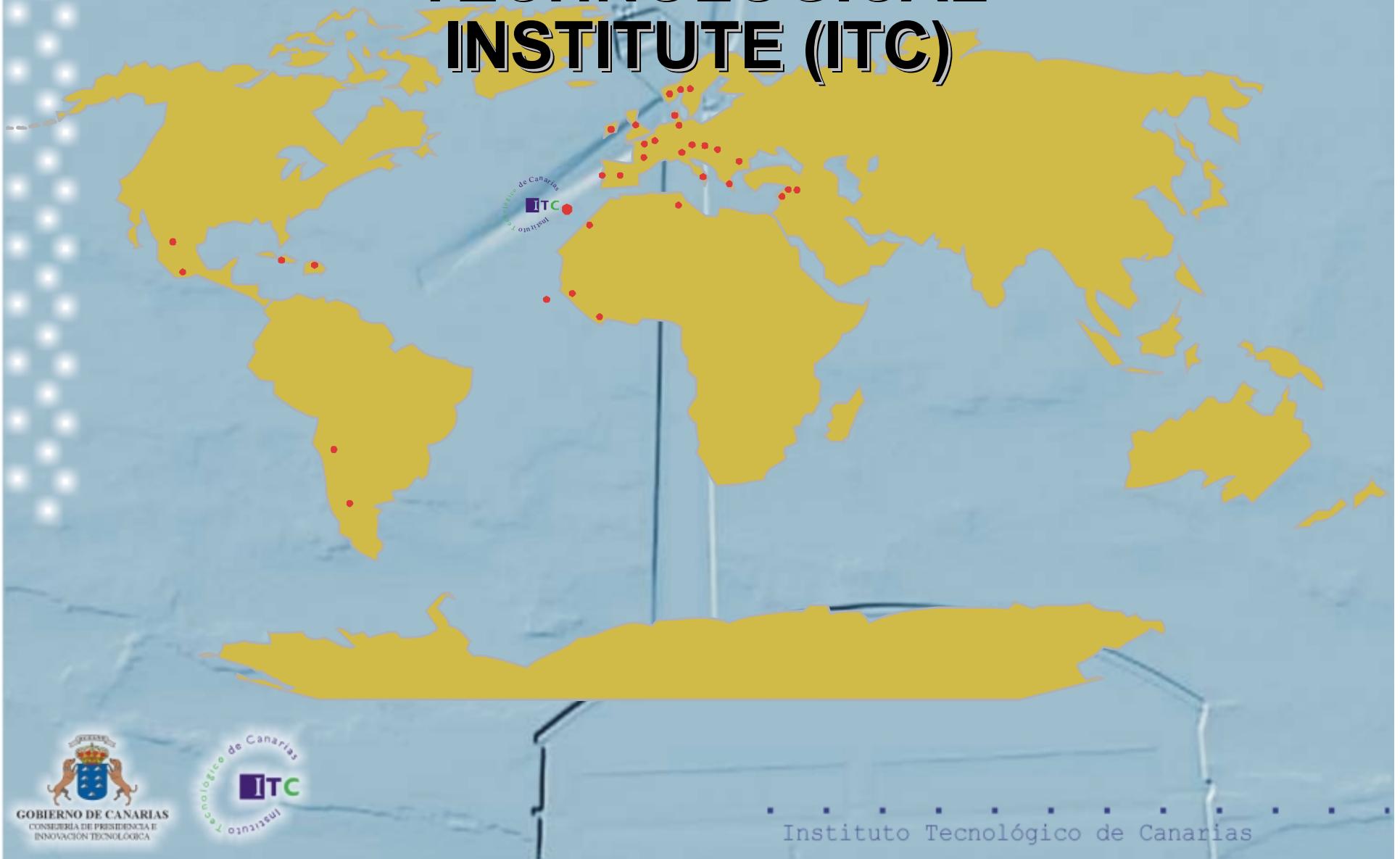


CANARY ISLANDS TECHNOLOGICAL INSTITUTE (ITC)



Instituto Tecnológico de Canarias

ITC - Description & Objectives

ITC (Instituto Tecnológico de Canarias) is a public company of the Canarian Government, appointed to the Regional Ministry of Presidency and Technological Innovation.

Its main objective is to foster the industrial development of the Canarian Archipelago, by means of R&D activities, services to SMEs and close contact with canarian administration bodies, universities and companies

Offices in Gran Canaria, Tenerife,
La Palma and El Hierro

ITC current staff: 180 people



Instituto Tecnológico de Canarias

Technical Direction

GENERAL OBJECTIVES :

To develop, to foster and to lead R&D activities and technical services which support the Industrial Development of the Canaries.

EMPHASIS:

- Applied R&D
- Technology Transfer to Canary Islands-based Enterprises.

AREAS:

- Renewable Energies.
- Desalination and Water treatment.
- Biotechnology and Environmental Sciences
- Medical Engineering.

GENERAL FACILITIES



Area: 109.000 m²

Mean wind speed: 7,5 m/s

Annual solar irradiation : 2.000 kWh/m²



RENEWABLE ENERGIES AND WATER DEPARTMENT



Instituto Tecnológico de Canarias

RENEWABLE ENERGIES AND WATER DEPARTMENT

OBJECTIVES:

Development of specific applications based on the utilisation of renewable energies, especially water desalination and electricity production (off-grid systems), heat and cold production in remote areas.



RENEWABLE ENERGIES AND WATER DEPARTMENT

- Electricity production using renewable energy sources
- Drinking water production (water desalination) by means of renewable energy systems
- Cooling, ice-production and air-conditioning by means of renewable energy systems
- Application of renewable energies in buildings and agriculture
- Development of low and medium power wind energy systems (wind-diesel included)
- Penetration of renewable energies in weak electrical grids
- Development and evaluation of desalination and water treatment systems

RENEWABLE ENERGIES AND WATER DEPARTMENT

➤ Technical Services

- Elaboration of wind maps
- Solar radiation studies
- Technical and economical studies of wind installations
- Technical and economical feasibility studies of solar installations

➤ Wind and Solar Systems Tests

- Testing platform for solar thermal systems
- Testing platform for low power wind turbines

➤ Software development services

- Systems monitoring
- Project management
- Renewable energy systems simulation and optimisation

