



CEE COMP QUARTERLY BRIEF N°1

SHARING THE EXPERIENCE OF THE FIRST EDITION

The Cambodia Energy Efficiency Competition is an innovative competition between buildings seeking to boost energy efficiency by addressing behavior change through games and internal challenge. Our aim is to increase awareness and responsibility, foster collaborations and creativity among the teams, while providing accessible and easy solutions according to the needs.

This project is inspired by a European competition that has successfully completed 5 editions. It is funded by the Cambodia Climate Change Alliance, who is itself funded by the European Union, Sweden and UNDP. The competition is also sponsored by Schneider Electric.

The first edition of the CEE comp between private buildings started in September 2021 with 22 buildings from 14 well-known companies. For one year, they will aim to save as much energy as possible by initiating behavior change and improving equipment management.

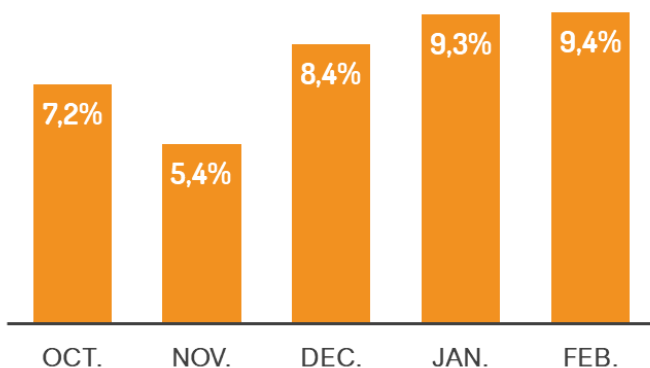
This report aims at sharing the results of the CEE Comp and providing key informations on energy consumption in Cambodian commercial buildings. By doing so, the quarterly reports shall help Cambodia's Energy Efficiency sector to capitalize on the learnings of the project to inform policies and programs.

KEY ENERGY SAVINGS FIGURE

During the first months of the competition, the candidates have implemented actions to reduce their electricity consumption. You will find out what they have done in the next pages!

Thanks to this, they have been able to make their first energy savings. Below is an idea of what their annual energy savings would be based on what they did each month. In October, their energy savings were equivalent to an annual average of 7.2% savings. We can see that their actions paid off even more after that, as the annual estimate savings rose to 9.4% in February.

ESTIMATED ANNUAL SAVINGS BASED ON MONTHLY SAVINGS



If you want to know more about the calculation of energy savings, you can go to the last 2 pages.

22
buildings

14
companies

2300+
employees

WHAT IS ENERGY EFFICIENCY?

Energy efficiency simply means using less energy to perform the same task.

CEE COMP MEASURES

1- Behavior change



2- Operational optimisation

3- Minor renovations



10% energy saved in 1 year by all candidates means 480 tonnes of CO2 eq saved

Equivalent to:



• 2.5 million kms by car

• 1 million litres of plastic bottles



BASELINE ENERGY CONSUMPTION

Most of the candidates of the first edition of the CEE Comp are office buildings, but there are also more specific buildings like restaurants, stores or gas stations.

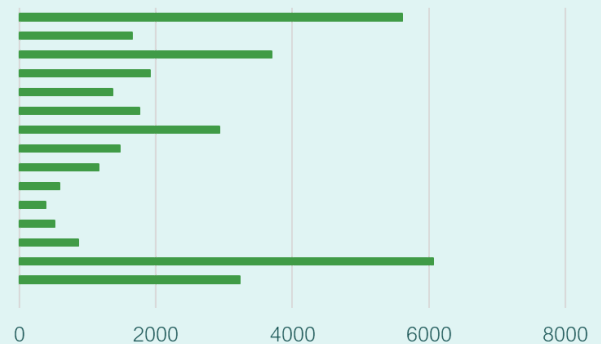
In total, the CEE Comp candidate's buildings consume more than 8 million kWh per year, which corresponds to 4800 tons of CO₂ eq (based on Cambodia's emission factor).

If buildings could save an average of 10% energy per year, this would save 480 tonnes of CO₂ eq, equivalent to almost 2.5 million kms by car or 1 million litres of bottled water.

