS)

Brake motor

Stainless steel motors for food and pharmaceutical industry

Fans

- Axial fans from 315 to 1600 mm diameter
- Centrifugal fans from 160 to 1120 mm diameter
- Special transformer cooling fans and fans for HVAC application
- Special industrial solution in ventilation
- Explosion protected fans in protection type „h“ (certificates ATEX)
- Fans for marine application (with type certificate: CRS, BUREAU VERITAS, RMRS)

Transformer cooling fan

03

Transformers

Power transformers (mineral oil alternative liquid)

- Generator transformers, transmission transformers and autotransformers up to 1000 MVA, rated voltage up to 550 kV
- HVDC power transformers up to 550 kV

HVDC converter transformer delivered to New Zealand

Medium power transformers

Rated power up to 160 MVA and voltage up to 170 kV

- With on-load tap changer
- With off-circuit tap changer
- Without regulation tappings

Medium power transformer for the Norwegian market

Distribution transformers

Oil-immersed distribution transformers, rated power up to 8000 kVA and voltage up to 36 kV

- Standard transformers with off-load regulation
- Transformers with on-load regulation
- Transformers with low electromagnetic radiation
- Amorphous core transformers

Eco-friendly distribution transformer

Special transformers

- Earthing transformers
- Converter transformers
- Transformers for locomotives and EMUs
- Furnace transformers
- Vibration-proof transformers
- Transformers with reduced width for installation in wind turbine towers
- Transformers for offshore application
- Autotransformers
- Transformers for mobile substations
- Traction transformers for fixed installations
- Dry-type transformers, rated power up to 5000 kVA and voltage up to 24 kV
- Reactors for compensation, metallurgical plants, rectifying devices, short-circuit and ground-fault current limitations

Earthing transformer for an offshore wind farm in the North Sea

Transformer and reactor diagnostics, servicing and repairs

Earthing transformer, rated power 500 kVA

Three-phase oil immersed transformer, rated power 40 MVA

Instrument transformers

- Current transformers from 72.5 to 800 kV
- Inductive voltage transformers from 72.5 to 550 kV
- Capacitor voltage transformers from 72.5 to 800 kV
- Combined transformers from 72.5 to 550 kV
- Power voltage transformers from 72.5 to 550 kV // from 10 to 333 kVA
- Earthing reactors for HVDC systems from 72.5 to 550 kV
- Medium-voltage current and voltage transformers up to 52 kV
- Low-voltage current transformers
- Special transformers for laboratory purposes
- Transformers with reduced environmental impact - GREENLINE

Combined transformers 245 kV for a customer in Austria

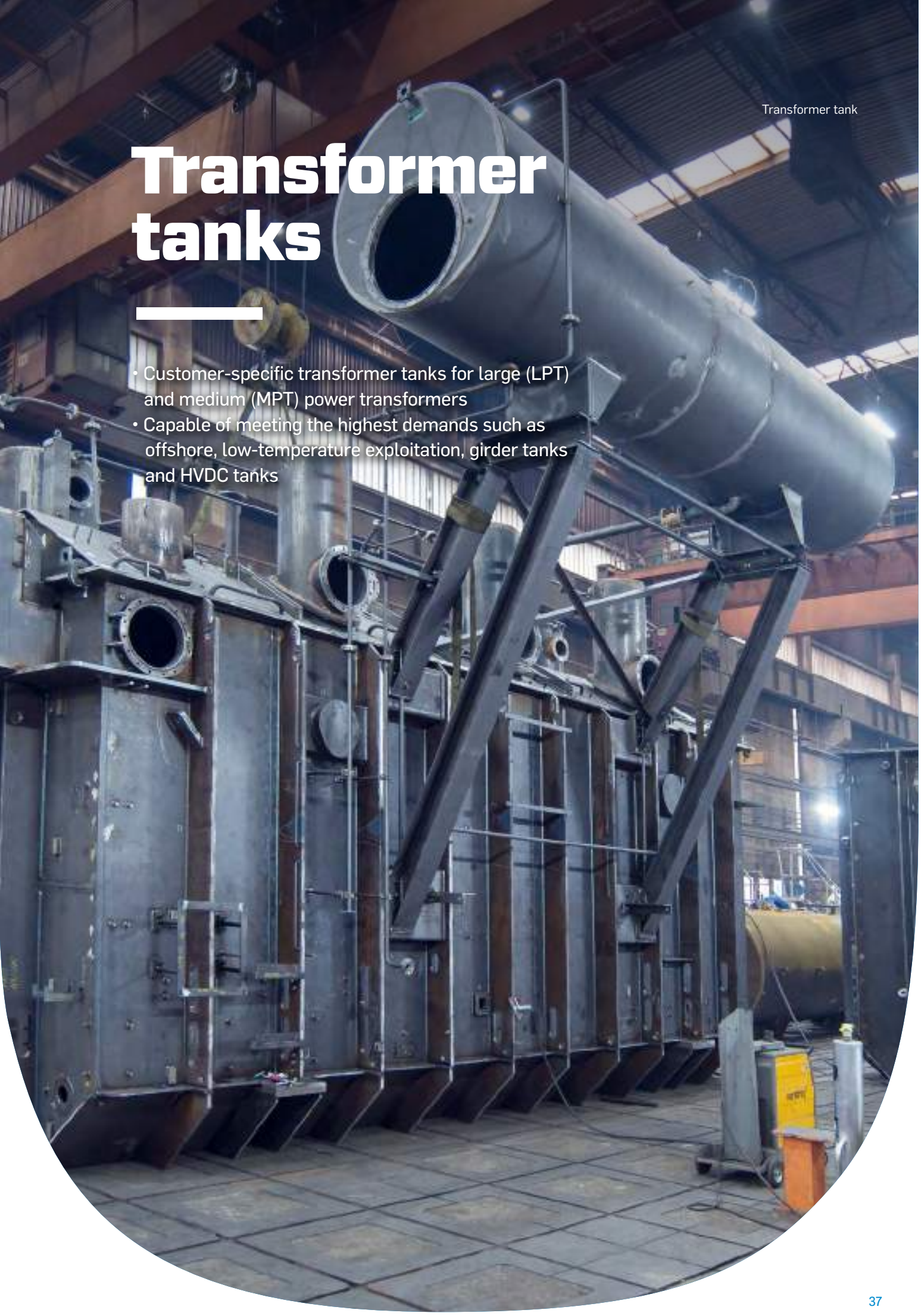
Station service voltage transformer 525 kV, with rated power 250 kVA delivered to the USA