➤ Instrumentation and Control Services

- Design and installation of data acquisition systems
- Control systems programming
- Scada and real time data analysis and transfer

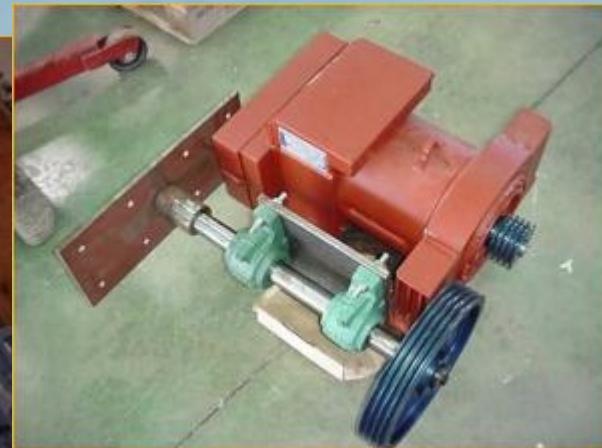
RENEWABLE ENERGIES AND WATER DEPARTMENT

- Modular reverse osmosis desalination plant driven by an off-grid wind farm
- Reverse osmosis desalination plant driven by a small wind turbine.
- Reverse osmosis desalination plant driven by an off-grid photovoltaic system
- Container with hybrid system (wind-photovoltaic-diesel) for electricity production
- Container for water desalination (no electrical connection to the grid needed)
- Ice production systems driven by small wind turbines and photovoltaic systems
- Cold storage plant driven by a small wind turbine
- 20 kW Wind-diesel system
- 4 kW Wind turbine

AEROBATEC

Small and simple Wind Turbine Prototype

- Design and development of a 4 kW wind turbine made of standard market components, (aim: simplicity and minimum cost)
- Suitable for manufacture in developing regions
- Easy maintenance

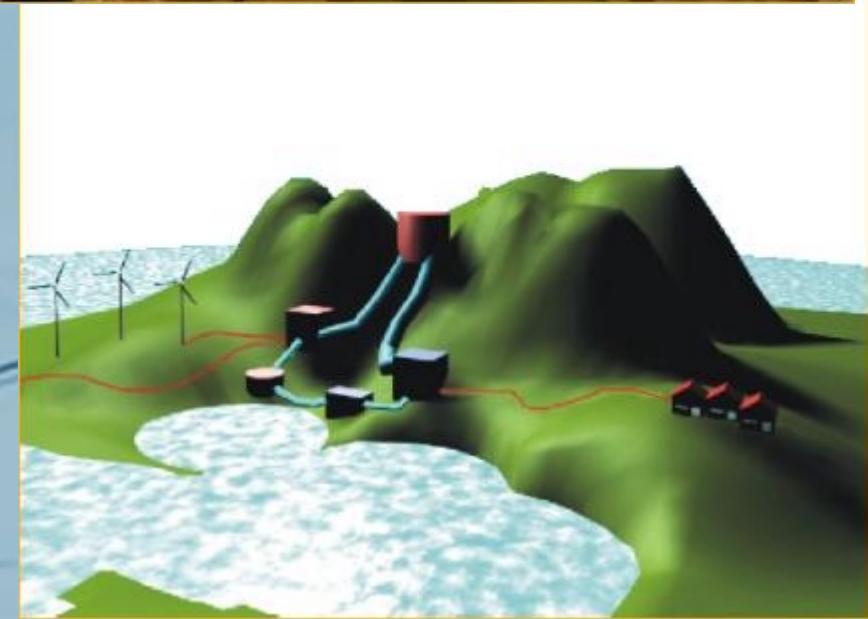


EL HIERRO

Wind Pumped-Hydro Systems



Wind Pumped-Hydro System for
the electricity supply of El
Hierro island



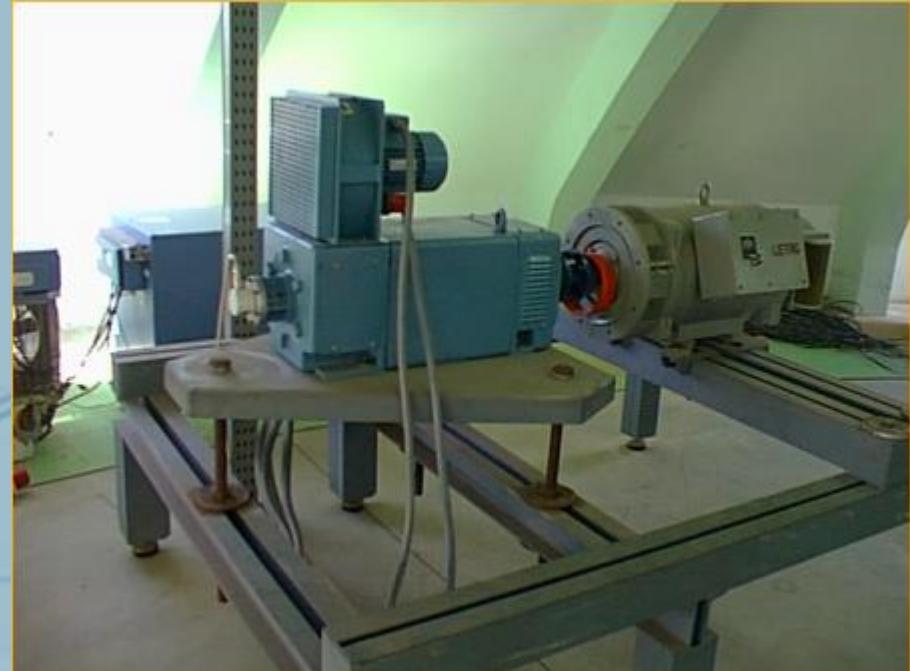
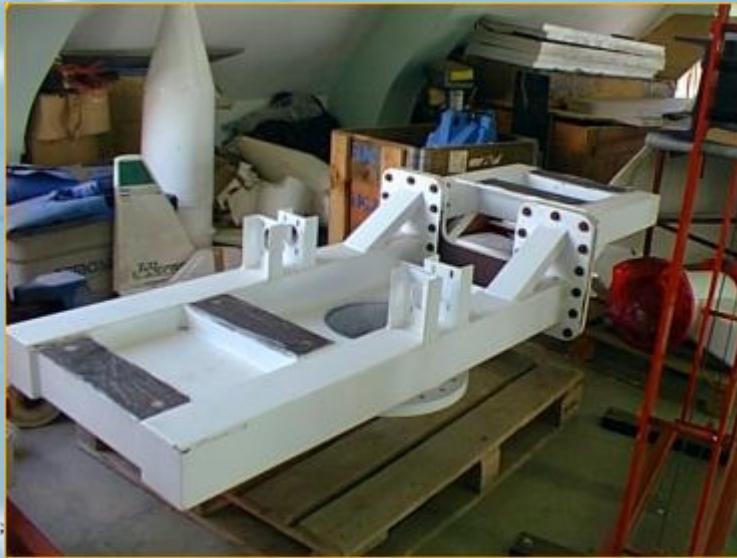
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EODIESEL 15-20

