

# WIND FLOW INTERFACE CONCENTRATOR FOR VAWT

 PATENTED TECHNOLOGY

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## ABSTRACT

The researchers of the University have developed a wind flow concentrator incorporated into a Vertical Axe Wind (VAWT), which allows a significant increase in wind speed before being injected to the turbine.

The system allows the optimization of the currents with independence of its direction and it is applicable to any type of VAWT. It is suitable for any type of building



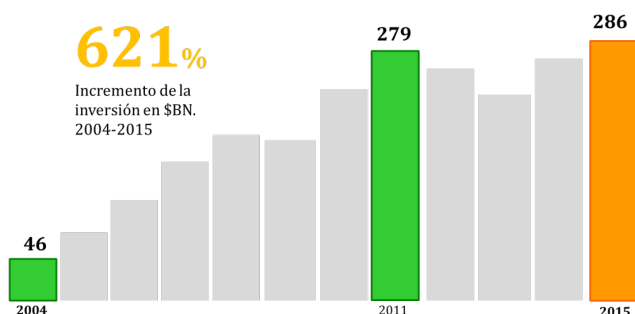
## INTRODUCTION

Renewable energies bring all those energetic sources with high rate of renewability together. The R&D projects included in this area have acquired special prominence in the last decade. According to information published by the Frankfurt School UNEP Collaborating Centre, in 2004-2016 period, the investment for projects related to renewable energy has been multiplied by more than 6 times, reaching 286 \$BN. Moreover, to this data it must be added the high diversification in contrast to the small number of fossil energy producers.

92% of the investment is allocated to projects related to solar and wind energy. The energy contained in the wind is about 2% of the total solar energy reaching the Earth. This means the equivalent of nearly 2 billion tons of petrol (TEP) per year (200 times higher than what is consumed by all countries in the planet), while approximately 5% is being used today.

### Inversión realizada en proyectos destinados a energías renovables

*Global Trends in renewable energy investment.*  
 Frankfurt School- UNEP Centre/ Bnef. 2015.



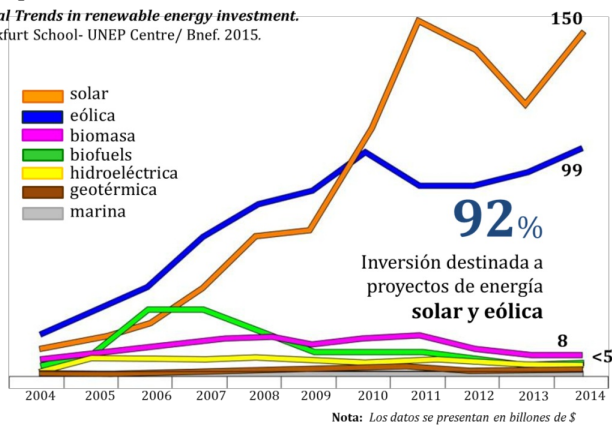
Much of the investment comes from microgeneration technologies projects. These systems are intended for individual use or restricted to a few users covering all types of renewable sources. Wind energy covers much of P&D project investment.

Its implementation in rural areas and open spaces begins to be remarkable. According to World Wind Energy Association, in 2005 the number of installed low-power turbines has been approximately 800,000.

One of the greatest challenges is to meet the current demand of the existing urban models. Last advances in microgeneration make possible to plan housing, buildings and urban equipment with certain energetic autonomy. This integration allows to plan architectural designs and solving the estimated rational demand by incorporating this type of systems.

### Inversión realizada en función del tipo de fuente renovable

Global Trends in renewable energy investment.  
Frankfurt School- UNEP Centre/ Bnef. 2015.



#### TECHNICAL DESCRIPTION

**EOLIA** is the first hybrid microgeneration system which is installable in any architectural volumes. In a single system, it is used wind and solar energy for the generation of electricity, in addition to rainwater harvesting for future usage.