Current transformers 525 kV delivered to Russia

Transformer monitoring system

- Online condition monitoring systems for all types of power transformers and shunt reactors
- Modular and adaptive solutions for new and existing transformers on the market
- Monitors and checks all vital transformer components (bushings, active parts, OLTC and cooling system)
- Asset management: condition assessments, diagnostics and fleet wide prognostics


Transformer Monitoring System – TMS



Transformer tank

Transformer tanks

- Customer-specific transformer tanks for large (LPT) and medium (MPT) power transformers
- Capable of meeting the highest demands such as offshore, low-temperature exploitation, girder tanks and HVDC tanks

04

Switchgear

High-voltage switching apparatus and switchgear

- High-voltage circuit breakers, rated voltage up to 145 kV, 8E1 series
- Disconnectors and earthing switches, rated voltage up to 420 kV, CB-N2 and Z series
- Metal-enclosed gas-insulated switchgear, rated voltage up to 145 kV

Metal-enclosed gas-insulated switchgear, rated voltage up to 145 kV, type K8D.6-N

High-voltage circuit breaker 8E1-I-123, substation in Slovakia

Medium-voltage switching apparatus and switchgear

- Air-insulated MV switchgear, metal-enclosed and compartmented, for rated voltages 7.2 kV, 12 kV, 24 kV and 38 kV, BVK series
- Metal-enclosed gas-insulated compact switchgear modules for primary distribution of electrical energy, for rated voltages up to 24 and 38 kV, KSMV and KSMA series
- Metal-enclosed gas-insulated ring main units (RMU) for secondary distribution of electrical energy, rated voltage up to 24 kV, VDA_{Σ}, VDA and VDAP series
- Factory pre-assembled concrete and containerised substations for secondary distribution of electrical energy in distribution and industrial networks, types KTS and VTS
- Vacuum circuit-breakers, rated voltage from 12 to 38 kV, VK and VK_{Σ} series
- Three-pole and single-pole disconnectors for indoor installation, rated voltage from 12 to 38 kV, RU series

Compact switchgear modules, KSMA series

Metal-enclosed gas-insulated
vacuum distribution switchgear (RMUs)

Vacuum circuit-breakers,
from 12 – 38 kV for indoor installation

Numerical protection

Feeder terminal units for MV power systems

- Protection, measurement and control
- Fault analysis

Numerical protection relay
KONPRO2 - Bay terminal RFX

Air-insulated switchgear BVK 12 installed in the UAE

Substation for secondary distribution of electrical energy, motorway in Croatia

Gas-insulated MV switchgear KSMV24

Low-voltage power distribution cabinets

- Low-voltage switchgear VMF series, with fixed apparatus groups and VMI series with withdrawable apparatus groups for power distribution and industry-related applications
- Low-voltage switchgear VMF-K series, with fixed apparatus groups, intended for reactive power compensation

Industrial LV power distribution cabinet for industrial plant

DC power supply system KONIS C (220 V, 50 A)

Uninterruptible power supply systems

for 24, 48, 60, 110 and 220 V

- Highly reliable integrated power supply systems
- Modular rectifiers in redundant parallel mode
- Integrated maintenance - rechargeable batteries
- Battery short-circuit protection, deep discharging and inadequate charging protection
- DC distribution board with fully selective circuit breakers
- Insulation monitoring and ground fault locating
- Real-time local and remote system control

05

Digital solutions

Remote critical and urban infrastructure monitoring and control

- Development of process information systems for automatic monitoring and regulation of facilities in the energy industry, gas distribution and transmission, water management and drainage, district heating and transport sectors and superordinate dispatch control centres
- Predictive equipment maintenance and maintenance process management

National Dispatch Center, Croatian Transmission System Operator

MARS - software IoT platform for energy, critical infrastructure and smart cities

- Real-time monitoring, management, analysis and reporting
- Receives a variety of technology-independent data from IoT devices, smart meters and sensors
- Reads data from a large number of devices simultaneously
- Areas of application:
  - Electric power
  - Public lighting
  - Water supply and drainage
  - Energy efficiency for buildings
  - Waste management
  - Parking
  - E-mobility
  - Environmental monitoring