20 kW Wind-Diesel System



- Wind-Diesel System for isolated villages
- 20 kW Synchronous (self designed) wind turbine, 20 kW diesel gen.
- Control system with PLC
- Modular construction



CENTRAL PUNTA JANDÍA

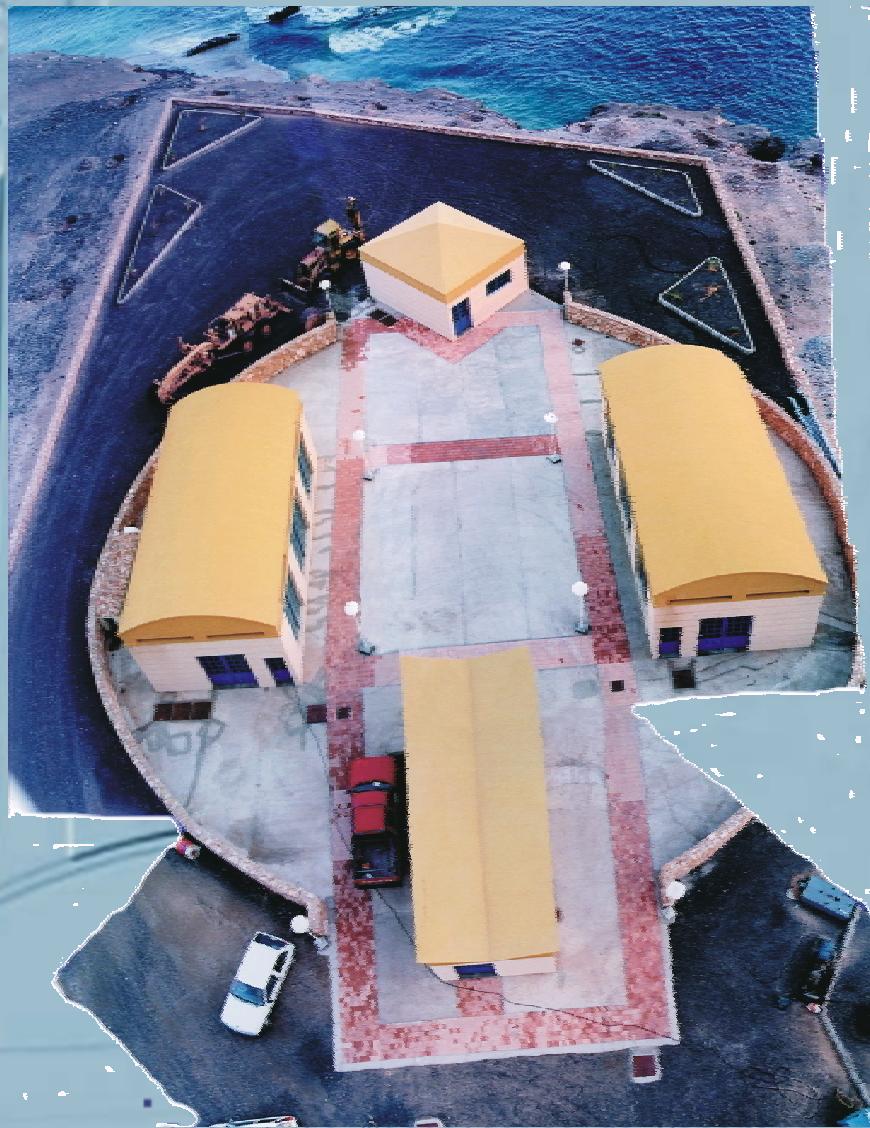
WIND-DIESEL SYSTEMS FOR ENERGY,
WATER, COLD AND ICE SUPPLY



Wind-Diesel System
in Punta Jandía
(Fuerteventura
Island)



Hybrid Wind-Diesel System.



Puerto de la Cruz Village. Fuerteventura





**Residential population:
450 persons (design
max)**

General View.



Instituto Tecnológico de Canarias

Puerto de la Cruz installations

- Wind Generator.
- Diesel Motors (work only when the wind speed is not enough). Flywheel.
- Desalination Plant (controlled load)
- Refrigeration plant (fish 0°C conservation)
- Ice Production.
- Waste Water Treatment



Vestas V27 Wind Generator

Nominal Power: 225 kW (130 kW limited)
Asynchronous Generator
Double Generator 50/225 kW
Three Blades, Variable Pitch



