



# The Sustainable Company



## **R&D and Technological Innovation for Sustainable Development “our CORE”**

30+ years of successful R&D technologies in solar, water treatment, hydraulic and wind power. Intellectual property rights of our products through National and Worldwide patents, protecting our technology to ensure our long-term viability and evolution.

## **Flexible Manufacturing and Key Operational Management**

Outsourcing in manufacturing at the same time that controlling the key aspects of in-house integration, assembly, transport and commissioning.

## **Reliable Delivery and Maintenance**

Highly-qualified technical service and procedures, including post-sales, preventative and corrective maintenance of our technologies.

Non-stop enhancing of our technologies to give our clients best available solutions.

## **Commitment with our Clients**

Long term relationship through shared ownership, BOT and O&M agreements.

## **Skillful Team**

Human team formed and with the "know-how" to design, manufacture and successfully manage projects in these water and energy sectors, with a completely innovative vision.

## TEMPERO ADES focuses, through four main areas of activities, in new technologies to help achieve UN Sustainable Development Goals



Horizontal two axis



... turbines.



Water from the wind



Polygeneration



Solar pumping



Direct pumping raft



Energy towers



Generation

<b>1</b> NO POVERTY	<b>2</b> NO HUNGER	<b>3</b> GOOD HEALTH	<b>4</b> QUALITY EDUCATION	<b>5</b> GENDER EQUALITY	<b>6</b> CLEAN WATER AND SANITATION
<b>7</b> RENEWABLE ENERGY	<b>8</b> GOOD JOBS AND ECONOMIC GROWTH	<b>9</b> INNOVATION AND INFRASTRUCTURE	<b>10</b> REDUCED INEQUALITIES	<b>11</b> SUSTAINABLE CITIES AND COMMUNITIES	<b>12</b> RESPONSIBLE CONSUMPTION
<b>13</b> CLIMATE ACTION	<b>14</b> LIFE BELOW WATER	<b>15</b> LIFE ON LAND	<b>16</b> PEACE AND JUSTICE	<b>17</b> PARTNERSHIPS FOR THE GOALS	

**THE GLOBAL GOALS**  
For Sustainable Development



Mediterranean model



Portable power station



Microdams ...



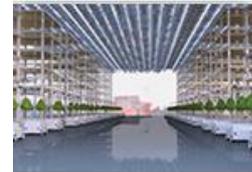
Low Energy Desalination



Dual axis monopost



Engine support



Energy Roof

## Vision

To be worldwide leaders in providing the society with easy, economic and sustainable access to water and energy

## Mission

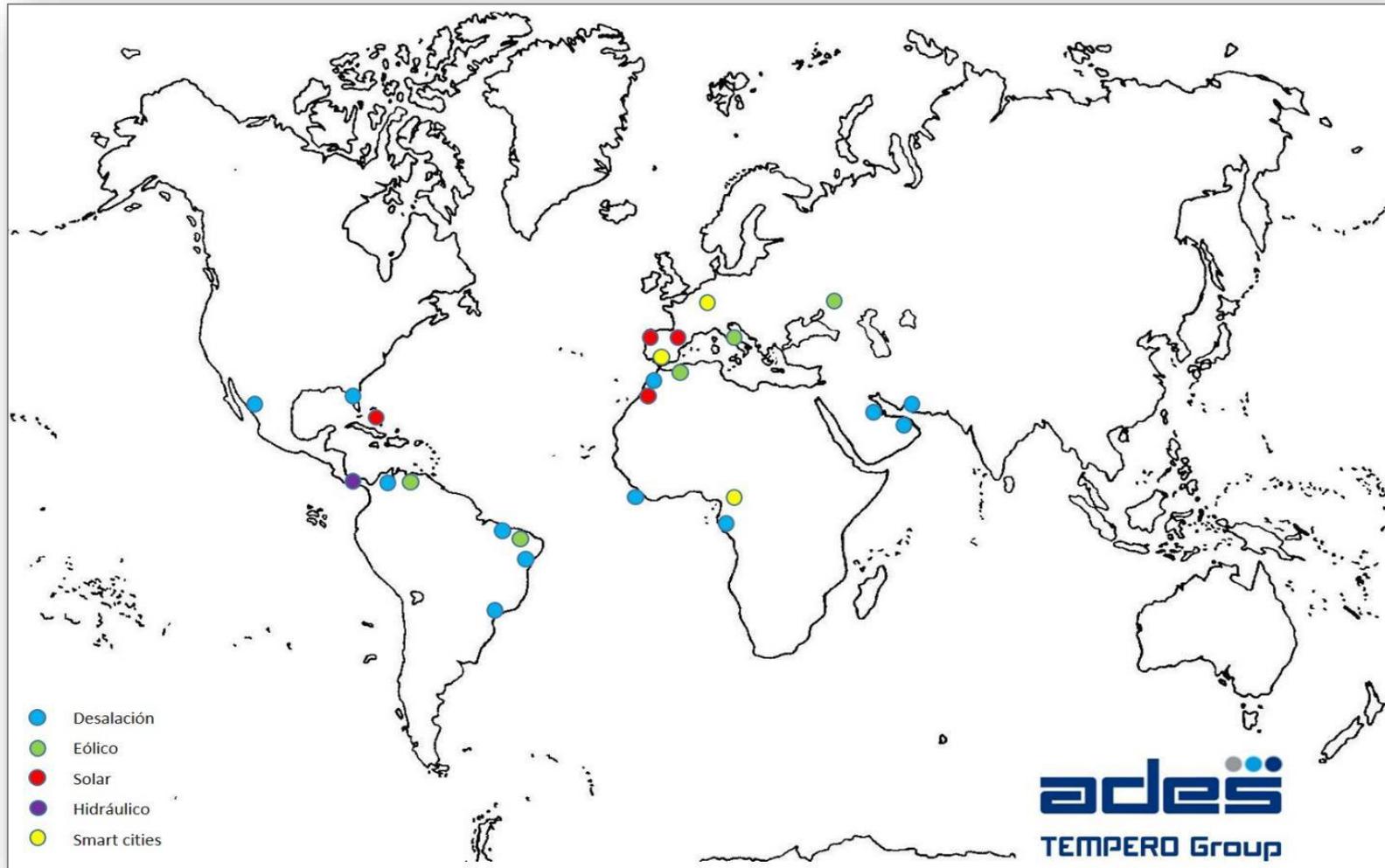
To supply water and energy with our own robust, reliable, economic and easy-to-operate-and-maintain Tempero technologies



## Values

- “Know How” client and market oriented
- Agility to develop new technologies needs
- Dynamic, entrepreneurial and integrity team
- Tenacity in delivery and pursuing objectives
- Commitment with the future of the society

- Spanish Industrial Technology & Engineering firm created in 1992
- Global presence with International partners & Branch companies



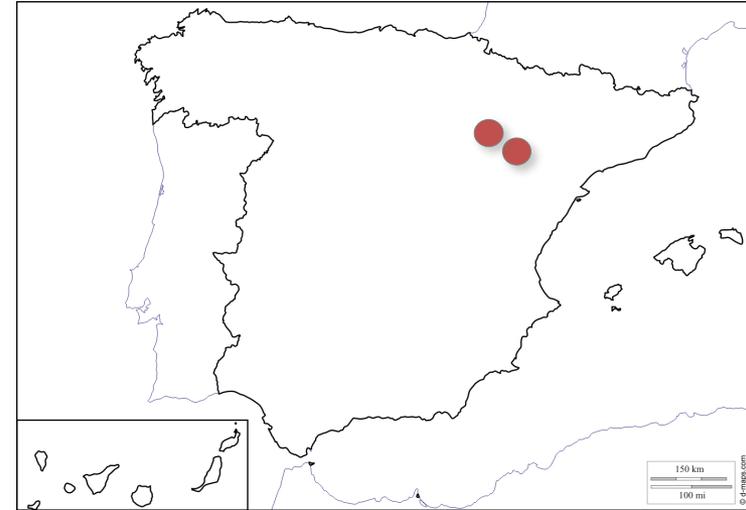
# TEMPERO facilities

## ZARAGOZA: Headquarters

- Technical offices, commercial and administration center

## TARAZONA: Divided in 3 main areas

- **ADES TECHNOLOGICAL CENTER & TRAINING ACADEMY**
  - 1.200 m<sup>2</sup> of facilities: classrooms, laboratories, 14 study rooms, library, recreation saloon, kitchen
- **ADES PRODUCTION CENTER** located on a 22.000 m<sup>2</sup> plat
  - Assembly of ADES machines
  - 6.000 m<sup>2</sup> of covered warehouses
  - 4.000 m<sup>2</sup> of open area
- **ADES PROTOTYPE**
  - 10.000 m<sup>2</sup> for prototypes & testing area



Training academy created in 2008, 2 Main segments developed

## OFFICIAL TRAINING ACADEMY, CERTIFIED BY SPANISH GOVERNMENT:

- Private centre for regulated vocational training that is authorized by the Government of Aragon (centre code: 50.019.071)
- Aragon Institute of Employment Collaborating Centre, approved in all specialties of the family Energy and Water
- RES Training courses through different levels specialized courses and High Grade on energy efficiency and solar thermal energy.