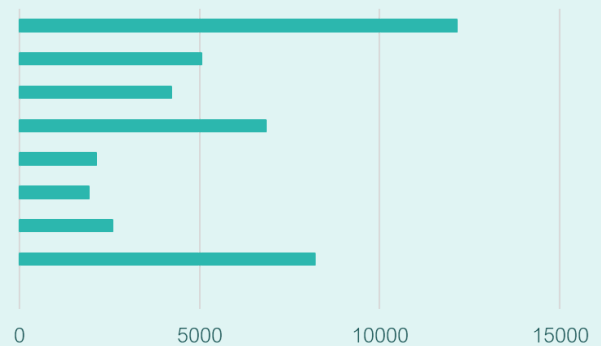
For your information, for the office buildings we find an average consumption of 2212 kWh/occupant and for the specific buildings the average is 5383 kWh/occupant.

BASELINE ANNUAL CONSUMPTION PER OCCUPANT (KWH/ OCCUPANT)

Office buildings



Specific buildings



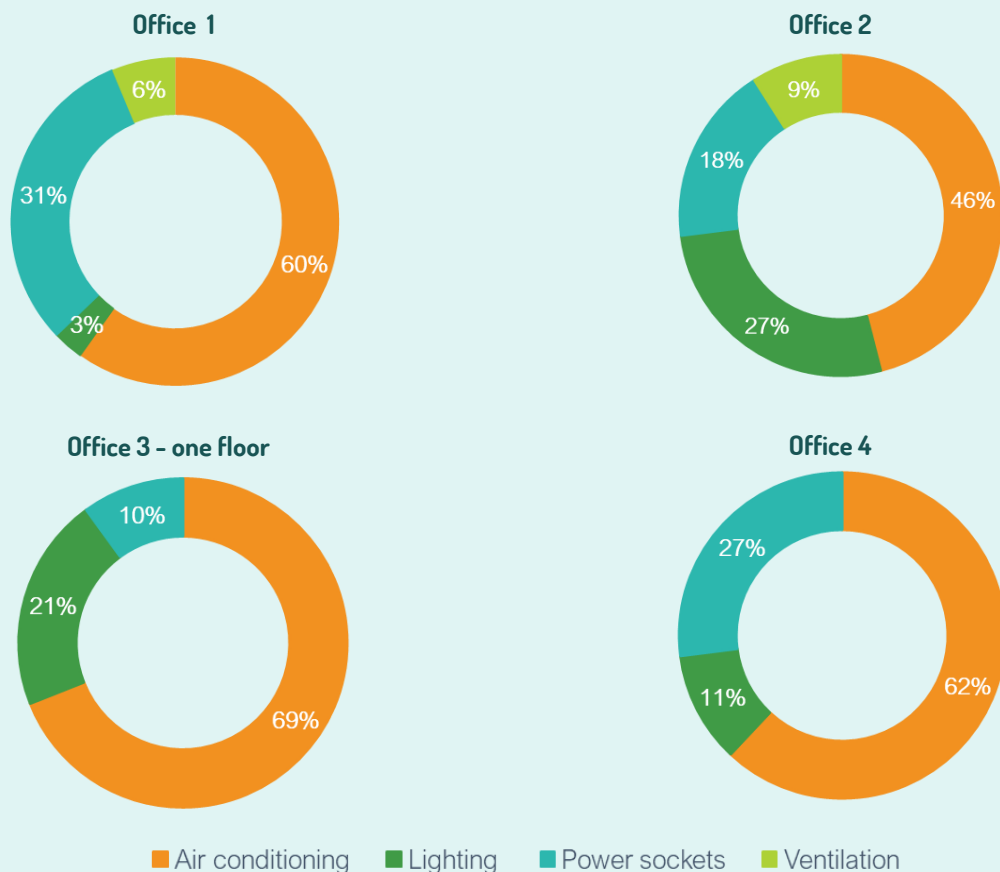
BASELINE ENERGY CONSUMPTION

In Cambodia, and in South East Asia generally, the equipment known to consume the most energy in office buildings is air conditioning.