Motor room. Inertia Flywheels



Flywheels: 300 kWs

Electric clutches

Resistance Bank: Controlled
Loads from 0 to 150 kW

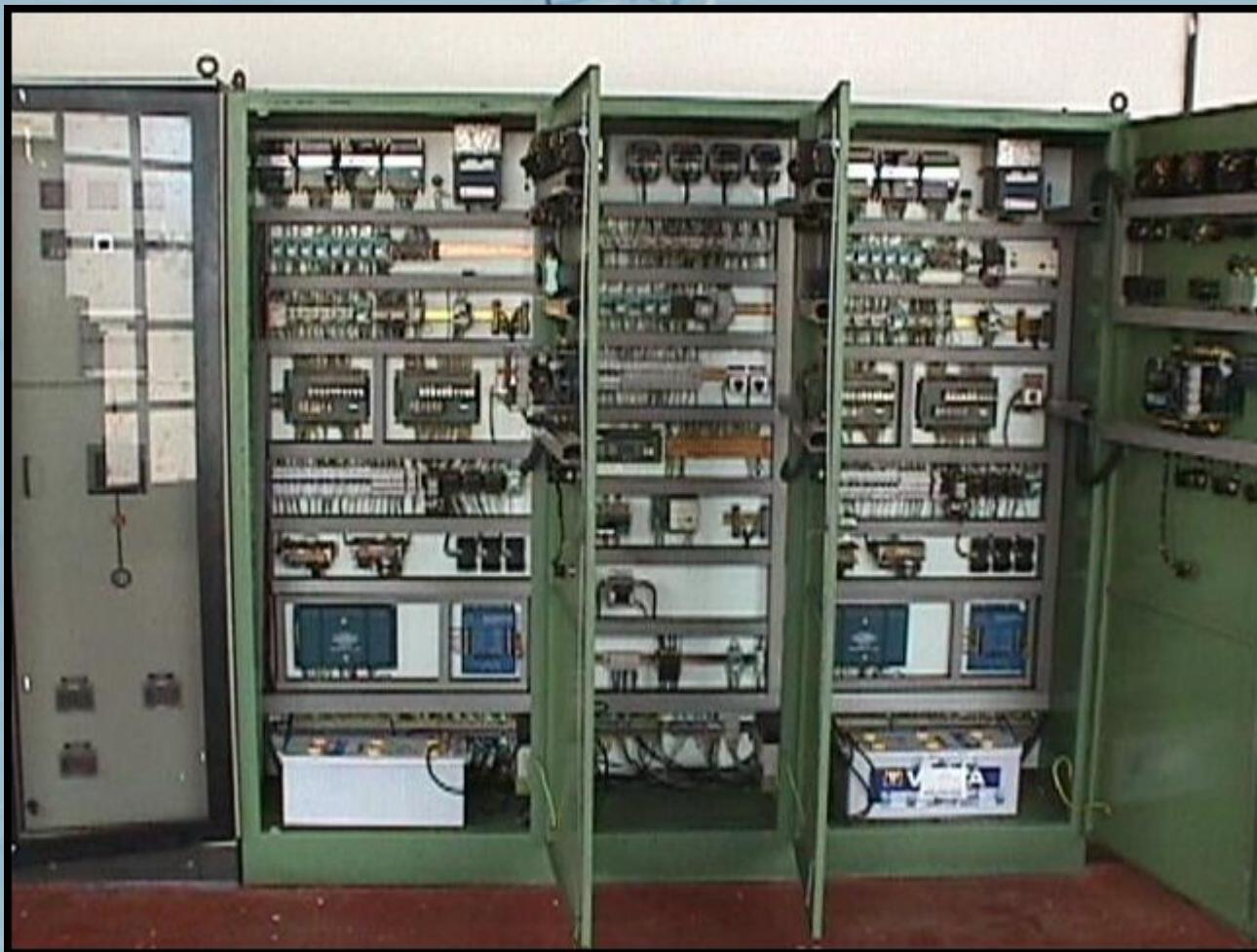
2 Diesel Motors
-speed controller
2 Synchronous generator
-65 kVA
-Excitation controller



Motor room



Motor room



-Desalination plant: 56 m³/d (only with wind)

Storage tank: 2 x 500 m³



Refrigeration plant: 1200 kg (2°C)

