

ISO 50001 Energy Management System Case Study

CHILE

METRO S.A.

Salvador Station – Line 1



Energy Policy: a new challenge.

Organization Profile & Business Case

Metro is a passenger transportation company located in Santiago, Chile, that has a net of more than 140 kilometers of extension, transporting daily more than 2.8 million people in 26 communes of Greater Santiago. It is the second most extensive metro in Latin America.

Our mission and vision is to guarantee, as a leading company of integrated public transport, a safe and reliable travel experience, with efficiency and sustainability, contributing to a better city and to be a company that all citizens feel proud of.

Metro principal values are:

- Customer orientation: We work to be one of the best service companies in the country.
- Safety: the safety of our passengers goes first.
- Operational Excellence: Predictable, safe and efficient transportation.
- Collaboration: Working together, we learn and move faster.
- Transparency: Oriented to all our acts

Case Study Snapshot

Industry	Transport
Product/Service	Passenger transport
Location	Salvador Station – Line 1 – Santiago, Chile
Energy management system	ISO 50001
Energy performance improvement period	1
Energy Performance Improvement (%) over improvement period	6%
Total energy cost savings over improvement period	3425 \$USD
Cost to implement EnMS	11300 \$USD
Total Energy Savings over improvement period	7,62 GJ
Total CO₂-e emission reduction over improvement period	9,146 metric tons

At METRO we are committed to improve life quality in the city of Santiago. Therefore we develop our operations and the growth of our network efficiently and with clean energy, through strategies and concrete measures that improve our energy performance, with the aim of being a sustainable company, financially sustainable and providing a quality service to citizens.

In this context, in 2017 METRO decided to implement an energy management system in Salvador station of the Line 1, which will allow it to achieve the strategic objectives of the company. Therefore, Metro assumes the following commitments on its energy policy:

- Ensure compliance with the applicable legal and regulatory framework, as well as efficiency and management of energy.
- Implement and maintain an Energy Management System that allows the company to increase energy performance through a continuous improvement process.
- Resource allocation from the senior management to develop energy efficiency projects.
- Apply good industry practices to improve our energy performance.
- Incorporate energy efficiency in our corporate strategy, as well as in the planning, operation maintenance processes of our assets, design and execution of our projects.
- Establish clear long-term objectives on the use of renewable energy sources, favoring an electricity supply based on a clean energy matrix and an efficient use of energy resources.
- Develop training initiatives for our employees and collaborating companies, so that they incorporate and promote the efficient use of energy in their activities.
- Promote the active search and incorporation of innovative technologies to enhance energy efficiency.
- Communicate our energy performance annually to the entire organization and to our stakeholders, reporting the results achieved and the lines of work developed.

Energy Policy: "This is a very important event for us; we recognize the objective of the financial sustainability and the Metro environment. We also look to extend the use of Non-Conventional Renewable Energies and having a system of efficiency. This policy is part of the Metro we want to build, a Metro that is sustainable and according to these times"

—Rodolfo Jaramillo. METRO Energy Area Leader.



METRO night in Santiago.

Business Benefits

The energy management system that corresponds to the Salvador station in the Line 1 of the Santiago Metro is certified under the ISO-50001 standard since the end of 2017. Its purpose is to be a pilot station and to consolidate a structure of systems and processes essential for the continuous improvement of the energy performance of our organization, which aims to be replicated in other stations.

One of the many benefits of implementing an energy management system is the installation of a measurement and verification system for the significant uses in Salvador station. In the past, METRO measurement system presented problems of reliability and data loss.

In October 2017, the successful installation of energy meters was carried out in the main consumption cabinets together with data acquisition software. Hence, the consumption in kWh of the lighting and power enclosures in the Salvador station are monitored and compared (in 4 blocks of 15 minutes per hour). This allows us to generate models of energy saving either replacing obsolete devices of the station or recommending patterns of behavior that promote savings, either by the staff of the station or by the personnel that operates these consumptions at a remotely.

This energy management system results in a 6% annual consumption savings, reflected in an energy saving of almost 21 MWh per year and a monetary saving of 3.425 USD in only one station of the METRO network.

These numbers become more attractive when we scale these values from a single station to a possible certification of 136 stations that represent our network at present and 162 stations that our network will have in the year 2027.

This year, it is stipulated to extend the scope and certify two more stations within the ISO-50001 implementation and certification plan. Placing a scenario where the 136 stations that are currently in operation, could reach estimated energy savings of 2.86 GWh per year and monetary savings of approximately 460.000 USD per year.

By the year 2027 these values become more attractive with all 162 stations predicted in operation and certified in the network, we can predict energy savings of almost 3,4 GWh per year, monetary savings of up to 555.000 USD per year and 1.481 tons of CO₂ emissions that could be avoided of releasing to the environment.

The implementation of the energy management system also influences aspects such as the frequency of maintenance in the facilities. There is a hidden saving factor in the use of maintenance personnel who will have to attend less frequently the facilities that will be equipped with latest technology and less prone to failures. For example, the LED technologies installed in enclosures and tunnels of the Salvador station have 5 times more useful life than the original fluorescent units, extending the maintenance plans.

In the same way, the inclusion of better technologies within the stations and platforms provides a better comfort to the consumer's travel experience since they generate less heat, for example, product of lighting equipment. In addition, it has reduced the interruption time in the replacement of obsolete equipment, which also improves the user comfort.

Since 2017 we have an energy power supply that is being fed by 60% of non-conventional renewable

energy since the inclusion of the Pelicano solar plant and the San Juan wind plant.

In this context, aspiring to reach 100% in the near future does not seem like a dream. These advances are related to the reduction of 130,000 tons CO₂ emissions at the country level, contributes to fulfill the commitment of Chile.