Some of the CEE Comp candidates were able to verify this by conducting a study with an Energy Management System* (EMS) which allowed them to know the distribution of their energy consumption by equipment. Below are examples of results found for some office buildings candidates. We can see that A/C is always the equipment that consumes the most in these cases.



EXAMPLES OF BREAKDOWN OF ENERGY CONSUMPTION BY EQUIPMENT



**Energy management systems are automation systems that collect energy measurement data and making it available to users through graphics, online monitoring tools, and energy quality analyzers, thus enabling the management of energy resources.*

BASELINE ENERGY SURVEY

To complement these quantitative data with more qualitative ones, an energy behavior baseline survey was also designed to understand the current level of awareness of the employees of CEE Comp participants. The CEE Comp project leaders sent the survey early enough in the competition to do a pre-assessment before the raising awareness activities start.

We received responses from 13 organizations. In total there were 565 respondents including 197 women (34.9%) and 368 men (65.1%).

Altogether, the results of the survey are much better than expected and participants already have both a rather good knowledge and trust in energy efficiency measures. Still, it is important to note that the companies participating to the first edition of the CEE Comp are ones with already strong environmental commitment, which might include a bias in the answers of the survey.

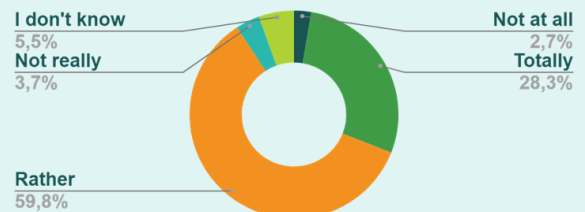
Most of respondents feel rather concerned by the environment and sustainable development and this is their first motivation to change their habits.

They report already paying attention to their energy consumption and have in the great majority good energy habits or are ready to change.

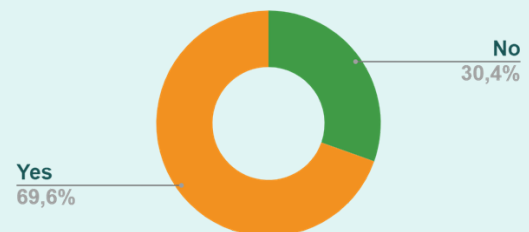
Employees admit that some actions can be set up in their organizations to reduce energy consumption. Awareness raising is the priority, followed by better maintenance of the equipment and better air conditioning management. The large majority (85.8%) believe that changing habits and small gestures can help to save energy.

EXTRACT OF KEY RESPONSES FROM THE BASELINE SURVEY

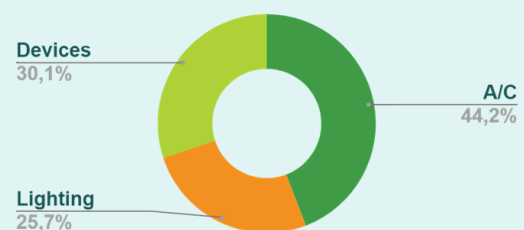
Do you feel concerned about sustainable development?



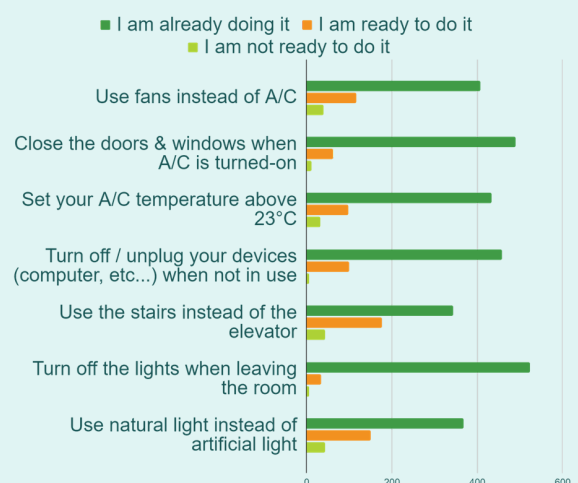
Have you already heard about energy efficiency?



According to you, which equipment consumes the most in Southeast Asia?



