

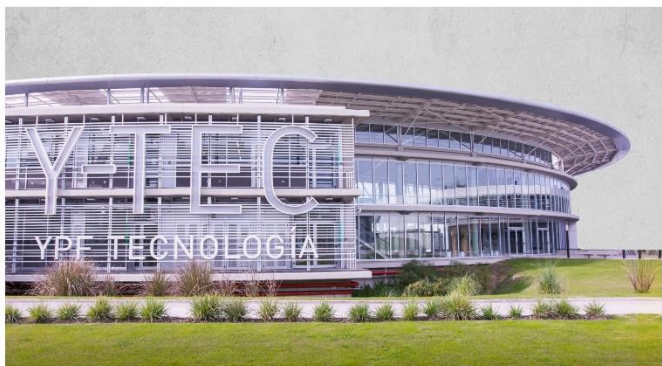
# ISO 50001 Energy Management System Case Study

2020

ARGENTINA

## YPF Tecnología S.A

*With the implementation of the Energy Management System we achieve 50,89% energy savings.*



### Organization Profile & Business Case

On October 1, 2013, YPF, together with CONICET (National Scientific and Technical Research Council), created YPF Tecnología S.A., Y-TEC, which is a new technology development company that aims to contribute to the sustained growth of the national energy industry.

Since May 2016, Y-TEC has carried out its activities in the city of Berisso, Avenida del Petróleo Argentino (RPN10) S/N°, Postal Code 1923, Province of Buenos Aires, Argentine Republic.

Y-TEC's mission is to research, develop, produce and market technologies, knowledge, goods and services related to:

- Exploration, exploitation, industrialization, transport and selling of liquid and/or gaseous hydrocarbons in general and other minerals, as well as their derivatives.
- Non-Fossil fuels, biofuels and their components, as well as electricity generation from hydrocarbons and everything related to alternative energies.

Y-TEC is committed to the continuous improvement of each and every one of its processes in an effective and efficient manner, promoting customer satisfaction and the professional development of its members, actively

working on health care, safety, the preservation of the environment and energy performance.

### Case Study Snapshot

<b>Industry</b>	Technology
<b>Product/Service</b>	Research and Development of the Energy Industry
<b>Location</b>	Berisso, Province of Buenos Aires. Argentina
<b>Energy management system</b>	ISO 50001
<b>Energy performance improvement period, in years</b>	3 years
<b>Energy Performance Improvement (%) over improvement period</b>	50.89 %
<b>Total energy cost savings over improvement period</b>	5,847.56 \$USD
<b>Cost to implement EnMS</b>	32,041.18 \$USD
<b>Total Energy Savings over improvement period</b>	3,017.59 (GJ)
<b>Total CO<sub>2</sub>-e emission reduction over improvement period</b>	0.593 (Metric tons)

Y-TEC is located on a 13,000 m<sup>2</sup> surface. Its facilities occupy a building designed with a modern and functional structure. It has 47 laboratories with high-complexity equipment, 13 Pilot Plants and an Engine Laboratory. The integration of equipment and human resources covers most technological specialties, and is directly applicable

to services and projects that are of interest to the company.

Y-TEC acts as a technological support for the Customer to gain high quality, low cost competitive advantages, prompt responses to technological innovations, continuous improvements to processes and an increase in profitability, for the Company’s operations in domestic and export markets.

Y-TEC used to carry out its activities in compliance with the integrated Management System in accordance with ISO Standards 9001, 14001 and OHSAS 18001.

At the end of 2016, Y-TEC’s General Management decided to implement and to certify the Energy Management System in accordance with the ISO 50001 standard, motivated to become a leading company in research and development in the energy industry and have an efficient management with the purpose of contributing to the global energy savings and to cut greenhouse gases.

### Business Benefits

#### **Is it possible to generate a Baseline with no history?**

Y-TEC is a company that started operating in the new building in 2016, the same year we started implementing the Energy Management System, and we did not have consumption statistics about this location; therefore, consolidating a baseline with accurate data was expensive.

