



PERGA TURBOGENERATOR

*An innovative solution to
improve energy efficiency in
water systems*

*The cheapest renewable
energy (LCOE)*



Our company

PERGA INGENIEROS, S.L. is a family-owned company founded in 2003 dedicated to the installation, exploitation and maintenance of electrohydraulic equipment.



- Company founded by **José María Pérez**, who was an engineer with more than 40 years of experience in relation to hydraulic and electrical installations, and in the field of teaching (UPM)
- With own resources dedicated to research, and after 8 years of tests, PERGA INGENIEROS developed in **2010** the **first prototype of PERGA Turbogenerator**.
- PERGA has a **7.000 m² Energy Research Center** in Totana (Murcia, Spain).
- Beneficiary in 2015 of a grant by the MINECO (Spanish Ministry of Economy and Finance) within the framework of the instrument Horizonte PYME.
- ISO 9001:2015 Design, production, assembly y maintenance of power systems through the use of Turbogenerators
- Distribución agreement with PAM Saint Gobain (2017)

PERGA Turbogenerator



It's a hydraulic microturbine connected to a submersible electric generator mounted inside a flanged steel pipe

- **100% renewable energy**
- **Proven technology** (on the market since 2011), with 18 units installed in Spain, Andorra and France.
- **Spanish and European PATENT since 2014 P11382256.3, and worldwide since 2017 PCT/ES2017/070116**
- **Suitable for use with drinking water (certified by ACS).**
- **Null environmental impact and absence of noise and vibrations.**



PERGA Turbogenerator



- Reaction **TURBINE**, axial type, built in bronze or stainless steel
- Submersible IP68 three-phase asynchronous **GENERATOR**
- Direct **COUPLING** turbine-generator, without gear boxes, through a stainless steel shaft.
- **METAL CASING** with a shape of flanged pipe, built in carbon steel

PERGA Turbogenerator

- PERGA Turbogenerators **are specifically designed** for each point
- The following table shows the range of values of the hydraulic parameters suitable for the application of PERGA Turbogenerators:

	Diameter	Flow	Net head	Power
Minimum value	50 mm	5 l/s	20 m	1 kW
Maximum value	600 mm	600 l/s (*)	250 m (**)	350 kW (*)

(*)

For greater values, several PERGA Turbogenerators can be installed in parallel

(**)

For greater values, several PERGA Turbogenerators can be installed in series

Opportunities

- **PERGA Turbogenerator** makes technically and economically possible small hydro potential points (1 kW – 350 kW) which until now were discarded, especially in water supply and distribution systems.
- Water companies, because of their processes, are high energy consumers. PERGA Turbogenerators **harnesses the currently dissipated energy, reducing energy consumption (and costs)** of the customer and **increasing efficiency** in their processes.
- PERGA Turbogenerator promotes **distributed generation, Smart Cities concept and rural electrification**.



- Reduced or even null civil works costs
- Ease assembly and high reliability
- Wide range of applications
- Low generation costs (LCOE)

Advantages of PERGA TG

- **High efficiency , with a maximum value of 70% (hydraulic and electrical)**
- **Operation with free flow downstream the Turbogenerator or with high backpressure (25 bar maximum)**
- **Submersible generator (IP68)**
 - **Optimum cooling of the generator,** operating with temperatures around 25 °C in the generator winding → Generator lifetime becomes longer
 - **It removes the need to install cooling and ventilation equipment,** reducing maintenance of the facility and its consumption
 - It eliminates the risk of installing in **places where there is an elevate risk of floods,** such as underground chambers



Advantages of PERGA TG

- PERGA Turbogenerator is maintenance free
- Axial design:
 - Casing of the machine is a piece of carbon steel pipe with flanges → **Less voluminous** → **Minimum civil works**
 - **Vibration-free**
 - **Quick and easy mounting:** place the Turbogenerator in the planned location, screw the connection flanges and connect cables
 - PERGA Turbogenerator will be installed with supports, **it doesn't require anchoring which reduces mounting costs.**
 - **Adaptability:** it can be installed in the **horizontal, vertical or tilted position**



