CORPORATE PRESENTATION

TECNOTURBINES

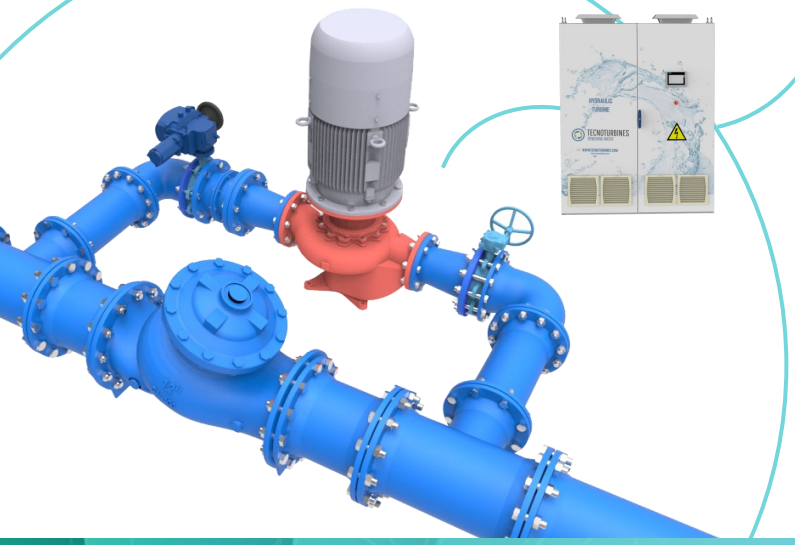
POWERING WATER

Turbines specially designed to recover energy under variable hydraulic conditions from water distribution networks, hydro power plants and industries.

OUR EXPERTISE

Hydraulic micro-turbines, specially designed **to generate electricity** under variable hydraulic conditions, using the **excess of pressure** present in the water pipes.

Grid tied



Battery charging

WHAT DO WE OFFER?

Energy costs reduction

Water distribution companies are facing an increase in energy demand and cost (5% - 30% yearly). Using their already existing hydraulic resources they can reduce their energy bill.

Excess of pressure reduction in water pipes

The overpressure at water distribution lines is cause of large expenditures on O&M and water loses of about 10% - 30%. Our turbines recover energy ONLY from the excess of pressure.

Energy supply at remote sites

Providing energy to remote facilities (reservoirs, water treatment plants, etc) or devices such as dataloggers for monitoring the water network where the access to the grid requires of large investments or diesel generator or battery periodic replacements.

OUR PATENTED TECHNOLOGY

Based on the Regenerative Breaking Technology, same technology F1 cars use on the KERS system, our turbines reverses the way turbines have typically be controlled.

Standard control turbine is based in mechanical manipulation of turbine & external elements (runners & impeller angles, floodgate, valves, etc.) in order to fix the impeller speed, so the generator keeps synchronized with the grid.

Tecnoturbines technology, electronically modifies the speed of the turbine to the point at which generates the maximum energy possible under the given hydro conditions, then feeds into the grid the generated energy with the required parameter of the grid operator.

PATENTED

F1 recovers energy,
from the moving Vehicle's kinetic energy,
under braking.

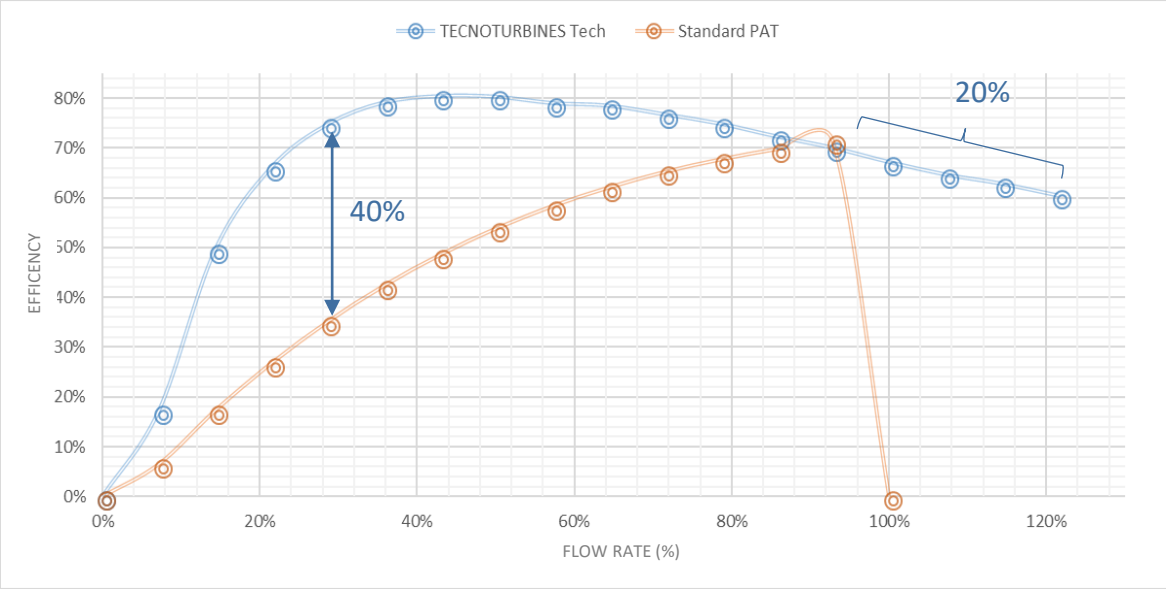
Tecnoturbines recovers energy, from the moving Hydraulic kinetic energy, in water.

OUR PATENTED TECHNOLOGY

Pumps as Turbines (PAT) under variable hydraulic conditions.

Tecnoturbines has developed a patented technology that allows reducing civil work costs up to 85%, increases energy generation up to 40% compared to traditional PAT and extends the working range up to 20%.

