TIM

Driving a smart sustainable future

A view of Data Center in Rozzano

Business Case for Energy Management

Company Profile/Business Case

TIM is the largest TLC company in Italy and is responsible for about 1% of the whole national energy consumption (it is 2nd largest consumer after the national railway company).

The TLC sector is physiologically subject to an annual consumption increase of about 4-5%, due to the continuous increase in demand for connectivity and new services.

Our goal is to move information all over the world in the shortest time and in the most efficient way possible.

Consumptions of a telecommunications company as TIM, are widely scattered throughout the territory. We have:

- About 35000 consumption points
- More than 1000 sites in medium voltage (offices and large central offices, CED)
- Thousands of sites in low voltage(small and medium central offices, SRB)

for this reason, it is essential to keep under control all point of energy consumption.

> *No measure, no manage"*
> —G. Kidric – Group's Energy Manager

Case Study Snapshot- the year 2016 vs 2015	
Industry	Telecommunications
Product/Service	Telecommunications services
Location	Italy
Energy Management System	ISO 50001
Energy Performance Improvement Period	1 year – 2015 vs 2016
Energy Performance Improvement (%) over improvement period	21 %[1]
Total energy cost savings over improvement period	961126 $USD*
Payback period on EnMS implementation (years)	< 1year
Total Energy Savings over improvement period	19428Gj
Total CO_2-e emission reduction over improvement period	8192 Ton Co2

There are the reasons why TIM's environmental strategy is complex and based on principles and actions developed around several points, such as:

[1] Baseline is the sum of baseline used for calculating target 2016

- use of renewable energy sources and natural resources (geocooling, solar cooling, free cooling)
- research of continuous improvement of energy use and environmental performance
- Adoption of procurement criteria which take energetic and environmental issues into account
- Developing dematerialization and new services which promote new ways of working, learning, travelling, and, in general, of living (Cloud services, Smart Working and Smart City projects)
- Contribution to the dissemination of a culture based on a correct approach to environmental themes both within and out of the company (internal communication campaigns and Multistakeholder Forum).

Among the first in Italy and in Europe, TIM obtained the ISO 50001 certification in April 2013, formalising the commitment in terms of energy saving and efficiency. It is an international acknowledgement which distinguishes us from our main competitors and further enhances the commitment that TIM has taken upon itself in its **Energy Policy**.

At the time, 3 sites are subjected to periodic certification by an external body. To the remaining TIM sites, though not certified, it is applied a similar process PDCA to improve energy efficiency as described previously.

Business Benefits Achieved

Business Benefits

ENERGY SAVED FOR INTERNAL EFFICIENCY

95 GWh
(Equal to 7% of annual energy used by households in the area of Milan)

EMISSIONS AVOIDED

- 36,709 ton CO_2
(Equal to the emissions generated during the year by 22,000 cars travelling an average of 13,000 km).

COSTS SAVED FOR TIM
- € 16 mln

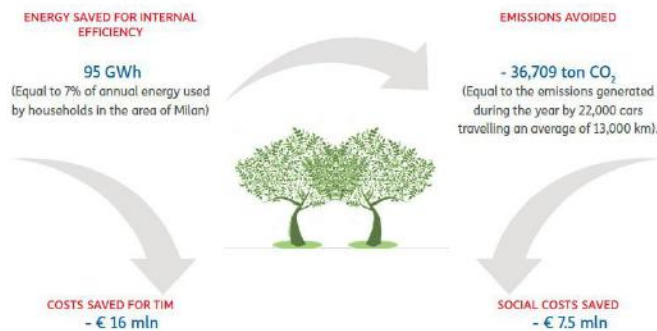SOCIAL COSTS SAVED
- € 7.5 mln

Figure 1: Global result of Energy Efficiency management in 2015

The results of the global approach to our energy consumption are summarised in figure 1, that shows the savings achieved in the year 2015.

In this context, the ISO50001 finds a natural accomplishment, helping the Company to make even more concrete and measurable the results of energy optimisation. In the following table the obtained results for the energy efficiency, since the EnMS was implemented, are reported:

site	type	before ISO 50001	after ISO50001	Unit
PDM	offices	3,1	2,3	kWh/p.
BO	offices+ TLC	12,6	9,8	kWh/p.
RZ	Data Center	0,54	0,58	1/PUE

table 1: specific energy consumption before and after implementing EnMS

> *"the ISO50001 really works: it provides to companies a method for continuous improvement of its performance, easily customizable to any reality"*
> —A.Trifirò- Resp. EnMS

EnMS Development and Implementation

The Scope of the EnMs, as reported in the ISO certificate is: "Monitoring and management of energy consumption for fixed and mobile telecommunications services and for the related infrastructure, in order to improve energy efficiency, for the sites of Rome (Parco de Medici), Bologna (Via Stendhal) and Rozzano (Via Toscana buildings D-F-C). Combined self-production for cooling, heating and electric power by natural gas in the site of Rozzano)".

The EnMS was built in 2011 and developed and improved year by year. Despite the possible synergies with the 9001 and 14001 systems, we decide to keep them separate from the energy area.

