Buenos Aires, Argentina

Energy efficiency of public buildings in Buenos Aires: The case of an office building

ICLEI Local Governments for Sustainability

Buildings account for more than 40 per cent of Buenos Aires' energy consumption. Understanding the different characteristics of energy consumption within buildings is necessary for informing strategies and promoting the reduction of energy use. The Sustainable Construction Policies Project (PoliCS) in Buenos Aires is a good example of how improvements in the energy efficiency of existing buildings in cities is possible.

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Abstract

The local government of Buenos Aires is responsible for the maintenance of approximately 1,500 buildings. These include schools, hospitals, offices, public service centers and cultural centers. To move forward with an energy efficiency building program, learning the consumption levels for each type of building is necessary.

For example, improvement measures were identified for the city's Environmental Protection Agency office building based on its consumption profile. This could result in a reduction of 27 per cent in lighting, 54 per cent for computer systems and 37 per cent for cooling and heating. Replicating these improvements is a challenge. Actions need to be taken, policies developed, and obligations and incentives established.

The importance of energy efficiency of existing buildings

In cities like Buenos Aires, energy consumption from the built environment is one of the major contributors of greenhouse gas emissions. Reducing the energy consumption of existing buildings, then, presents an opportunity for cities to decrease their contribution to climate change.

The government of the Autonomous City of Buenos Aires spends over 20 million Euros per year on electricity for its 1,500 buildings. Energy consumption in the residential and service sectors of the city has doubled in the last decade, mainly due to the low cost of energy – subsidized by the National Government – and the increase in the individual demand for electricity through the increasing use of electricity and electronic appliances.

In the public sector, employees in public premises are often not aware of the amount of energy their buildings and offices consume since they do not pay the bills directly. This makes the situation especially precarious. However, since energy waste is high the potential for saving is, too. Public authorities should provide good examples and encourage others to follow.

Population / Land area
~ 3 Mill. / 203 km²

Municipal budget
Approx. € 3.6 billion (2010)

Buenos Aires joined ICLEI in August 2004.

PoliCS - Sustainable Construction Policies is an ICLEI initiative that involved five local governments in South America with the objective of improving energy efficiency and expanding low-carbon economies. Buenos Aires was selected to participate in PoliCS, in part, due to its work with PEEEP.

Case Study

The city context

As Argentina's most populated city and its capital, Buenos Aires is one of the nation's largest energy consumers. The city's highest consumption rate is found within its residential sector followed by services, commerce, and industry. Government is the lowest energy consumption sector.

Buenos Aires is not a large producer of energy and consumes more than it produces. Fossil fuels and energy from power stations are imported into the city. The energy market is regulated by the national government, most of which is carried out by the National Energy Secretariat. Generation and distribution facilities are operating at their capacity due to a lack of investments. For this reason, the national government usually imports energy in order to satisfy growing demand.

Buenos Aires: Achieving reductions of energy consumption in public buildings

In 2008, the Environmental Protection Agency (APRA) of Buenos Aires created the Program of Energy Efficiency in Public Buildings (Programa de Eficiencia Energética en Edificios Públicos, or PEEEP) as part of their policy focusing on greenhouse gas emissions reduction.

PEEEP's objective is to optimize energy consumption in public buildings with the goal of setting an example for the whole of society. If successful, carbon dioxide emissions in the city will be reduced.

Through PEEEP's implementation, energy diagnoses are carried out in public buildings of different types. From these evaluations, recommendations on how to operate the buildings more efficiently are developed.

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Center of the City of Buenos Aires

PEEEP is implemented by APRA in cooperation with the National Institute of Industrial Technology (INTI) and the Engineering Faculty of the Buenos Aires University, who provide technical support.

To obtain an energy diagnosis, a series of activities are carried out, including:

- Surveys of buildings' structures;
- surveys of operating electrical equipment and their consumption levels;
- installation of sensors to record temperature and humidity;
- measurement of electrical energy consumption by equipment placed on the principal and sectional electrical boards;
- survey of the number of personnel in each office and on each floor during every working hour of the day;
- survey of thermal comfort;
- measurement of lighting above working stations; and
- analysis of buildings' water consumption.

Once the results of the diagnosis are obtained, recommendations are developed for each type of building to be incorporated into an Energy Management System (SGE). The SGE centralizes information on the improvement measures by producing a document that provides information on which measures should be implemented and in what manner. It also provides information for the follow-up of each implemented measure by verifying its effectiveness in energy reduction.

For the SGE application, an energy manager is appointed by the person responsible for the building. For example, in a hospital, the energy manager would be appointed by the hospital's director. This person ensures the system's functionality and is accountable for implementing the recommendations and their monitoring. The manager should be the person who is responsible for the building's maintenance and, in most cases, should respond directly to the authority in charge of the building. This person should have a technical background with knowledge of electrical systems and the building's operations, for example, the number of staff, their working hours and energy habits, structural problems, and the building's history with maintenance and replacements. Above all, the person should be familiar to staff and capable of giving instructions. The manager only works on the implementation and monitoring phases. For example, he/she will document data on the monitoring of equipment.

Results

The diagnosis of the APRA building took place between September 2008 and April 2009. The results highlight the importance of local data on energy use. The energy consumption of the most important components were:

- Lighting: 40 per cent of the building's total electricity consumption. Potential saving in this sector is 27 per cent.
- Computers: 18 per cent of electricity consumed. It was discovered that 35 per cent of computers turned on were not in use. Saving potential in this segment is 54 per cent.
- Cooling & Heating: 15 per cent of electrical energy consumed. This sector has the potential of achieving a 37 per cent decrease through the application of recommendations.