Tecnoturbines has developed a **patented technology** to generate energy under variations of head and flow, to offer a solution to the limitations of the pumps as turbines. The energy can be either fed into the power grid or supply energy to remote locations.



OUR PATENTED TECHNOLOGY

ADVANTAGES

1. Energy generation under hydraulic variable conditions

Allows and absorbs variability of head and flow typically present in water distribution networks, meaning that the turbines keep generating energy regardless of the hydraulic conditions.

2. Efficiency increased up to 80%

Our system we can take the pumps as turbines to their most optimal working point at every time, reaching a total efficiency of between 70% and 80% for more than half of the working range. This system also increases the nominal working range by 20% compared to the conventional PAT, which implies more energy production for the same installation.

3. Higher energy production

The output will result in higher energy generation, since from adv. 1 we can generate for longer periods and recover the full hydraulic availability and from adv.2 we generate more energy than standard PaT's for the same given hydro conditions.

OUR PATENTED TECHNOLOGY

The United States of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Michelle K. Lee

Director of the United States Patent and Trademark Office

Europäisches Patentamt
European Patent Office
Office européen des brevets

URKUNDE

Es wird hiermit bescheinigt, dass für die in der Patentschrift beschriebene Erfindung ein europäisches Patent für die in der Patentschrift bezeichneten Vertragsstaaten erteilt worden ist.

CERTIFICATE

It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.

CERTIFICAT

Il est certifié qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule de brevet.

Europäisches Patent Nr. | European patent No. | Brevet européen nº

2725444

Patentinhaber | Proprietor of the patent | Titulaire du brevet

TECNOTURBINES S.L.
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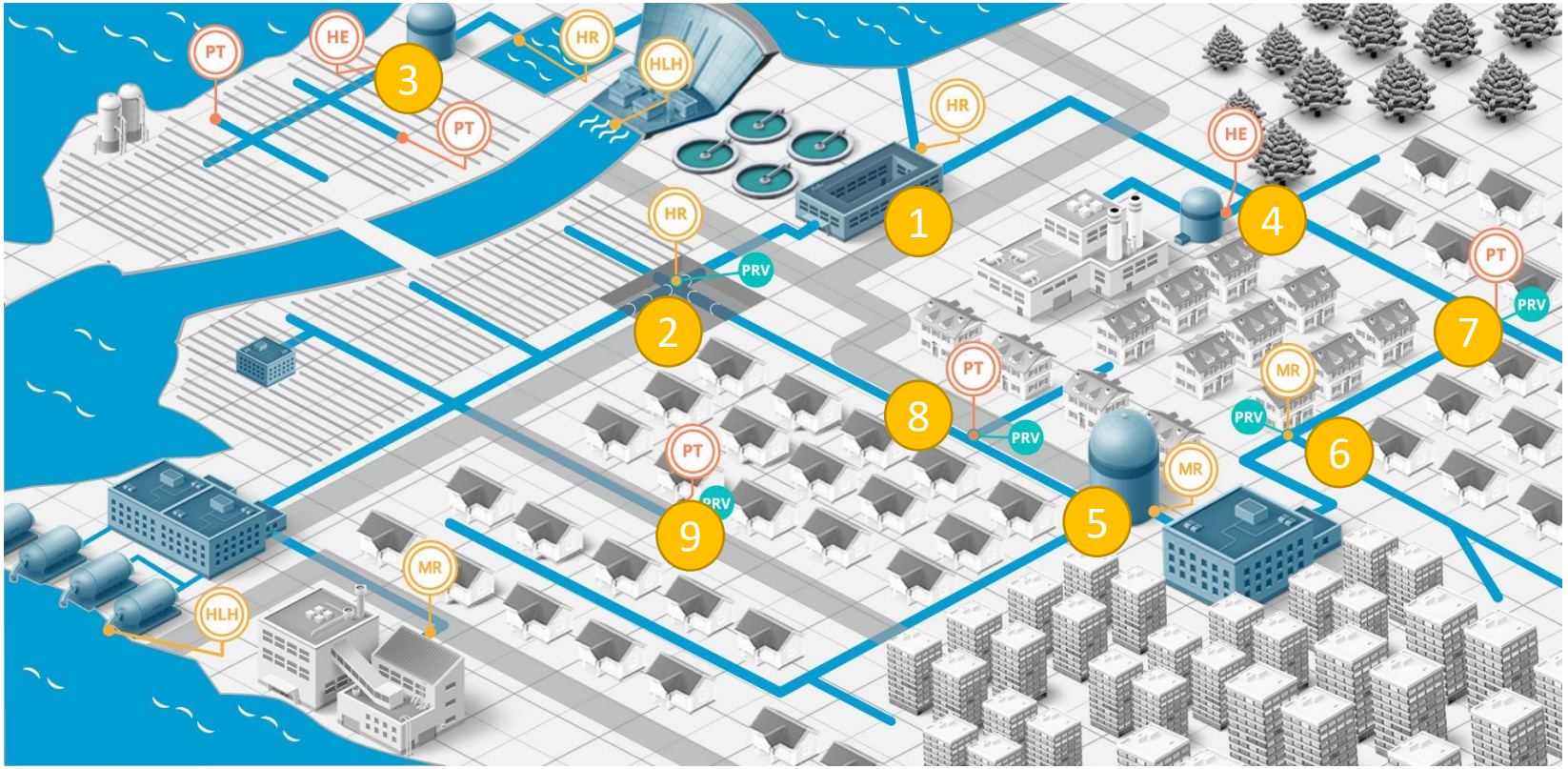
03179 Formentera del Segura/ES