The path towards efficiency begins with the **Smart Center:** the monitoring system for real time energy monitoring (**www.ti-green.it**). **T**hanks to this

proprietary monitoring system covering about 50% of the group's total consumption, through a network of over 30,000 sensors, physically located within data centres, central offices, offices, shops and laboratories, in the national territory of TIM, energy are constantly monitored. In this way, it's possible to identify the behaviours that have to be corrected and to propose and validate new energy saving solutions and strategies.

The number of fixed and mobile network sites with sensors was 2,768 in the year 2015.

Figure 2: monitoring at Smart Center

The lessons learned during in the PDCA process generates **ideas and concrete proposals** that are applied within the Group. For example, air conditioning systems in buildings, management of lighting systems, good habits in the office; if managed properly and with common sense - on a large scale helps to improve the environmental impact of the entire company.

The sites we have to choose to submit at ISO50001 certification are among those that best represent the reality of TIM: we start with the higher consuming building containing only offices (2012)- site PDM; after a site containing both offices and telecommunications facilities has added (2014)-site BO, and finally a CED in 2016- site RZ. In that way, the EnMS would be ready to be easily extended to the other sites.

Organizational

The core of the system is located in the Energy Group Plans & Certifications Business Unit: this unit has responsibilities of project management of energy

efficiency projects; identification of related loans; certification in the field of energy management.

The EnMs is structured as follow:

-Top management and the management Representative are in the Energy Group Plans & Certifications unit

-The management representative is also the group's energy manager.

The EnMS has also an EnMs Responsible that supports the management representative and coordinates the energy team activities.

The energy team is representative of: Energy Group Plan & Certification unit , Healt Safety & Environment unit, site manager (people that has the responsibility for the maintenance of the building), Technical manager (people that has the responsibility for the maintenance of the technical infrastructure (energy systems, HVAC,….), HQ Engineering that design energy efficiency plan, and Purchasing of Energy and Energy services.

All the data are stored in a shared repository dedicated to the ISO 50001, so every energy team's member can easily reach it.

Energy review and planning

The energy consumption is monitored with the use of the TI green system for electricity and gas. Where this data are not available, the information is gathered from the local maintenance headquarters that provide the data directly from the meters. Indeed, for each office involved ISO50001, a team is identified as a reference to taking the relationship with the EnMs and the energy team, to provide data and to guarantee the programmed energy saving activities.

Review, analysis and planning

Baseline: if not differently specified, is the average consumption of the previous three years.

Enkpi: the Energy Performance Indicator, for highlighting the trend of energy performance over time. It is defined as energy consumption vs significant variable. In particular:

- Enkpi1: electricity/consumption area (kWh/m2)
- Enkpi2: electricity/person (for offices)
- Enkpi3: gas/heated volume (Sm3/m3)
- Enkpi4= PUE (Power Usage Effectiveness) for CED: (Ptot /PIT)

Other Enkpi are defined if needed.

IPE: In addition to EnKPI, we use other indicators, which are able to get trend of specific action to improve efficiency, for tracking if there have or haven't happened, and if it is properly following a defined action plan (eg number of LED lamps replaced monthly) month), or to keep critical items under control.

"ISO 50001 improves the quality in energy use. Poor quality costs money. Good quality saves money." - I.Perissi, - Energy Team Member

With the analysis of Enkpi and the significant energy uses, we can identify the priority areas for action, that are collected in the Energy Review as a register of opportunities that is constantly updated.

Significant energy use defined as below:

1. the incidence of total electricity consumption above 9%
2. the incidence of total expressed in TEP above 10
3. other areas of intervention can be identified with the following criteria:
   - Based on whose efficiency measures that are easy to apply even if they are not part of significant consumption (such as LED replacement lamps in CED or central offices)
   - Based on those which, although their low consumption, are not easily controllable (eg. pressurizers in central offices)

Solution to increase energy efficiency may consist of:

- operational interventions or process: for example, procedures, training, objectives for the specific Business unit, dedicated resources, the definition of specific responsibilities

- Technical intervention or plant: for example, high-efficiency machines, buildings, equipment
- Design of products optimised for energy consumption during production, during his entire life (LCAn analysis) and disposal

Financing

economic resources for interventions can result from

a) energy performance contracts

b) company's financial resources

c) use of public funds if available (eg white certificates)

Duration

Approximately one year in order to set up the whole EnMS (in the year 2012)

Cost-benefit analysis

In this graph is reported specific energy consumption per person of both the 2 sites since 2012:[2]
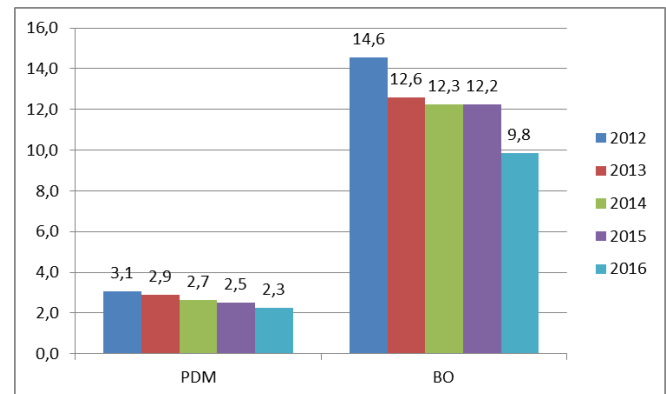

Figure 3:kWh/y/person

The difference in order of magnitude between BO and PDM is due to the high-intensity activities peculiar of telecommunications in BO.