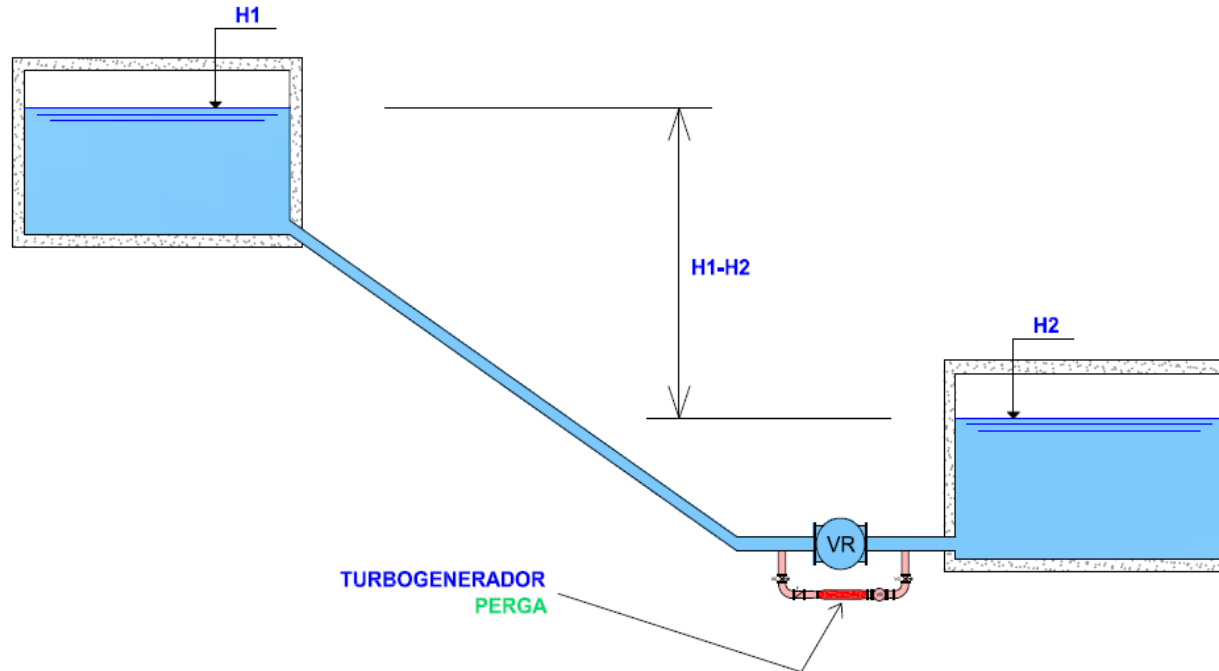
Advantages of PERGA TG

- It doesn't require oil or lubricants
- Control system is managed by PLC, it is **not** needed personnel permanent assigned
- High profitability and reduced generation costs (LCOE) and pay-back
- Innovative, patented and proven technology: it may benefit from a grant
- Null environmental impact: null or reduced civil works, without visual impact and absence of noise and vibration



