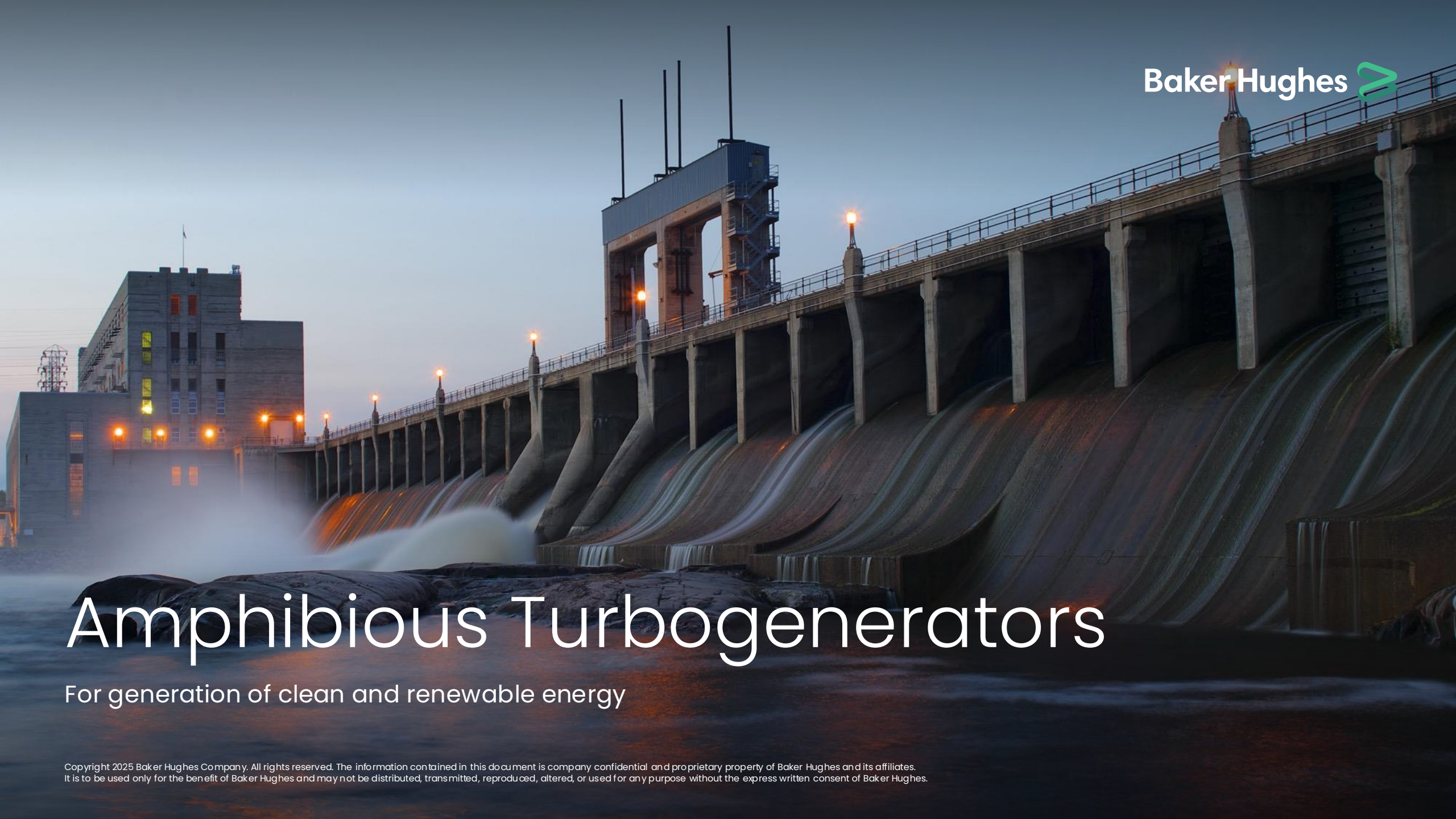

Amphibious Turbogenerators

For generation of clean and renewable energy

Concept and features

The Baker Hughes Amphibious Turbogenerator (TGA), licensed by HIGRA in the European territory, is an innovative solution for clean energy generation, contributing to a more sustainable future.

The product stands out for its efficiency and adaptability in diverse aquatic environments transforming hydraulic potentials into renewable energy. It replaces reducing valves in water distribution networks, uses waterfalls to recover energy by harnessing differences in water elevation.

The Amphibious Turbogenerator integrates an electric generator and a turbine, capable of operating both submerged and out of water.