TYPICAL LOCATIONS FOR TURBINES



GRID TIED TURBINES

MR TURBINA MICRO REGEN

HR TURBINA HYDRO REGEN

BATTERY CHARGING

PT PICOTURBINA

HE TURBINA HE

TYPICAL LOCATIONS FOR TURBINES

1

Water Treatment Plant – In line installation
The gross water comes to the plant to be treated before suppling to the city.
The pressure is typically killed in a storage tank.
Typical power range in these sites: **100kW to 500kW**

2

Main PRV for distribution in the city. – By pass installation
After the water treatment plant, water is distributed in the city. Depending on the size of the city, one to several main lines supply water downstream.
Typical power range in these sites: **50kW to 200kW**

3 4

Water Tank away from the city. – In line installation
Some water tanks are away from the city and electric grid connection. Electrification is needed for operation. Battery Charging turbine can supply that energy.
Typical power range in these sites: **500W to 5kW**

5

Water Tanks in the city. – In line installation
Water distribution tanks are used to stabilize pressure and demand in the city. The pressure is typically killed in a storage tank.
Typical power range in these sites: **5kW to 50kW**

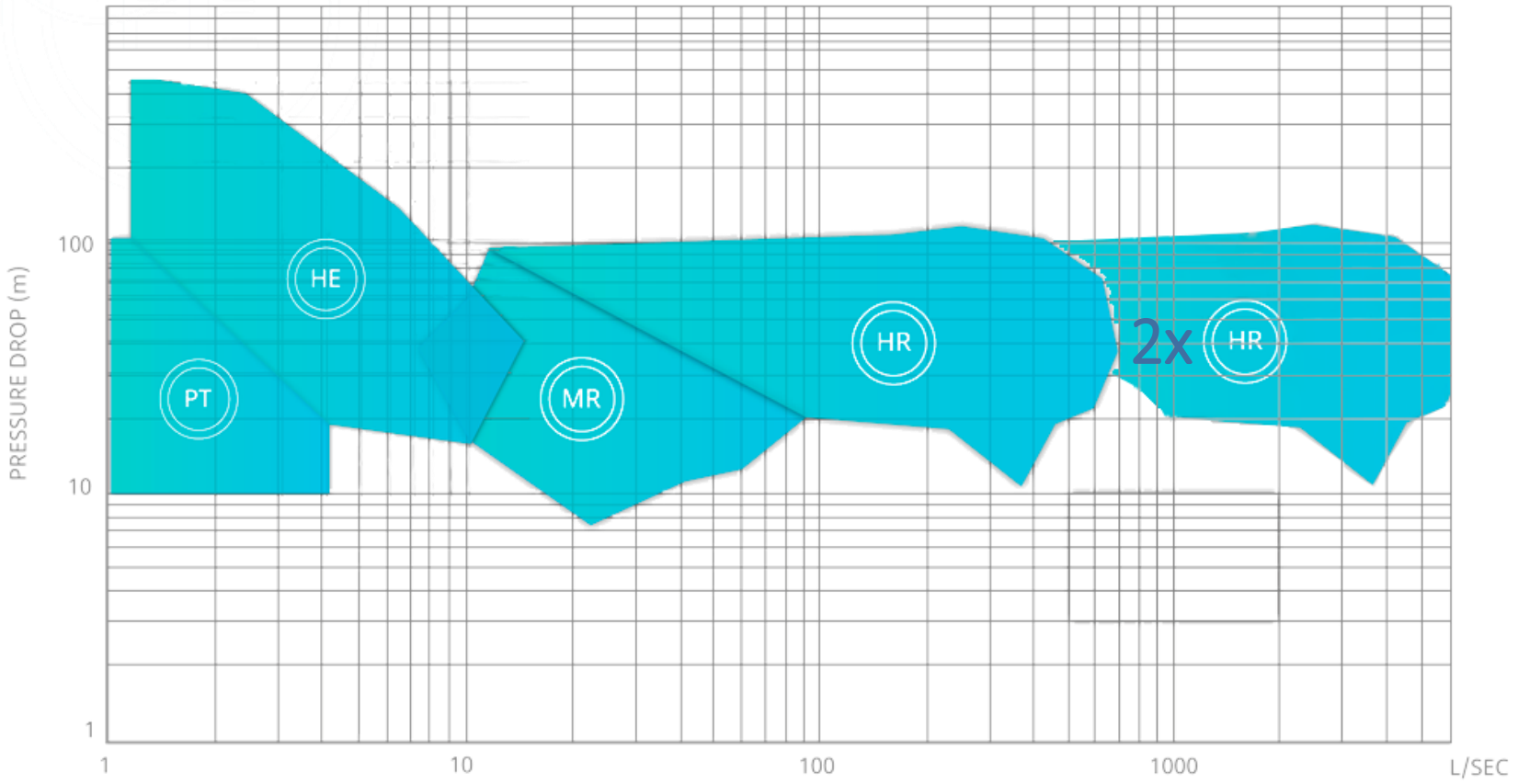
6

PRVs in the city – Grid Connection – By pass installation
Secondary distribution lines, might require of pressure reduction. PRV are installed.
Typical power range in these sites: **5kW to 50kW**

7 8 9

PRVs in the city – Off Grid – By Pass Installation
Secondary distribution lines, might require of pressure reduction. PRV are installed and monitoring of the status of the sit is needed (Flow, Pin, Pout, etc.). Usually the utility installs dataloggers powered by batteries requiring replacement every 1 – 4 months.
A Picoturbine solves this problem. Power of a Picoturbine: **25W**