About the cost of implementing the EnMs, it is necessary to emphasise the ISO 50001 system was able to collect and systematise the ordinary activities of analysis, monitoring, supervision systems, design and implementation of interventions to improve efficiency.

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[2] BO= offices+ central offices (tipical plant of TLC communication) - PDM = offices

For this reason, there are no extra costs due to the implementation of ENMS than those of the operating personnel and costs for certification.

Approach used to determine whether energy performance improved Cost-benefit analysis

After the definition of the baseline and energy performance indicator (Enkpi), specific interventions of energy saving are tracked by the definition of the appropriate IPE. The energy consumption variability (due to the external temperatures) is estimated every year conducting a regression analysis on the base of the HDD and CDD.

At the moment we monitoring 10 Enkpi and 6 IPE for PDM (mainly offices), 3 Enkpi and 7 IPE for BO (mixed offices and ICT spaces) and 2 enkpi and 3 IPE form RZ (mainly ICT spaces).

Any of the above indicators or methodologies are periodically (at least 2 times per year) reviewed. The indicators will be discarded if they are no more able to describe a changing reality if they are insufficient to describe new energy allocation or use, and they will be replaced with newly defined performance indicators.

Approach used to validate results

To grant an efficient exchange of information and a continuous alignment between the central EnMS organisation and the certified area, a meeting with every headquarter is scheduled periodically (usually every month). The local team support in case of more information are needed and has also the aim to communicate, as soon as possible, any change in the program due to external or unexpected events (increase or decrease of personnel, devices out of order, set point changes…)

With the support of qualified internal auditors, TIM has periodically verified the process quality and measured the results obtained in the certified sites. Every Audit's report is stored in the Telecom Italia repository dedicated to the ISO 50001, and an action plan follows the audit's recommendations.

Steps were taken to maintain operational control and sustain energy performance improvement

Regarding operational control, there are specific procedures for the maintenance activities; these are provided according to the quality system documentation for the unit that has the responsibilities of the site. These instructions are included in the Tender Maintenance. In this document, are inserted the service standards for proper and effective management of activities having an influence on the pursuit of the energy objectives.

In some cases, these instructions are also included in the register of *"legal requirement and other requirements"* in order to be sure that the activities are properly conducted verified and registered (for example internal procedure of Temperature control in Data Center).

Development and use of professionals expertise, training and communications

We believe that is very important to spread a green awareness in the company. So, we develop specific initiatives with the aim to stimulate people towards virtuous, responsible and informed behaviour.

- In 2014 and 2015 TIM organised a nation-wide event, the *TIM Energy Day*, during the European sustainability week, which has involved all of the TIM employees. Each employee gave its contribution in terms of virtuous behaviour by creating a Green Decalogue: 10 good habits to keep at the workplace to save energy, and that was spread by the company intranet.
- in 2016 the "*Archimede Energy Saving*" contest was held, with the participation of 28.000 TIM employees. By means of the crowdsourcing Archimede platform, an interactive space, suggestions and contributions regarding 6 basic pillars of energy saving and efficiency were gathered. The initiative contributed to focus people on environmental topics and increase awareness on

virtuous behaviour within and out of the company, together with TIM's commitment to implement some of the suggestions of energy saving and efficiency on a large scale.

- alongside these initiatives, the "*employee engagement*" has been reinforced by means of particular communication, learning and information plans so as to guide collective behaviour towards the energy goals that have been set, by sharing, coordinating and integrating competencies in different organisational units.

Figure 4: Mr Watt, the energy coach and mascot for the "*employee engagement*" program,

- Furthermore, inside the company's intranet, a specific space dedicated to green topics has been created, and the "Energy People" Community comprising about 2000 TIM people who are particularly interested in Energy topics

- *"The purpose of communication of energy topics is to produce a virtuous behaviour"*
  - D. Lanati, - Energy Team Member

Tools & resources:

- TIGREEN (platform for real-time analysis of energy/gas/water consumption) and IPE
- CUSUM chart and carpet plot for the verification of unexpected deviations
- Tools developed during previous collaborations with research centres/universities for automatic subdivision by type of consumption and forecasts of future consumption
- collaboration for document sharing
- video conferencing for meetings of energy team / internal audits when insights are needed

Lessons Learned

- The first step to became more efficient, eliminate energy waste and bad habits that affect energy consumption, is to keep everything under control. It's mean you have to measure and monitor.
- Communicate at any level, People Engagement at any level
- Use CUSUM Chart for individuate unexpected consumption

Keys to Success

- High commitment ad any level
- Real time monitoring.
- Think big, don't forget the details
- Tracking of significant deviations from the expected data