

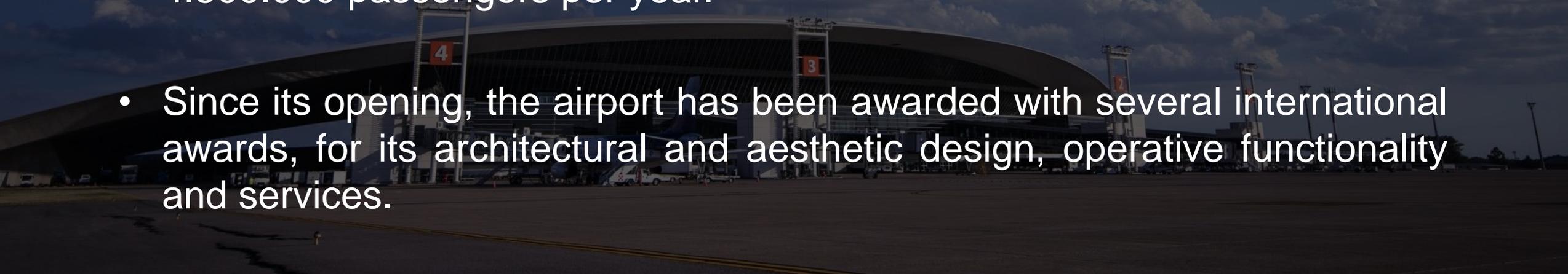


Aeropuerto de Carrasco
MONTEVIDEO URUGUAY



Carrasco International Airport – Energetically Efficient Airport Project

- Puerta del Sur S.A. is the concessionaire of Carrasco International Airport, and belongs to Corporación América S.A., an investment capital group that encompasses different service and infrastructure companies around the world.
- Since 2003, Puerta del Sur have the responsibility of the Administration, Operation, Commercial development and Maintenance of Carrasco International Airport.
- In 2009, the new Passenger terminal was inaugurated, with capacity for 4.500.000 passengers per year.
- Since its opening, the airport has been awarded with several international awards, for its architectural and aesthetic design, operative functionality and services.



In 2007 started the Construction of the New Passenger Terminal. From the beginning the company opted to directly involve the Maintenance and Infrastructure personnel in the Design, Direction and Control of the project, in order to:

- Contribute with the experience acquired in the airport operation
- Facilitate the operational transition from the old Terminal to the new Terminal without major inconveniences.



Design - Roof

- The roof consist of thermal isolating structure covered by a TPO membrane, Firestone brand (USA) as a hydric protection, with an surface of 47,000m².



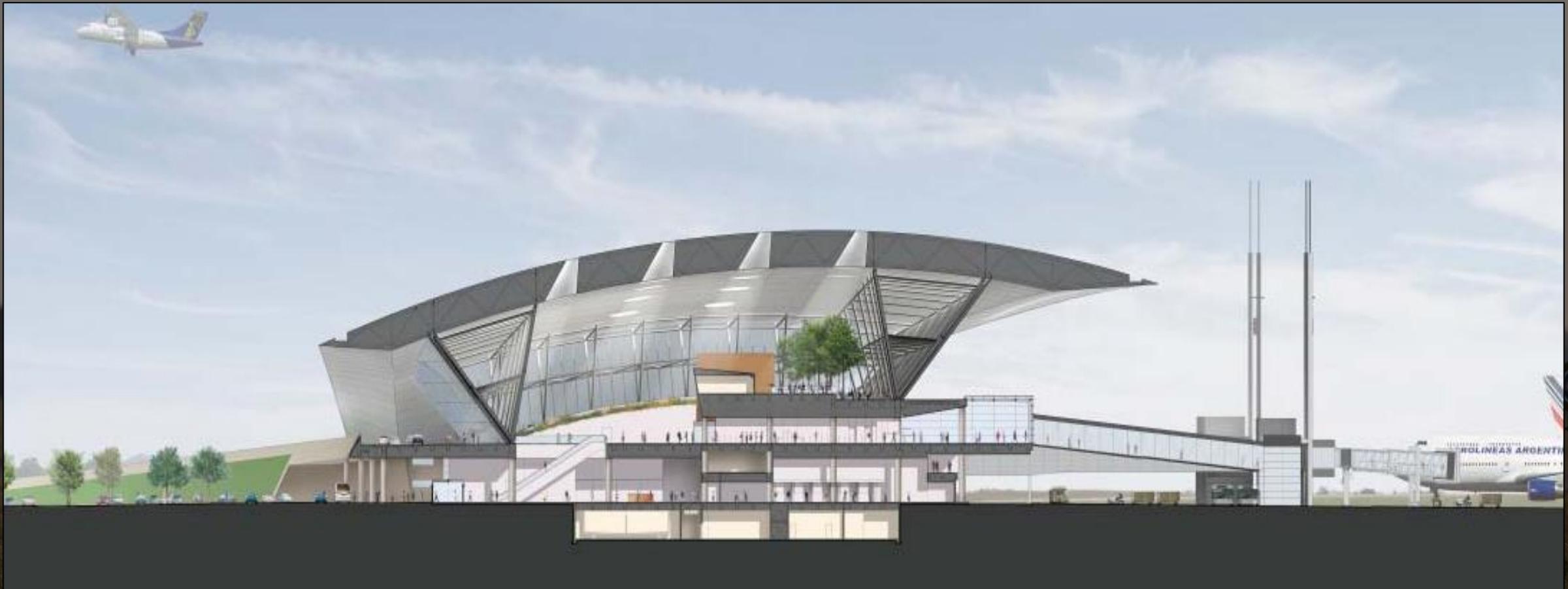
Design - Curtain Wall:

The outer walls is formed by a Curtain Wall of 11.000 m² with double glazing, hermetic sealed, achieving excellent thermal insulation, taking advantage of the natural day light.



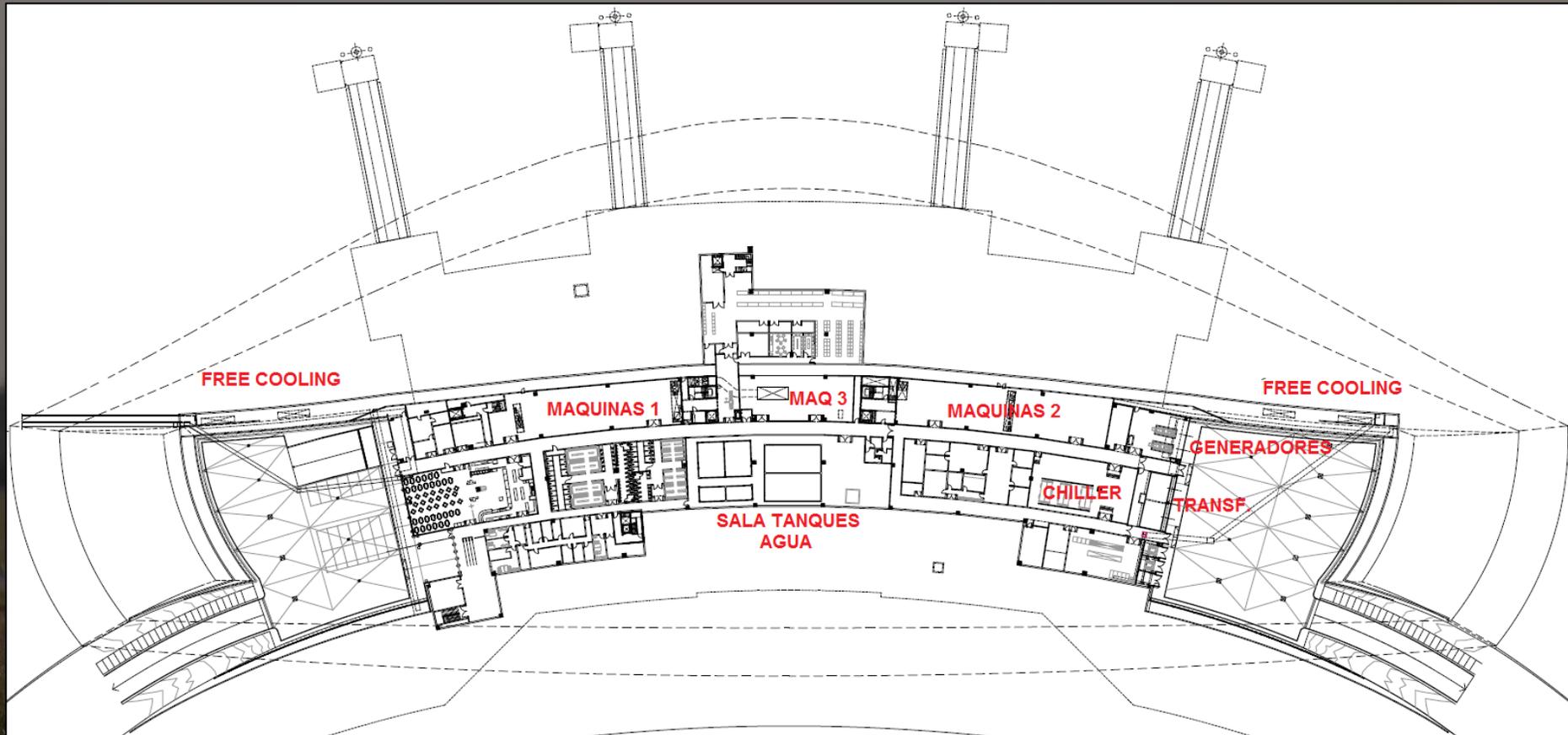
Design – Building:

The building has 5 levels, and all the technical services were installed underground, to optimize the power of the equipment improving its efficiency.



Design – Engines room

The Engine Rooms are placed underground, with large size unified equipment to improve efficiency.



Design – Installations

- The airport have 36 AHUs (Air Handling Unit) and two High Efficiency Modulating Chillers, Trane brand.



In 2015, we set the goal:

**How to further improve Energy Efficiency, reducing
CO2 emissions**



How?

- ✓ Implementing an EMS (Energy Management System).
- ✓ The EMS is based on field measurements of each of the systems involved, looking for savings opportunities.
- ✓ If You Can't Measure It, You Can't Improve It.
- ✓ A measurement system was installed in each machine room to obtain the most relevant data

What was detect with the EMS?

- ✓ 55% of total consumption was for Air Conditioning
- ✓ The AHUs were not functioning correctly, using cold water to cool the environment during winter, even though the temperature outside was 10°C/50 °F.
- ✓ Forced draft fans, which ran 24hs per day, 365 days a year, represented 15% of our total consumption.

Action plan established - Objective:

- ✓ To introduce modern technology to improve airport's energy efficiency, and also introduce renewable energy generation, as a source of energy "clean, safe, and environmentally friendly".



Scope of the: **Energetically Efficient Airport Proyect**

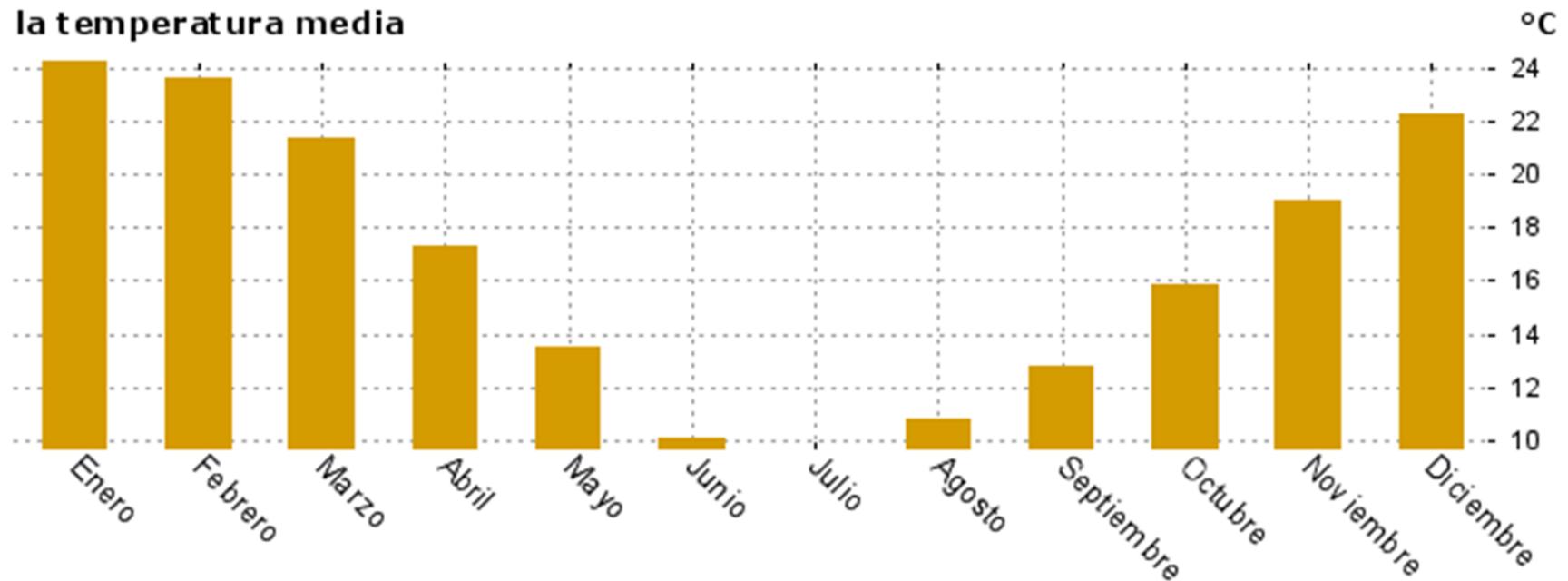
1. To eliminate 100% of fossil fuel use for airport heating, by installing a new heat pumps system, reducing energy consumption by 40%.
2. Optimizing the Free Cooling system managing to reduce 20% of energy consumption for cooling.
3. Replacement of luminaires to LED Technology
4. Supplying 11% of the electrical energy consumption by renewable sources, through a Photovoltaic Solar Plant within the premises of the Airport

1. Montevideo Climate

The Climate in Uruguay ranges from 3 ° C in winter to 30 ° C in Summer, which requires both Heating and Cooling systems.

Estadísticas meteorológicas Montevideo, Uruguay

la temperatura media



1. Original Thermal Conditioning System

Heating system consisted of two boilers of 1.000.000 Kcal/h each, powered by Natural Gas.

Two 850TR Chiller for cooling.



BOILER



CHILLER

1. Operation in Summer

Only the Chiller is used



1. Operation during mid-season and winter: Opportunity...!

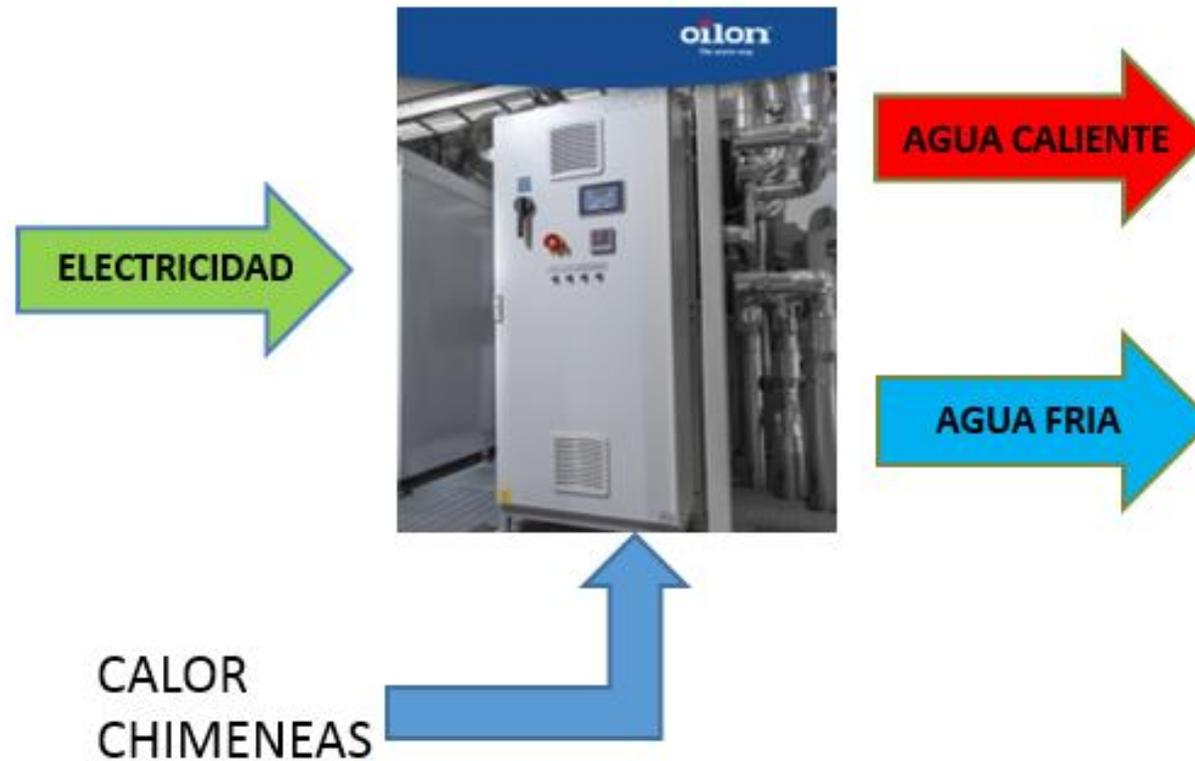
During mid-season and winter, it is necessary to produce Heat for the building and Cold for the Duty Free and Technical Rooms.