OUR PRODUCTS



PT Picoturbine

HE HE Turbine

MR Micro Regen

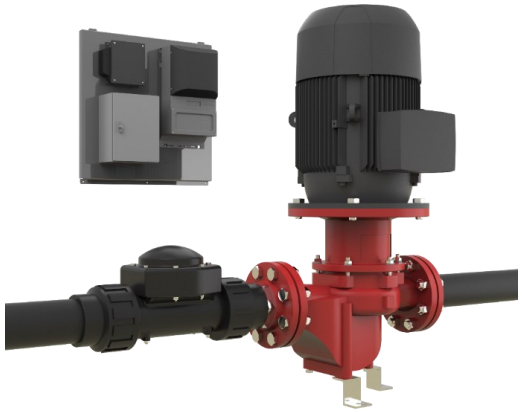
HR Hydroregen

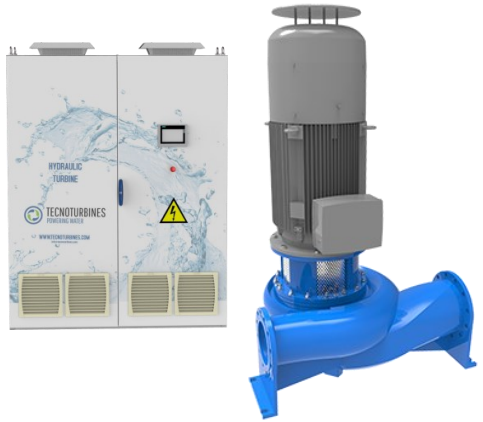
BATTERY CHARGING

GRID TIED

GRID TIED TURBINES

MICRO REGEN	FAMILY	HYDRO REGEN
2kW to 25kW	POWER RANGE	25kW to 315kW
10 to 90 liters/second	FLOW RANGE	60 to 560 liters/second
1,5 to 11 bars	PRESSURE DROP RANGE	1,5 to 13 bars
PN16 ; PN25	MAX. PRESSURE	PN16 ; PN25





GRID TIED – ADVANTAGES

PAYBACK FROM 2 YEARS ON

Feasible projects with a short payback and high ROI. With a permanent flow of incomes at a low risk.

80% REDUCTION IN CIVIL WORKS

Reduces 80% in civil works and 40% the total cost of a standard hydro project. Installed directly in-line over the already existing water pipe.

UP TO 80% GLOBAL EFFICIENCY

Patented technology capable of recovering energy under variable hydraulic conditions at very high global efficiency.

100% RENEWABLE & MINIMUM IMPACT

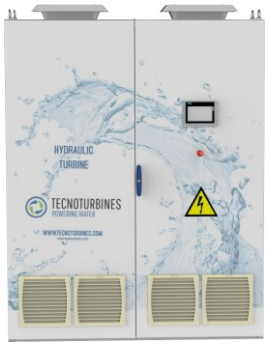
100% Clean & Renewable Energy. Less impact than solar, Eolic technology (Both, visual & infrastructure) or electric connection (Civil works, installation, infrastructure)

QUALITY

Top Brands & Components used in the manufacturing of the system.

GRID-TIED TURBINES – APPLICATIONS

INSTALLATION IN PARALLEL WITH PRVs



WATER RESERVOIR INLETS

MICRO HYDROPOWER PLANTS

BATTERY CHARGING TURBINES

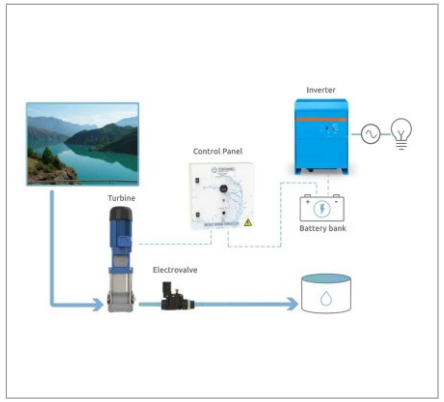
PICOTURBINE	FAMILY	HE TURBINE
Up to 25	**POWER RANGE**	500W to 3kW
0,5 to 1liters/second	**FLOW RANGE**	1 to 16 liters/second
1,2 to 1,8 bars	**PRESSURE DROP RANGE**	1,5 to 39 bars
PN10	**MAX. PRESSURE**	PN16 ; PN25; PN40

BATTERY CHARGING – ADVANTAGES

QUICK & EASY INSTALLATION
Directly installed
on the PVR.

QUALITY
100% Compatible
with tap water;
IP67 protection.

SECURITY
Prevents vandalism;
No visible elements
outdoor.



BATTERY CHARGING – APPLICATIONS

Electrification Water Treatment Plants

Remote Control & Monitoring

Chloride Dosing Systems, etc

TECHNICAL & FINNACIAL SUMMARY

					PayBack compared versus (years)		
Battery Charging Model	Pressure Range (bar)	Flow Range (l/s)	Power Range (kW)	Efficiency (%)	Grid contract connection	Battery replacements	Disel Generator
Pico	0,65 - 1,8	0,6 - 0,95	0,005 -0,0 25	11% - 15%	Inmediate	0,5 - 1	
Pico XL	1 - 12	1 - 10	0,3 - 1,5	29% - 52%	Inmediate	0,5 - 1	
HE Turbine	0,5 - 4	4 - 20	1,5 - 3	35% - 55%	1 year	1 - 2	1 - 2

Grid Tie	Pressure Range (bar)	Flow Range (l/s)	Power Range (kW)	Efficiency (%)	Paybacks*	IRR* (10 years)
MicroRegen	1 - 40	1 - 150	3 - 25	50% - 75%	3 - 7	15% - 50%
HydroRegen	1 - 13	25 - 500	25 - 300	65% - 77%	3 - 5	20% - 80%

* Depends on feed-in tariff and feed-in mode (Self-Consumption or Energy selling) as well as on civil works cost associated to the project.