The electric generator is wet-type and cooled by the fluid passing through the machine, which enhances performance and reliability.

The turbine is designed according to the application operating conditions, using CFD tools to optimize the geometry and achieve high efficiency.

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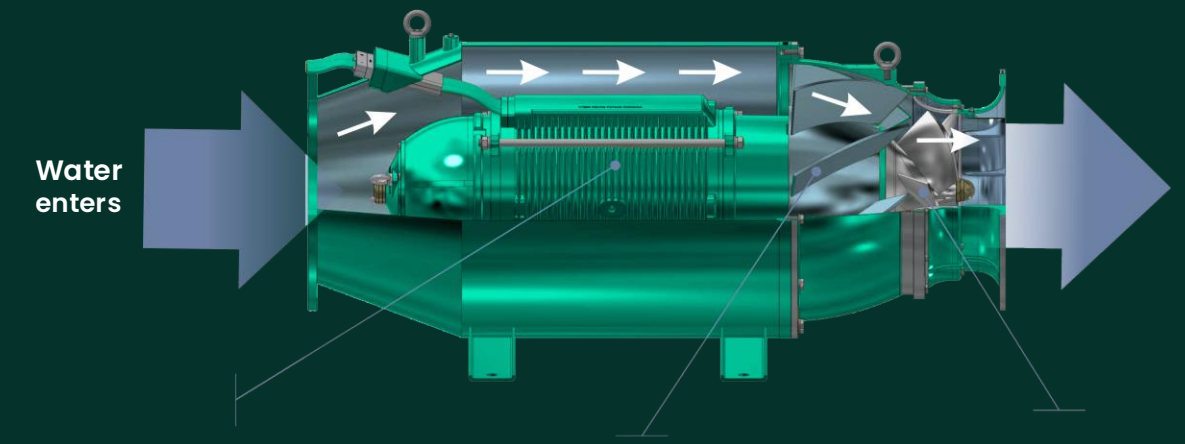


Electric generator **Distributor** **Turbine**

POWER
Up to 500 kW*

FLOW RATE
0.1 to 4.5 m³/s*

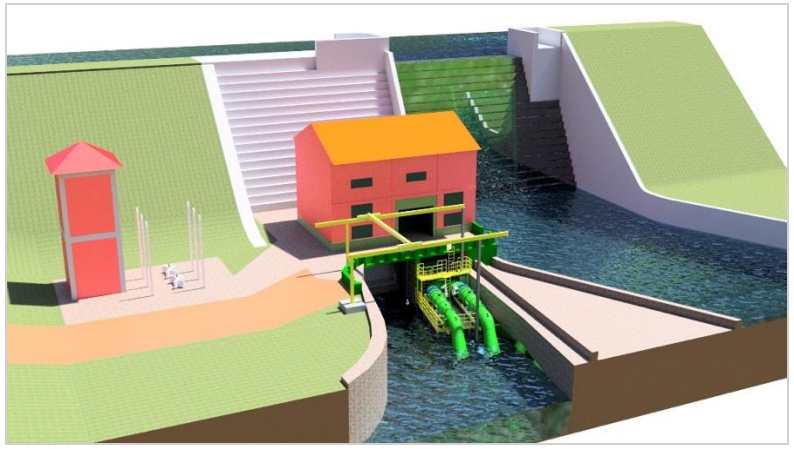
HEAD
5 to 200 m*

ON-GRID TECHNOLOGY

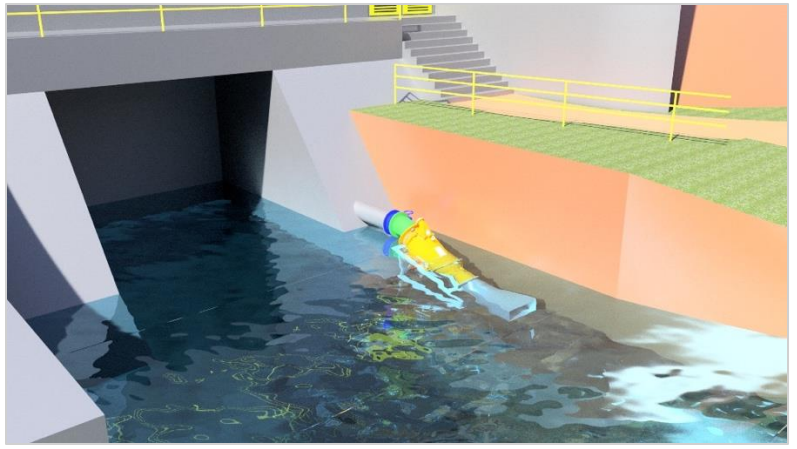
* Unit amount per Amphibious Turbogenerator, possible to reach through parallel modulation.