Energy efficiency: Salvador Line 1 ISO-50001 Certification

“This important and historic initiative of Metro is aligned with the commitments and country challenges that have been agreed upon in the framework of the United Nations Conference on Climate Change 2015 (COP21)”

—Sustainability METRO Report 2017 on the inclusion of two non-conventional renewable energy contracts.

Plan

EnMS organization chart at METRO

So that the energy management system could work in Metro, the unit of EnMS was created on this organizational structure.

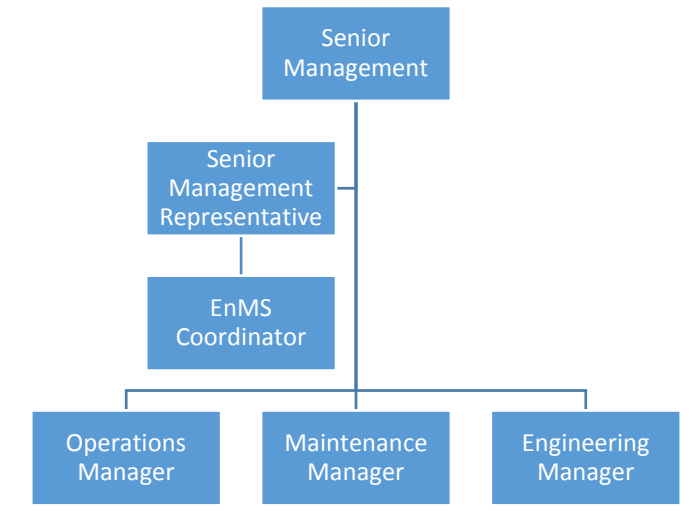


Chart 1: Organizational Structure at METRO.

Training and awareness

During 2018, about 40 people were trained on energy consumption and the benefits of the energy management system implemented in Salvador. These people are responsible for the operation and maintenance of the systems in this station. It is expected that this number will double over the course of the current year. The diffusion and awareness is a fundamental part of METRO's internal processes to promote energy savings.

We also began training on the incorporation of energy efficiency in the design of processes and projects topic.

Implementation of the EnMS

Through the installation of a measurement and verification system and together with data acquisition software for the significant uses in Salvador station, we could determine the main consumption cabinets.

Due to monitoring and comparison the data that is saved in 4 blocks of 15 minutes per hour, allows us to

generate models of energy saving either replacing obsolete devices of the station or recommending patterns of behavior that promote savings, either by the staff of the station or by the personnel that operates these consumptions at a remotely.

ISO-50001 Plan

After the positive results from the certification of Salvador station in line 1, an implementation and certification plan of an energy management system has been created that will add two additional stations to the existing certification for this year, which will generate savings up to three times what we present today. These estimated savings will boost more certifications in the medium and long term.

Do, Check, Act

The energy management system in Salvador station in line 1 was implemented by the engineering management as a pilot project to promote the good use and optimization of the energy in the METRO systems.

The implementation was based on the installation of a measurement and verification system in the main consumption panels of the Salvador station Line 1, together with the incorporation of data acquisition software that takes the values of these meters in real time. This software is compatible with several communication protocols which will reduce the obstacles of data transmission when we certify the next stations on the upcoming years.

Every week there is verification on the energy consumption in kWh of the Salvador station in Line 1. Monthly, meetings are held with the senior management and the maintenance and operations personnel to discuss this energy performance and there is continuous training on energy efficiency issues to pursue the premise of energy saving not only in this station but in the other stations of the network.

Both these trainings and the incorporation of energy efficiency measures in the equipment of the station have reflected energy savings of up to 6% over the previous year. Among the activities that led to energy saving are the following:

- Training of 40 workers responsible for the operation and maintenance of the energy management system.
- Change of 140 lighting equipment to the latest LED equipment on the facilities of the staff of the station.
- Installation of time switches in the air conditioners and water heater to interrupt the energy consumption when the working day is over.
- Change of 33 fluorescent lightning tubes to LED tubes in the tunnels to the adjacent stations

The challenge will be even greater when more stations of our network will be included in our current ISO-50001 certification. Within METRO we are motivated to continue developing energy efficiency measures in the Salvador station and in the inclusion of new stations to our current ISO-50001 certification.

Transparency

On METRO energy area, there is software for data acquisition that allows the behavior of the significant energy uses of the Salvador station of Line 1 to be monitored every 15 minutes. With these data, monthly reports are made and communicated to those responsible for the management system of Salvador station, from the top management to the workers who guarantee the correct operation and maintenance of the systems.

All the documents of the management system, from the policy to the energy performance of the station, rest on an internal network in the METRO systems.

We also have an annual sustainability report where our measures related to the use of energy are published.



METRO Santiago.

Lessons Learned

METRO has lessons learned due the loss of an ISO-50001 certification in previous years, that's why METRO team focused on recovering the certification at Salvador station in Line 1, and will help on the implementation of EnMS in other stations.

Some of these lessons are:

- The involvement of senior management, direct responsibilities were assigned and resources were directed in the management budget for the consolidation of the energy management system.
- Creation of an energy area with responsibilities for the correct management of electricity supply contracts and the optimization of the use of present and future energy.
- The necessary training was begun to strengthen the awareness for the use of energy within METRO systems in stations and corporate buildings.
- The correct development of the internal audits of our energy management system allowed us to learn on the balance that should exist in the documentary part of the ISO-50001 and the own savings of the functionality of the energy system.
- Our energy management system incorporated organizational infrastructure into our processes, assigning responsibilities to stakeholders and supervising the good compliance of the committed activities

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.