MARS used for energy efficiency of school building

- Digital platform with open and modular architecture
- Advanced regular and automated reporting and alarming system
- Advanced real-time data visualization capabilities
- Integration with various business and process systems, independent of hardware and software manufacturers
- Data analysis, validation and calculation
- Data integrity and ability to connect with cyber-secure systems

Various applications with advanced visualization capabilities

Development of SCADA software solutions in substation automation

PROZA HAT EDS is a proprietary system for power plants and substation automation

- Complete SCADA functionality
- Operates on secure Linux virtual or physical systems
- Graphical interfaces based on web technology
- One editor tool for complete engineering process
- KONČAR proprietary solution

- New generation SCADA system Proza HAT EDS introduces architectural upgrades which enable integration of solutions with different operating platforms using physical and virtual environments
- Core of the system is based on the new Proza HAT platform – open source code
- Secured with Linux OS, user authentication, centralized event logging and secure control operations
- Communication protocols: IEC61850 Client, IEC60870-5-101/103/104, Modbus RTU/TCP
- Standalone configuration tool enables easy and efficient engineering

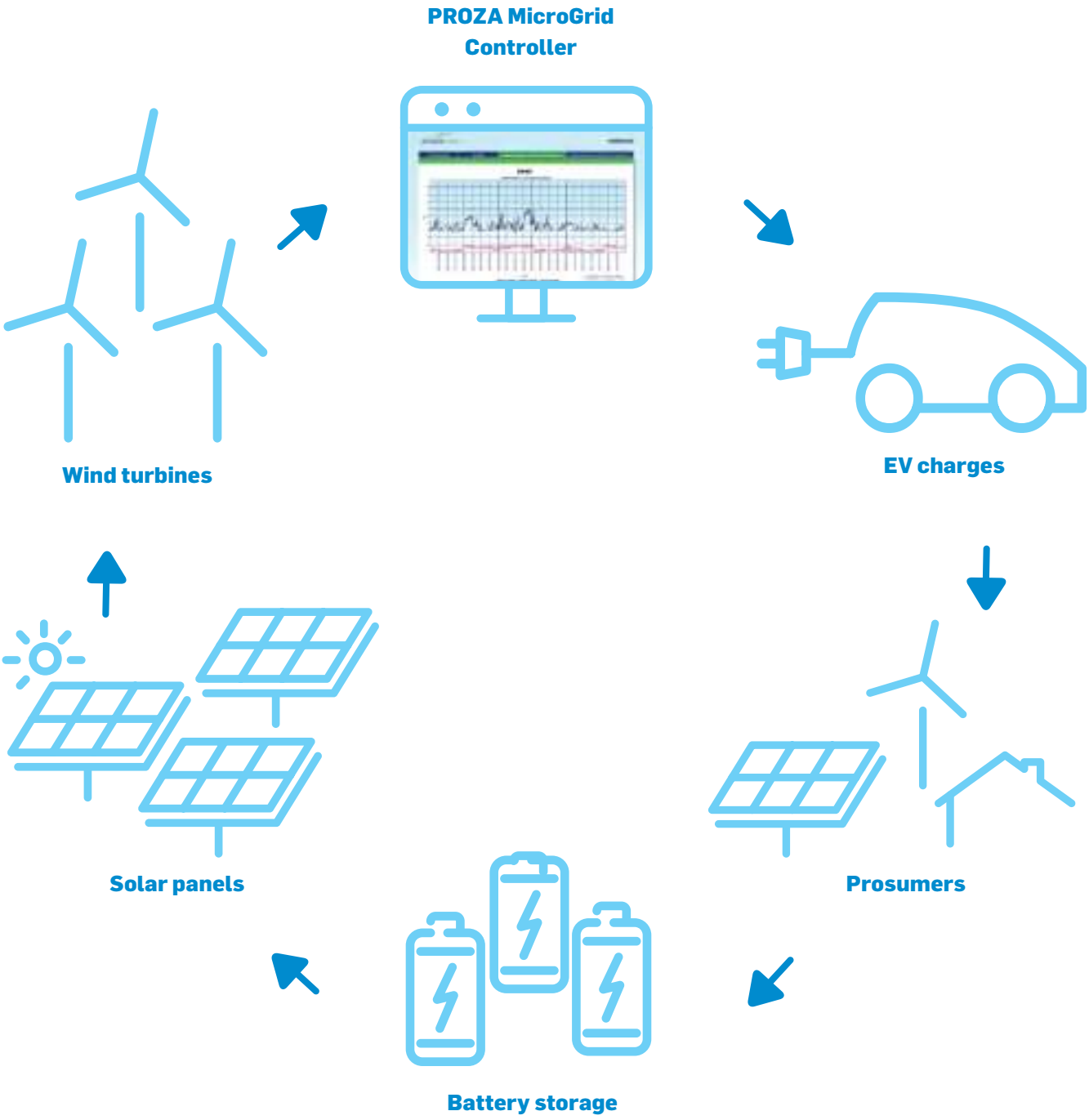
PROZA HAT EDS graphical interface

Development of microgrid-related software solutions

PROZA MEMS Microgrid energy management system

- Microgrid planning, optimization and generation system
- Battery storage system optimization
- Electric vehicle charging stations
- Advanced metering/Industrial Internet of Things software platform
- Grid connection and voltage regulation