Overview of your energy habits:



LESSONS LEARNT: UNDERSTANDING ONE'S BUILDING

Before seeking to implement energy savings measures, it is first essential to get to know one's building, which means in particular to:

- Find out about the building envelope, the electrical equipment (quantities, date of installation, model, etc...)
- Understand the operation of the different electrical appliances (management, operating time, efficiency with respect to comfort, maintenance protocol, etc...)
- Understand the behavior of the building users
- Possibly, find out what the main energy expenses are (using a power meter, EMS...)
- Possibly, identify malfunctions

This allows to define which are the main elements to target and which are the potential action levers to save a maximum of energy.

The candidates understood this and conducted their investigation. On this page are some examples of activities implemented by the 14 participating organizations.

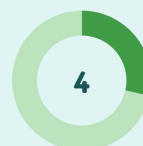
EXAMPLES OF ACTIONS IMPLEMENTED BY THE CANDIDATES



Walk around the building



Conduct an EMS study



Use/install thermometers

And also:

- Check if the use of the different equipment is automatic or manual. Who has the control ?
- Count the number of A/C and lights.
- Locate windows to define the potential for natural ventilation.
- Observe the hours of use of the A/C, lights and computers.
- Check that the insulation of the building and between the different rooms is correct.
- Check if people remember to turn off the lights or A/C when leaving.



LESSONS LEARNT: GETTING EVERYONE ON BOARD

EXAMPLES OF ACTIONS IMPLEMENTED BY THE CANDIDATES



Create a green team in charge of implement the competition



Top management sent an official communication to employees



Give a presentation to raise employee awareness of energy efficiency



Create/plan a newsletter or a dashboard

And also:

- Training at onboarding stage for the green team to learn practices to save energy.
- Have a member of the green team in each department to keep the motivation.
- Rely on the CSR policy to engage employees
- Regular written communication to update about the CEE Comp (Telegram, mails...)
- Explain what is at stake in energy efficiency (climate change, energy mix...)
- Talk to people individually to better motivate them.
- Encourage all employees to participate in the CEE Comp activities
- Organize an internal competition and give rewards.

Energy savings in a building is a true team effort and it is important to get everyone involved to get started and move forward with the competition.

Here are a few things to help ensure successful employee onboarding:

- Understand everyone's role in the competition, especially the project manager and the green team.
- Train the green team and employees on the energy context and energy savings.
- Have motivating and effective communication to engage employees in the CEE Comp activities, encourage them to develop or maintain good energy habits and keep them informed of progress.

On this page you will find the ideas implemented by the candidates of the first edition of the CEE Comp to involve all occupants in the competition.



CHALLENGES ENCOUNTERED

By getting to know the building and the energy habits of the participants better, the project manager and the green team were able to identify objectives and activities to be implemented. They also sometimes observed challenges and obstacles that were more difficult to overcome.

Below are some examples of situations reported by several candidates.

Sharing knowledge and experience through the CEE Comp could in some cases help find solutions to these problems.

The organization has computers with heavy software that take a long time to reboot

Landlord don't want change to be made in the buildings

The building has large windows that lead to an increase in heat

The maintenance of the electrical equipment is not scheduled

Some air conditioners are not efficient

People forget to turn off the air conditioning or lights when they leave

The building has a data center or servers room that gives little flexibility and sometimes the organization doesn't want to take the risk to increase the air conditioning set point.

Doors remain open even if the air conditioning is on (company culture or health reason)

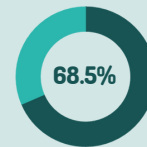
SAVINGS CALCULATION MODEL

In order to be able to calculate monthly savings, the CEE Comp follows the International Performance and Measurement Verification Protocol (IPMVP). Applicant buildings must provide their historical monthly electricity consumption, ideally for the last three years prior to the competition and a minimum of one year of consumption. The applicant can find this information on the building's electricity bill.

Many variable factors influence the electricity consumption of a building, such as the weather or the number of occupants. However, the applicant has no control over these factors. Besides the historical electricity consumption, the CEE Comp calculation model therefore takes into account the weather factor and other variables that the participating buildings are able to provide to calculate the savings. The choice of variables has an impact on the accuracy of the calculation model, and it is important both to find the right factor and to monitor it in order to integrate it into the model.

The quality of the prediction of the calculation model can be assessed by the statistical coefficient R^2 which is obtained through linear regression.