APRA implemented the following recommendations:

- All of the 77 TRC monitors were replaced by LCDs. TRCs consume 128 watts, whereas LCDs consume 100 watts.
- The substitution of transformers resulted in an energy saving of 16 per cent; lighting improved by 10 per cent.
- During non-work hours electricity is disconnected. A procedure was established, where the last person to leave each floor became responsible for switching the central switch box off. Previously, lights, computers and other equipment were often left on throughout the night.
- An energy saving system was installed in the computer server that is able to detect when individual computers have not been in use for a certain period of time, in which case they are put into sleep mode or shut down.
- Although the water pumps' consumption is minimal (1 per cent of total), a 90 per cent energy savings was achieved by repairing a water pipe in one of the building's toilets. This issue was detected and repaired based on the energy consumption analysis. The analysis indicated a problem since the same amount of water was being pumped both during and outside of office hours.

Lessons learned

Despite the energy savings stated above, the financial savings were not significant due to the low cost of energy in Buenos Aires. Since the financial savings are small and implementation of the recommendations present extensive repayment periods for the needed investments, decision makers in the public sector do not have incentives to replicate PEEEP in other buildings. For this reason, Law 3246/09 is of great significance (see background for more information).

The implementation of energy diagnoses in existing buildings is not a simple task; it requires experts and the availability of appropriate technology. Technical capacities are, in general, limited. It is therefore necessary to promote the development of human capital.

While models exist that can rapidly estimate energy consumption in different building sectors, they are not comprehensive enough and do not necessarily reflect the level of consumption in individual buildings.

Analysis of samples from different types of buildings can establish common standards and recommendations that can be adopted by similiar buildings. Solutions are not universal, so it is important to give attention to those that will most likely attain wanted results in a majority of cases.

The energy manager is a key figure in implementation and monitoring, and the profile of these managers may vary according to the type of building.

Low or high energy costs may represent barriers or incentives when energy reduction measures are being pursued. In the case of the agency, the implementation of such measures was based on the leadership's decision to send a signal that energy consumption reduction was a priority, without considering economic aspects. Thus, energy efficiency measures are not always implemented for their cost-effectiveness. In some cases they may be implemented because leadership has decided to consider other indirect costs.

The public sector is the agent of change and must lead by example by recognizing existing barriers and difficulties, and plan policies and develop instruments to promote progress.

PEEEP and Law 3246/09

Law 3246/09, approved by the city council in 2009, sets guidelines for the Government of Buenos Aires to pursue energy efficiency.

Its objectives are to reduce and optimize the city's energy consumption as well as reduce its greenhouse gas emissions.

To achieve this objective, Buenos Aires has established energy consumption and CO_2 reduction goals for the next 3, 5 and 10 years, taking into account each of its activities, including public lighting, construction projects and procurement.

The implementation of this law also allows PEEEP to expand, mandating the adoption of energy efficiency practices in all public buildings. Thus, the buildings that have not been included in PEEEP will have to implement an energy consumption monitoring system and appoint an energy manager.

Replication

The program was originally implemented at the Environmental Protection Agency's head-office to serve as an example for other public buildings. 15 buildings are planned to be evaluated under PEEEP. The four buildings that have already been diagnosed were monitored for six months in the summer and winter. The 5th building is currrently being evaluated.

PEEEP's goal is to obtain energy diagnosis for 5 different types of public buildings:

- Administrative offices,
- hospitals,
- schools,
- cultural centers,
- citizen service centers.

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INTI technician measuring the temperature of one of the boards of the agency

From the information collected it is possible to determine energy consumption characteristics for other buildings within each type, as well as implement the energy efficiency recommendations that presented good results in the diagnosed buildings.

The plan is that by 2011, three of each building type will have been diagnosed. This will allow for a better understanding of common standards that can be applied to each building in order to achieve better energy efficiency.

The low energy prices increase wasteful energy use. The public sector can show examplary behavior that will encourage the wider adoption of energy efficiency measures that can be replicated at the national level.

This program is the first of its kind from the public sector in Argentina. Given the country's dire energy situation -- its wasteful use of energy due to low energy rates -- and the obligation of the public sector to set a positive example for energy efficiency measures, replicating this project on a national level is crucial.

Budget and Finances

APRA is expected to invest € 150,000 in professional contracts to implement the energy saving diagnosis and € 100,000 for equipment for 15 buildings. The cost of human resources needed for each energy diagnosis is approximately € 10,000.

The equipment purchased will be installed in each building in order to provide data in a shorter period of time for a larger number of buildings.

The full equipment includes sensors that measure temperature and humidity both inside and outside the building, energy analyzers that measure energy consumption, and equipment specifically designed to record the use of lights and other equipment. This equipment will be connected to a system that enables online consultation on a continuous basis.

Buenos Aires Environmental Protection Agency

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Key Contacts

Environmental Protection Agency (APRA)
Autonomous City of Buenos Aires, Argentina
Tel:+54-11/4124-79000 ext 138
Email: planeamiento_apra@buenosaires.gov.ar
www.buenosairest.gov.ar

ICLEI Secretariat for Latin America and the Caribbean
Project Office in Brasil
Av. IV Centenário 1268,
Sala 215, 04030-000
Jardim Luzitânia
São Paulo, SP. Brasil
Tel: +55 11 50843079
Fax: +55 11 50843082
Email: iclei-lacsbrasil@iclei.org
www.iclei.org/lacs/portugues

ICLEI World Secretariat
Capacity Center
Kaiser-Friedrich Strasse 7
D-53111 Bonn, Germany
Tel: +49-228 / 976-299-00
Fax: +49-228 / 976-299-01
Email: capacity.center@iclei.org
www.iclei.org

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Agencia de Protección Ambiental
Ministerio de Ambiente y Espacio Público
Buenos Aires Ciudad

British Embassy
Brasilia

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