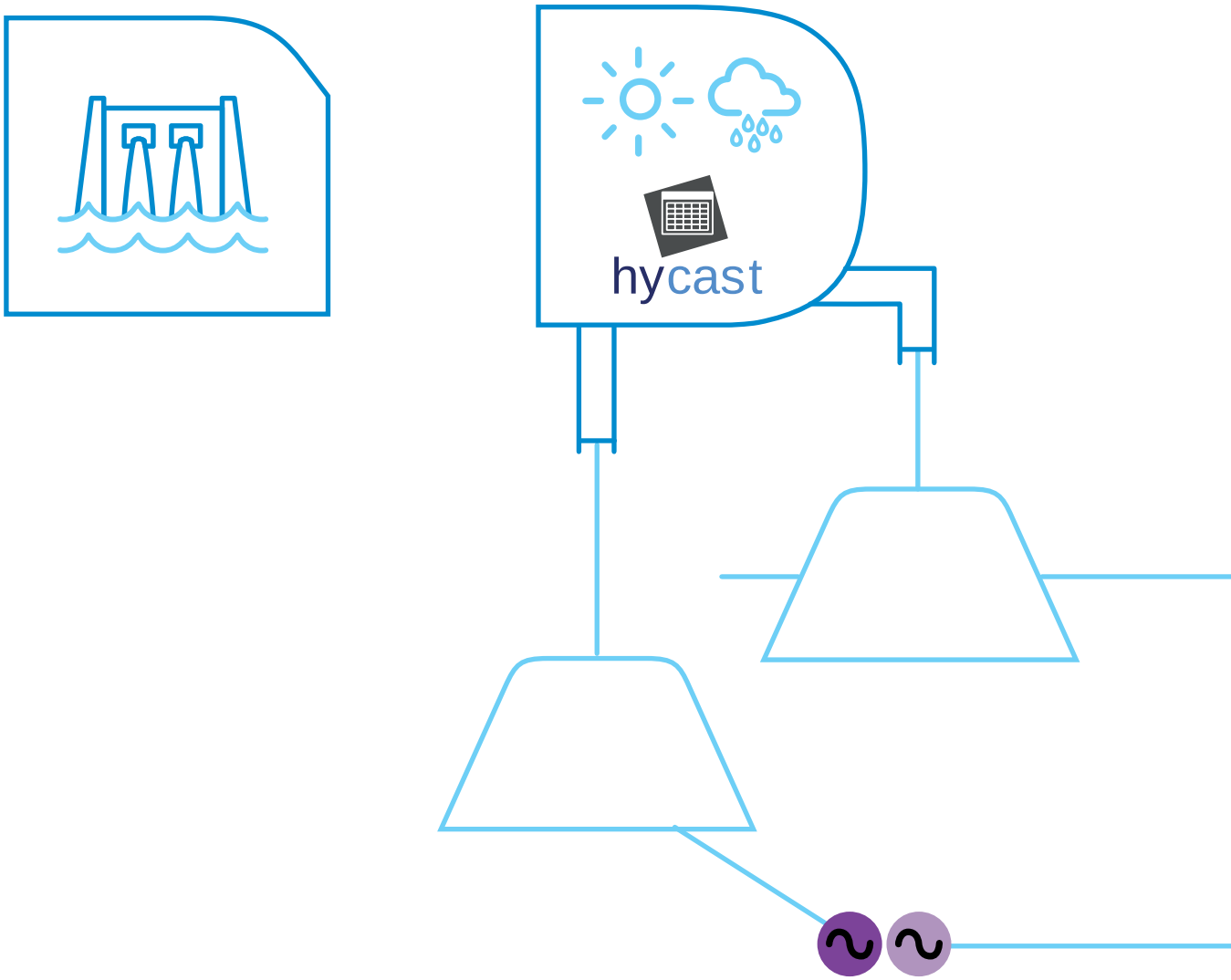
- Highly-scalable, flexible and extensible – can be adapted as your microgrid configuration changes and supports up to 100% renewable energy systems
- Cybersecure – it supports multi-layer password protection, encrypted data, VLANs for traffic segregation, firewalls and smart switches in accordance with IEC 62443
- Self-renewable microgrid – maintains system integrity, reliability and stability should a power generation source go offline
- Applying experience from successful H2020 research projects dealing with flexibility and active demand response