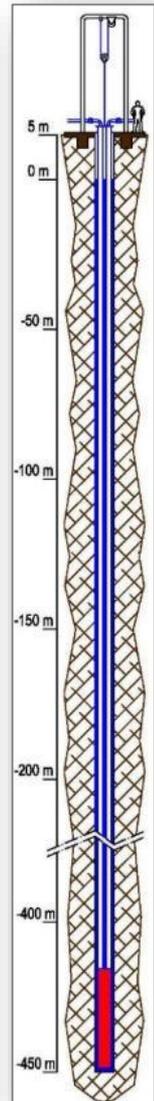
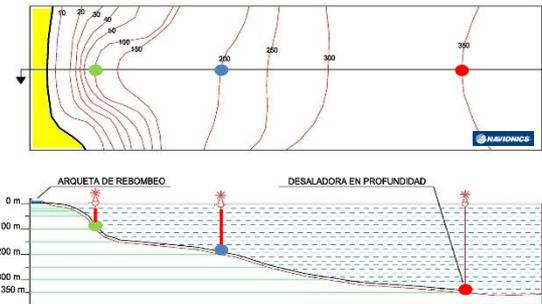
## ADES TECHNOLOGIES AND KNOW-HOW TRANSFER:

- Training for ADES customers, oriented in problem solving
- Transfer for partners and Licensed companies
- Based on Real practices of manufacturing, assembly, installation and operation & maintenance in the production centre and the prototype testing area



# TEMPERO main technology patents

- Deep Water Desalination
- Solar Pump double positive displacement
- Super Tracker 2 and 3-axis PV solar trackers
- Surplus Solar Rotating House (Ecodomus)
- Solar concentration tracker
- Parking with PV charging and 1-axis solar tracking
- Mono-blade pendulum wind turbine
- Sustainable buildings with integration solar + wind
- Hybrid solutions for isolated or connected micro grids
- Transportable power station with ICT\*
- Transportable headquarter center with ICT\*
- Transportable medical center with ICT\*
- Energy collector and supply e-bus stop
- Water from air (turbine in the desert)
- Hydrobus, high velocity sea boat (70 knots)



\*ICT = information and communication technologies

# TEMPERO main Technologies

## WATER AND DESALINATION



Low Energy Desalination



Solar pumping



Water Tower



From wind to water

## SOLAR TRACKERS



Horizontal single axis



Horizontal two axis



Dual axis monopost



Parabolic concentration

## WIND TURBINES



Generation



Engine support



Direct pumping raft

## ISOLATED SOLUTIONS – SMART GRIDS



Portable power station



Polygeneratio



Energy integration



Energy towers

## SUSTAINABLE BUILDINGS



ECODOMUS



Energy Roof



Parking



Building tracker

## HYDRAULICS



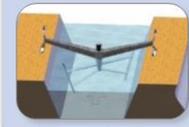
Microdams...



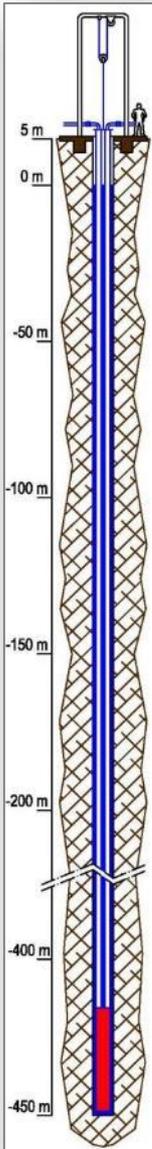
... with consecutive ...



... turbines



Channel turbine



A good desalination project starts by obtaining a good inlet of water (inexhaustible, with consistent quality and unchanging to external phenomena). **In-depth intake** meet these requirements better than any other ones.

The method of desalination is the typical reverse osmosis (R.O.) It works by applying pressure to a flow that goes through a set of membranes, obtaining as a result two flows: a diluted one (permeate) and another one more concentrated (brine).

ADES' procedure achieves the pressure by placing the membranes in the bottom of a water filled pit or in the seabed, thus applying the desired levels of hydrostatic pressure. The flow through the membranes is done through the brine circuit by a low power pump. The permeate drains to a hopper located at the bottom, kept at atmospheric pressure, for its removal to surface by a pump. With the current state of technology, R.O. membranes achieve high efficiency with pressures around 39 / 44 bars, for conversion rates of 30 / 36%, (which can be achieved at 390 / 440 m depth for a sea water density of 1032 kg/m<sup>3</sup>.)

- All these requirements are achieved by building a **deep well at the coast**, digging through permeable soils, finishing it with adequate health protection. If it does not go through permeable soils, a surface inlet will be designed using horizontal shorebirds drains in filtering beds. The execution and development of the well (by over pumping) is an engineering project that requires high-skilled professional "know-how". Once data related to construction (diameter and depth) and hydraulics (dynamic levels and flow rates), are known and after water is analyzed, the plant will be designed to meet the desired quantity and quality, applying the method described in the referenced ADES' patent.
- In the case of **seabed desalination**, the system takes advantage of cliffs near the coast, with depths of around 400 meters, reducing the problem to the power supply for the underwater plant, and the pumping of the permeate to the coast.

This type of underwater plants can obtain high flows, with a very reduced environmental impact and a specific consumption as low as 1,65 kW-h / m<sup>3</sup>, *half of the usual desalination plants energy consumption.*

## Ficha Técnica Provisional POZO DESALADOR

Una vez perforado y desarrollado el pozo costero, que deberá ejecutarse atravesando terrenos estables y permeables (rocas preferentemente) y obtenidos los datos hidráulicos, análisis físico, químico, biológico y temperatura del agua, se diseña la planta de ósmosis.

El flujo de agua aportado por el pozo, que atraviesa las membranas, se genera por la succión de la bomba de salmuera aprovechando el principio de vasos comunicantes. El permeado se bombea desde el fondo del pozo, hasta la superficie para su uso.

Sistema de alta fiabilidad por la calidad del agua bruta y reducido mantenimiento, por la eliminación los elementos mecánicos mas importantes (bomba de alta presión, turbina de recuperación - booster y tubos de alta presión) con mínimo consumo específico de energía.

**DATOS TÉCNICOS (Tolerancia ± 5%)**

- Producción: 2000 m<sup>3</sup> / día
- Potencia: 150,5 kW
- Consumo específico: 1,8 kWh/m<sup>3</sup>

**Calidades**

- Agua bruta: ≤ de 32.000 ppm
- Permeado: 221 ppm - 3 años - 22° C
- Reconversión: 35%
- Pretratamiento: no

**Obra civil perforación pozo costero**

- Profundidad: 450 m
- Diámetro mínimo perforación: 26" (0,66 m)
- Nivel estático: ≤ 10 m

**Desarrollo por sobrebombeo.**

- Profundidad de la bomba 449 m
- Caudal desarrollo ≥ 260 m<sup>3</sup>/h durante mínimo 24 h
- Nivel dinámico ≤ 15 m

**Equipo Ósmosis: 30 tubos de 4 membranas 8" + filtros 10 micras**

**Pozo salmuera**

- Material: Duplex Inox.
- Diámetro: 0,3 m
- Longitud: 445 m
- Motobomba: 154,7 m<sup>3</sup>/h a 30 mca
- Potencia: 18,5 kW
- Tubería de impulsión: Ø 168 x 3 mm, embreada.

**Pozo permeado**

- Material: Duplex Inox.
- Diámetro: 0,168 m
- Longitud: 445 m
- Motobomba: 83 m<sup>3</sup>/h a 450 mca
- Potencia: 132 kW

**Emisario salmuera: Tubería PE Ø 200 mm - 6 at**

**Montaje: Pórtico abatible + cabrestante 25 T + accesorios**

**Opcional: Planta generadora de energía.  
Sistema cogeneración 200 kW (solar + eólico + térmico)**

Revisado 11/05/2015

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## DIAGRAMA DE FLUJO PROCESO DESALINIZACIÓN EN PROFUNDIDAD A PARTIR DE MEMBRANAS

El principio de funcionamiento, parte del concepto hidráulico de considerar la membrana (figura 1) como una válvula de tres vías (una entrada y dos salidas) de dos posiciones, normalmente abierta, en la que la tercera vía abre a partir de un rango de presión (superior a la presión osmótica de la solución) como se ve en los esquemas hidráulicos adjuntos.

Figura 1

Figura 2

La presión se consigue sumergiendo la membrana en un pozo lleno de agua (figura 2) a una profundidad condicionada por la presión osmótica de la solución. El flujo (1) a través de las membranas (100%) se consigue al succionar desde la vía del concentrado (2) mediante motobomba de baja presión (4), venciendo las pérdidas de carga del circuito y membranas, un flujo del 60/65%. Esta motobomba (4) absorberá el 9% de la potencia total demandada por el proceso.

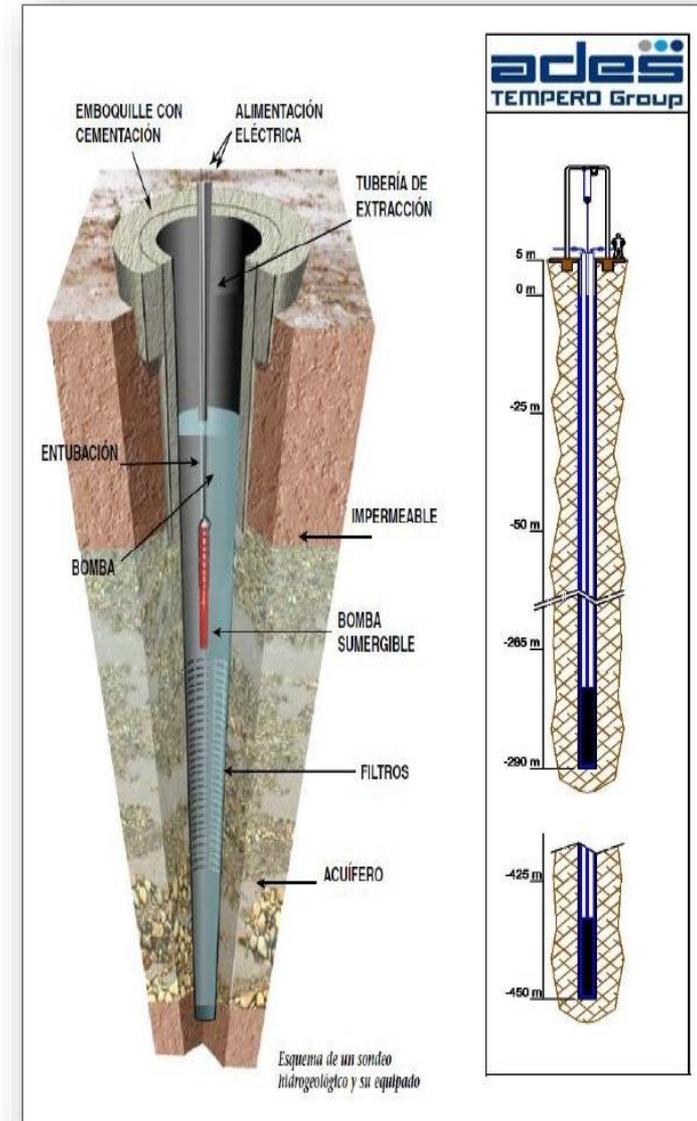
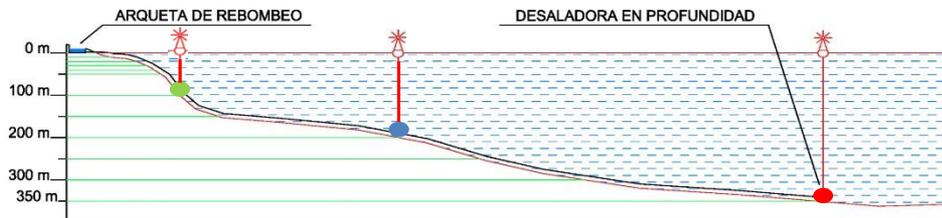
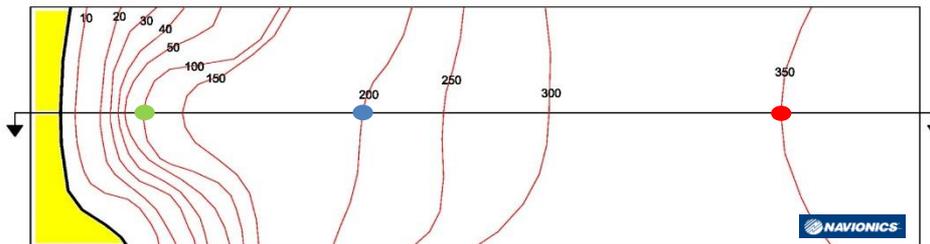
Figura 2

Figura 2

El flujo de permeado (3) que representa el 35/40%, drenará a una cántara situada en el fondo del pozo y a presión atmosférica, desde el que será bombeado por la motobomba (5) hasta la superficie, venciendo la altura debida a la profundidad. Esta motobomba (5) absorberá el 91% de la potencia total demandada por el proceso.