For the development of the 2017 baseline, an agreement was reached with the Undersecretariat of Energy Efficiency by which, based on data collected from design, equipment manuals, billing and monthly measurements, we would build a baseline with theoretical data for that cycle. For subsequent cycles, we used collected data of energy consumption and relevant variables.

In this manner, we succeeded in strengthening the management system, creating awareness of the rational usage of energy resources used in the development of the activities, promoting culture, rational resource usage habits, good practices and, in time, these might be replicated at home.

#### **Results**

- **2017 Year.** The objective was to achieve 25% in Energy Savings and to obtain the ISO 50001 certification.

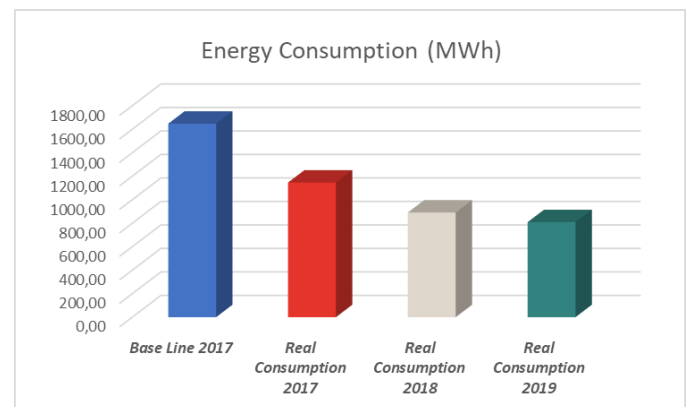
Therefore, the energy Performance for the 2017 period resulted in savings of 30.43% regarding electrical energy and, in September 2017, the ISO 50001 certification was achieved.

- **2018 Year.** The objective was to achieve 20% in Energy Savings. The energy Performance resulted in savings of 23.39%.

- **2019 Year.** The objective was to maintain the energy savings of 2018 and the ISO 50001 certification. Both objectives were achieved, and the energy Performance resulted in savings of 26.47% and we retained the ISO 50001 certification.

In total, savings of 50.89% was achieved in the 3 year period. The total energy cost savings were USD 5,847.56, the total energy savings were 3017.59 (GJ). These numbers equal 0.593 (metric ton) of CO<sub>2</sub> reduction.

The cost of implementing the System was USD 32.041,18. This includes both the implementation, certification and maintenance of the ISO 50001 Standard. A total of 4608 hours was allocated for the aforementioned tasks.



#### **Y-TEC’s Energy Performance**

There have been some enlightening results, such as the significant decrease in consumption values which was reflected in the awareness of workers and in the responsible use of electrical resources. There is a direct link between the campaign carried out by the company and the one that is being developed by the National Government and the energy sector.

*“The implementation of the ISO 50001 helped us understand Y-TEC’s energy performance and to improve the use of resources to collaborate with the Environment that surrounds us”*

—Santiago Sacerdote, Y-TEC’s General Manager

**Plan**

In mid-2015, the Undersecretariat of Energy Savings and Efficiency, under the Ministry of Energy and Mining, launched the Pilot Project for training workshops and for the implementation of the EMS, and Y-TEC was selected to be part of it. The project consisted of training the personnel involved in the implementation of the system, as well as in carrying out the first energy review.

The project allowed Y-TEC:

- To optimize Y-TEC’s the energy performance.
- To strengthen the rational use of the energy.
- To provide continuity and integration of every action and to maintain the results achieved.
- To assess, plan and define critical processes.