Hydroelectric repowering

With minimal environmental impact

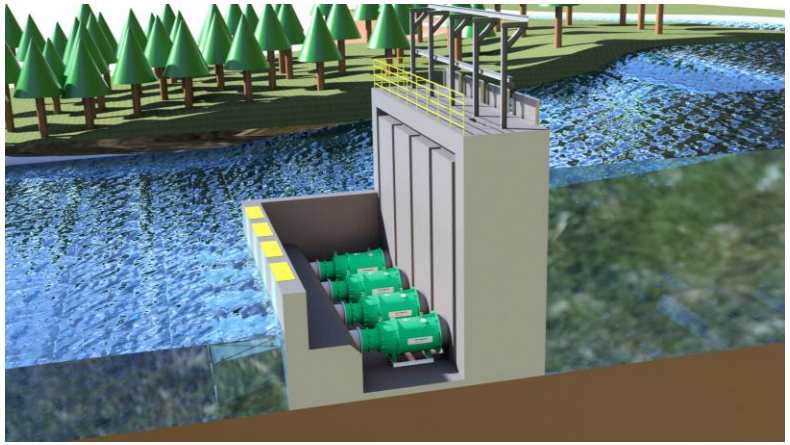


Hydro repowering



Ecological flow

Run of river



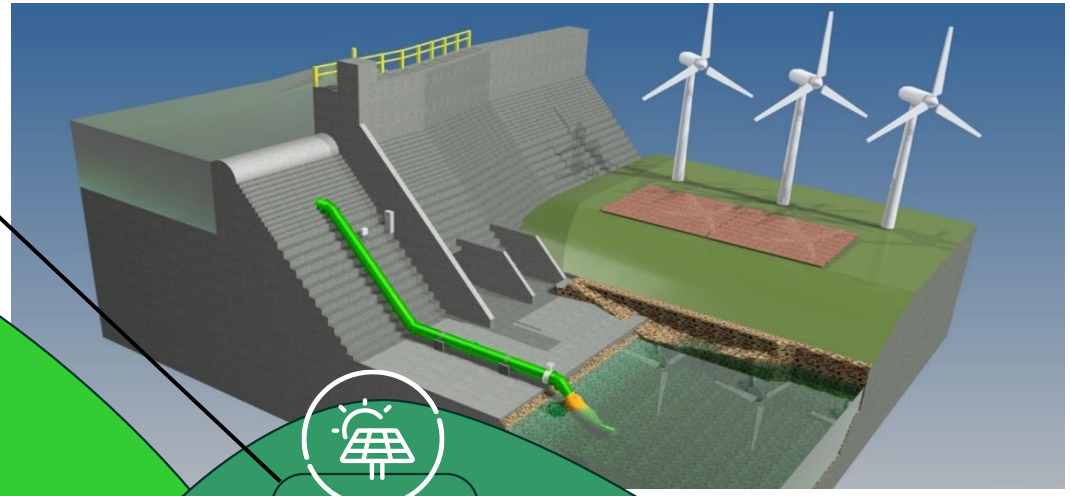
Run of river

Energy recovery from:

- Dams
- Reservoirs
- Rivers
- Waterfalls
- Water lifting

Pumped storage hydropower

With minimal installation work



The pump carries water upstream under conditions of low electricity demand

Upper reserve

Water is stored as a form of potential energy, ready to flow downstream when electricity is required

Turbogenerator generates grid-ready power

Lower reserve

Mini pumped hydro units:

- Improve flexibility and stabilization of the electrical grid
- Help reduce CO_2 emissions
- Optimize energy generation from variable renewable sources