### Highlights

- 1 CAPEX - 30% cheaper than standard R.O. process
- 2 OPEX - 50% cheaper
- 3 Time To Market "start" - From 4 months
- 4 Very low environmental impact due to low recovery

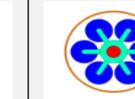


# WATER DESALINATION

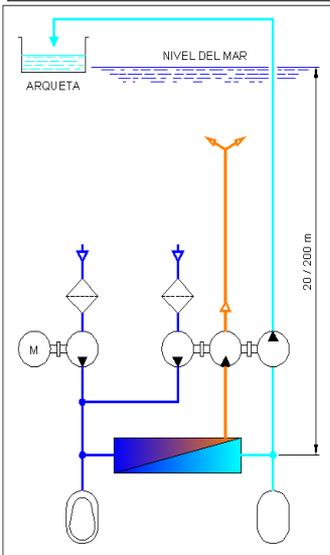
## On/Near/Off Shore Desalination plants

### ON SHORE

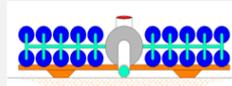
On Shore Plants: Static Level  $\leq 10$  m / Dynamic Level  $\leq 15$  m

Deep (m)	350 m	400 m	350 m	400 m	350 m	400 m	350 m	400 m
Min $\varnothing$ Drilling (inch / mm)	15,2" / 385		22" / 560		24" / 610		28" / 711	
Min $\varnothing$ for Installation (inch / mm)	12" / 305		18,9" / 480		20,9" / 530		25,4" / 645	
Vessels Configuration								
Membr / Vessel / Stage	6 x 1 x 1		6 x 2 x 4		6 x 3 x 5		6 x 6 x 4	
Total Membranes	6		48		90		144	
R.O. Feed (m <sup>3</sup> /h)	10		80		150		240	

Permeate <300 ppm (m3/h)	2	3	16	24	30	45	48	72
Recovery	20%	30%	20%	30%	20%	30%	20%	30%
Concentrate (m3/h)	8	7	64	56	120	105	192	168
Concentrate (ppm 3th year)	39.936	45.630	39.936	45.630	39.936	45.630	39.936	45.630
Installed Power (kW)	5	6,6	27,2	43,2	51	81	81,6	130
Consumption (kWh/m3)	2,5	2,2	1,7	1,8	1,7	1,8	1,7	1,8

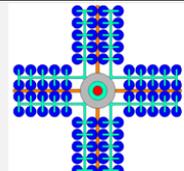


### NEAR SHORE

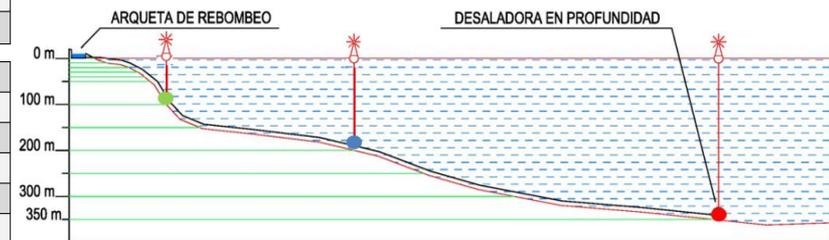
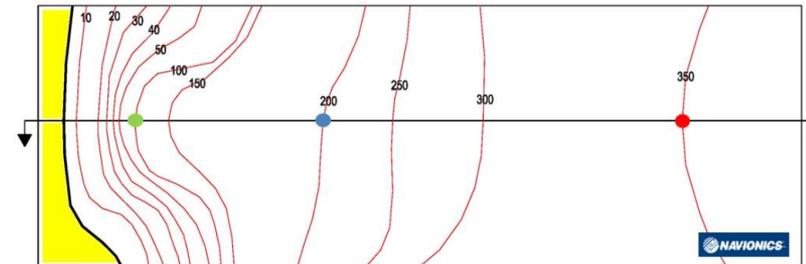
Deep (m)	50 m	100 m	200 m	
Vessels Configuration				
Membr / Vessel / Stage	5 x 10 x 5 - 5 x 20 x 5	5 x 10 x 5 - 5 x 20 x 5	5 x 10 x 5 - 5 x 20 x 5	
Total Membranes	50	100	50	100
R.O. Feed (m <sup>3</sup> /h)	100	200	100	200

Permeate <300 ppm (m3/h)	40	80	40	80	40	80
Recovery	40%		40%		40%	
Concentrate (m3/h)	60	120	60	120	60	120
Concentrate (ppm 3th year)	52.900		52.900		52.900	
Installed Power (kW)	79	158	70	140	52	104
Consumption (kWh/m3)	1,97	1,97	1,8	1,8	1,5	1,5

### OFF SHORE

		300 kW Plants Modules	
Deep (m)		200 m	350 m
Vessels Configuration			
Membr / Vessel / Stage		45 x 5 x 5	88 x 5 x 5
Total Membranes		230	440
R.O. Feed (m <sup>3</sup> /h)		463	885

Permeate <300 ppm (m3/h)	139	177
Recovery	30%	20%
Concentrate (m3/h)	324	708
Concentrate (ppm 3th year)	45.630	39.936
Installed Power (kW)	300	300
Consumption (kWh/m3)	2,3	1,7

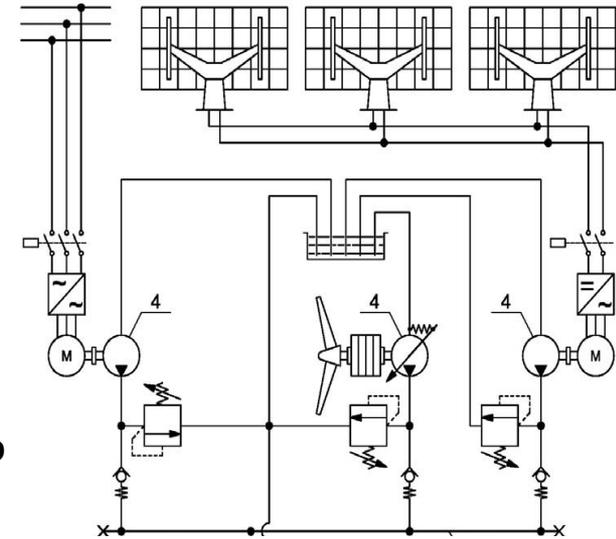


# Sustainable Agriculture

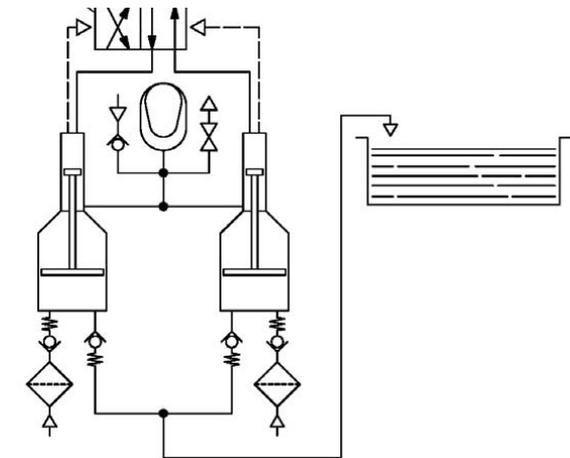
## Water Solar/Eolic Pumping Patent ES201700151

### Solar/Eolic pumping kit with positive displacement pumps of 50 l/s to 600 mca

- 100% power saving. "0" OPEX
- Hydrostatic transmission to ADES positive displacement pump.  
Grid hybridation allowed
- Able to pump water with high efficiency directly proportional to any range of power captured !

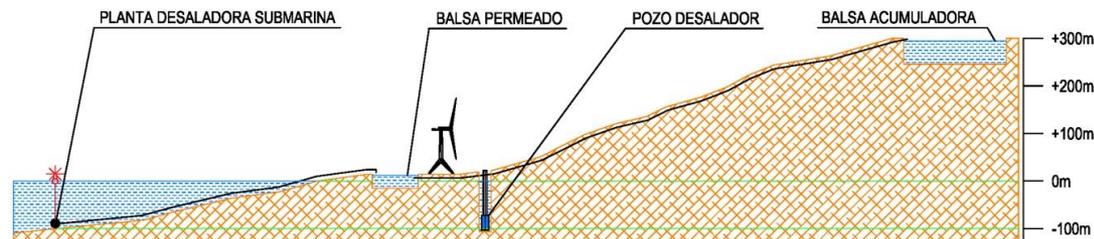
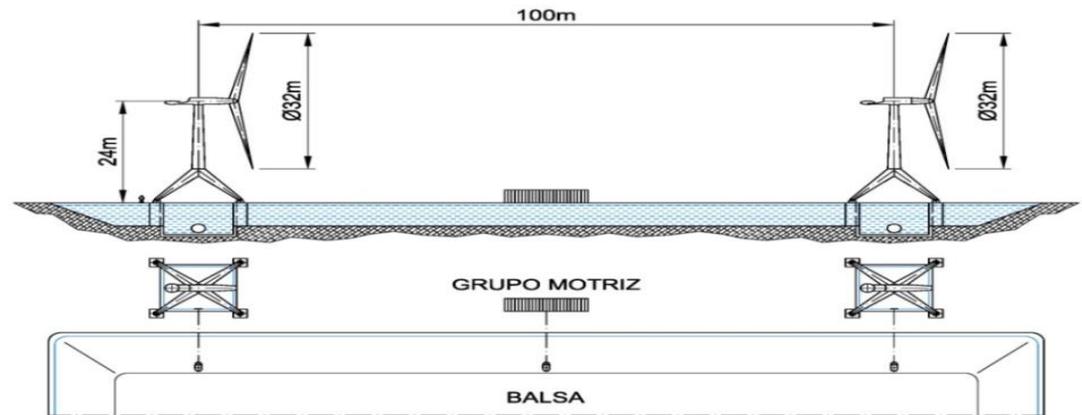
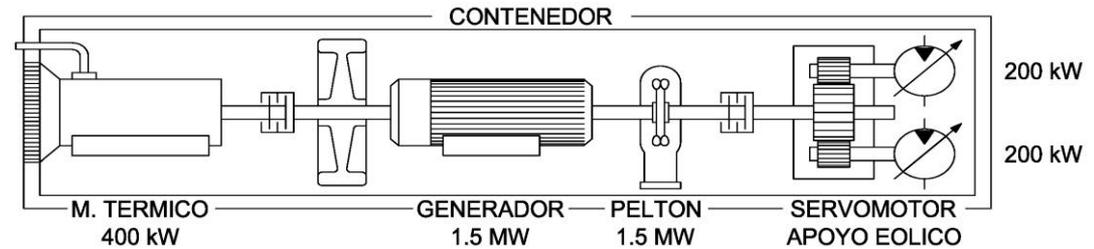