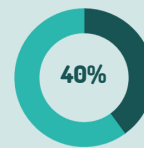
R^2 OF THE SAVINGS CALCULATION MODELS



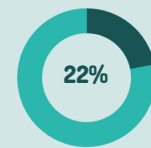
Average R^2 on savings models

AVERAGE R^2 ON TEMPERATURE

Office buildings



Specific buildings*



*buildings with specific processes that can be constraining and limit energy savings (restaurants, shops...)

NEED FOR OTHER VARIABLES TO FINETUNE THE MODELS

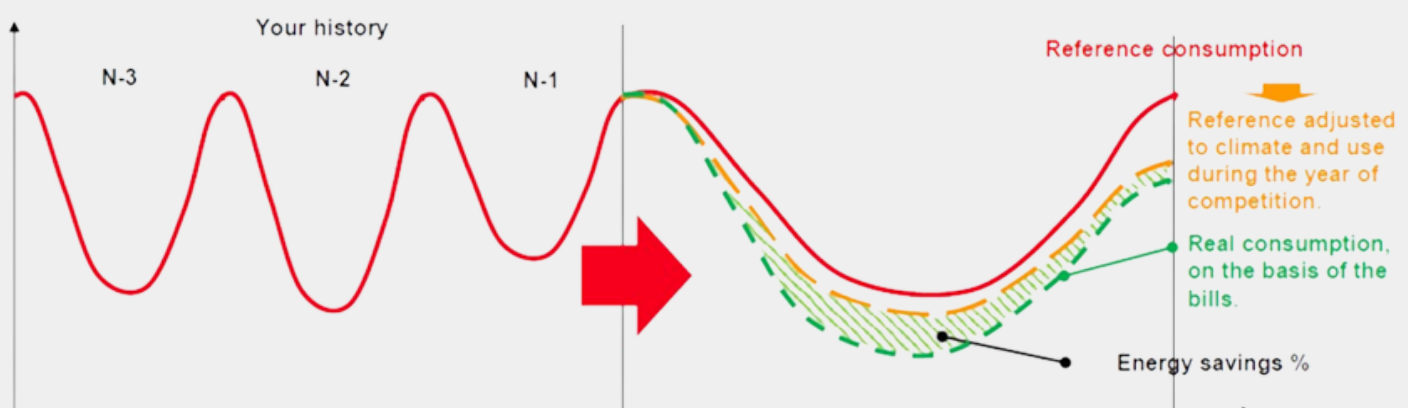
Office buildings

- Number of staff
- Occupancy rate
- Working hours

Specific buildings

- Number of staff
- Activity volume (ex: sales, number of customers, kg produced, etc...)

The experience of the first edition of the CEE Comp showed that temperature (Cooling Degree Days) was not a sufficient variable in Cambodia to build a reliable calculation model. The CEE Comp therefore worked very closely with participants to identify other variables to be included in the models.



CUMULATIVE SAVINGS

The cumulative savings correspond to the sum of the past months savings divided by the average annual consumption. The cumulative savings helps to better appreciate the savings trajectory and so the arrival point at the end of the competition.

Below are the averages for the first months of the competition. After 5 months, the candidates have saved an average of 3.9% of energy, which corresponds to a trend over the year of about 9.4% of energy savings. The next few months will tell us whether energy savings will continue, accelerate or slow down.

The February box plot is also given allowing you to better appreciate the distribution of energy savings by building. It shows the minimum and maximum values of the cumulative savings of the candidates as well as the 1st quartile (25% of the candidates

below Q1), the median (half of the candidates below the median) and the 3rd quartile (75% of the candidates below Q3).

In order to fully appreciate these savings, it is also important to note that the first two months, the candidates took some time before really setting up their activities. In September and October the CEE Comp team organized green team sessions to inform the candidates about the competition and to give them organizational advice. In November technical workshops were held to train them on energy efficiency management and on electrical devices. This may explain why the savings in October and November are less important than savings of following months. In addition, although the weather is taken into account in the calculation model, candidates may have had an advantage in implementing their activities with cooler temperatures in December and January.

CUMULATIVE SAVINGS AVERAGE



BOX PLOT OF FEBRUARY