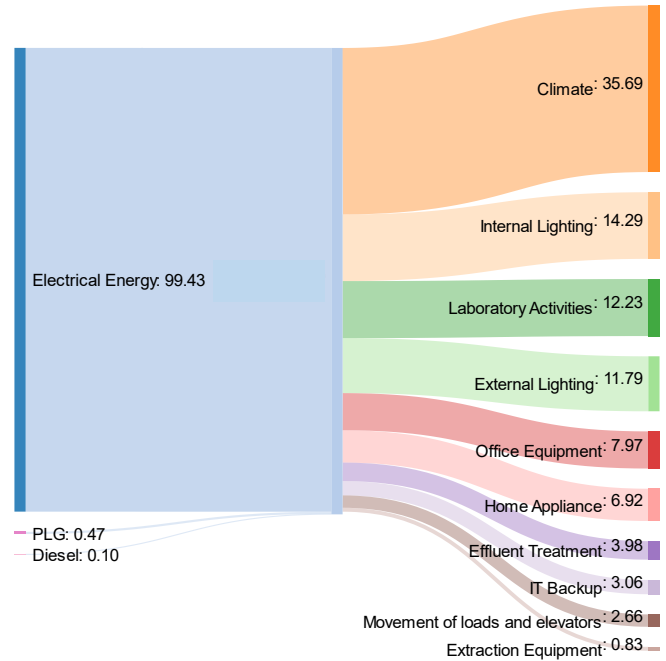
The head of QESH brought a proposal to Y-TEC’s General Manager to implement and certify ISO 50001 while showing the financial, social and environmental benefits for Y-TEC, as well as for the environment. Since Y-TEC is the most important company in the country with regard to the research and development of new energies, the General Manager accepted the proposal to enter the Program of the Secretariat and assembled a team of Energy Efficiency to carry out the program, which is one of the main goals of the company.

**Energy Review**

First of all, the uses and consumption of energy involved in Y-TEC’s operations, whether in production or otherwise, and within the scope of the Management System, were identified.

This identification is shown in the Sankey Diagram, where the uses and consumption percentages can be seen. The consumption was defined based on design, calculations, estimates, and some were contrasted with

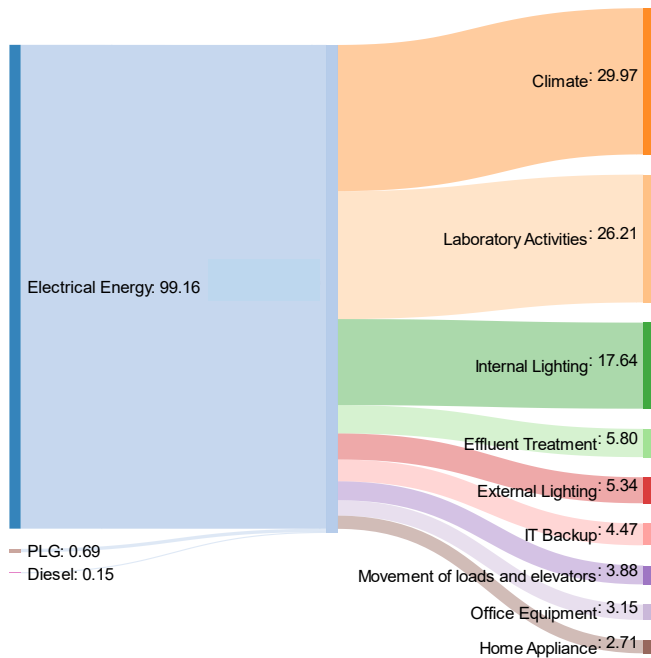
measurements (billing data). The energy source, which is electrical in its entirety, was also included.



**Sankey Diagram 2017. Uses and Consumption**

The largest source of energy is Electrical Energy by 99.43%, then PLG by 0.47% and, finally, Diesel by 0.15%. The Pareto diagram (75-25) was the tool used to analyze the significant energies. It was also used to determine Y-TEC’s significant energy usage, showing the following as significant energy uses: climate, lighting and laboratory activities.

Management indicators were defined and the 2017 Baseline was prepared. Due to the building being new and to the fact that there was no historical data available, to obtain the baseline, design data was used (MWh/month). A mathematical model was developed to plan the 2017 baseline monthly. After gathering sufficient data and acquiring a history, it was possible to apply mathematical models, such as the polynomial regression. As a result of the actions taken during 2017 and 2018, the uses and consumption of energy for 2018 are shown in the following graphic.