EQUIPO DE BOMBEO, SOLAR 2 EJES + RED P6													
Potencia nominal bomba SOLAR (kW)	200			Potencia nominal bomba RED (kW)	100			Elevación bomba (m.c.a.)	34				
Caudal bomba (m <sup>3</sup> /h)	1800			Caudal bomba (m <sup>3</sup> /h)	900			Rendimiento	0,83				
	Enero	Feb	Marzo	Abril	Mayo	Junio	Julio	Agosto	Sep	Oct	Nov	Dic	TOTAL anual
Horas equivalentes Seg 2 ejes	131,7	181,0	258,3	246,9	284,9	302,6	322,8	292,4	248,1	207,6	148,1	119,3	2747,2
Horas Red Tania P6 (2017)	392,0	352,0	376,0	400,0	376,0	368,0	392,0	744,0	384,0	392,0	368,0	408,0	4952,0
Solar Q=m <sup>3</sup>	196.706	270.471	385.846	368.824	425.566	452.046	482.308	436.914	370.715	310.190	221.294	178.170	4.104.347
Red P6 Q=m <sup>3</sup>	292.824	262.944	280.872	298.800	280.872	274.896	292.824	555.768	286.848	292.824	274.896	304.776	3.699.144
Solar+Red P6 Q=m <sup>3</sup>	489.530	533.415	666.718	667.624	706.438	726.942	775.132	992.682	657.563	603.014	496.190	482.946	7.803.491



# "PROGRAMMED" RENEWABLE Energy Generation

- Hybrid renewable energies systems (wind + solar + hydro)
- The new ©ADES continuous flow piston pumps admit an irregular and heterogeneous energy supply (just like the renewable energies are...)
- So if we install two water accumulation ponds at different altitudes, we can use the solar PV energy (through an inverter) to move the pump and rise the water to the highest pond. Also, wind can move the bi-blade turbine, which might directly be applied to the pump through a mechanical oil-hydraulic mechanism.
- When energy is needed and there's not enough wind and/or sun, water accumulated in the higher pond can fall back to the lower pond (or discarded) through a Pelton turbine, producing hydroelectric energy through the inverter.
- Highly accumulated water can be used, either to produce hydroelectricity or, if it is salt water, it might be used on an ©ADES patented "deep desalination" process to produce fresh water.



### Highlights

- 1 Ease of transportation and reduced installation time
- 2 Innovative technology, as it facilitates the disposal of waste from the treatment processes
- 3 Versatility, as it adapts to all types of installations on the client's site
- 4 Simple operation and low O & M cost.



# SOLAR TRACKERS



# SOLAR TRACKERS

## Technology for 1, 1+1, 2 axes

### *Highlights*

- 1** State-of-the-art technology to maximize solar plant production
- 2** Robustness
- 3** Cost effective X Benefit
- 4** Recognized World wide track record.



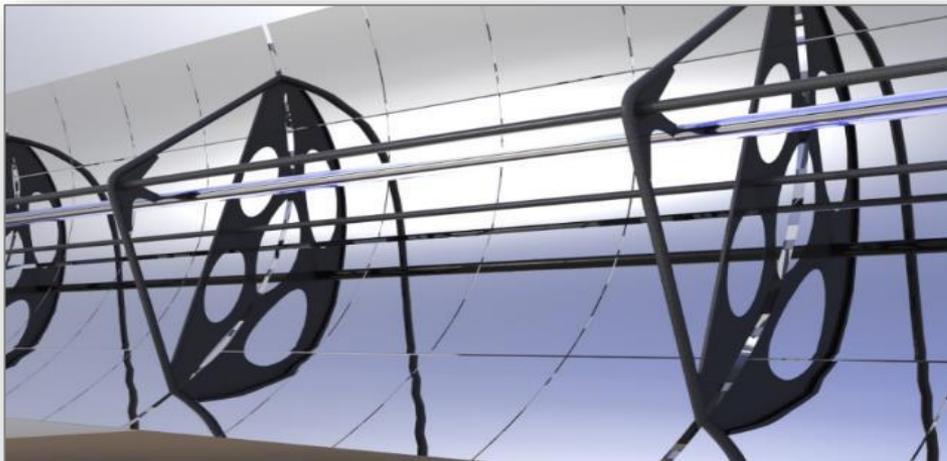
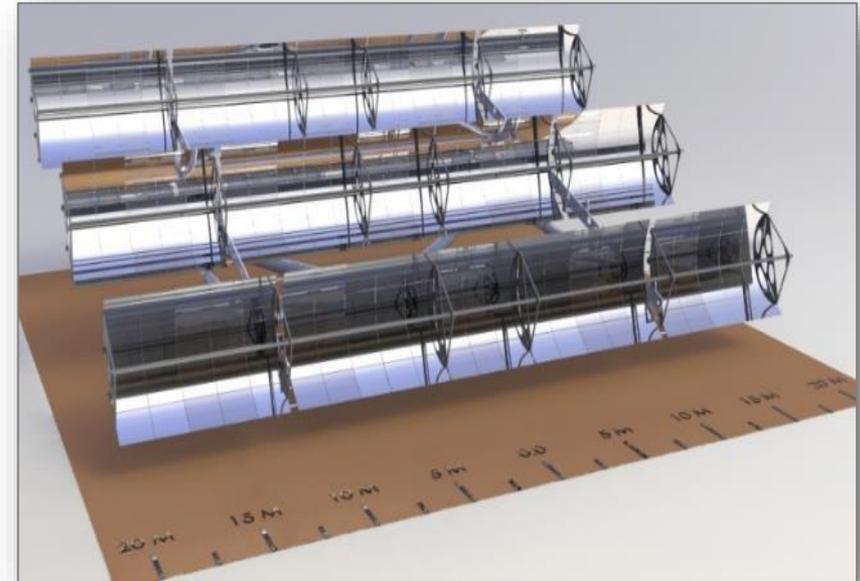
# SOLAR TRACKERS

## Technology 1, 1+1,2 axes

- International technology leaders in solar tracking systems
- More than 200 MW installed
- Own range of patented solar trackers up to 70kW 2 axis Super Tracker
- Suitable with any panel of the market (PV and thermal)
- Energy gain: up to 42% compared with a fixed installation (depending on latitude)



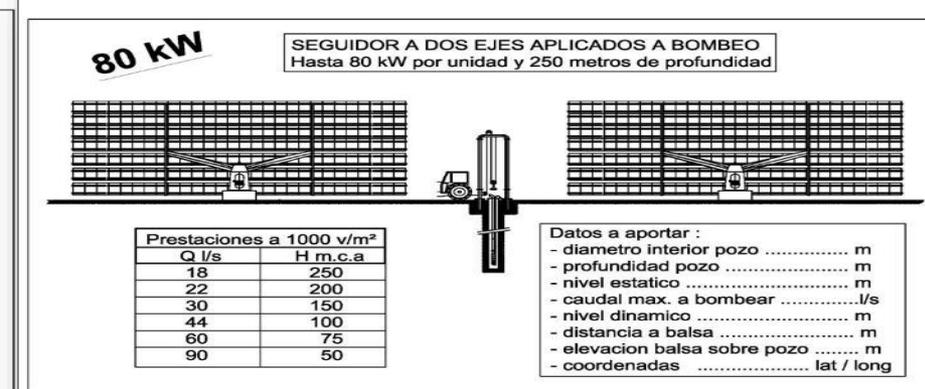
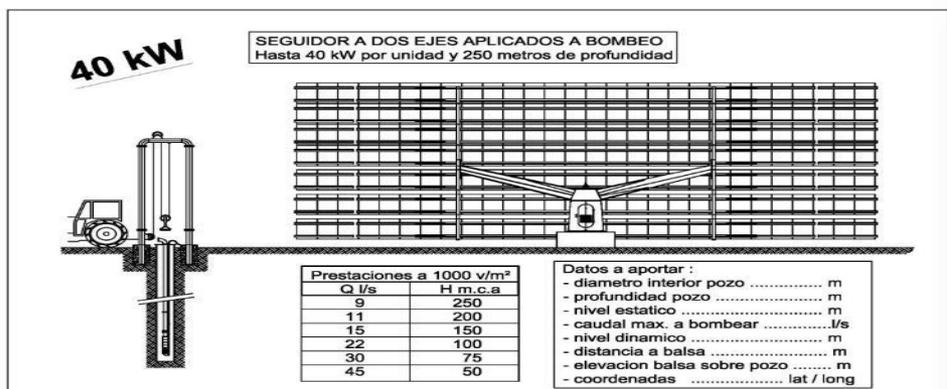
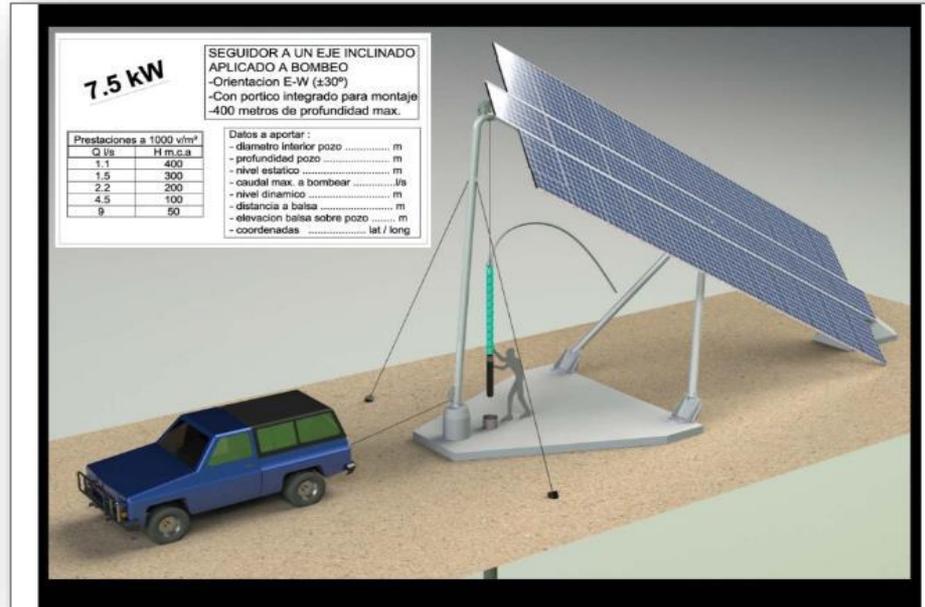
- Cylindrical parabolic collectors and absorber tubes
- Area = 770 m<sup>2</sup> → 410 kW
- 3 axis tracking system with 4 tractor clamps
- Industrial processes:
  - Reduces fuel consumption in processes with hot air needs: dehydration of feed, cement production processes, etc.
  - Decreases greenhouse gases and pollutant emissions (CO<sub>2</sub>, SO)
  - Reduces industrial sector dependence on the variability of fuel prices