1. New Air Conditioning System

Media Estación e Invierno

CHILLHEAT



1. Heat pump



In May 2016, two Oilon P380 heat pumps (Finland) were installed to extract heat from the Duty Free Shop to pump it into the rest of the Airport. The new system completely eliminates the use of fossil fuels for heating and is 400% more efficient than the boilers.

- 240 Ton CO2 Eq./Year

2. Free Cooling

The control system of each of the 36 AHUs (Air Handling Unit) was optimized, to take as much air as possible from the exterior to condition the building, achieving a considerable energy saving of 20%.

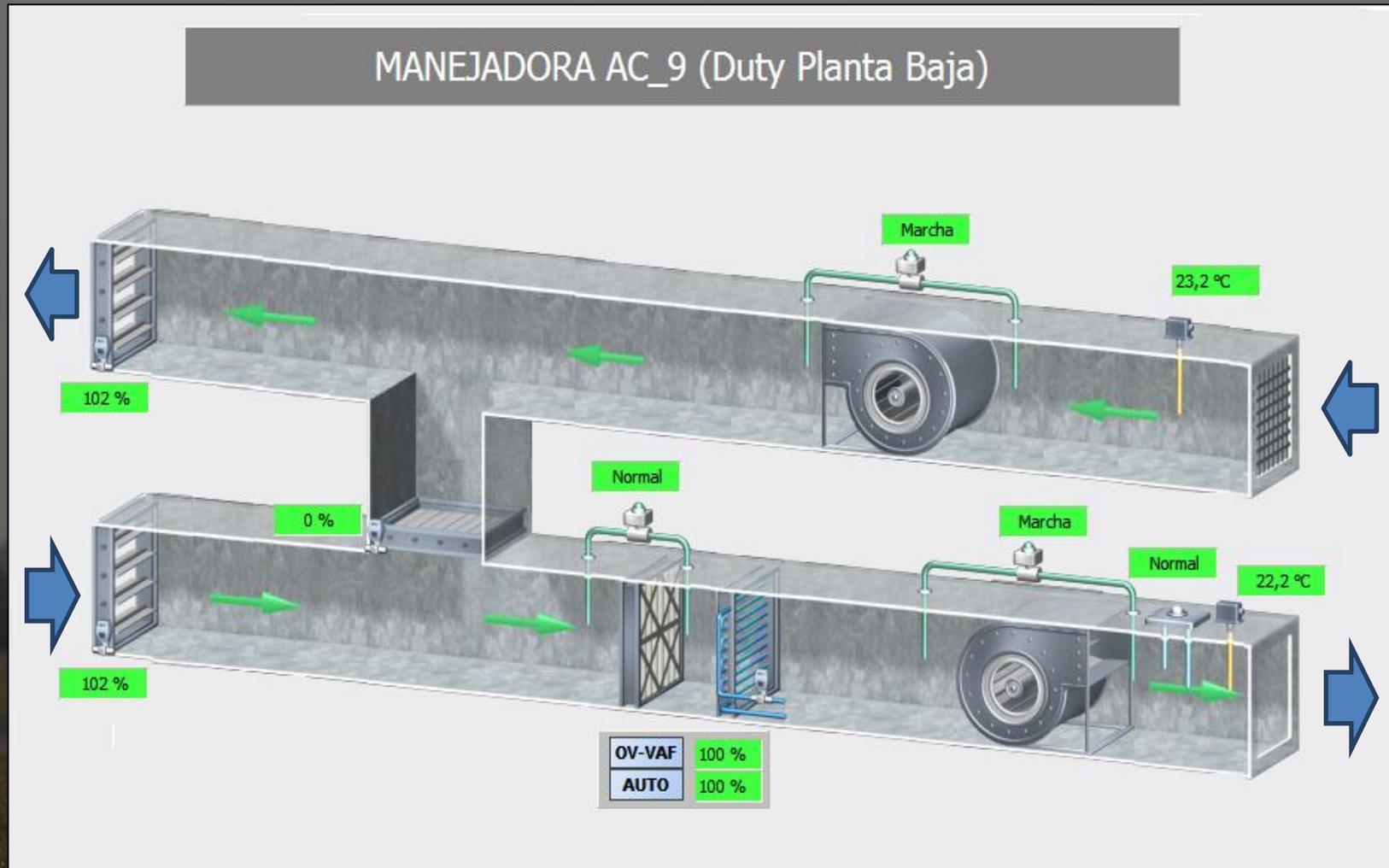
This was possible because of the unified equipment's located underground, with single, shared set of exterior and air input and output