Potential applications

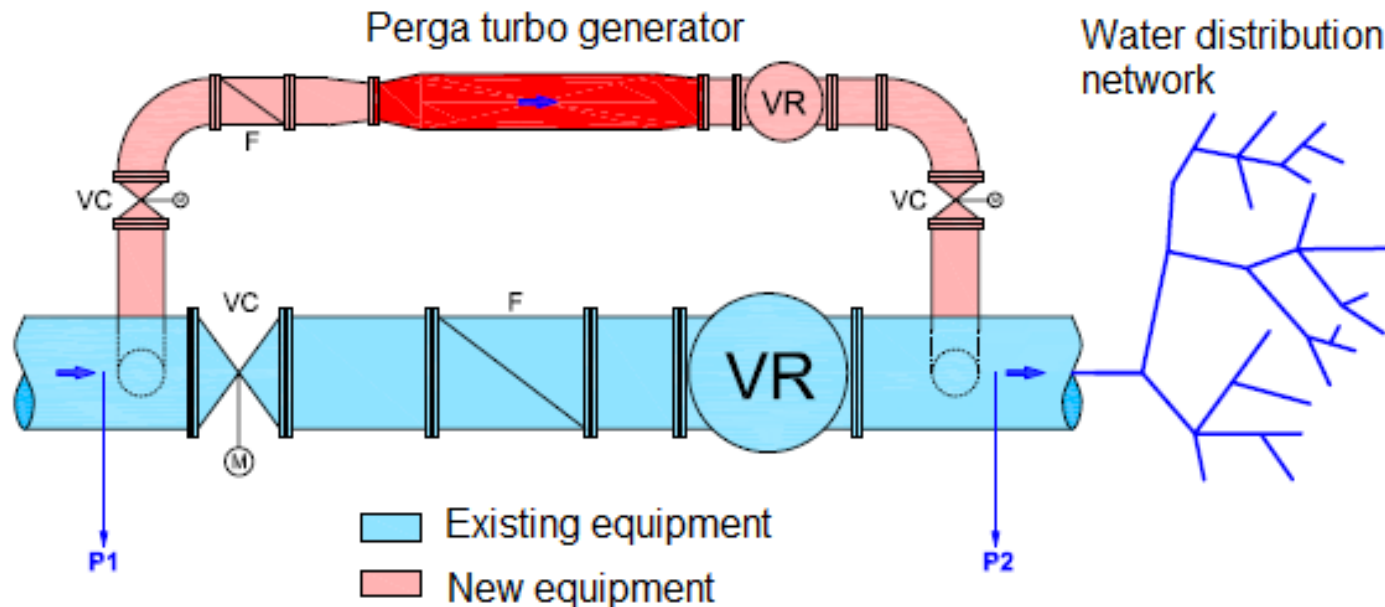
Entrance to water deposits



- Flow reducing valves: regulate flow entering the deposit, dissipating energy
- **PERGA Turbogenerator presents minimal civil works and occupies a reduced space in the installation.**

Potential applications

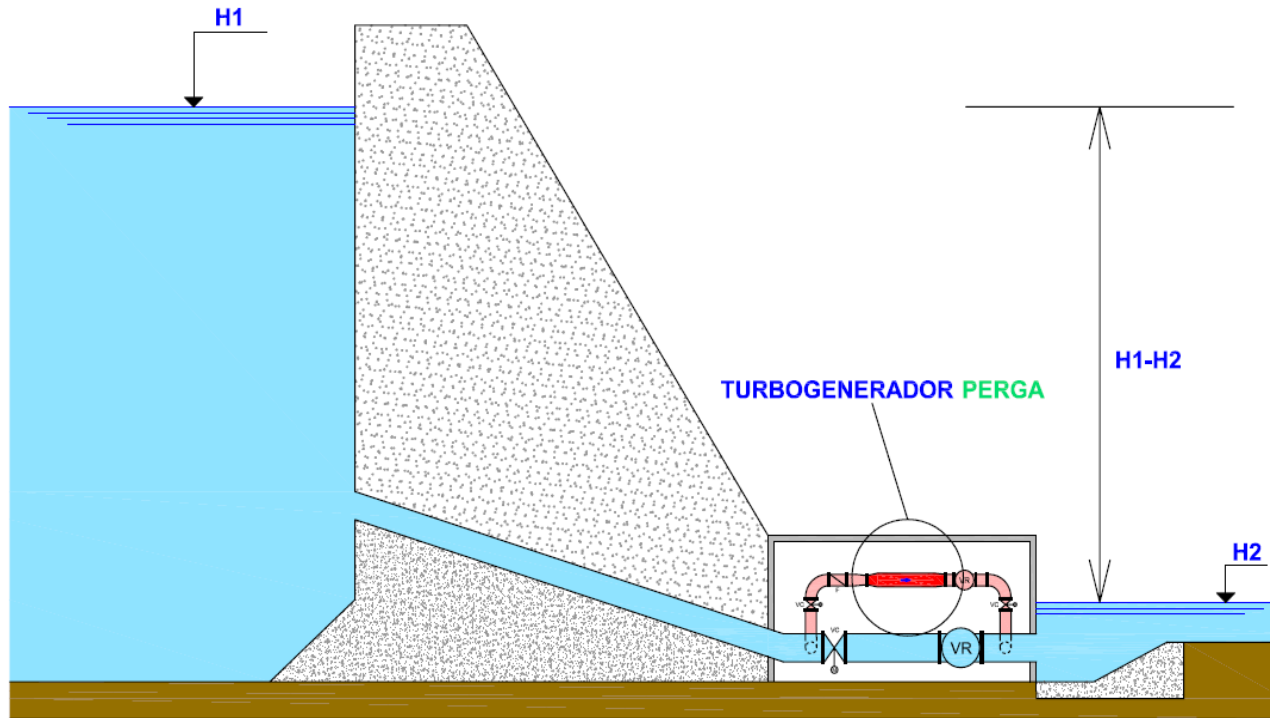
Water distribution networks-in parallel to regulatory valves