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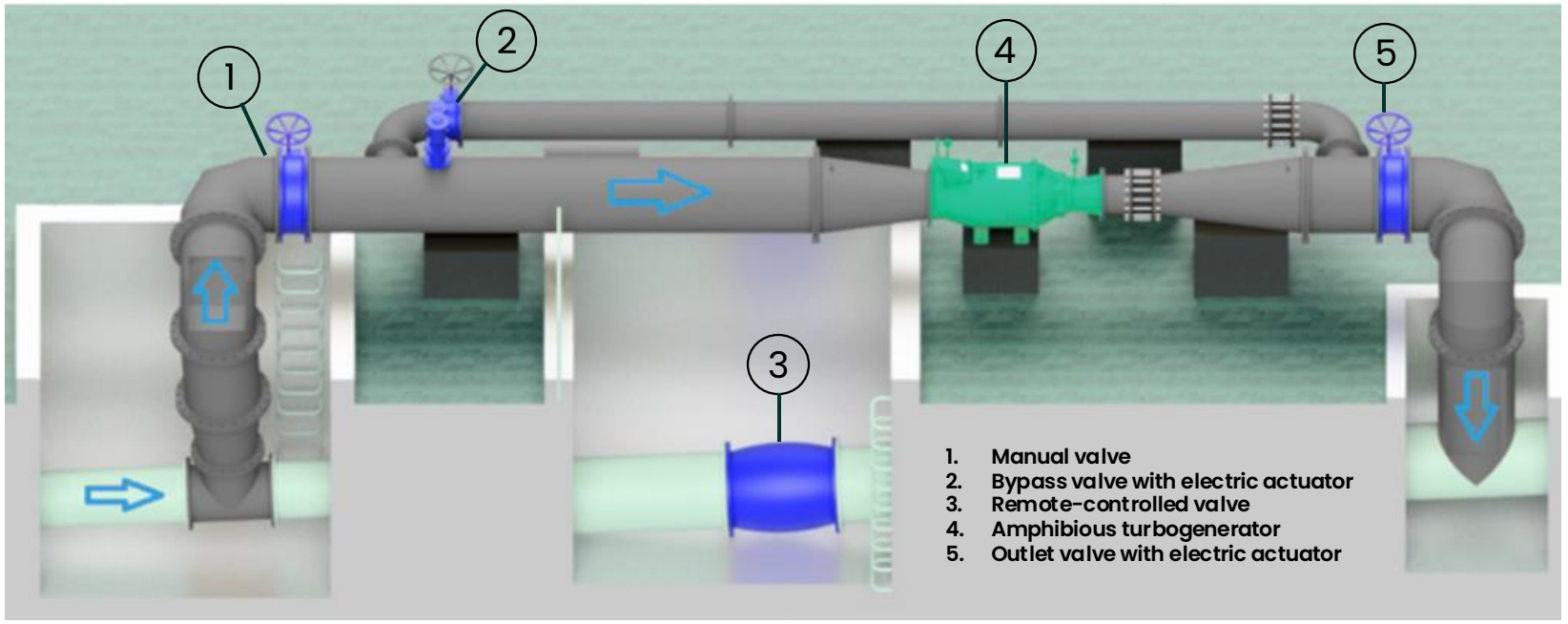
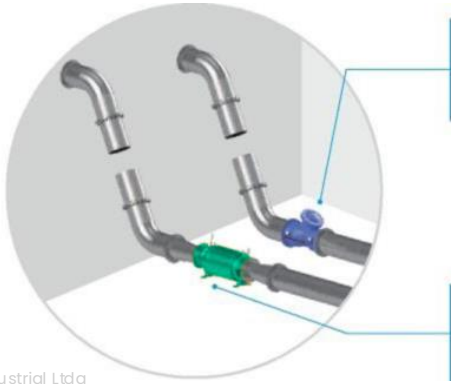
Distributed network pressure control

Enhanced water system redundancy



Replacement of pressure-reducing valves in water supply systems
Controlling the pressure required at exit and using the energy dissipated by the valves to generate electric energy.



Traditional system with pressure-reducing valve

System with turbogenerator

Turbogenerator in pressure reducing for:

- Energy recovery in water and wastewater systems
- Network greater efficiency, reliability and operational safety

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Benefits

Electric power generation
The energy that was previously dissipated as heat in pressure reducing valves is recovered and converted into electricity.

Low operating costs
The energy generated can be used to supply water system operations, reducing dependence on external energy sources.

Ease of integration
Turbogenerators can be installed in existing piping systems, working inside and out of water, in any position, leveraging the current infrastructure without the need for major changes.

Low noise
Approximately 60 dB

Simple alignment
Compact, monoblock system

Automation and remote control
The system offers automated distribution pressure control, with remote operation, which improves operational efficiency.

Reduced risks of leakage and accidents
Totally hermetic, no moving parts are exposed.

Sustainability
The implementation of this technology contributes to the reduction of CO_2 emissions, since energy generation is done in a clean way and without emission of polluting gases.

Our turbogenerator has an eco-friendly design based on mechanical and electrical systems cooled with water, and oil-free technology.

Turbogenerator operation concept is developed to meet fish-friendly regulations and to preserve fish life.