Sankey Diagram 2019. Uses and Consumption

The management focused on seizing opportunities to improve significant uses, such as:

- Reduction of the hours of artificial lighting without compromising the quality of daily operations.
- Optimization of climate control equipment by reducing operating hours and redefining the thermal comfort range in winter and in summer.
- Daily operational control in laboratories and common areas.
- Raising awareness among personnel of the need to improve energy performance by means of talks and audiovisual communications.
- Replacement of halogen lighting with led technology.

All actions had a favorable impact on the improvement of energy performance and they are reflected in a reduction of monthly energy consumption.

This was achieved due to a list of improvement opportunities shared with certified standards (ISO 9001, 14001 and OHSAS 18001, for example, Planning and control of maintenance operations, repairs, follow-up monitoring of equipment, calibration of measuring instruments) for the purpose of fully integrating Y-TEC's management system.

*“Energy Efficiency is the most profitable source of energy in financial, social and environmental terms. The Improvement of its Performance should be a global commitment.”*

—Gustavo Hovakimian, QESH & Energy Head

### Do, Check, Act

By analyzing data of the energy Matrix, it became clear that climate control and lighting consume 57.38% of the electrical energy of the building. The main motivation behind the implementation of the energy system is to reduce and eliminate habits that have a negative impact on the energy, such as setting climate equipment at 21°C in winter and at 24°C in summer, turning off unnecessary lights, turning off equipment that is not being used in the development of activities in the laboratories. For that purpose, plans for turning on air conditioners in summer and heating in winter were submitted, as well as action plans for turning lighting on and off in common spaces, meeting rooms, laboratories and auditoriums and operational controls for laboratory lighting, temperature and activities.

#### 2017 Baseline

To build Y-TEC's baseline, the measurement of transformer 2 was used.

The Baseline is developed taking into account lighting and climate control measurements for January, external lighting according to usage hours and design data of Air Conditioners (usage hours and performance).

**a. Climate control:** Two mathematical models were developed, one for winter and another one for summer. The average room temperature differential to decide between one model or the other is 15 °C.

**b. External Lighting:** The basis was the measurement of external lighting affected by usage hours in January and the number of days in each month.

**c. Internal Lighting, Laboratory Activities, Offices, Meeting Rooms, Home Appliances, Office Equipment, others:** The basis was the measurement of sectors affected by usage hour in January and the number of days in each month. In this way, the data necessary to build the Baseline is obtained. It will be compared monthly with the real monthly consumption of 2017.

Then, by having a history, we adjusted the baseline.

### 2018 Baseline

At the end of 2017, we carried out several analyses to build the 2018 baseline, among which were the Degree-Day Method, Regression Analysis and Monthly Comparison with the same month of the previous year. We concluded that, by not having historical data, due to the actions taken during 2017, the appropriate method for the development of the 2018 baseline is the Monthly Comparison with the same month of the previous year (the same method used for the 2017 baseline).

### 2019 Baseline

The Baseline was developed considering monthly measurements of the different sectors, external lighting measured according to power-on hours, monthly consumption of Air Conditioners by sector, and usage hours and power of each piece of equipment.

The Polynomial Regression was used to build the Baseline.

Given the significance of climate control in Y-TEC's energy performance, the polynomial regression was carried out between the room temperature (taken from the National Weather Service, La Plata Aerodrome) and the energy consumption of Air Conditioners, thus obtaining the complete cycle correlation.