- Pressure reducing valves: regulate the necessary pressure downstream (typically 5 to 6 bars), dissipating energy.
- PERGA turbogenerator can operate with high backpressure**, therefore it is suitable for this application.

Potential applications

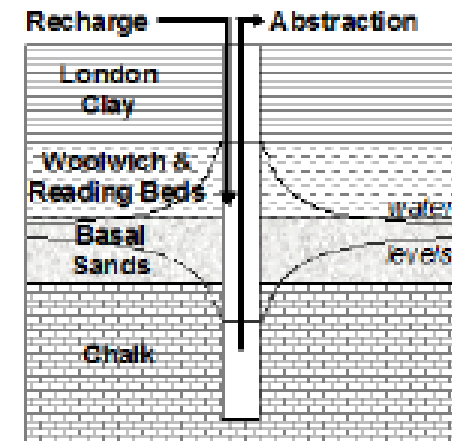
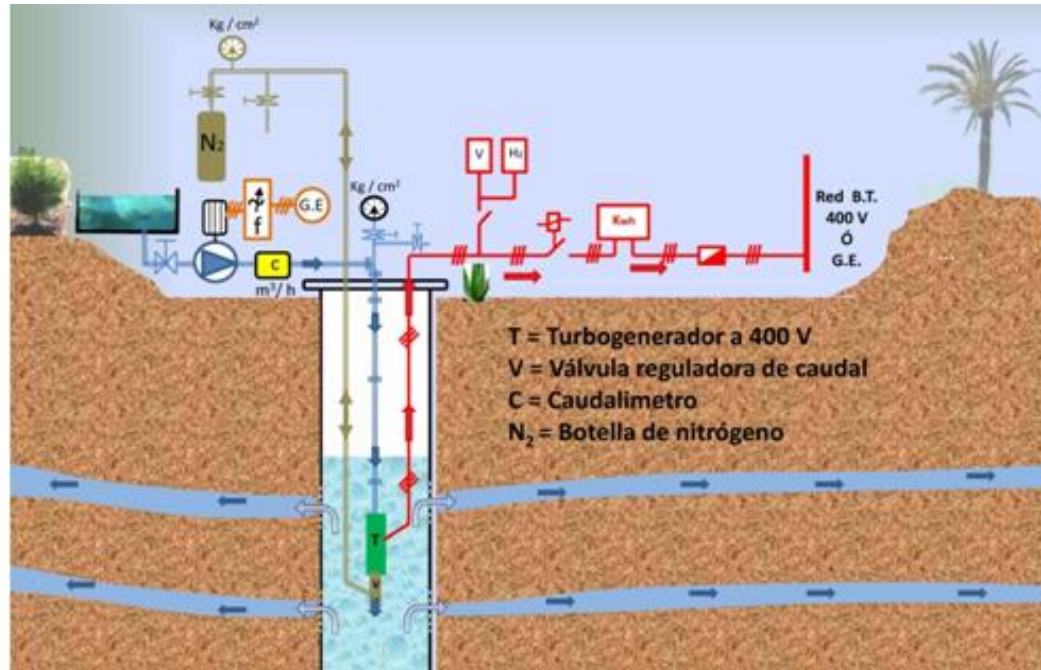
To maintain environmental flows



- Environmental flow: water to sustain the ecosystem downstream.
- PERGA Turbogenerator minimal civil works and range of flows **makes technically and economically feasible its installation** in these location points.