- 180 Ton CO₂ Eq./Year

2. Free Cooling

Air extraction
towards outdoors

Exterior air input



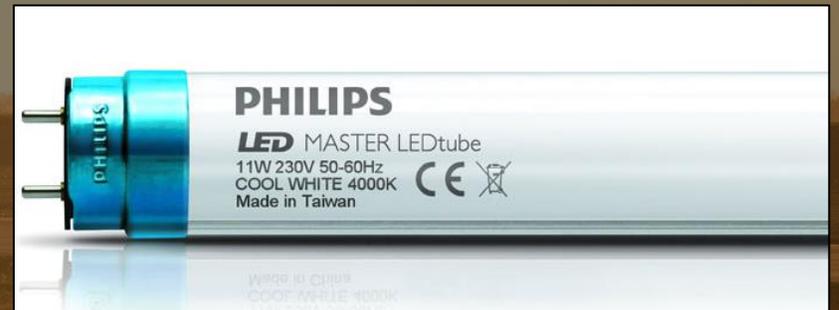
Ambient air input

Conditioning air
pumping into ambient

3. LED Lighting

Between 2016 and 2017, 2,700 fluorescent and metal halide luminaires were replaced by LEDs, achieving a reduction in the Carbon Footprint equivalent to:

- 70 Ton CO2 Eq./Year



3. Photovoltaic Solar Generation



Last August 7th 2018, the Photovoltaic Solar Plant was inaugurated within the airport boundaries with a power capacity of 500kWp, and solar tracking to improve the energy capture.