# SOLAR TRACKERS

## Pumping Equipment

- Our motorised pumps use a hydrostatic transmission to drive rotors at variable speed and remotely control power with high levels of performance. The system is essentially comprised of a hydraulic pump actuated by the rotor of a wind turbine and/or by an electric or thermoelectric motor, which sends a hydraulic fluid (high pressure oil) to a hydraulic motor which, in turn, activates the rotor of a pump submerged in water via two flexible conducts, forming a closed circuit.
- The reliability and reduced size of the components (pumps and variable speed hydraulic motors) make these systems ideal for installation in small areas as deep wells.
- The special design of our motorized pumps eliminates the main mechanical problem faced by all submersible pumps: axial load.



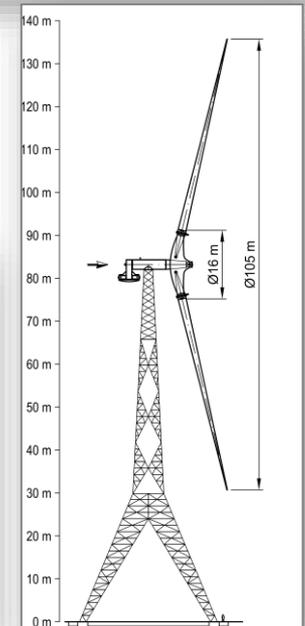
# WIND TURBINES



Mono-blade from 65 kW to 350 kW  
Bi-blade from 65 kW to 2,000 kW

### Highlights

- 1 Large energy production
- 2 Excellent cost-benefit ratio
- 3 Robustness, allowing very low cost of O & M



# WIND TURBINES

## Pendular Wind Turbine

- Range of Power
  - Current design: from 60 kW to 335 kW
  - 2016 design : 1 or 2 MW
- The ADES wind turbine design includes three passive mechanical systems:
  - swiveling single-blade rotor
  - pendulum power train
  - self-steering nacelle
  - Captures, compensates, accumulates and reinstates energy from wind gusts providing a more tolerant power to the grid and diminishing structural overloads

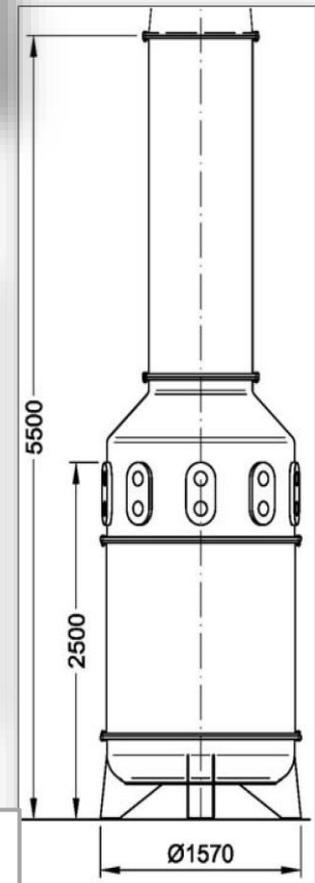


- Distributed generation (injected to the grid)
- Isolated generation
- Supply of constant mechanical energy for specific applications (dwell pumping; drainage; desalination...)
- Hybrid systems (wind + solar + diesel)
- Smart micro-grids
- Engine support for reducing fuel consumption
- Generation on areas with turbulent wind flows
- Wind farms repowering: taking advantage of an existing infrastructure (column and foundation) and increasing the turbined areas
- New wind Parks
- On-demand programmed energy generation: directly coupling a wind turbine with a continuous flow piston pump, which pumps water to a high altitude pond or deposit where it's kept until energy is needed, and obtained by a Pelton hydraulic turbine (see "Programmed renewal energy generation")



**Engine support**

**Repowering**

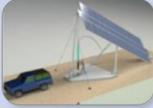


**Energy on-demand**

## WATER AND DESALINATION



Low Energy Desalination



Solar pumping

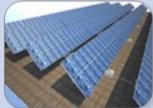


Water Tower



From wind to water

## SOLAR TRACKERS



Horizontal single axis



Horizontal two axis



Dual axis monopost



Parabolic concentration

## WIND TURBINES



Generation



Engine support



Direct pumping raft

## ISOLATED SOLUTIONS SMART GRIDS



Portable power station



Polygeneration



Energy integration



Energy towers

## SUSTAINABLE BUILDINGS



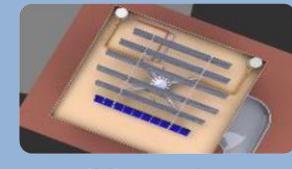
ECODOMUS



Energy Roof



Parking



Building tracker

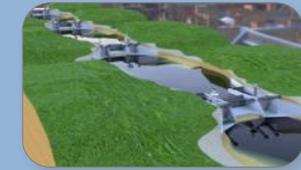
## HYDRAULICS



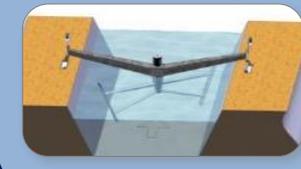
Microdams...



... with consecutive ...



... turbines



Channel turbine

# Water & Energy Tower (sustainable farming)

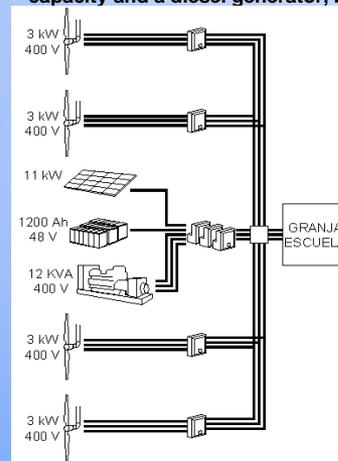


CONSUMERS	Power (kW)	Hours/day	Total/day
1 Electric winch (1.000 kg)	2,50	0,0	0,0
2 Deep well pump + discharge pipe	7,50	3,0	22,5
3 Water treatment plant (UV + osmosis)	7,50	4,0	30,0
4 Irrigation programming system (12 plots)	0,10	15	1,5
5 Feed production mill	5,00	0,5	2,5
6 Milking equipment	4,50	2,0	9,0
7 Milk cooling tank (1000 liters)	2,00	3,0	6,0
8 Freezer A +++ (2 x 920 liters)	0,30	3,0	0,9
9 A +++ chest refrigerator (2 x 900 liters)	0,30	3,0	0,9
10 Milking room lighting (LEDs)	0,70	2,5	1,8
11 Training room lighting	1,50	6,0	9,0
12 GSM telecommunications	0,10	24	2,4
13 Blinking houselight (11 miles)	0,02	8,0	0,2
14 Battery charger (vehicles)	2,10	0,0	0,0
Considering a 15% loss, daily energy production should be 100 kW/day. 365 = 36.500 kWh	Total yearly: 100 kWh x		86,6 kW

**ENERGY AVAILABILITY (kW) = generators x yearly-equivalent hours = kW-h/year:**

- 4 x wind turbines 3 kW x 1.200 h/year = 14.400 kW-h/year
  - Solar tracked structures 11 kW x 2.100 h/y= 23.100 kW-h/year
- TOTAL renewable energy = 37.500 kW-h/year**

Although the balance is positive, it will be necessary to have batteries with storage capacity and a diesel generator, because supply and demand do not coincide at the same time



# Water & Energy Tower (sustainable farming)

## WATER & ENERGY TOWER + FARMING AND TRAINING

**Each tower module** is designed from an intake point of raw water (well- river - beach) capable of delivering at least 3l/s, not far from an extension of arable land of at least 3 hectares. This scheme will attend a community of 300-400 people, with a investment estimated between 275,000€ - 330,000€. If the quantity and quality of raw water are favorable, the project can serve to larger communities.

Energy Tower, along with the water and the land, will be the third major component of this equation of prosperity. Able to capture, process, store and provide power and water in remote locations, it will provide the basics to develop sustainable farming.

The farm guarantees the survival of generations, providing agriculture and animal breeding and allowing food preservation, also providing revenue from the sale of surplus production. Farm School will give a basic general education in addition to specific training in agriculture.

With 11 kW photovoltaic + 12 kW wind power + energy accumulation in batteries and all supported by a 15kVA diesel generator, Energy Tower ensures the power supply to the various consumers and facilities (well pump, water treatment / desalination plant, milking room, refrigeration tanks, freezers and refrigerators, lighting, telecommunication, flashing beacon,...) as well as potable water for human and animals. Water surplus can produce more irrigation.

**The Agricultural Project:** will be developed depending on the quantity and quality of raw water and on soil analysis. Tolerant and productive species will be sought both for human and animal consumption. Watering will be done under pressure from the high Tower deposits, with high-efficiency systems (drop-drop) on 12 plots of 2,500 m<sup>2</sup> in which crops are rotated, starting with a green manure (vetch, beans, peas,...) followed by short roots' crops (cabbage, onion, spinach, potato, lettuce, corn, sweet potato,...), ending with deep-rooted crops (cucumber, pepper, tomato, beets, carrot,...). They will alternate every 4 - 6 years in each plot.