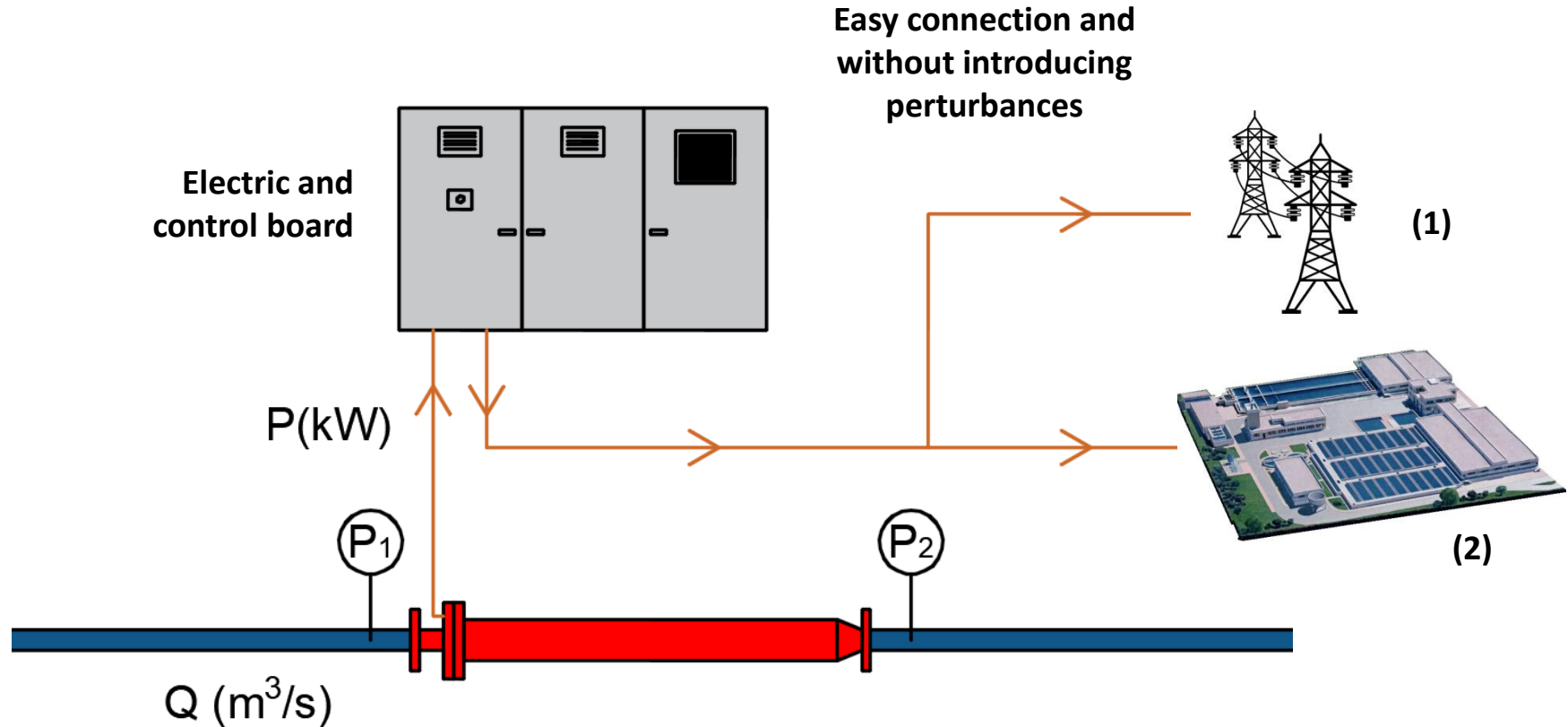
Potential applications

In managed aquifer recharge



- Groundwater pumping system: over exploited aquifer.
- Managed aquifer recharge plans: water is injected into the aquifer (the reverse situation to pumping groundwater), with the objective of storing excess water and recovering the depleted aquifer
- PERGA Turbogenerator would make use of the hydro electric potential that occurs during the recharge.