Real cases examples	Pressure (bar)	Flow (l/s)	Power (kW)	Efficiency (%)
3kW Ayto Navas	4,2	15	3,2	51%
5kW EMATSA	1	70	4,9	72%
32kW Canal de la Huerta	3,4	120	30	75%
45kW Planta Niza (Colombia)	2,9	204	45	77%
97kW HIEKAWA (Japan)	5,8	240	102	75%
135Kw Monterrey (Mexico)	5,8	323	143	77%

INSTALLATION EXAMPLES

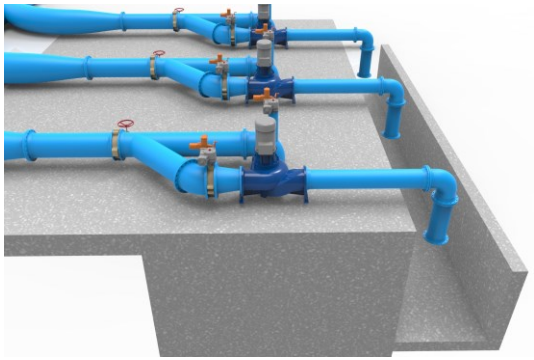
PARALLEL WITH PRVs via a By-Pass

BEFORE

AFTER

WATER TREATMENT PLANT

BEFORE



AFTER

INSTALLATION EXAMPLES

PARALLEL WITH EXISTING OLD TURBINES

BEFORE

AFTER

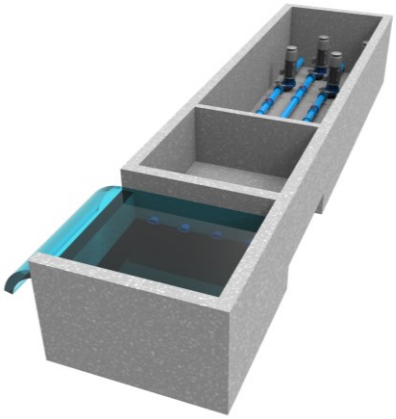
CASE STUDIES

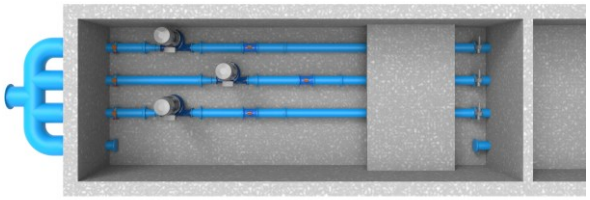
1. Water Treatment Plant – 460kW
   - Aguas de Maniales (Colombia)
2. In parallel with PRV – 250kW
   - Aguas de Monterrey (Mexico)
3. Water Tank – 100kW
   - Aguas de Manizales (Colombia)
4. Parallel to an Old Turbine – 35kW
   - Canal de la Huerta (Spain)
5. Battery Charging – 35kW
   - Canal de la Huerta (Spain)
6. Picoturbine – 25W
   - Canal de la Huerta (Spain)