Therefore, for the development of the baseline, the following energy contributions were added:

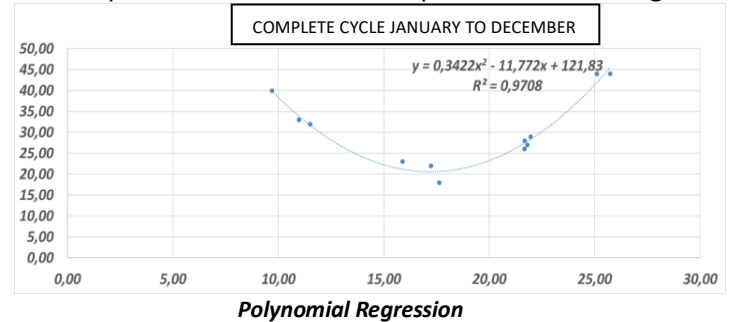
**a.** Climate control: to measure monthly climate control consumption, we used the correlations obtained according to average monthly temperatures from the previous period, making adjustments month by month as per temperatures of the current year.

**b.** External and Internal Lighting and Power Circuits: monthly consumptions were taken into account, measured by external lighting and power circuits of the year. As regards external lighting, the lighting measured according to each lightbulb's power by usage hours was considered.

### Standardization of the 2019 Baseline

Due to architectural and construction features of the building, the planned baseline was standardized adjusting it month to month according to the average external temperature during business hours. In this way,

we reduced the gap between the estimated consumption and the real consumption of the building.



### General Management Commitment

Y-TEC's General Manager, by anticipating the energy scene of the country, decided that it was necessary to try to understand and make use of resources in a reasonable manner, and to make it a daily task. Due to this awareness and the actions carried out, we achieved the goals and objectives set, making it part of the daily tasks of each employee at Y-TEC. Therefore, we ensured that energy and its care be everyone's commitment at Y-TEC.

### Training and External Service

2016 Year Implementation Workshop of a Management System of Energy per the ISO 50001 Standard. CREA/ATISAE, sponsored by the Undersecretariat of Savings and Energy Efficiency under the Ministry of Energy and Mining.

2017 Year. Collaboration with the external Consultant Energy Performance.

### Energy Efficiency Team

Multidisciplinary team consisting of support areas and techniques under the leadership of QESH.

### Measurements

The measurements gathered, as well as operational controls, are carried out by the General Maintenance and Services area with calibrated equipment according to Y-TEC's calibration plan. The equipment employed to carry out measurements and operational controls are: Schneider PowerLogic ION 8650 Meter, Fluke 337 True RMS Clamp Meter S/N 7916333, Testo 405i 48925149 series Thermal Anemometer.

## Keys to Success

- Awareness among the laboratory personnel about who was responsible for turning lights and equipment on and off.
- Implementation of the plan for turning air conditioning on and off and its temperature as its own operational control.
- Implementation plan for turning external and internal lights on and off with the relevant monitoring.
- To ensure continuous improvement, being ambitious with the definition and fulfilment of the energy performance objectives.

## Transparency

Upon receiving the Energy Management System certification, all Y-TEC personnel, as well as the whole working team, were informed and thanked for the commitment undertaken regarding the ISO 50001 implementation and certification.

The accomplishment of Y-TEC's ISO 50001 Certification was published in YPF S.A.'s 2017 sustainability report, and the fact that Y-TEC still holds the ISO 50001 Certification was published in the 2018 sustainability report.

In 2018, an interview about Y-TEC's Energy Management was published in the *Desafíos 013* magazine. This magazine is distributed to Universities, Institutes, Liaison Offices and other YPF businesses.

The results of the energy performance are reported annually to all Y-TEC by means of the internal social media (Workplace), achieving a daily commitment from everybody to improve habits at a company level, as well as at a personal level.

## Lessons Learned

- To have a greater influence in change management for future building alterations. For example in the choice of extraction engines for hoods in laboratories.
- Design communication strategies to demonstrate in advance the commitment of the Directorate in order to make staff aware of energy performance.
- Publishing the energy performance results fosters commitment, since the personnel can see their contribution. Plan communication campaigns to raise staff awareness.
- Develop a skills plan to hire suppliers that affect significant uses in order to add value to management.
- Putting together a multidisciplinary team that covers all areas of interest adds great value to the system.

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit [www.cleanenergyministerial.org/energymanagement](http://www.cleanenergyministerial.org/energymanagement).