General scheme

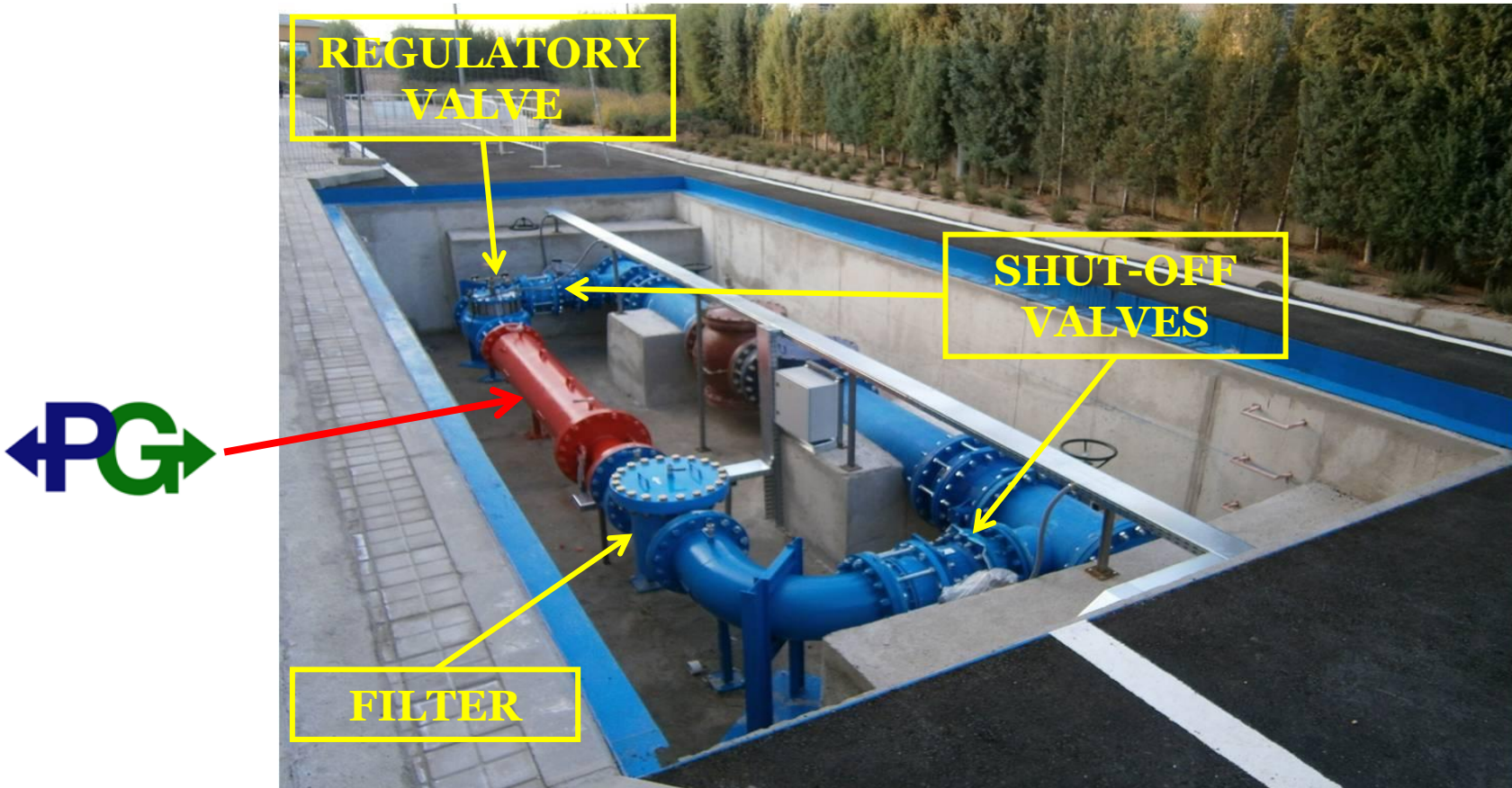


$H = P_1 - P_2$ (unused energy in the PRVs) [mca]