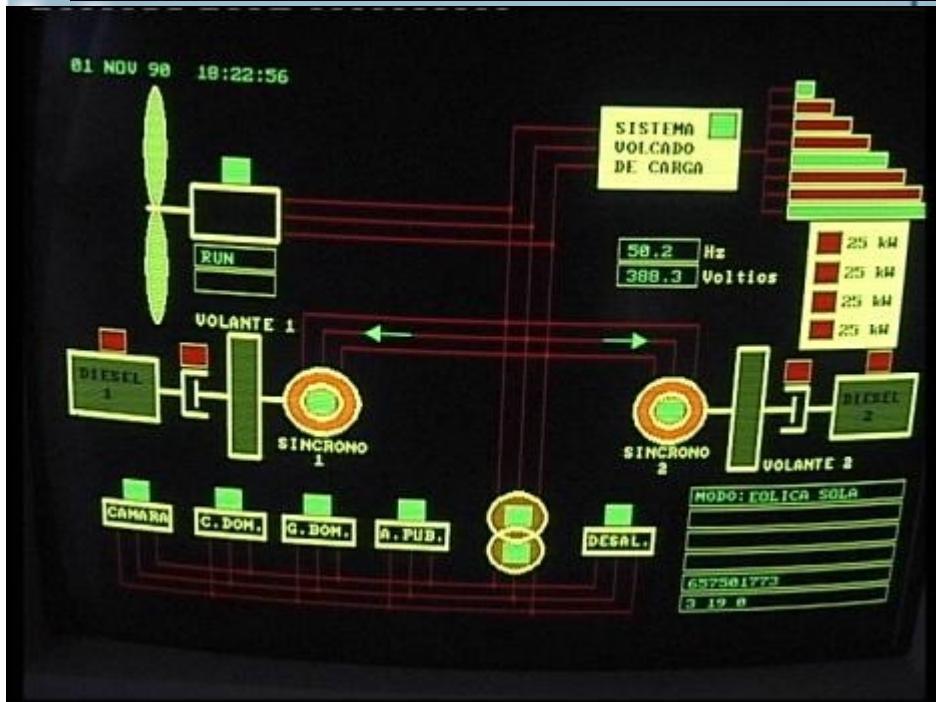


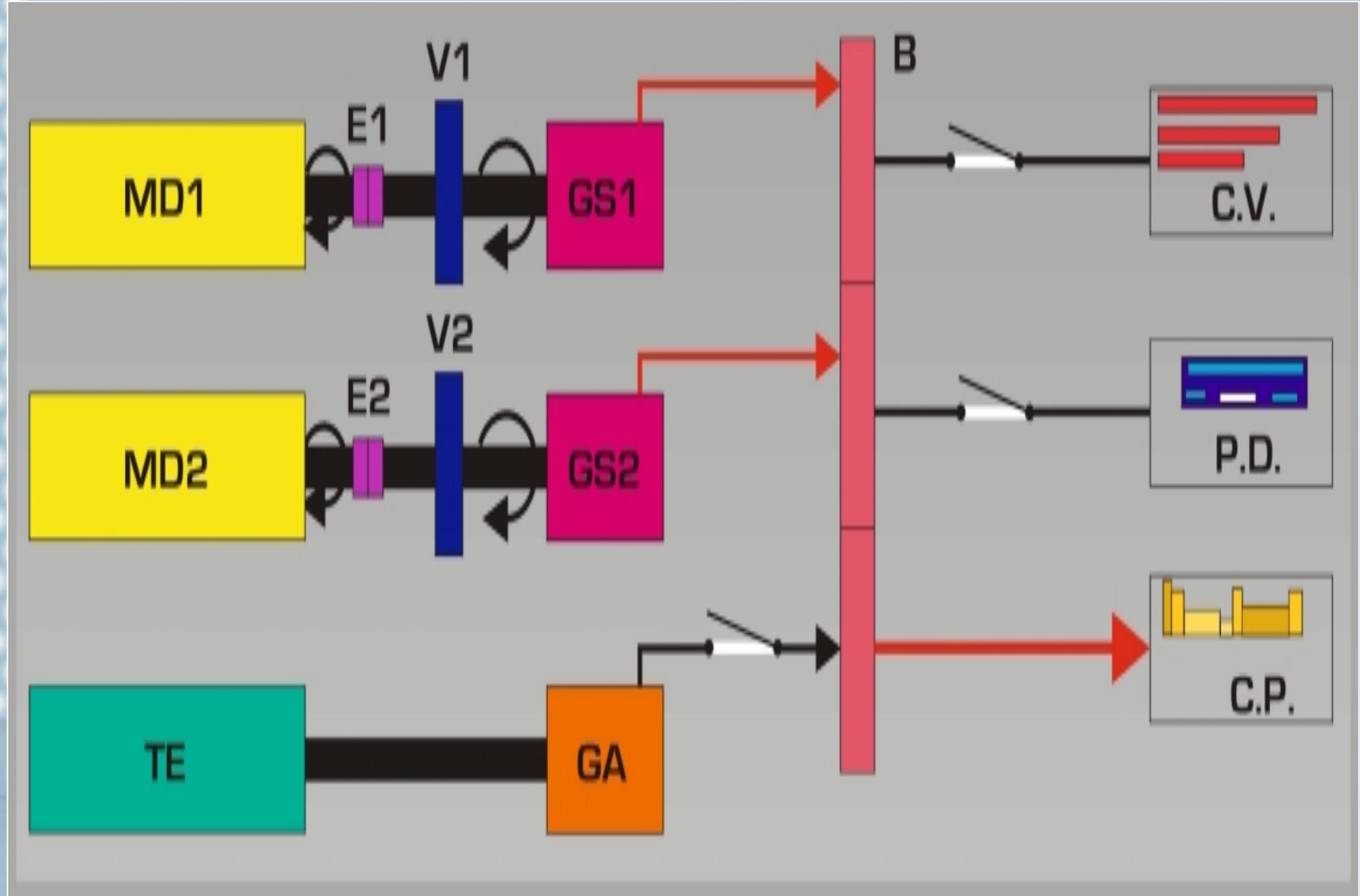
Ice production: 1000 kg/d



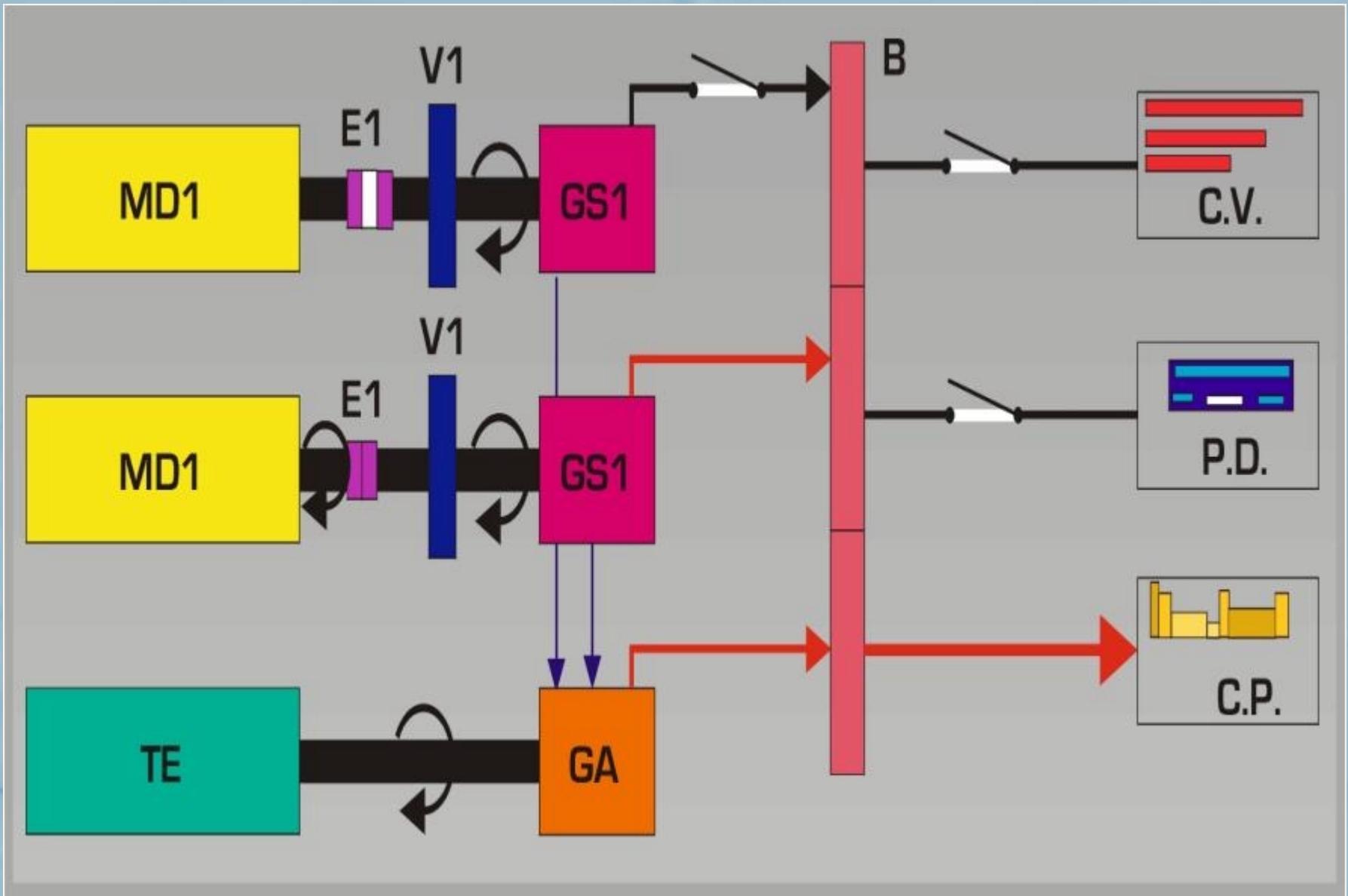


Control room

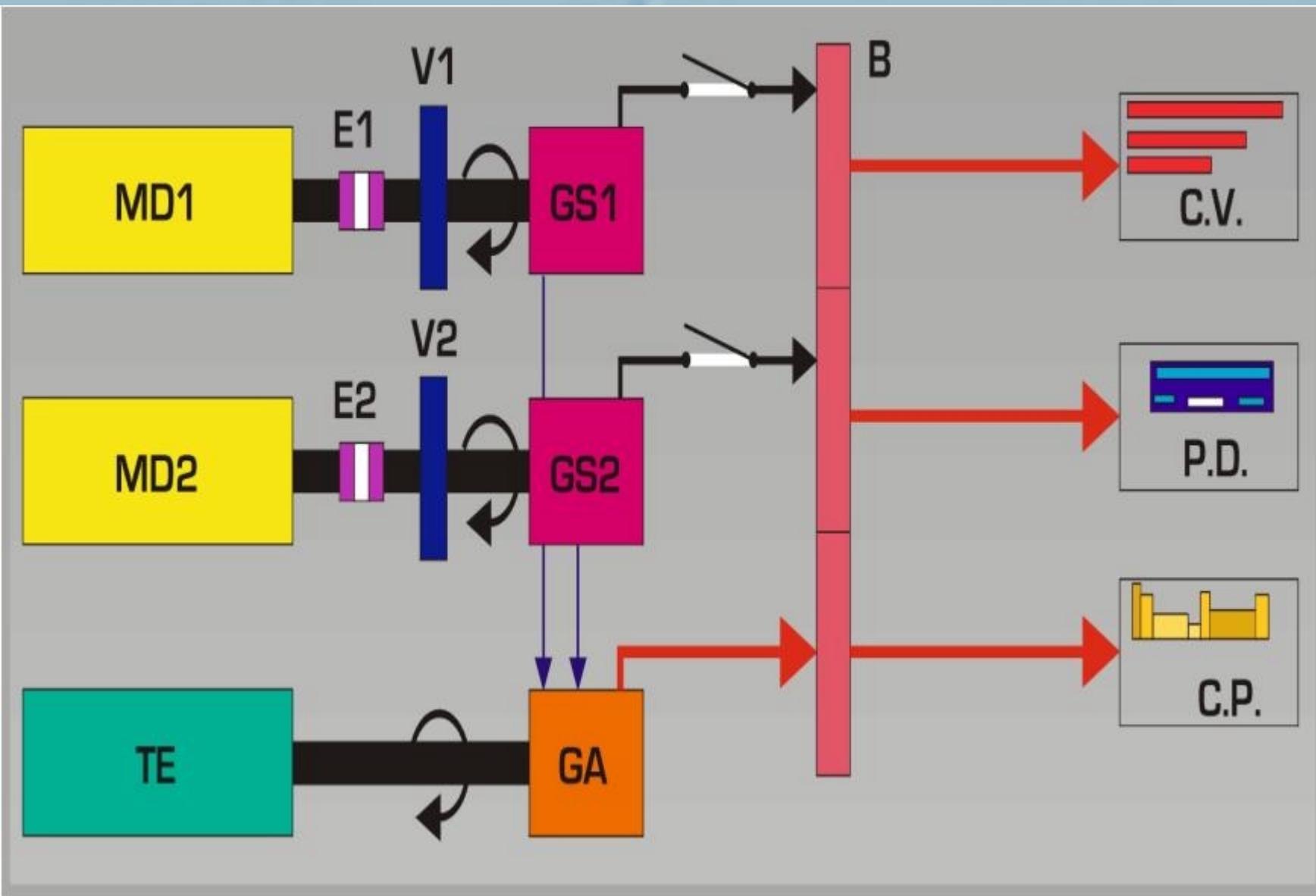




DIESEL MODE

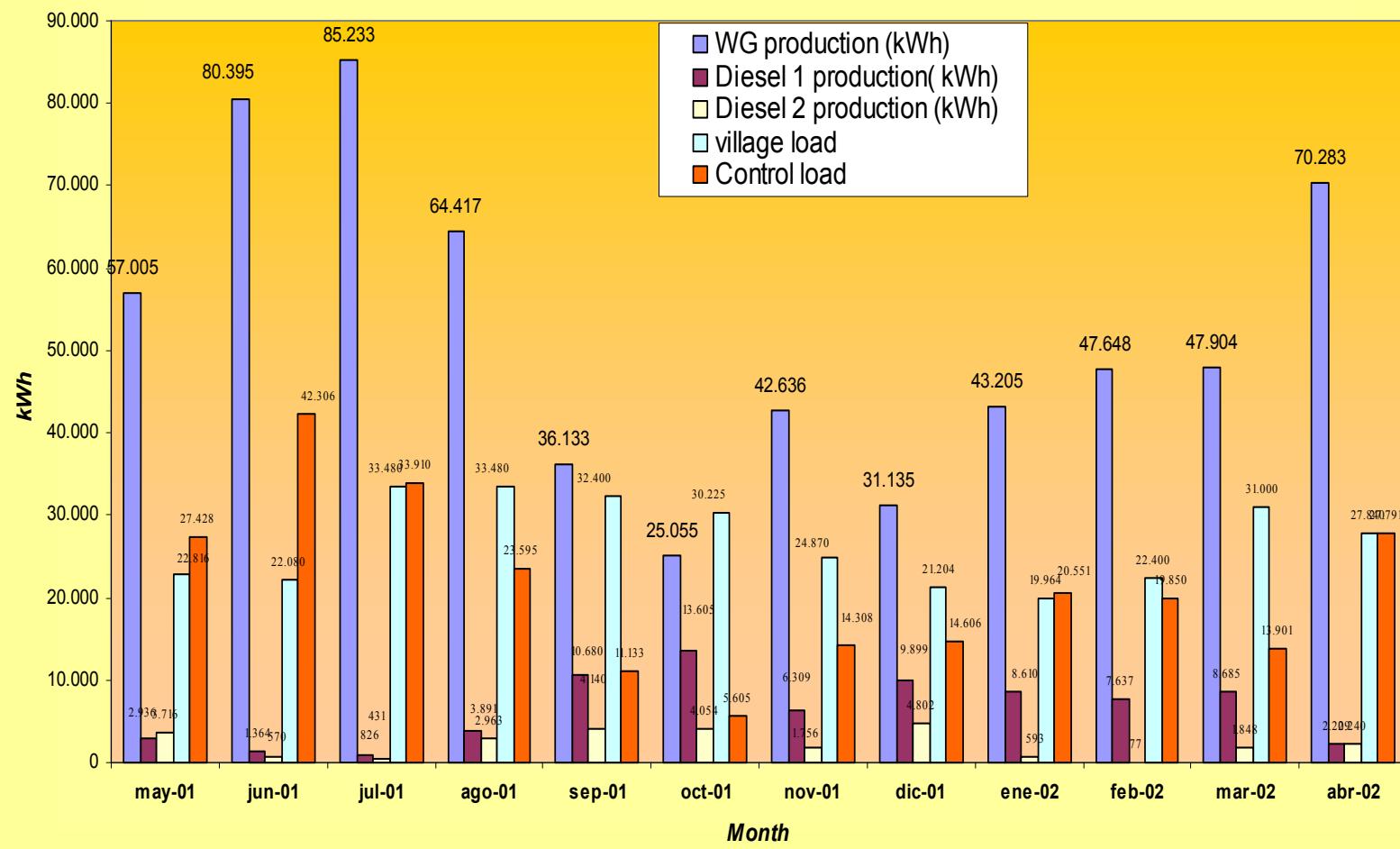


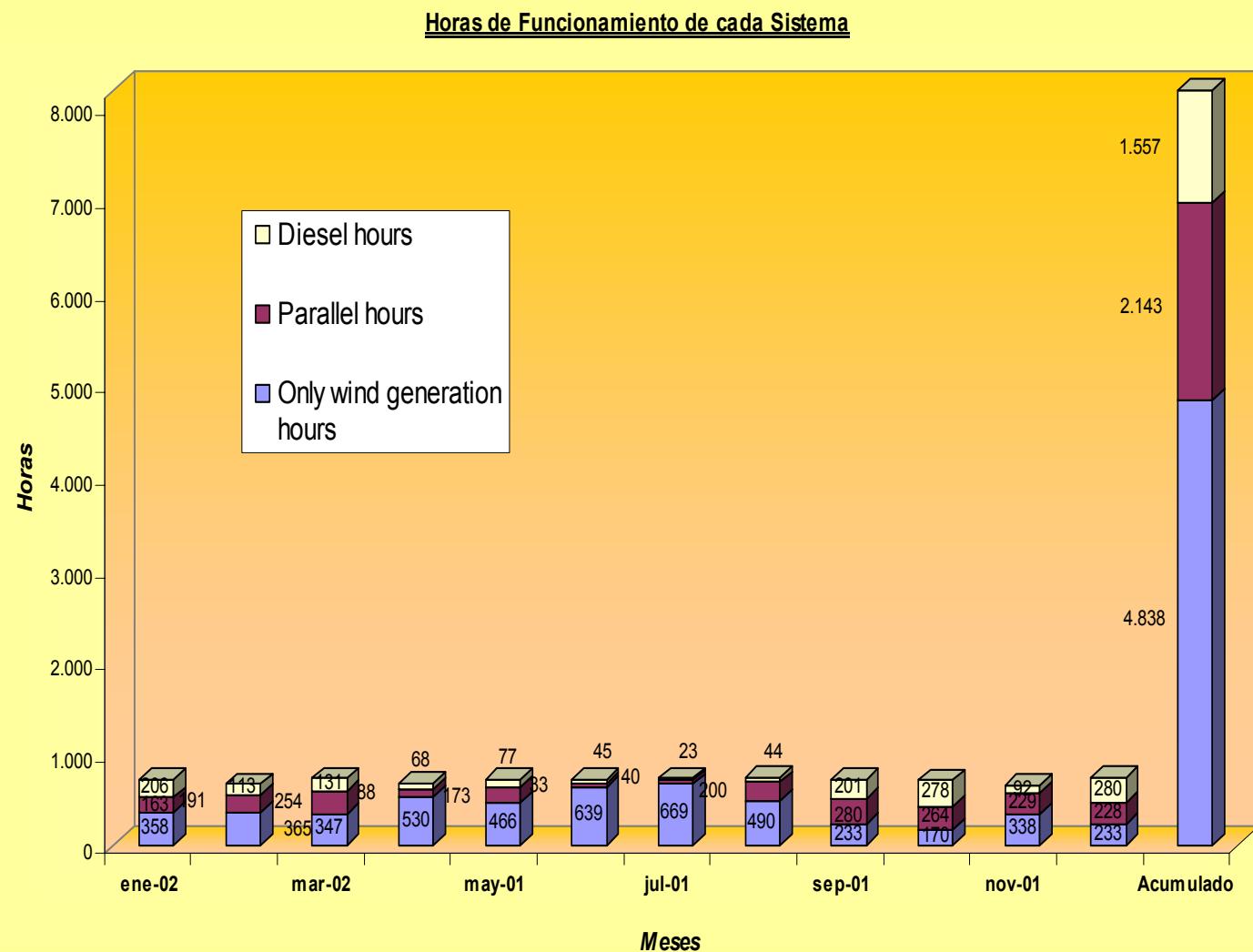
WIND-DIESEL MODE



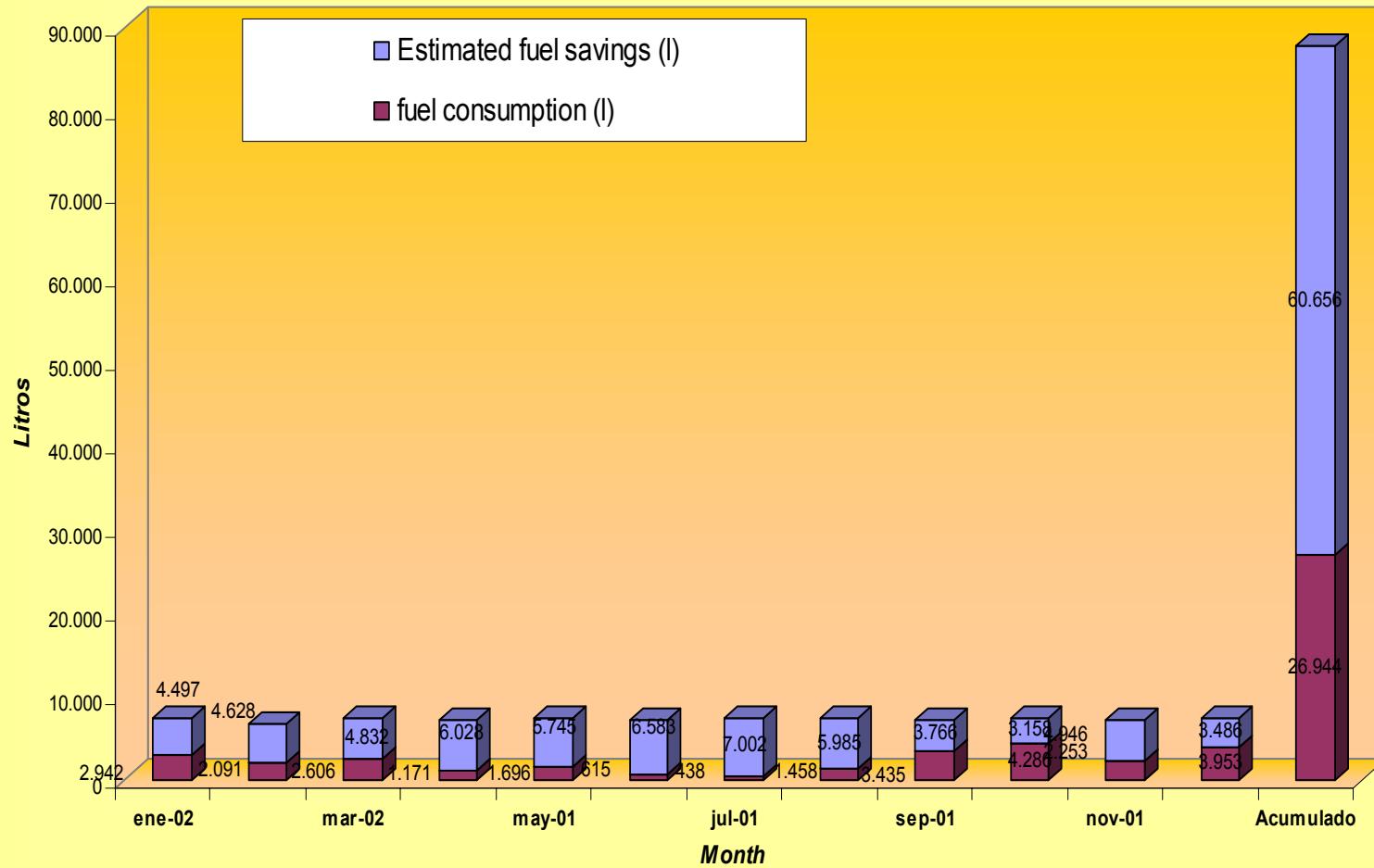
WIND MODE

Energy of the system





Fuel savings and consumption



Costs comparation		Grid Connection	Diesel system	Wind-Diesel System
		20 km		
Investment costs	Euro	1.111.872,39 €	30.050,61 €	324.546,54 €
Diesel Motor		0	12.020	60.101
Buildings		0	18.030	24.040