**The livestock project:** will enhance the use of indigenous breeds, ensuring their genetic improvement and handling conditions, favoring those species that best transform agricultural sub products in food (meat, eggs, milk, honey,...) particularly rustic species: poultry and goats.

The **poultry farm** will be installed on 3000 m<sup>2</sup> fences, with food and water bowls, shaded areas and a 100 m<sup>2</sup> facility with 70 roost nests to house 500 laying hens and collect 28 dozen eggs per day (28x12 = 336), with a water consumption of about 150 l/day for the whole hens.



The **goats' farm** will use agricultural products and by-products in addition to the surrounding wild grasses, with rotational grazing system in semi-stabled, with scheduled delivery and lactation. An average delivery of 1.7 kids per year and 400 liters of milk between deliveries, intended largely for the manufacture of cheese. A herd of 275 mothers produce 301 liters of milk and 12 kg of meat per day, if the kids are sacrificed to achieve 10 kg and goats are replaced every 5 years. Water consumption for the whole goats farm is about 600 l/day.



On another hand, in addition to food and incomes from the sale of products, the **School Farm** will provide education and training, even allowing to obtain the title of Agricultural Technician with experience in planning and management of farms and their products, and creating mechanisms for dissemination and outreach to communities.

**In the Coast:** When the scenario is near the coast, the water resource will be taken from a beach well next to the sea (33,000 ppm salinity). The desalination conversion rate is 35% and much of the available energy will be spent in the desalting process, so the size of the agronomic project must be reduced, enhancing other activities (fishing, tourism, etc.)

**Inland:** When the brute water comes from inland wells with salty water ( $\approx 3.000$  ppm), where the flow of brine can not be poured into the sea, the desalination plant will be projected with an 80% conversion, through an evaporation of the flow of brine (20 %) obtaining salts and adjusting the size of the agricultural project to the availability of energy and water.

The aim is that all members of the community can have sustainable livelihoods "**giving value to local resources**" and increase their quality of life and opportunities within a perspective of respect for the environment, applying ecological techniques: (re-use of animal manure as an agricultural fertilizer, plant development that favor use and soil conservation to minimize soil erosion,...) Solutions such as these will make the population settle, avoiding migrations.

# Water & Energy Tower (sustainable farming)

## WATER MANAGEMENT

Of the different uses, drinking water for people and animals will be a **priority**, with the remainder for industrial and agricultural use. This means that the treated water tank height must be full or nearly full, keeping a reserve of at least 4 days for priority supply.

For agricultural irrigation water quality requirements are lower, but the amount required will be much greater, paying attention to implement a high-efficiency irrigation, selecting crops more tolerant and with better effects on soil conservation. When the raw water quality is acceptable, direct irrigation is possible just with a pre-filtration step, which may increase the irrigable area.

If the raw water is brackish or salty, it shall be treated as a whole, with conversions of 35% and 80% fresh water rate respectively. In these cases the irrigable area will have to be reduced (see attached hydraulic diagram)

Because of low storage capacity (4 m<sup>3</sup>), the availability of water for irrigation must match the availability of energy. Therefore, it is important to plan them well, using an annual calendar of availability of water and energy resources, taking into account the contributions by rain. The demands will be planned and quantified according to the different possible usages, alternating irrigation of more water demanding species with other less water demanding ones, so that the maximum needs are mismatched.

From this planning, a high frequency drip irrigation system will be projected, installing a network of underground irrigation pipelines (primary + secondary) to feed each of the twelve 2,500m<sup>2</sup> plots, on the 3 hectares planned. Each plot will have a group of PE aerial pipes, 16 mm in diameter (tertiary network), with built-droppers of 1.6 l/h, each 0.4 m, with line spacing of 1.2 m (41 lines with 124 drip emitters each = 5,084 / plot), which is an irrigation dose of 3.25l/m<sup>2</sup> per hour, with a flow rate of irrigation: 8.13 m<sup>3</sup>/h per sector, if the pressure in dropper (from the tank height) is 1 kg/cm<sup>2</sup>.

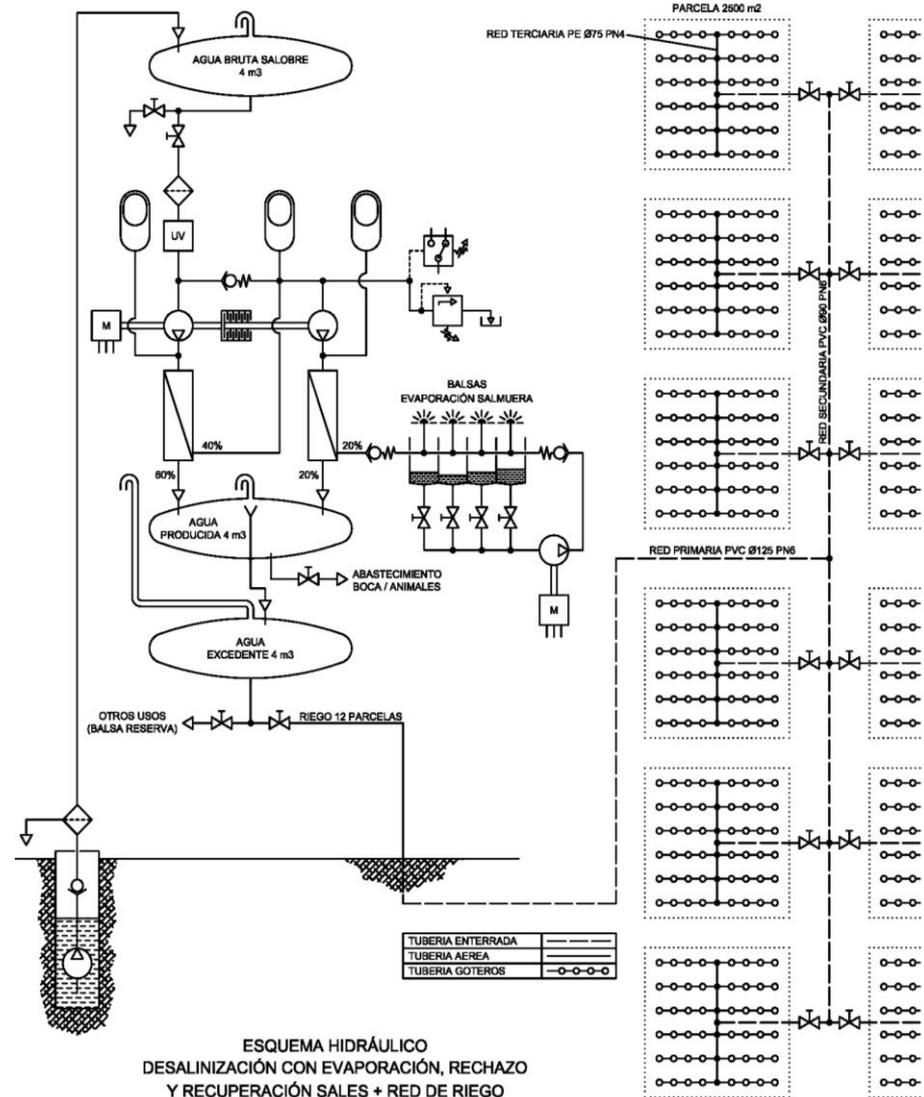
Once the daily dose for the crop is completed, another sector will be irrigated. If the available flow is enough, two or more sectors would be irrigated simultaneously. Whenever possible, the strategy will aim to have more storage of water, next to the tower location (dams, ponds...).

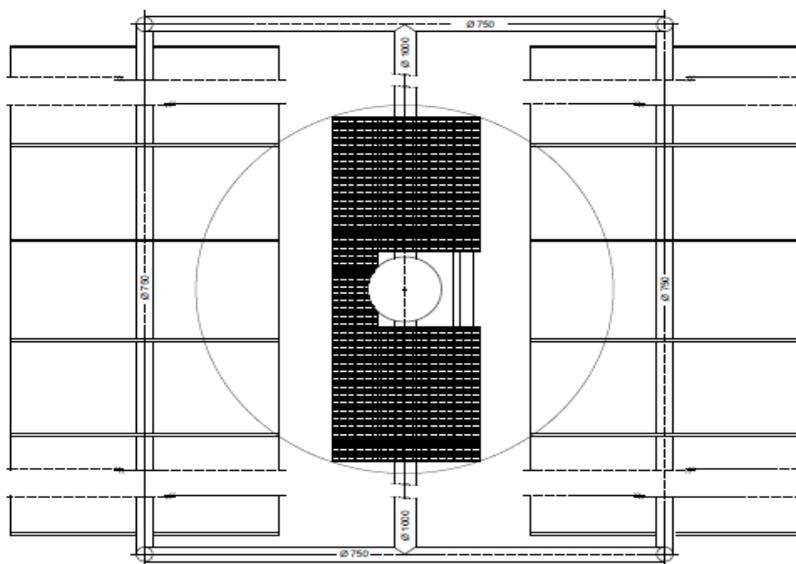
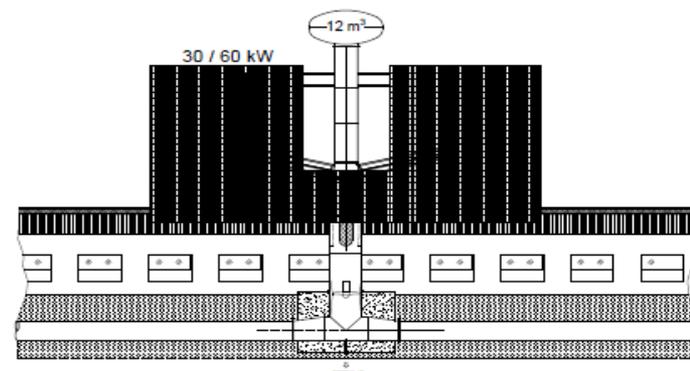
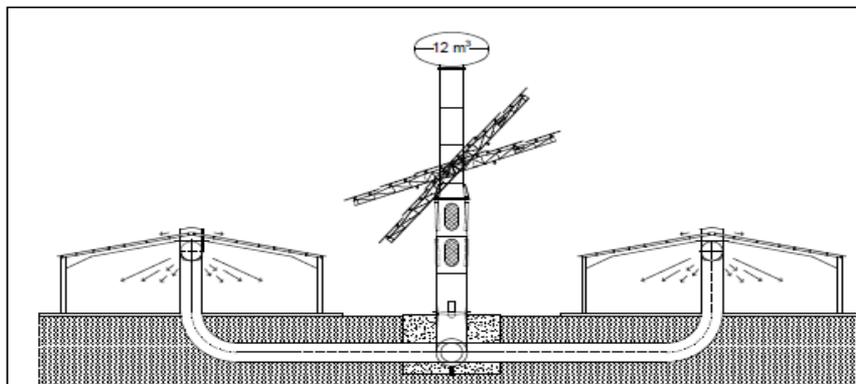
For drinking water management, several different supply points (fountains, animal troughs, etc.) should be planned, at strategic places for the community. Ideally, a double domestic pipeline' network should be developed (one for supply and the other as sewer). Animals' supply would be better by automatic troughs on farms.