$$P = 9,81 \times Q \times H \times \eta$$

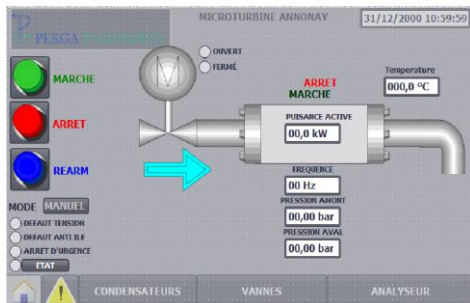
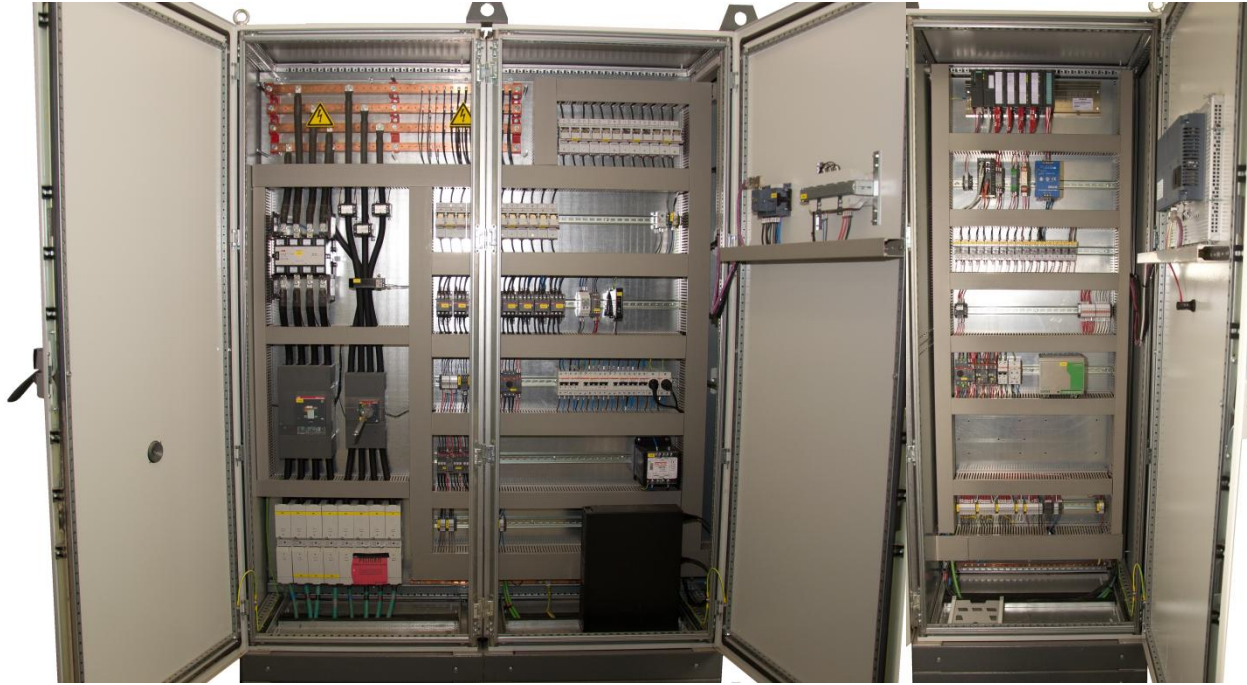
- (1) **Sale of energy to the network:** Economic benefit and energy efficiency
- (2) **Selfconsumption in the own facility:** Economic savings and energy efficiency

Typical hydraulic installation



Parallel or bypass installation to the existing hydraulic facility, so in case of any contingency, water supply will be restored through the existing installation

Electric and control board



View of the inside of the **electric** (equipped with protective relays, circuit breaker, contactor, net analyzer and capacitor bank) **and control board** (PLC, UPS, etc.) associated with each PERGA Turbogenerator. This element is included in the supply to be made by PERGA.