1. Water Treatment Plant - 460kW

- Site Pictures

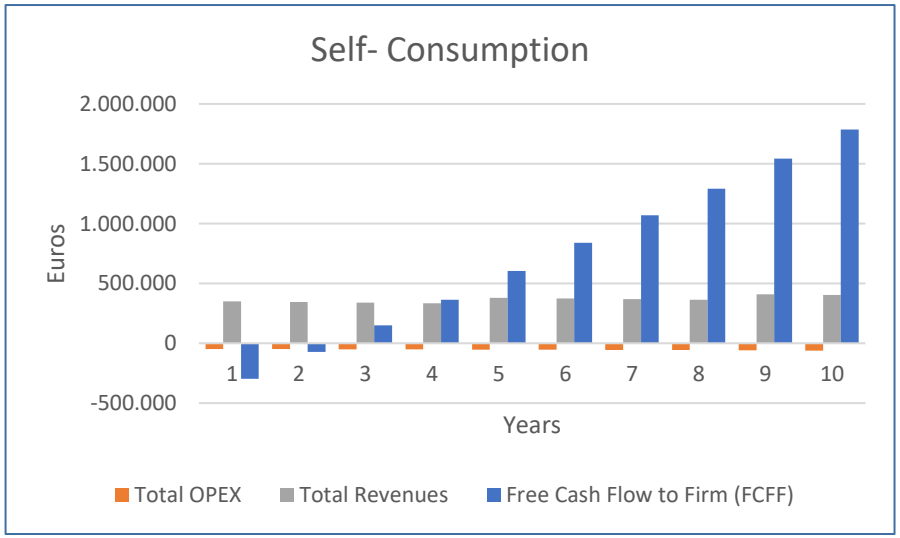
- Site Proposal

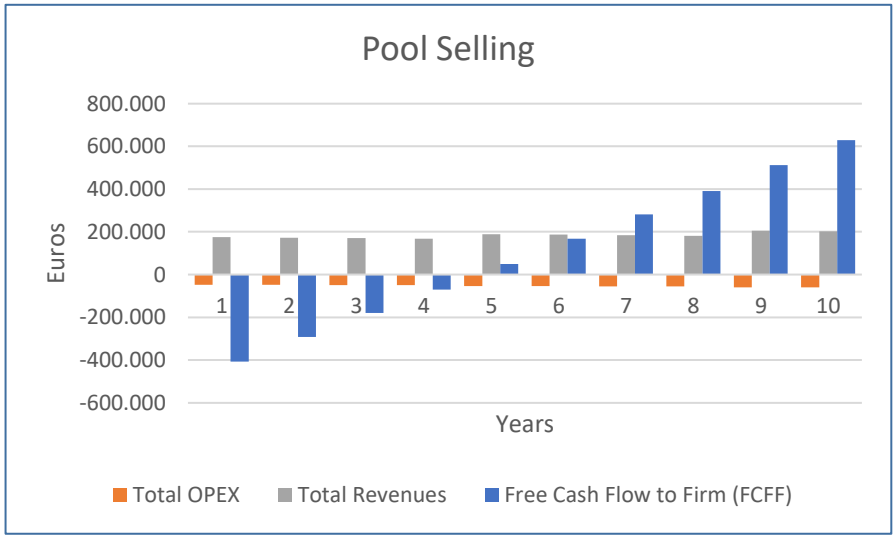




1. Water Treatment Plant - 460kW

Project:	Popal - 460kW	
Considerations		
Yearly Working Hours	Hours / Year	8.409,6
Selling Price		
Electricity Price - Self-consumpti	€ / kWh	0,090
Electricity Price - Pool	€ / kWh	0,055
Costs		
Tecnoturbines Equipment	€	448.222 €
Civil Works & Installation*	€	53.787 €
Transmission Line*	€	11.206 €
Shipment*	€	8.964 €
O&M Provider Cost*	€ / Year	30.072 €
Outcomes		
Total Investment	€	526.661 €
Power Installed	Kw	462
Energy Generation*	(kWh/Year)	3.885.235
Selling to Pool		
IRR	%	34%
Project Payback*	years	4,00
NPV Project	10 years	663.521 €
Incomes	year	174.836 €
Self consumption		
IRR	%	75%
Project Payback*	years	2,40
NPV Project	10 years	447.921 €
Savings	year	349.671 €

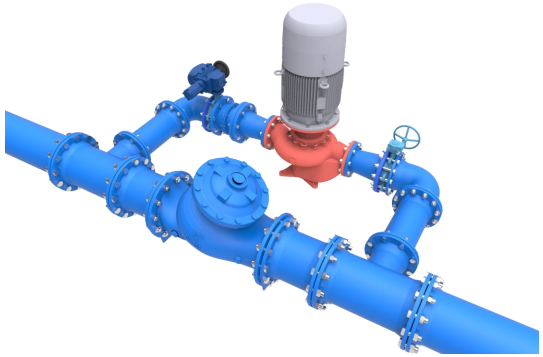




2. Parallel to PRV – 250kW

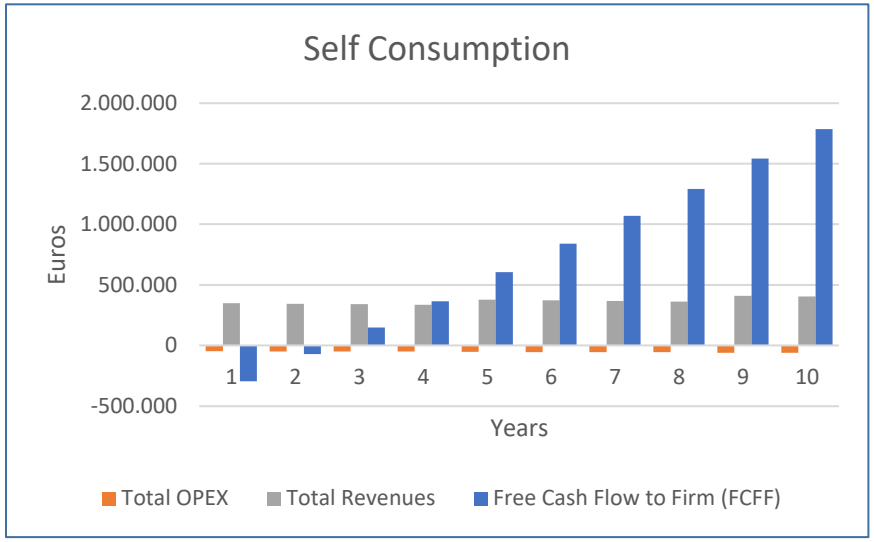
- Site Pictures

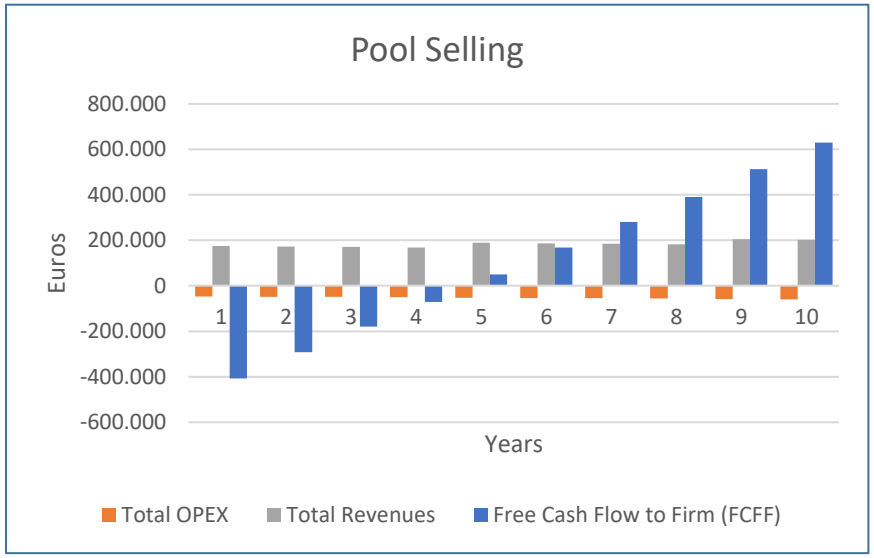
- Site Proposal



2. Parallel to PRV – 250kW

Project:	Tanque Pozos 9 - 247kW	
Considerations		
Yearly Working Hours	Hours / Year	8.409,6
Selling Price		
Electricity Price - Self-consumption	€ / kWh	0,090
Electricity Price - Pool	€ / kWh	0,045
Costs		
Tecnoturbines Equipment	€	257.379 €
Civil Works & Installation*	%	12,0%
Transmission Line*	%	2,5%
Shipment*	%	1,0%
Contingencies*	%	2,0%
O&M Provider Cost*	€ / Year	13.272 €
Outcomes		
Total Investment	€	302.420 €
Power Installed	Kw	247
Energy Generation*	(kWh/Year)	2.077.171
Selling to Pool		
IRR	%	42%
Project Payback*	years	3,4
NPV Project	10 years	482.386 €
Incomes	year	93.472,70 €
Self consumption		
IRR	%	85%
Project Payback*	years	2,3
NPV Project	10 years	885.819 €
Savings	year	186.945,41 €