## Criteria for the Water & Energy Tower site selection:

At first, a fertile land must be located, well drained and near the water intake. This water must be of homogeneous quality, unchanging and unchanging with external phenomena. The intakes from well executed deep wells may better ensure these conditions.

Energy Tower, including 4 m<sup>3</sup> tanks, is transportable on truck or container and it can be manually assembled with the only help of an electric winch, which will also serve for assembly and maintenance of the pumping well, if it was 1 m far from the tower base.





## GRANJAS + ECOLOGICAS

**CRITERIOS DE DISEÑO :** Nave bien aislada y estanca, con presión positiva en su interior.

- El aire entra filtrado y humidificado fluyendo impulsado por el ventilador a través de ductos subterráneos que lo atemperan, generando flujos transversales de entrada en el interior de la nave y saliendo por trampillas basculantes en cumbrera.
- Mejor reparto del aire mediante flujo transversal.
- Ambiente más higiénico y controlado. El animal respira más y mejor.
- Mayor independencia de las condiciones climáticas exteriores.

**PRESTACIONES Y EQUIPOS :**

- Seguidor solar a dos ejes  $\leq 60$  kW sobre torre.
- Almacenamiento de baterías + Grupo electrógeno.
- Aire filtrado y atemperado  $\leq 60.000$  m<sup>3</sup> / h a 33 mm.c.a.
- Motor ventilador 15 kW + Inverter.
- Humidificación controlada.
- Depósito de agua tratada 12.000 litros a 15 m.

Dibujado	Fecha	Formato A3	Notas	<b>ades</b> TEMPERO Group	
MC	29/05/2017		HOJA 1/1	Nº Plano	Rev
Escala	TORRE ENERGETICA DE CLIMATIZACION Y DE AGUA CON INTERCAMBIADOR DE CALOR SUBTERRANEO PARA GRANJAS E INVERNADEROS			_PR-2017-12	7

# WIND TURBINES From Wind to Water

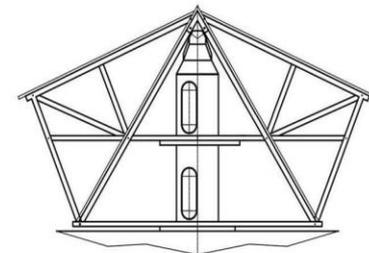
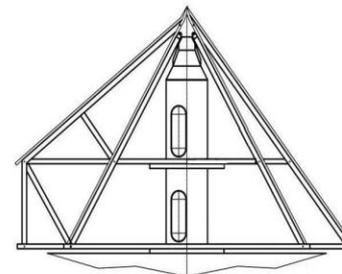
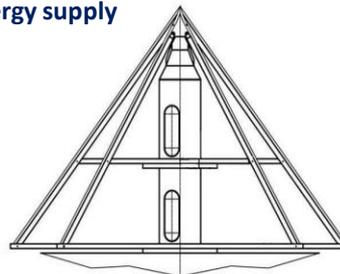
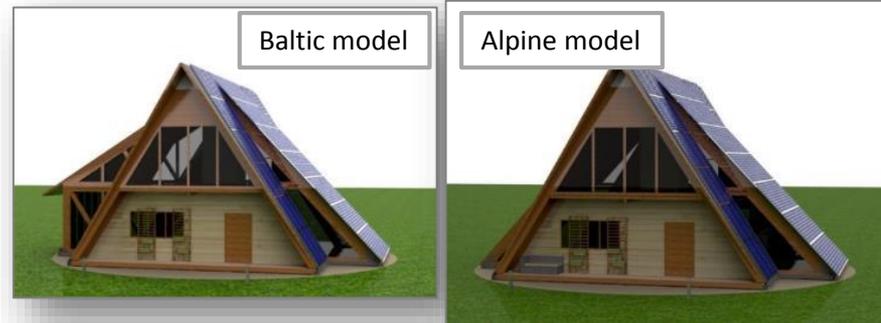
- There are many processes in the market for obtaining drinking water and/or purifying it from a primary source (river, well, lake, etc ...).
- These processes involve large investments and the use of complex chemical and physical processes that need a lot of energy, which in many cases comes from pollutant fuels. Thus, these alternatives are justified only to attend huge consumptions, generally in densely populated areas.
- ADES' solution obtains water from wind energy in any isolated place without any pre-existing infrastructure. The source of water is the air and drying it we get two completely separate products:
  - Pure condensed water. An addition of minerals is needed, to make this pure water drinkable.
  - Dry air. It can be used for drying processes conservation of food.
- Only a small proportion (20%) of the energy captured by the turbine will be transformed into electricity, using energy from the expansion of previously compressed and cooled air.

This is a machine that brings an improvement of the quality of life in remote places, especially when it comes to small rural communities who live in coastal areas, deserts, etc... Water (that was evaporated by the sun heat), is condensed using a renewable resource, without producing any waste or contaminant.

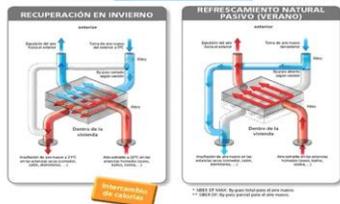
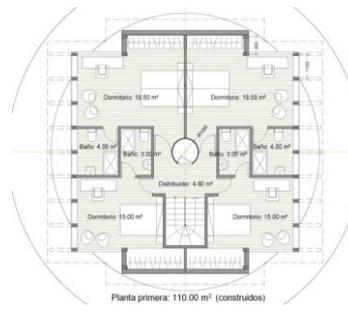
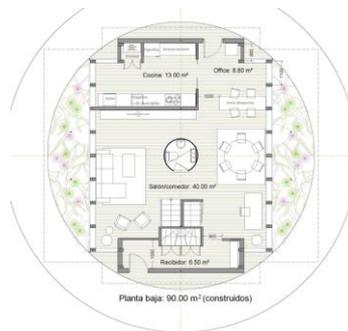
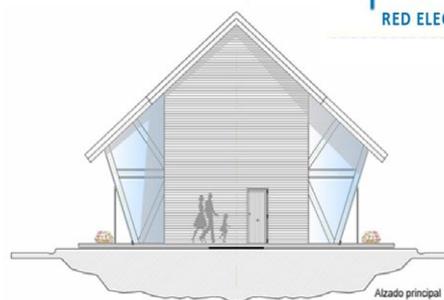
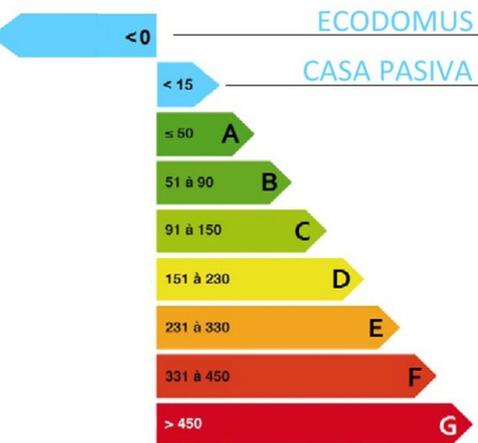


# “ECODOMUS”: Rotate Solar House

- Economically profitable. Ecologically sustainable.
- A new concept of building for solar energy efficient use destined to services and individual housing markets.
- Photovoltaic surface: 154 m<sup>2</sup>
- Power: up to 32 kW
- CHARACTERISTICS
  - Self-supporting structure allowing complete freedom for the design of inner dividing and thermal insulation solutions, complying with all regulations
  - Optimization of solar thermal and photovoltaic energy, and interior lighting, due to the varying shapes of the building and its rotating system
  - Access to an economic, modular and ecological home or offices building, which is facilitated by the incomes from selling the energy produced, and the savings due to self-sufficiency
  - Provides an innovative and environmentally friendly external image
  - Contributes to sustainable development through the choice of construction solutions and clean energy supply to the grid
- APPLICATIONS
  - Houses, offices, hotels or holiday complexes, restaurants, spaces for exhibitions, etc.



# "ECODOMUS": Rotate Solar House (II)



**Bepos-e+nergie**  
Cumple con la normativa de edificación BEPOS\*



CUMPLE CON EL CODIGO TECNICO DE LA EDIFICACION CTE  
\*normativa francesa de edificación energeticamente Positiva.

**Energy generation over buildings and open spaces, designed to cover any kind of structure without impacting its cover, and reducing thermal loads through shading.**



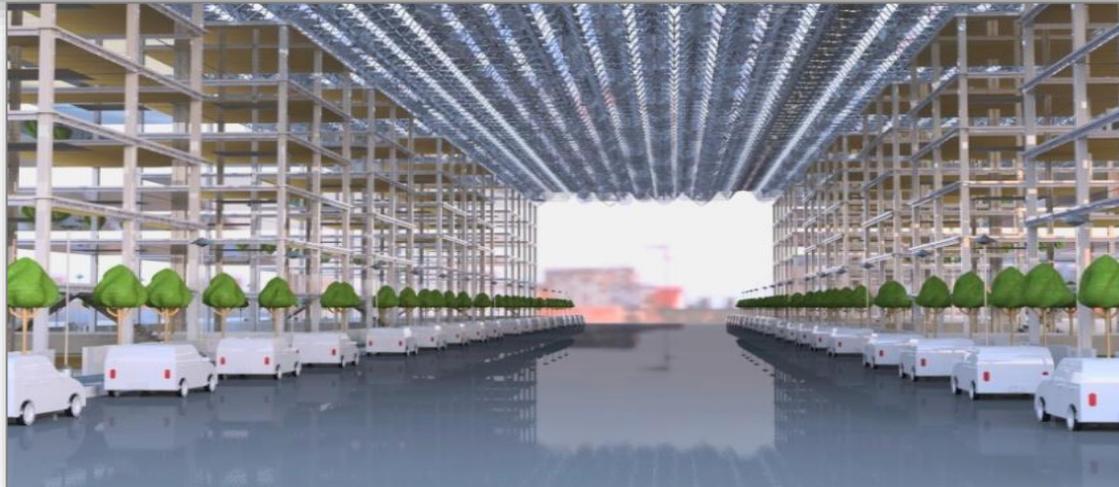
## Features:

- High power density (between 130 and 136 W/m<sup>2</sup>)
- Strong 32 kg/m<sup>2</sup> high stiffness structure
- Possibility of covering more surface by overhanging (up to 10 m), raising the installed power and shading walls.
- New buildings might be projected with a space between columns that are integer multiples of the distance between knots (2 m to 2,5 m) achieving a “whole structure” that improves seismic-proof attributes of the building.