PROZA HAT MicroGrid Controller

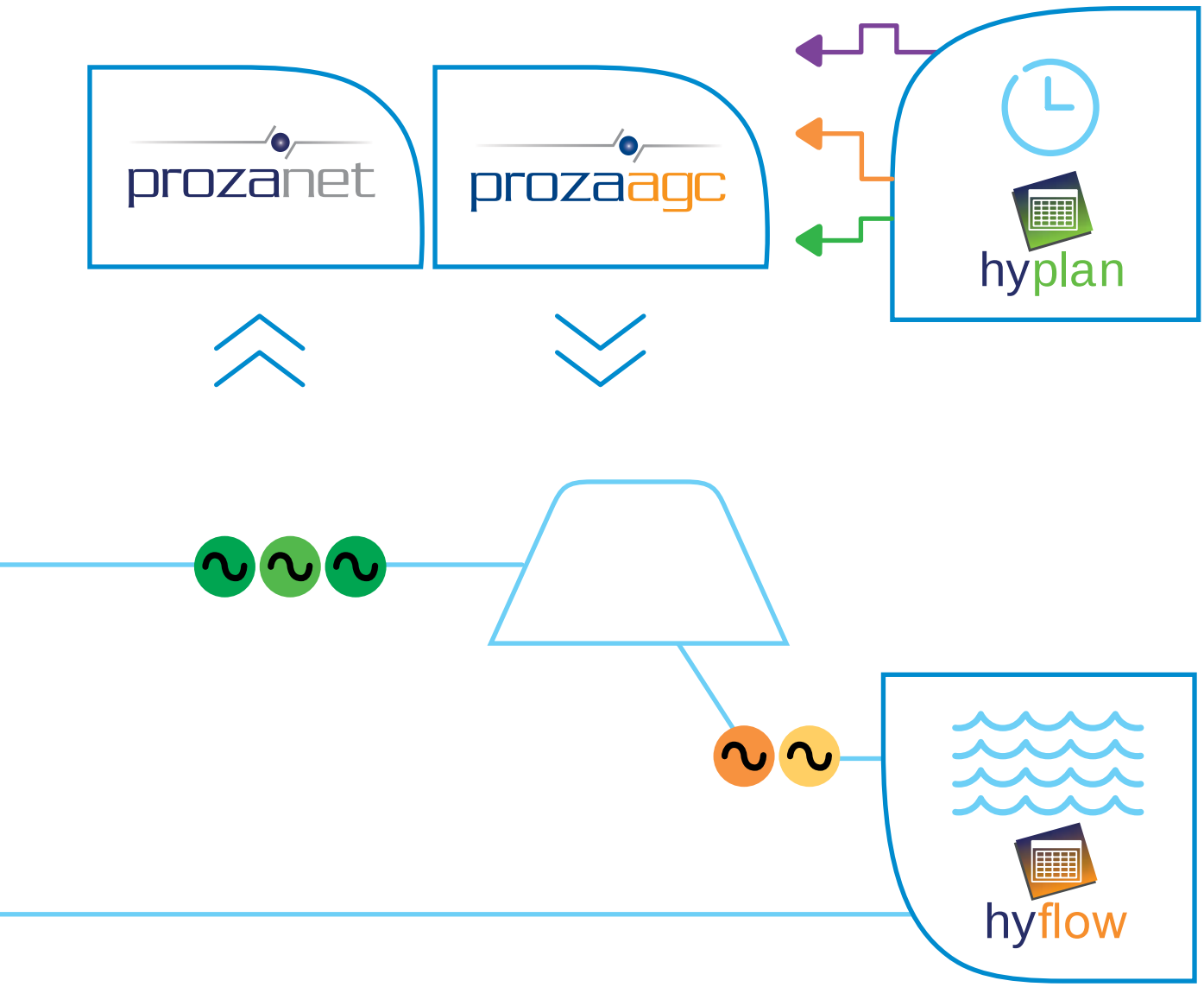
Automatic Generation Control (AGC)

- PROZA AGC system, proprietary development
- Load frequency control (LFC) for transmission system operators (TSOs)
- LFC and automatic schedule execution in generation control centres (GCCs)



PROZA AGC functionalities include:

- Input and output data pre-processing
- Control area and control block support
- Unlimited sources for input measurement
- Imbalance netting support
- PI regulation algorithm
- Priority order list for AGC unit selection
- Optimal power distribution based on AGC price



PROZA AGC with a comprehensive set of modules

06

Rail solutions

KONČAR's development, design and manufacture of rail transport equipment dates back to 1949, when the company developed the electric traction motor for trams. Since then, KONČAR has been continuously operating in the rail industry.

Today, KONČAR develops, designs, manufactures, retrofits and maintains rolling stock for railway, industrial, regional and urban-suburban transport. Our product range includes electric locomotives, electric multiple units - EMU and diesel multiple units - DMU, and trams. We also design, develop and manufacture components and subsystems for rolling stock, such as power and instrument transformers, control and communication systems, static voltage converters for main and auxiliary drives, control, switchgear, protection and signalling devices, traction and other electric motors, as well as steel structures of car bodies and bogie frames.

Low-floor train

Our solutions include

- Rail vehicles
- Components and systems for rail vehicles
- Rail infrastructure engineering
- Components and systems for rail infrastructure
- Rolling stock maintenance

Diesel-electric train

Rail vehicles

- EMU (Electric Multiple Units)
- DMU (Diesel Multiple Units)
- Trams
- Electric locomotives
- RV modernization

EMU for commuter transportation

EMU for regional transportation

Three-section low-floor tram TMK 2300LT delivered to the city of Liepāja, Latvia

Five-section low-floor tram TMK2200 delivered to the city of Zagreb, Croatia

Modernized locomotive for Croatian railways

Electronic equipment for vehicles – Control systems

- Train Control and Management Systems (TCMS)
- Energy Metering Systems (EMS) for electric rolling stock

Rolling stock converters and traction motors

- Propulsion converters for electric and diesel-electric trains, trams and locomotives
- Self-consumption inverters and battery chargers for electric and diesel-electric trains, trams, locomotives and passenger rolling stock

Traction motors

- Asynchronous squirrel-cage motors
- Rated power from 65 to 525 kW
- Rated voltage up to 1000 V
- Rated speed up to 5280 rpm for EMU train motors and 4580 rpm for tram motors
- Insulation class index 200