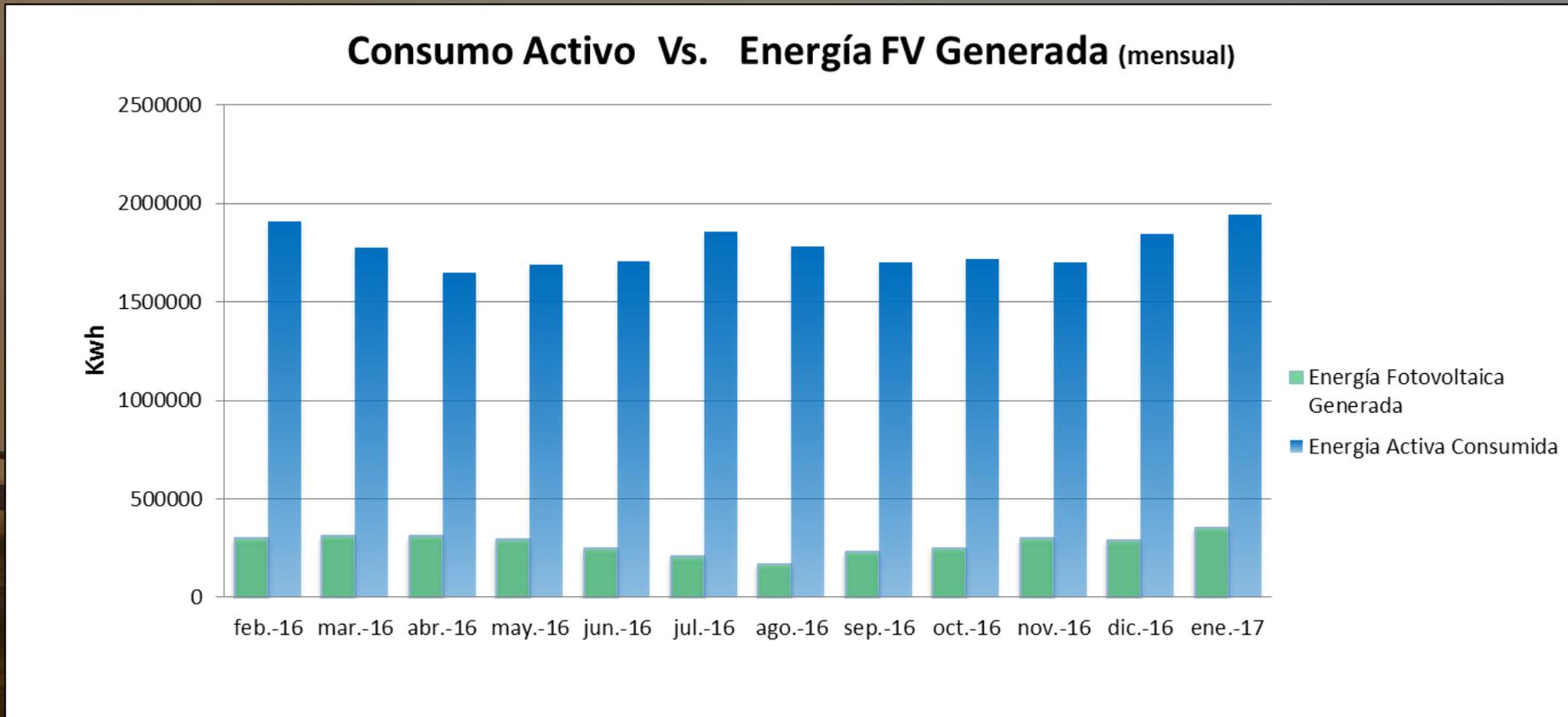
3. Photovoltaic Solar Plant Installation

The Airport has been working with the Ministry of Industry, Energy and Mining (MIEM) since 2015 in order to facilitate the installation of a Photovoltaic Solar Plant within the premises of the Airport. The result of the cooperation, and of the Executive Branch's interest in greenlighting the project, resulted in Decree 108/14, which lawfully enables us to generate electrical power, without returning excess into the main grid.