Current installations

Installation with excellent results in Canal de Isabel II, S.A.

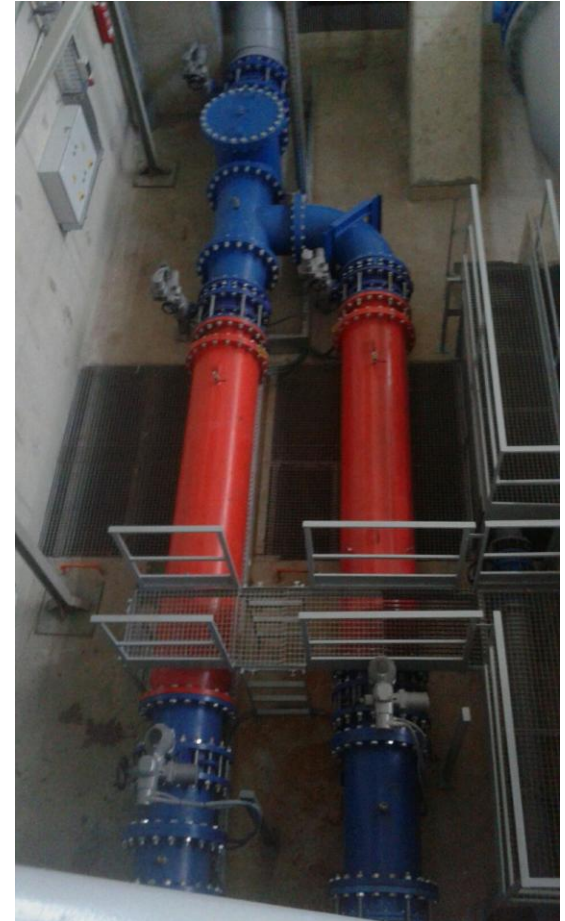
- Installation of 200 kW in 2012. Excellent operating results.
- Increased installed power to a total of 770 kW in 2014
- Increased installed power to a total of 1125 kW in 2017

Other customers:

- Consejo Insular de Aguas de Gran Canaria
- Mancomunidad de Canales del Taibilla
- Diputación de Jaén
- Comú D'Andorra Vella
- Hydrowatt (Annonay-Francia)
- Société Canal Provence (SCP) (Marsella-Francia)
- Txinzer
- Eau Service Haute Durance

Executed installations:

<http://www.cieperga.com/instalaciones.php?idsubmenu=1>



Available tools

- The **INSTITUTO DE CRÉDITO OFICIAL (ICO)** provides the customer of PERGA the **INTERNATIONALISATION FOR THE COMPANY FUND (FIEM)**, with extremely favourable conditions (ten years loan with an interest rate lower than 2%).
- As this is a new and innovative product, any project equipped with PERGA Turbogenerators is susceptible of being partially subsidized with aid proceeding from public bodies.



Experiencie and awards

- Prestigious customers



- Excellent references
- Honorable Mention in the Activity Category in the 1st Edition (2016) of the Energy Excellence Award of the **MUI awards**, granted by the General Directorate of Energy and Industrial and Mining Activity of the Region of Murcia
- Recognition of the technical novelty at the SMAGUA 2017



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A photograph of an industrial facility, likely a water treatment plant, featuring large concrete structures, metal walkways, and several large pipes. Two prominent white pipes with blue flanges run parallel in the center. Red pipes are visible on the sides. The scene is viewed from an elevated position looking down into the facility.

***THANK YOU
FOR YOUR ATTENTION***

PERGA INGENIEROS, S.L.