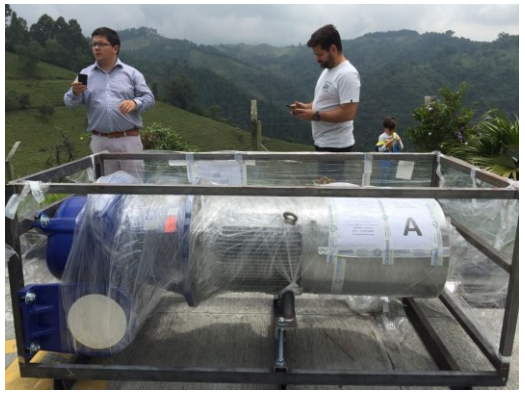




3. Water Tank – 100kW

- Site Pictures



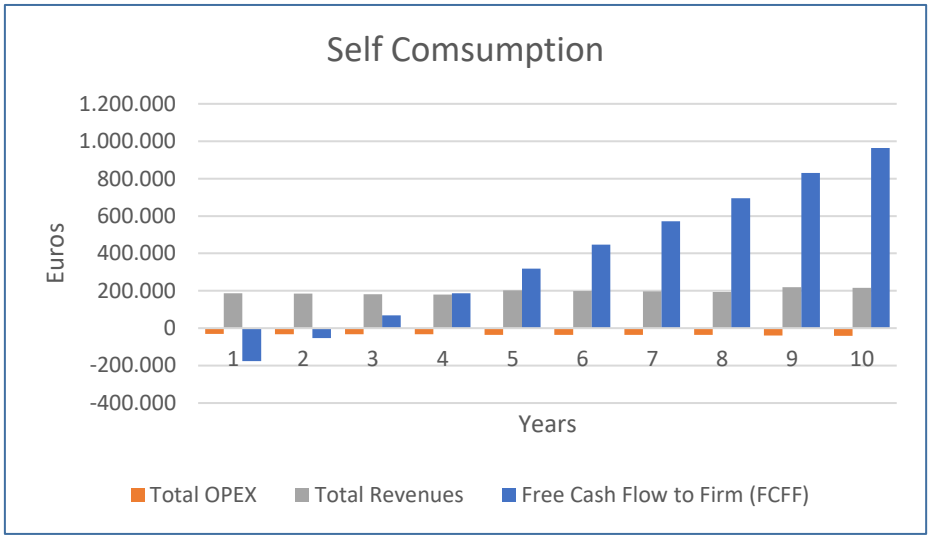


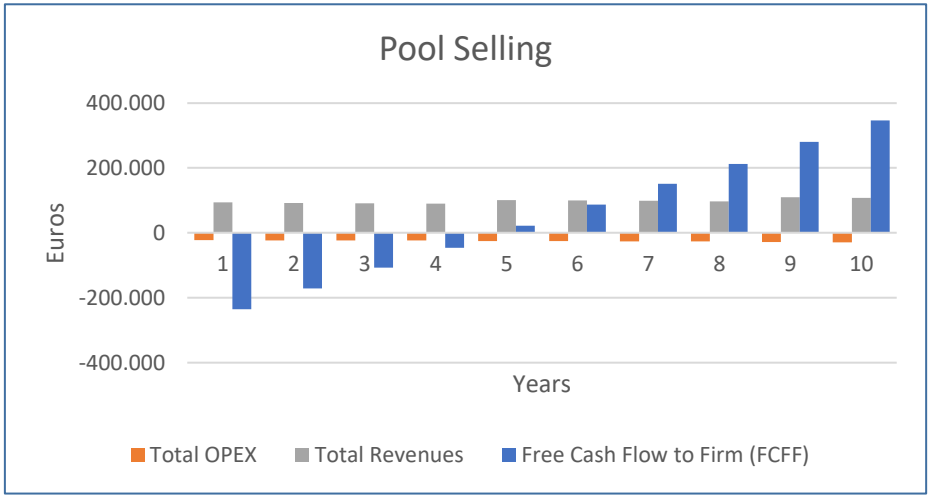
- Site Proposal




3. Water Tank – 100kW

Project:	100kW	
Considerations		
Yearly Working Hours	Hours / Year	8.409,6
Selling Price		
Electricity Price - Self-consumption	€ / kWh	0,090
Electricity Price - Pool	€ / kWh	0,055
Costs		
Tecnoturbines Equipment	€	135.625 €
Civil Works & Installation*	%	12,0%
Shipment*	%	1,0%
Contingencies*	%	2,0%
Transmission Line*	%	2,5%
O&M Provider Cost*	€ / Year	7.272 €
Outcomes		
Total Investment	€	159.359 €
Power Installed	Kw	100 €
Energy Generation*	(kWh/Year)	840.960
Selling to Pool		
IRR	%	28%
Project Payback*	years	4,30
NPV Project	10 years	160.029 €
Incomes	year	37.843 €
Self consumption		
IRR	%	54%
Project Payback*	years	3,00
NPV Project	10 years	323.362 €
Savings	year	75.686 €