- 353 Ton CO2 Eq./Year

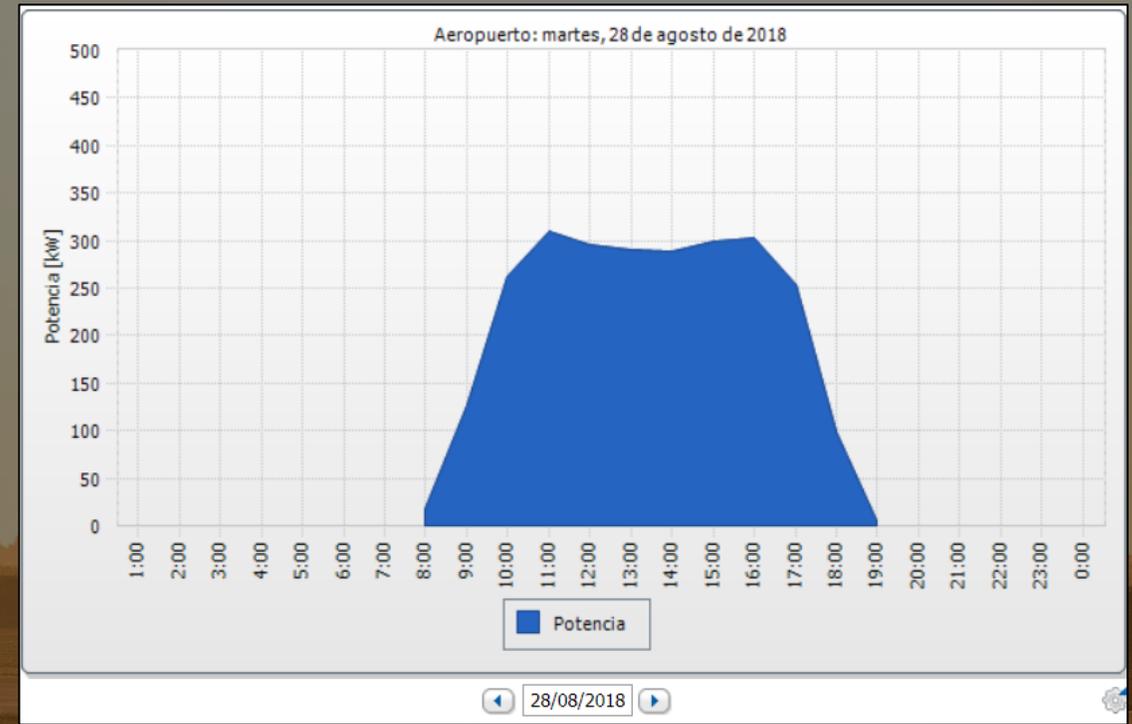
3. Photovoltaic Solar Plant Installation

The airport is generating 11% of the total yearly consumption from a renewable source



3. Photovoltaic Solar Plant Installation

The Plant is connected ON GRID and functions completely automatically.



4. Photovoltaic Solar Plant Installation

Characteristics:

- 1540 Jinko panels, 315 Wp
- 7 SMA Inverters (Germany), 60 KW
- German IDEEMATEC Mobile structure
- AllWeatherInc Weather Station (USA)
- Zero injection system.



Electric car chargers

The airport has installed 22kW and 7.4kW car chargers at the Terminal's Parking lot. I



Photovoltaic Solar Plant Inauguration



Energy Savings and Carbon Footprint

The country will benefit with a yearly energy savings of **800MWh**, or the equivalent of **250** homes

Pollution and energy efficiency:

With the incorporation of Heat Pumps, we have avoided the burning of **122,444 Nm³ of GN/year** at the boilers

The energy for the new Heat Pumps will be entirely supplied by the new Solar Plant.

698 Ton CO₂ eq. per year.

17.450 Ton CO₂ eq. During the Project's lifetime (25 years).

Achievements and Awards

- At Puerta del Sur and our Airport Community we are very proud to have received the MIEM's National Energy Efficiency Award in 2016
- We have certified Carrasco Airport according to ACI World's Level 2 ACA (Airport Carbon Accreditation)
- We are very pleased to have received the DERES award to Positive Corporate Social Responsibility Practices.



Measures of results:

- At 2015 by the use of **ACA Programme Level 1**, and ISO 14064-1:

Carbon Footprint (Mapping): 1405 tCO₂ e

- Executing the Energetic Efficiency Project we achieved:

Carbon Footprint (Reduction): 737 tCO₂ e

- At 2017 through **ACA Programme Level 2**, and ISO 14064-1:

Carbon Footprint (Reduction): 405 tCO₂ e

Results

- We have incorporated a renewable energy source to our power system, as a “Clean, Safe, and Environmentally Friendly” source.
- We will reduce the atmospheric emissions by 698 Ton CO₂ eq. per year and 17,450 Ton CO₂ eq. throughout the lifetime of the project.
- We replaced the use of fossil fuels such as Natural Gas, with power supplied by our own Solar Plant.
- We have improved the energy efficiency of our New Passenger Terminal by incorporating more efficient technology
- We have lowered our demand on the main grid as a power source, which is often backed by petrol, and we will supply our installations directly. This is in line with the Uruguayan Government’s policy of promoting Distributed Renewable Energy Generation.

THANK YOU