Wind Generator				240.405
Value after write off	Euro	0	0	0
amortization period	years	20	20	20
Producción Energética	kWh/year	246.740	246.740	246.740
interest	%	5	5	5
Métodos de Amortización				
uniforme	Euro/year	55.594	1.503	16.227
Coste de Oportunidad				
Metodo medio	Euro/year	27.797	751	8.114
		0	0	
Salary	Euro/year		36.061	42.071
fixed costs	Euro/year			12.020
Total Fixed Costs	Euro/year	83.390,43 €	38.314,52 €	78.432,08 €
Fixed unitary cost	Euro/kWh	0,34 €	0,16 €	0,32 €
Spares	Euro/year	0	11	721
Fuel Consumption	Euro/year	0	31.589	10.407
Electricitu fee	Euro/year	20.361€		
Other Variable costs	Euro/year	0	1.106	291
Total Variable Costs	Euro/year	20.360,73 €	32.705,65 €	11.419,29 €
Variable Unitary Cost	Euro/kWh	0,08 €	0,13 €	0,05 €
Total Cost		103.751,16 €	71.020,18 €	89.851,37 €
Total Unitary cost	Euro/kWh	0,42 €	0,29 €	0,36 €

Costs comparison		Grid Connection	Diesel system	Wind-Diesel System
		20 km		
Investment costs	Euro	1.111.872,39 €	30.050,61 €	324.546,54 €
Diesel Motor		0	12.020	60.101
Buildings		0	18.030	24.040
Wind Generator				240.405
Value after write off	Euro	0	0	0
amortization period	years	20	20	20
Producción Energética	kWh/year	740.220	740.220	740.220
interest	%	5	5	5
Métodos de Amortización				
uniforme	Euro/year	55.594	1.503	16.227
Coste de Oportunidad				
Metodo medio	Euro/year	27.797	751	8.114
		0	0	
Salary	Euro/year		36.061	42.071
fixed costs	Euro/year			12.020
Total Fixed Costs	Euro/year	83.390,43 €	38.314,52 €	78.432,08 €
Fixed unitary cost	Euro/kWh	0,11 €	0,05 €	0,11 €
Spares	Euro/year	0	11	721
Fuel Consumption	Euro/year	0	94.768	41.629
Electricity fee	Euro/year	183.247 €		
Other Variable costs	Euro/year	0	1.106	291
Total Variable Costs	Euro/year	183.246,56 €	95.884,05 €	42.640,67 €
Variable Unitary Cost	Euro/kWh	0,25 €	0,13 €	0,06 €
Total Cost	Euro/year	266.636,99 €	134.198,57 €	121.072,75 €
Total Unitary cost	Euro/kWh	0,36 €	0,18 €	0,16 €