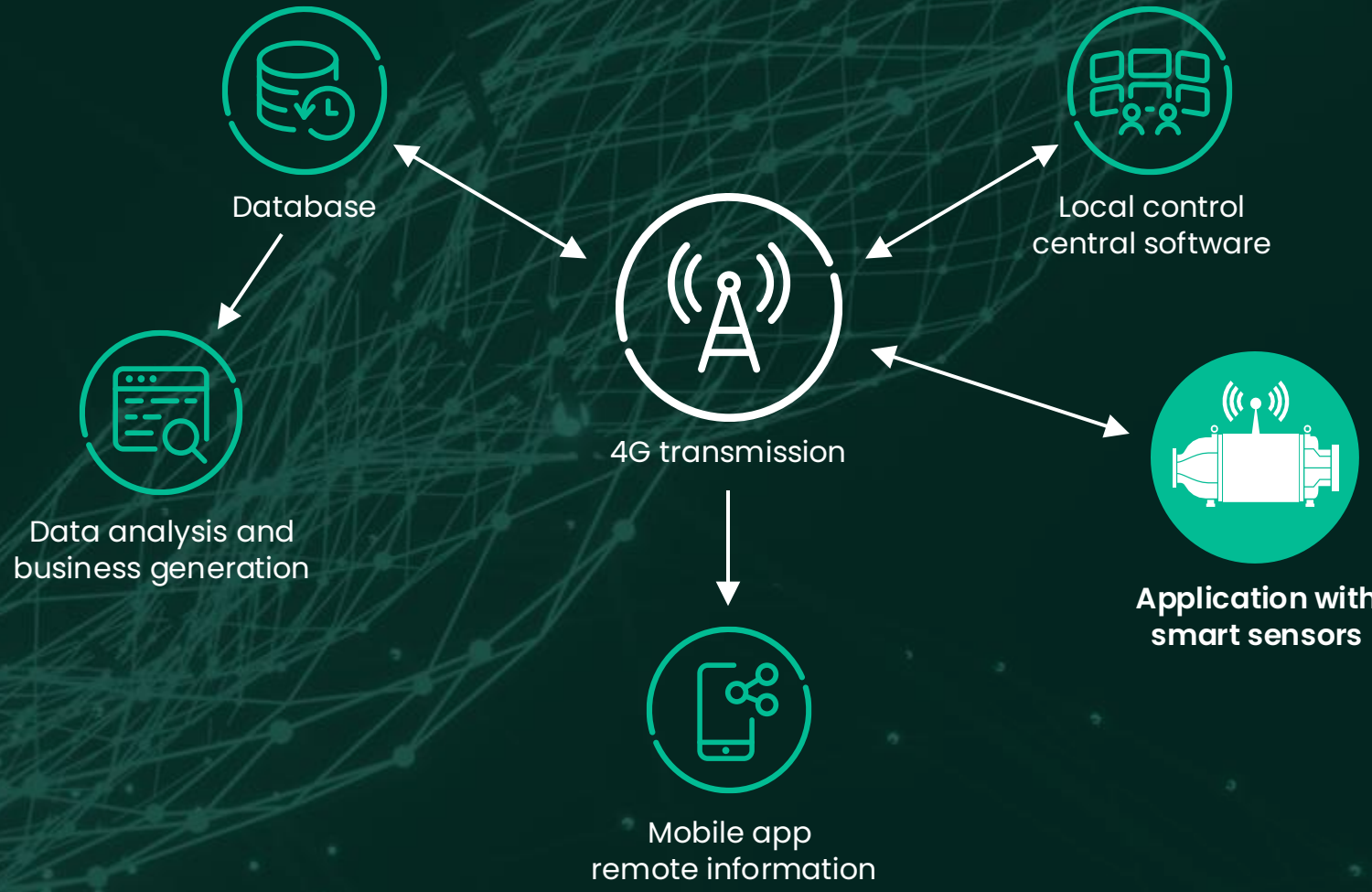
Connected to Industry 4.0

IOT (Internet of Things)

Through sensors installed on the amphibious turbogenerator and other components of the unit, it can be connected to a local control center that establishes remote connection to mobile technologies (tablets, smartphones, supervision systems, etc.), enabling remote and continuous operation and monitoring of the power generating system.

The use of a database enables thorough management of the operations and maintenance of the whole unit.

- Full remote operational management
- Full control of the system variables
- Power control management
- Data management for preventive and predictive maintenance



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bakerhughes.com/amphibious-turbogenerators