

# SOLAR PV | EFFICIENT IN PANELS

IVÁN SOTO (EXPORT MANAGER)  
& OSCAR SÁNCHEZ (PRODUCT MANAGER)  
POLYLUX

## The ECO transformers in photovoltaic installations

Photovoltaic panels only offer a performance of 30-40%. This is why in photovoltaic installations, the necessity of elements with high performance, like ECO transformers, is essential.

**M**assive increment of the energy demand, progressive increase but non predictable of the fuel price, constant social and media pressure about climate change and other factors, opened the door to the investigation of alternative energy and energy efficiency. Because of that, most of world's governments have decided to develop an energy efficiency program as a priority policy.

This new policy, either for being climate change a main theme of the global summits or for the actual economic crisis (specially in Europe) or a combination of both, makes that energy saving stops being just an added value and becomes a necessity for environmental and financial sustainability.

### Next directive about energy efficiency

The energy demand, far away from being stabilised, increases every year and according to several studies, to alarming levels. Some studies even raise this alarm to the point of ensuring that the worldwide provisioning is in danger by 2025. Even if you are sceptical about the lack of provisioning, it is evident that we are not using properly the world's resources. As a result of this energy efficiency begins to gain importance.

Energy efficiency can be defined as a reduction of energy consumption maintaining the same energy services, without decreasing our comfort and life quality,

protecting the environment, ensuring the supply and encouraging a sustainable behaviour of its use.

Based on transformers, a key element in most of the electric installations, the energy efficiency lies with a reduction of their electric losses in order to obtain a higher performance of the total installation.

The European Parliament, due to the immediate necessity to regulate and establish a pattern of ECO design, is implementing actions and plans to adopt in short a new directive (Directive 2009/1225/EC), in which it is established that the only relevant environmental aspect is the energy in the phase of use, which can be addressed through product design.

This new directive will affect to each product related to energy in order to be considered ecological. In relation to transformers, it will establish maximum and minimum figures for load and no load losses, and will be compulsory providing the client with more information about the product.

This new directive will be applied in two tiers with the objective of smoothing the economic impact for countries and companies who want to comply with it. The first measures will be effective as from 2016 while the second ones as from 2020.

With this package of new measures, Brussels pretends to save between 11.5TWh and 17.5TWh per year by 2025 (just in the

field of transformers).

### ECO transformers of Polylux

In the long history of Polylux, there has always been a special treatment for high performance transformers and together with the awakening of renewable energy, Polylux was ahead of the European directives creating transformers with ECO designs.

ECO transformers provide a higher performance compared to standard transformers and together with technical and economical advantages, make them become a main element of any application that must have or desire high level of energy efficiency.

To get an idea, if we compare a standard transformer of 100kVA with and ECO-type of same rating (working with a typical value of 85% of load ratio and considering a lifetime of 20 years) it can be stated that:


The purchasing price difference is recovered in a bit more than 3 years due to the lower exploitation costs of the ECO-type.

At the end of its lifetime, the losses saved by and ECO transformer are 170MWh, which is equivalent to 14.62toe (tones of oil equivalent) which means a saving in emission to the atmosphere of 58.97\*.


\*Value calculated according to energy production of the coal (as stated in the Renewable Energy Plan IDAE 2005-2010).

For an approximate calculation of the payback time (T) in years of the purchasing

### Losses standard transformer 100 kva: Pérdidas transformador estándar 100 kva:

	● Efficiency	97,3% aprox.
	● Rendimiento	
	● No load losses	611W
	● Pérdidas en vacío	
	● Load losses	2187W
	● Pérdidas en carga	

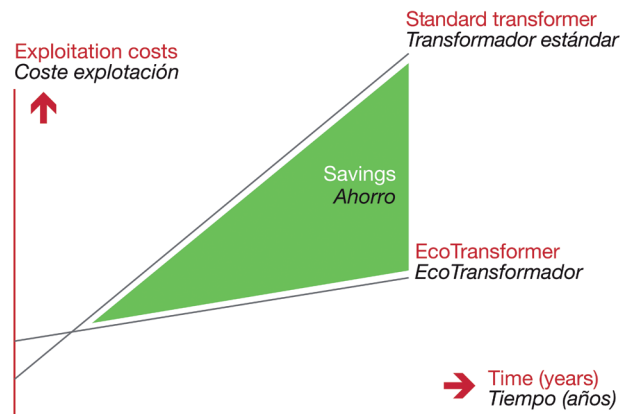
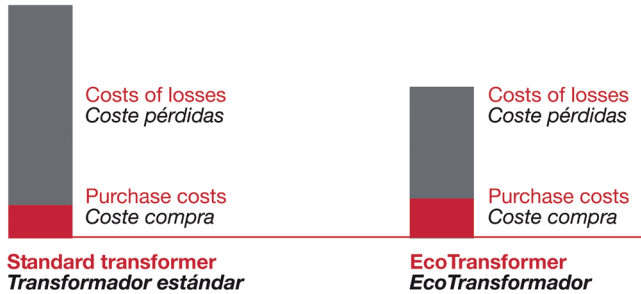
### Losses eco transformer 100 kva: Pérdidas eco transformador 100 kva:

	● Efficiency	98,5% aprox.
	● Rendimiento	
	● No load losses	468W
	● Pérdidas en vacío	
	● Load losses	1050W
	● Pérdidas en carga	

## Exploitation costs during lifetime (20 years) Coste de explotación durante vida útil (20 años)

During the expected lifetime, the costs of the electrical losses exceed multiple times the purchasing costs of the transformer.

*Durante la vida útil, sólo las pérdidas representan un coste que supera en múltiples veces el coste de adquisición del transformador.*



price difference in front of exploitations costs it is possible to apply the following formula:

$$T = \frac{PT_{ECO} - PT_{STANDARD}}{(LT_{STANDARD} - LT_{ECO}) * t * PEE}$$

Where  $PT_{ECO}$  and  $PT_{STANDARD}$  are the price (€) of the ECO and standard transformers respectively.

$PT_{STANDARD}$  and  $LT_{ECO}$  are the losses of the transformers (kW),  $t$  represents the operating hours per year of the transformer and  $PEE^*$  is the price of the energy in €/kWh.

\*For an exact calculation it is necessary to take into account the fluctuations on the price of the energy (kWh).

### ECO transformers characteristics and advantages

ECO transformers high performance is achieved due to the high quality materials used in their manufacturing and to a new and improved design. Those high performances, which can achieve values of 99%, reduce the energy costs produced by the operation.

Moreover, due to its improved design, they provide the following technical advantages:

- Lower heat generation, reducing necessary cooling provisions in the area of installation.
- Longer lifetime, thanks to reduction of thermal load on the isolation materials.
- Lower voltage drop (difference between no load and full load output voltage) avoiding fluctuations in the output voltage.
- Suitable for higher ambient temperatures.
- Lower inrush current, avoiding tripping of protection devices at the moment of

connection.

- Lower acoustic noise level (dB).

### Applications

Because of all aspects previously explained, ECO transformers are specially useful and profitable in several industrial applications such as renewable energy installations, where global performance of the installation is one of the key factors of its profitability, ecological buildings where energy efficiency sustains the viability of the project and railway installations where energy and economic savings are two of the traits of greater importance for an adequate operation.

As renewable energy was designed to supply certain part of the energy demand, reducing the dependency from other polluting technologies, this is perhaps one of the most significant cases, since it appears incongruous to talk about any kind of renewable energy (wind, photovoltaic, thermo-solar or any other type) without considering energy efficiency essential in the electrical system.

### The ECO transformers in photovoltaic installations

Photovoltaic panels only offer a performance of 30-40%. This is why in photovoltaic installations, the necessity of elements with high performance, like ECO transformers, is even higher.

Transformers have several essential functions in a photovoltaic installation since they protect the network of possible DC current injection coming from the photovoltaic field, offer galvanic insulation which isolates the installation from possible disturbances in the grid (and vice versa), which also allows to disconnect and isolate the installation from supply help-

ing thus the maintenance tasks. In some occasions, transformers are also used for voltage conversion in order to be able to connect the electrical system to the grid.

Moreover, if we consider that the installations incorporate several elements that produce losses like inverters, cables, batteries, switching components, etc., it is essential to have high performance elements capable of guarantee that the performance of the global installation barely decreases because of them, using thereby the maximum of the energy produced by the photovoltaic installation. Because of this reduced performance of the global installation, any product or innovation which allows increasing its productivity becomes an essential component in the installation.

### The future in our hands

It is obvious that the world's energy current situation is not sustainable neither economically nor environmentally as the energy demand is in constant increase, and some energy resources like the fossil related ones are lacking and decreasing progressively. Because of this, different solutions are being studied and applied by the majority of the governments, highlighting energy efficiency as one of the most cost-effective to improve the actual situation in short and long term.

However, energy savings do not only lie in the government's hands and in large scale projects since if a responsible use of the energy is not made in a daily basis, achieving a worldwide change of tendency will be very difficult. For this reason, new ecological designs, like ECO transformers, are recommended in all type of electrical installations. By doing so, we are closer to that sustainable future so wanted ◀◀