EMU train motor

Tram motor

Converters

KONTRAC GP550DE
propulsion and auxiliary converter for DEMUs

KONTRAC GP550AC
propulsion converter for EMUs

KONTRAC PN50AC
auxiliary converter for substations

KONTRAC GP170DC
propulsion converter for trams

KONTRAC PN90DC
auxiliary converter for multi-system trains

Rail infrastructure engineering

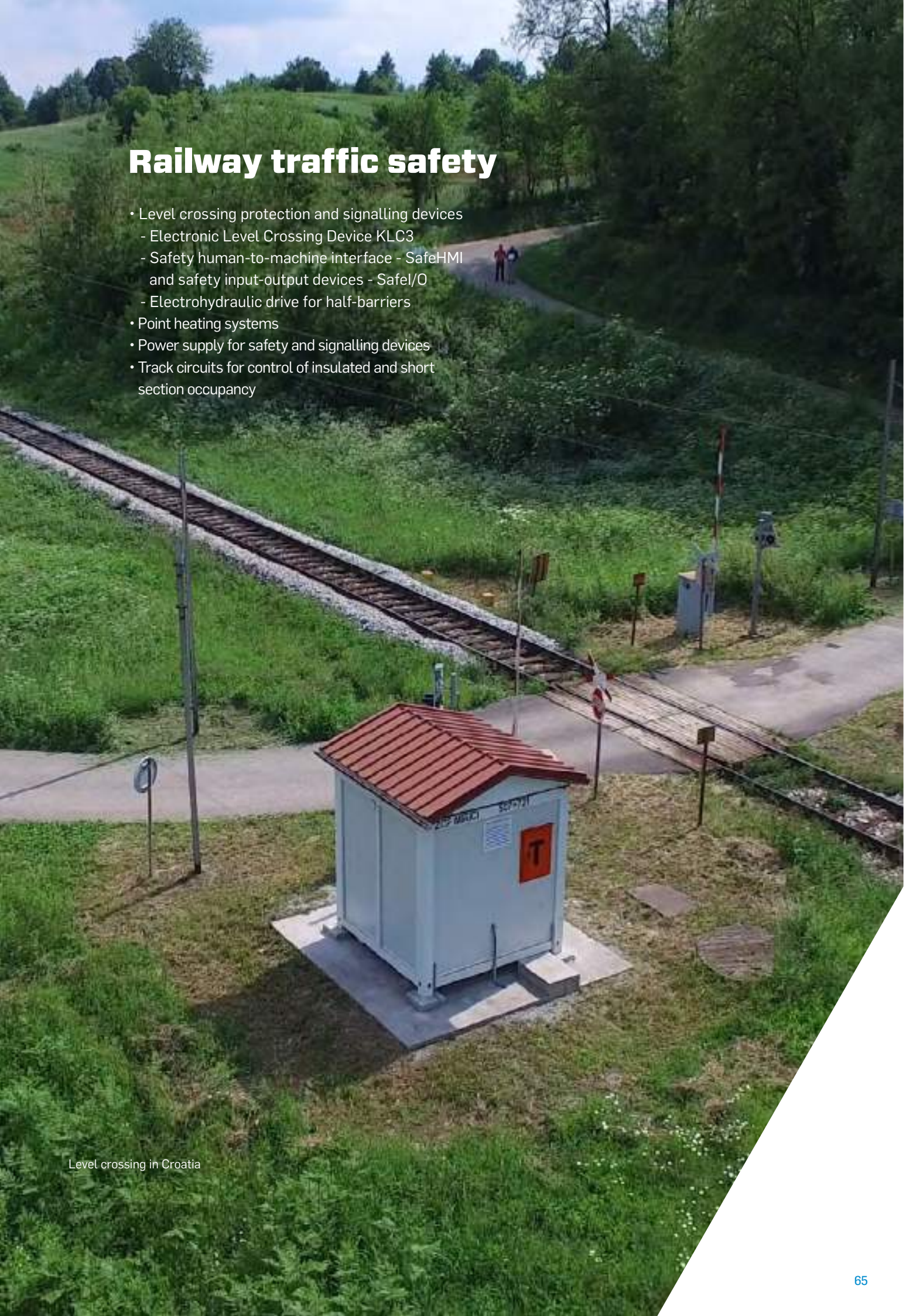
Electric traction

- Electric traction substations
- Reactive power compensation plants
- Overhead contact line sectioning plants
- Local and remote control
- Coach pre-heating and air-conditioning devices
- Rectifier stations

Electric traction substation

Railway traffic safety

- Level crossing protection and signalling devices
  - Electronic Level Crossing Device KLC3
  - Safety human-to-machine interface - SafeHMI and safety input-output devices - SafeI/O
  - Electrohydraulic drive for half-barriers
- Point heating systems
- Power supply for safety and signalling devices
- Track circuits for control of insulated and short section occupancy



Level crossing in Croatia

Components and systems for rail infrastructure

Rail infrastructure equipment

123 kV switch

Single-phase power transformer

Reactive power compensator

SCADA for remote control

Level crossing

KLC3 – KONČAR Level Crossing 3rd generation

Hydraulic half-barrier

Safety human-to-machine interface

DC traction power supply systems

- Compact DC switchgear with integrated rectifier
- Nominal voltage of 750 V, nominal busbar current up to 4000 A
- Metal-enclosed withdrawable feeder 2600 A
- Twelve-pulse diode rectifier up to 3000 A