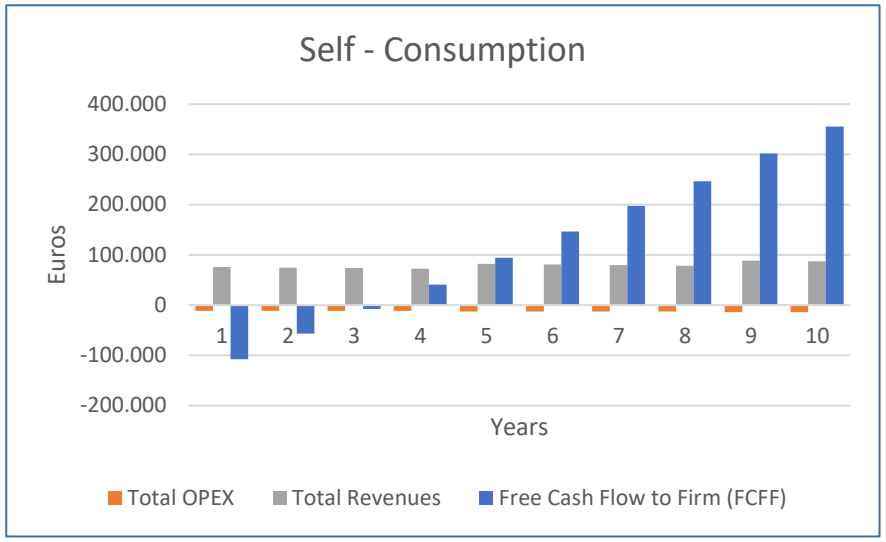
4. Parallel to an Old Turbine – 32kW

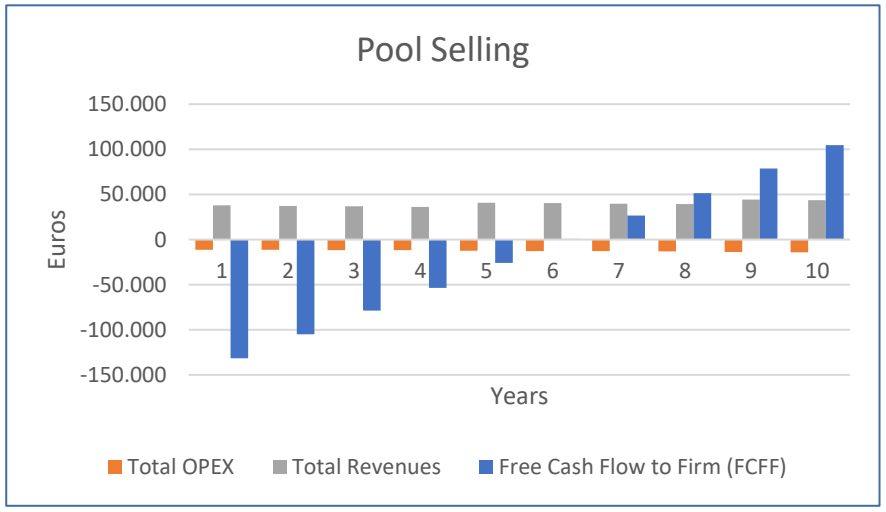
- Site Pictures

- Site Proposal

4. Parallel to an Old Turbine – 32kW

Project:	32kW	
Considerations		
Yearly Working Hours	Hours / Year	8.409,6
Selling Price		
Electricity Price - Self-consumption	€ / kWh	0,090
Electricity Price - Pool	€ / kWh	0,055
Costs		
Tecnoturbines Equipment	€	40.500 €
Civil Works & Installation*	%	12,0%
Shipment*	%	1,0%
Contingencies*	%	2,0%
Transmission Line*	%	2,5%
O&M Provider Cost*	€ / Year	3.600 €
Outcomes		
Total Investment	€	50.828 €
Power Installed	Kw	32 €
Energy Generation*	(kWh/Year)	269.107
Selling to Pool		
IRR	%	24%
Project Payback*	years	4,70
NPV Project	10 years	43.136 €
Incomes	year	12.110 €
Self consumption		
IRR	%	50%
Project Payback*	years	3,20
NPV Project	10 years	95.403 €
Savings	year	24.220 €





BATTERY CHARGING TURBINE

Electrification of a Water Tank

VALENCIA (SPAIN)

PRESSURE DROP: 20 METERS

FLOW RATE: 13.5 LITERS / SECOND

GENERATED POWER: 550W

ISOLATED ELECTRIC POWER SUPPLY

HE

PICO XL

BACKGROUND

EGEVASA, a water utility in Valencia, has a water tank located in a remote area with no access to the electric public grid.

THE SOLUTION

Tecnoturbines installs a PICO XL turbine in parallel to the reducing valve to obtain energy for providing electric power to the site. The system has a battery bank of 24V and 240Ah capacity equipped with a 230V inverter to power the lighting system.

BATTERY CHARGING TURBINE

Electrification of a Water Tank

BATTERY CHARGING TURBINE

Picoturbine with remote monitoring for ACUAES

SEGOVIA (SPAIN)

PRESSURE DROP: 18 METERS

FLOW RATE: 1 LITER / SECOND

GENERATED POWER: 25W

ISOLATED ELECTRIC POWER SUPPLY

PT

PICOTURBINE

BACKGROUND

ACUAES manages different installations located in remote areas of Segovia to control the supply of several municipalities to provide energy to the Communities of Villa and Tierra de Pedraza. The company needs a solution that allows them to monitorize the supply of several municipalities.

THE SOLUTION

Tecnoturbines installs five picoturbines, one for each reservoir, including a remote control system. As a result, the company can manage and monitorize the five reservoirs located in different areas from one single point.

BATTERY CHARGING TURBINE

Picoturbine for remote monitoring for ACUAES

TECNOTURBINES
POWERING WATER

THANK YOU FOR YOUR ATTENTION