**On buildings:**  
Industrial , malls,  
allowing “in site”  
generation, and  
reducing the thermal  
load by shading



**Commercial  
streets:**

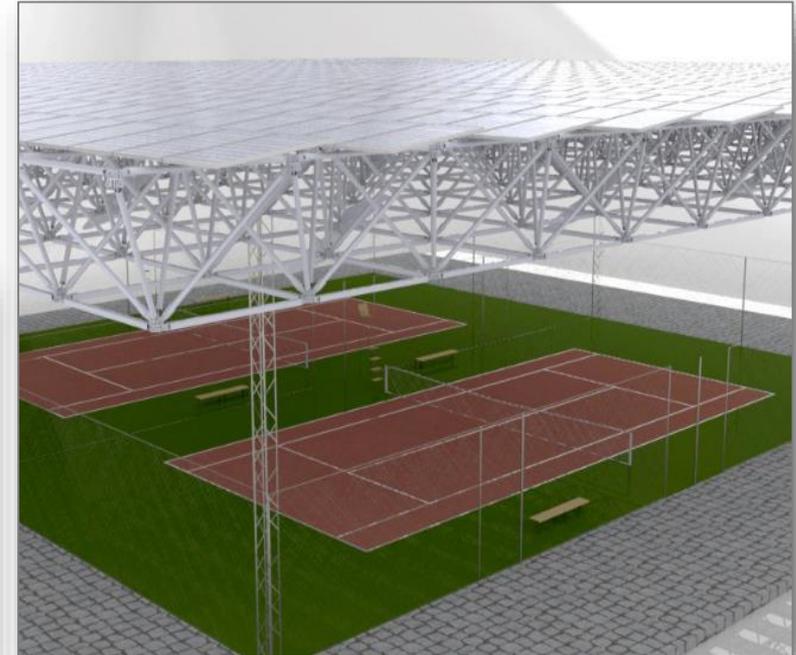
allowing shaded  
surroundings,  
improving area  
habitability

## Sport areas:

The structural specifications allow to shade wide open areas while generating power (> 40 meters between pillars).



Avenue crossings and bus stops.

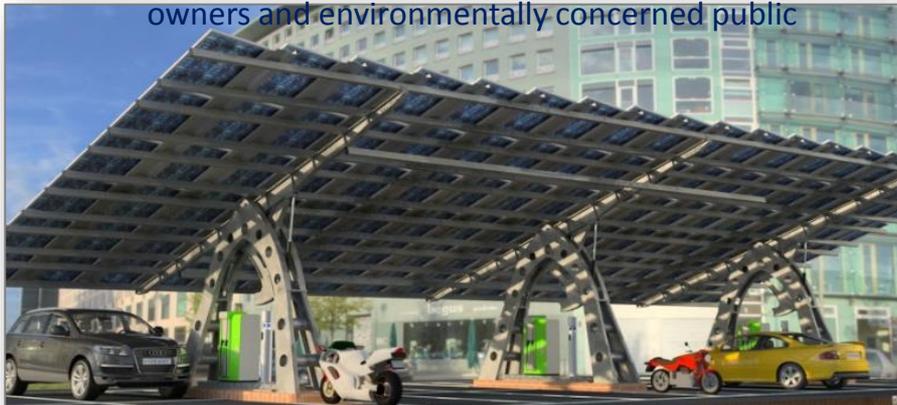


## Others:

Irrigation ponds or water reservoirs: Shading reduces water temperature and evaporation, providing PV power for pumping, even in off-grid areas.

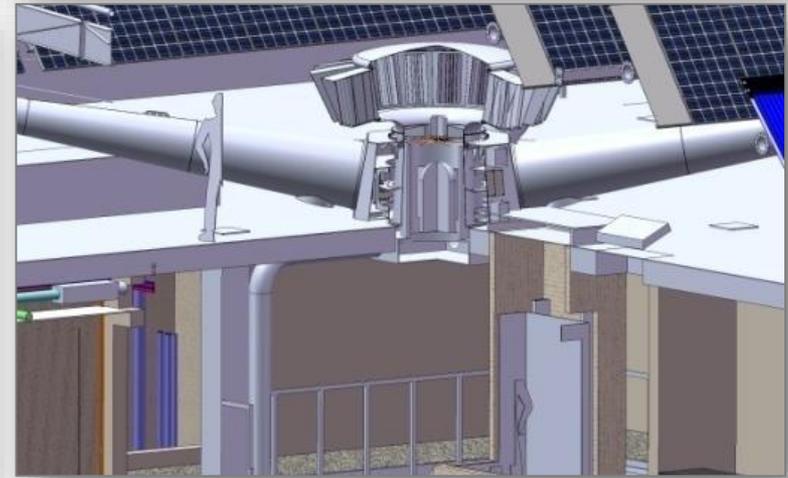
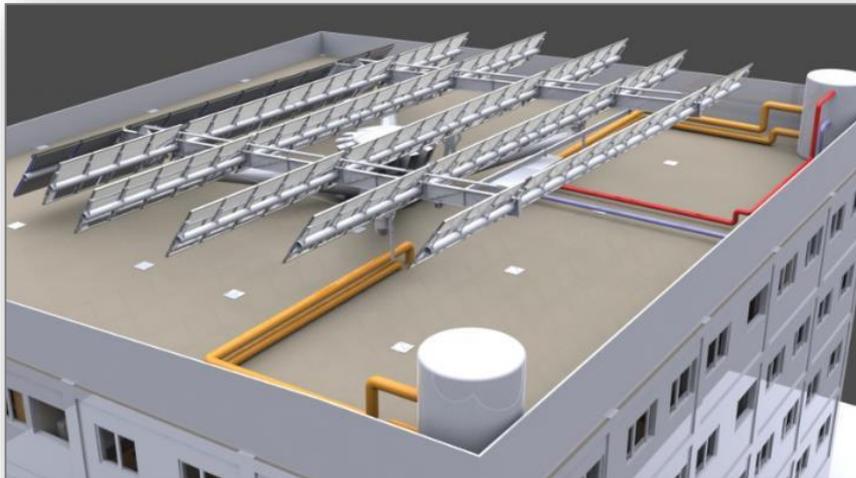
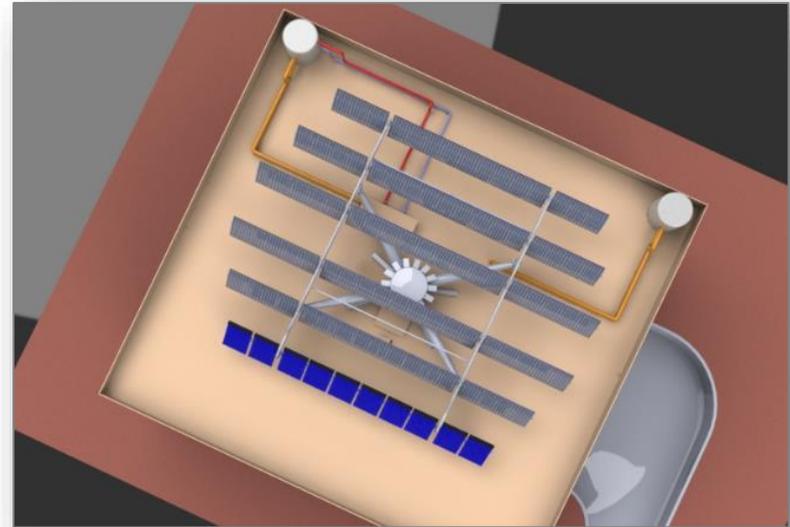
# Solar Parking with PV Charging

- As a new solar tracker application, this parking concept maximizes the utilization of solar energy for electric vehicle charging and selling the excess to the grid
- Module characteristics:
  - Photovoltaic roof dimensions: 10,8 x 24 m
  - One axis solar tracking generation: up to 48 kW
  - Capacity for 16 cars and 6 motorcycles per modular unit
  - Up to 3 recharging stations for electric vehicles
- Advantages
  - Surplus production can be sold to the grid
  - It provides an innovative and eco-friendly image, and also attracts new customers, like electric vehicle owners and environmentally concerned public



# City Building 3 axes Solar Traker

- Supplies:
  - Electric energy (36 kW)
  - Thermal energy (73 kW)
  - Clean air renewal ( $\leq 4000 \text{ m}^3/\text{h}$ )
  - Air conditioning
  - Fire protection
- Thermal and photovoltaic modules juxtaposed to modify the sun exposure as needed
- Low visual impact from the street
- Designed for buildings with flat roof and preferably squared section



# Modular Energy Towers

- Poly-functional modular energy towers capture solar and/or wind energy depending on the utilization. Options offered by specific surroundings' conditions
- Constant production of energy
- Modular design
- Permanent stationary and safe structure
- Built-in battery bank
- Protection from short-circuits
- Protection from atmospheric discharges
- Addition of pressure to water for distribution
- Various set-ups for different outputs and functions
- Articulated extensions for easy maintenance



# TRANSPORTABLE POWER STATION

## ○ Range of models

- 70 kW (50 % wind + solar + batteries and 50 % diesel) with solar tracking system
- 60 kW (40 % wind + solar + batteries and 60 % diesel) with solar tracking system
- 50 kW (30 % wind + solar + batteries and 70 % diesel) with solar tracking system
- 10 kW: manual control

## ○ Design advantages

- Sustainable and immediate solution
- 3 power sources for a 24 hours energy delivery and a battery bank:
  - PV modules
  - Wind turbines
  - Diesel generator
- Plug & Play
- Transportable design:
  - By ground
  - By sea
  - By air (special version)



# TRANSPORTABLE POWER STATION (II)

## ○ BENEFITS

- Reduces fuel needs
- Less dependence on petrol costs
- No needs of power / transmission lines

## ○ APPLICATIONS

- Rural areas
- Isolated areas, islands, etc.
- Emergency needs (Camps /Hospitals...)
- Industrial needs (Mining industry....)
- Water pumping
- And many others...

## ○ OPTIONS

- Information and Communication Technologies (ICT)
- Can be accommodate with others technologies



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