Metal-enclosed withdrawable feeder 2600 A

Low-floor tram

07

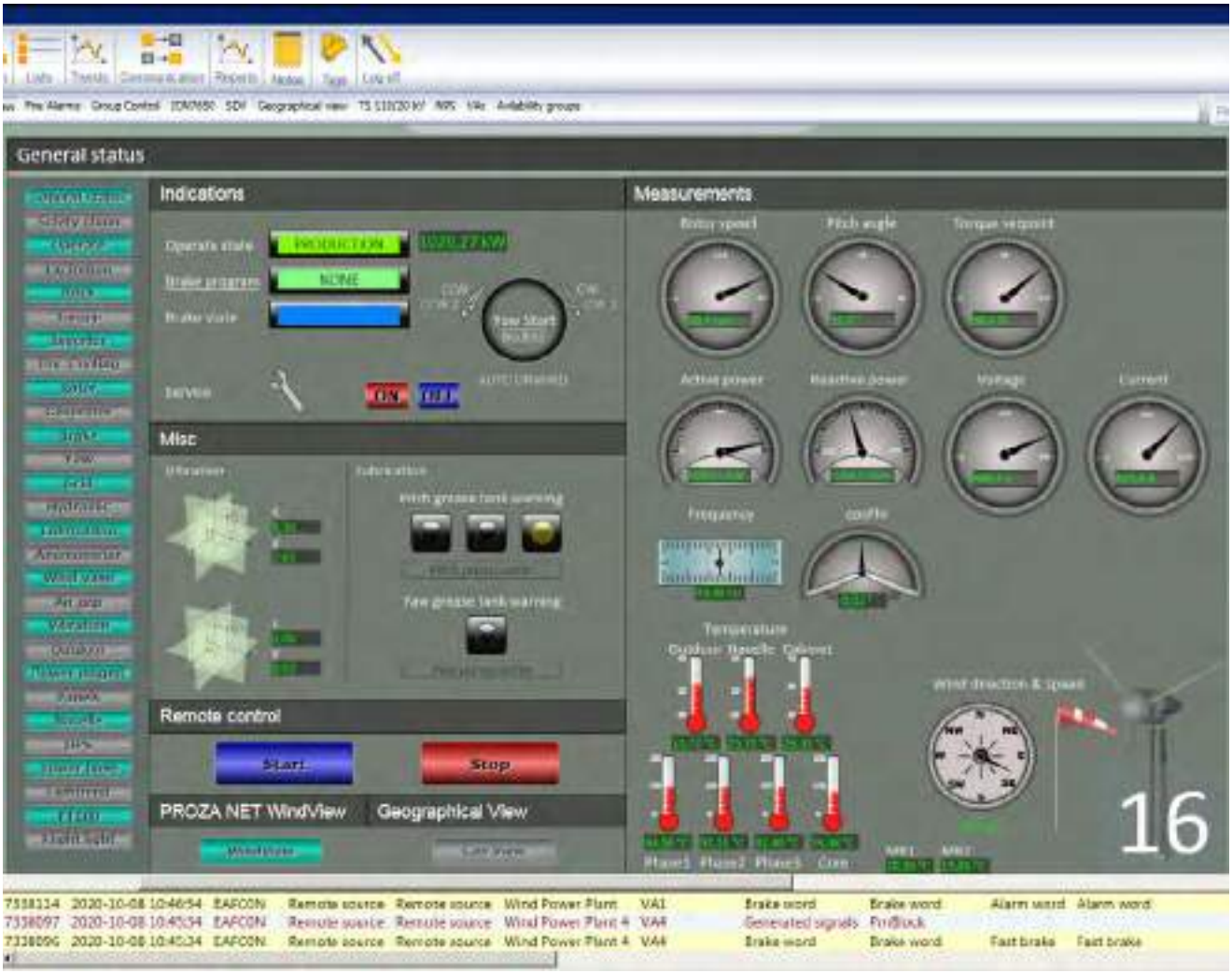
Renewables and environment

Wind power plants (WPPs)

Planning, design and maintenance

Wind turbine control system

- Modular embedded computer system
- High level of vibration and EM resistance
- Independent blade control and management
- Diagnostics and visualisation tools
- Advanced control algorithms



PROZA for WPP control, monitoring and predictive maintenance

Static frequency converter KONvert W1500 at a WPP in Croatia

Frequency converter

- Robust and compact design (high-power density)
- Fully automated control
- Remote monitoring
- Reactive power control
- Generator excitation system integrated in the converter

Wind turbine monitoring

- Independent embedded computer system
- Continuous monitoring of structure conditions by measuring vibrations, stress and electric system values
- Early detection of non-permissible and potentially dangerous conditions
- Operation analysis and optimization

Small Hydro Power Plants

Turnkey projects – electrical and mechanical equipment

- Generator and turbine
- Control, measuring, protection and remote control
- LV and MV plants
- Hydro-mechanical equipment – water intake

SHPP in Bosnia and Herzegovina

Photovoltaic Power Plants

- Turnkey projects – photovoltaic power plants
- Project contracting based on the principles of functionality and integrity

PVPP Vis, Croatia

PROZA for PVPP control, monitoring and predictive maintenance

KonSol – converter equipment in a container at a PVPP project in Croatia

Modular central inverter equipment

- Two independent parallel inverters up to 1.5 MW
- Connection to 10 or 20 kV network via a transformer and SF_6 MV switchgear
- Compact turnkey solution integrated in a container
- Remote control and monitoring
- Low transportation, installation and maintenance costs

Cubicle-integrated power converters

- High-power converters with various modes of operation
- Easy integration into smart grid solutions
- Advanced power plant monitoring

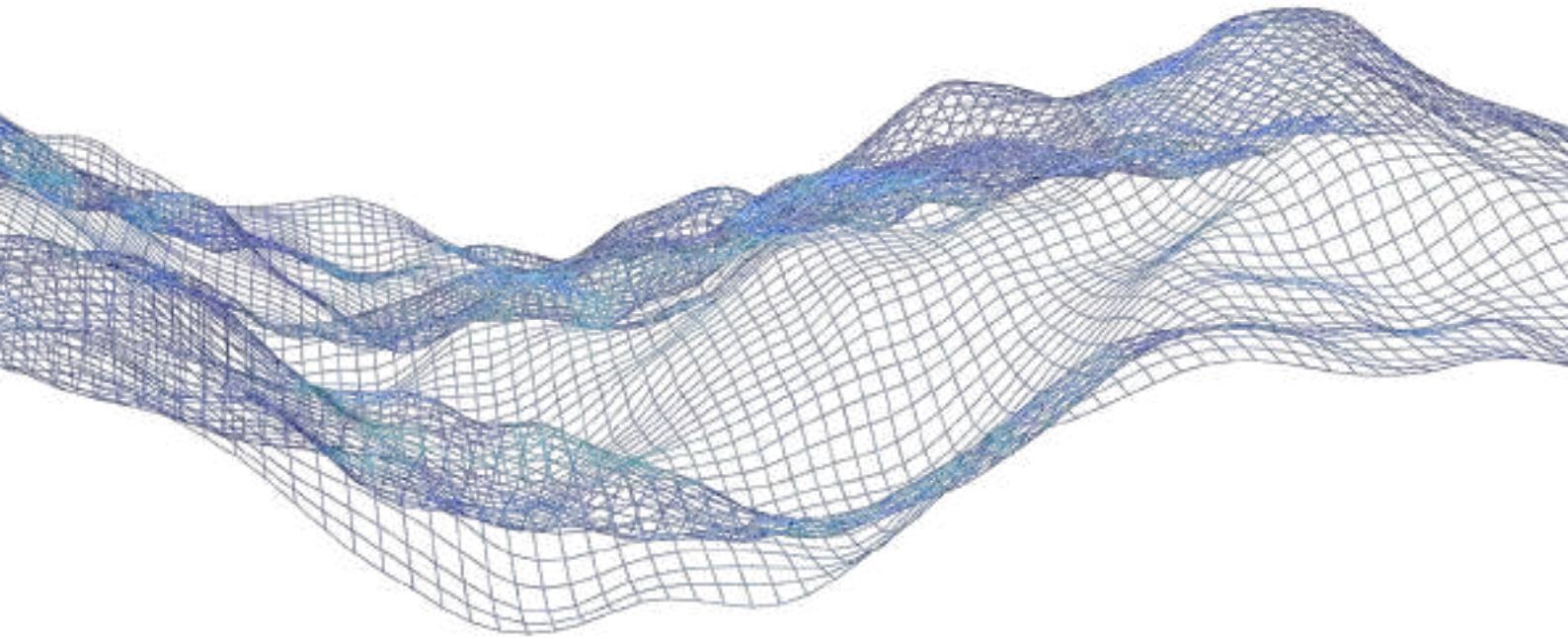
KonSol – converter equipment in a container at a PVPP project in Croatia

Power converter

Smart Environment

Electromagnetic field monitoring system

- Continuous monitoring of electromagnetic non-ionising radiation from all sources (radio, TV, telecommunications)
- Easy and intuitive web access allows local communities to monitor electromagnetic pollution
- Results facilitate dialogue and understanding between telecom operators and local communities
- Autonomous power supply through photovoltaic panels



Air quality monitoring system

- Continuous monitoring of gases and particles in the environment
- Electromagnetic field system extension within the same web platform

MEP – Electromagnetic field monitoring system

08

Laboratory Center

- Accredited in accordance with requirements of standard EN ISO/IEC 17025
- Established to help tackle global market demands
- Its operation is based on 60 years of experience, expertise, quality and efficiency
- Modern testing and metering equipment

Chemical laboratory within the Laboratory Center

The Laboratory Center consists of eight laboratories equipped and trained to carry out over 500 testing and calibration methods in accordance with requirements of international standards and technical specifications.

High-voltage laboratory

Environmental testing laboratory

It offers services in the following areas:

- High-voltage and low-voltage power equipment
- Cables
- Material properties (physical, chemical, electrical, magnetic)
- Environmental impact
- Electromagnetic compatibility
- Electrical safety
- Radio equipment
- Gas appliances
- Electromagnetic field sources
- Low-voltage electrical installations and lightning protection systems
- Acoustics (noise)
- Calibration of measuring and test equipment

Noise and vibration laboratory

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