Wind breezes on the terrestrial surface are characterized by their intermittence, reduced speed and absence of predominant direction. **EOLIA** is able to replace the low energetic density of breezes through their capture and concentration. It allows to reach a significant speed increase before being injected efficiently into the turbine.

The interface is characterized by an architecture capable of sectorize the wind input in different sections, injecting the wind flow strategically. Its architecture is adapted to the nature of breezes, obtaining their capture regardless of their direction.

**EOLIA** increases the number of operating hours and the range of performance in comparison to traditional wind microgeneration systems. **It is translated in an exponential increase of the electrical output.**

In addition, the interface incorporates own regulatory mechanisms acting in presence of winds of importance in order to regulate the inflow, keeping a sustained circulation. In case of strong winds, mechanisms for the maximum protection of the set are included.

The system configuration is ready for the installation of solar capturing systems. This added value allows to model a hybrid system capable of meeting much of the electricity demanded by the building.

#### TECHNOLOGY ADVANTAGES AND INNOVATIVE ASPECTS

##### ADVANTAGES OF THIS TECHNOLOGY

- Increase of electrical output.

Interface makes it easy to achieve the nominal power of the wind generator at slower speeds, leading to a longer period in nominal operation.

- Increased operating range of action

The flow control devices make it possible to adapt the interface architecture to the requirements of the speed of the current.

- Adaptation to the turbulent nature of the breezes

The design of blades and the sectorization practiced allow both the capture and the continuous injection when turbulent nature breezes are present without affecting the performance.

- Compatibility with other types of microgeneration systems and technical equipment

The interface configuration allows the incorporation of other microgeneration systems such as solar capture systems, passive solutions, technical equipment, green roofs, etc.

- Easy installation

Its incorporation is suitable for the majority of architectural volumes, industrial, technical, service facilities, auxiliary, agricultural, military, etc.

- No attached plot is required for its installation.

- It allows energy storage.
- Its dimensions are adaptable to meet the energy demand
- Customizable tonalities to suit the aesthetics of the building

### INNOVATIVE ASPECTS OF THIS TECHNOLOGY

There are three innovative aspects of great importance. Firstly, EOLIA combines in a single system three different types of technologies capable of producing electricity and it reuses rainwater for consumption.

Secondly, EOLIA has been designed to be built into any type of architectural volume. Currently, the installation of systems that use wind energy in buildings is non-existent, except a few cases concerning skyscrapers. EOLIA is the first system to exploit this type of energetic source, as well as solar, intended to be installed into the building itself.

And thirdly, EOLIA is made up of a structure of concentration which has been modeled to use a type of energetic source minimally exploited (such as breezes circulating on the terrestrial surface). This geometry is the result of applying a method developed by researchers. The method determines for each specific case the characteristics that must have the various elements of the wind concentrator so that the maximum output of the system is obtained.

### CURRENT STATE OF DEVELOPMENT

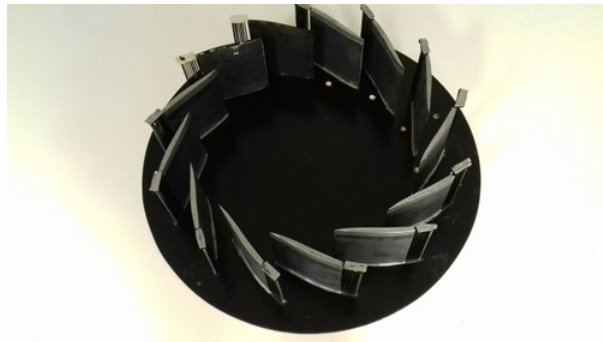
EOLIA has successfully completed all the previous and necessary steps to deal with a life-sized proof of concept.

At this stage the relevant numerical simulations were completed by means of mathematical software and CFD in order to define an efficient design.

The results of the simulation were validated by tests performed on a prototype on scale.

The built prototype has dimensions of 60 cm Ø and 16 cm high, integrated on a turbine of three rotating blades and 40 cm Ø.

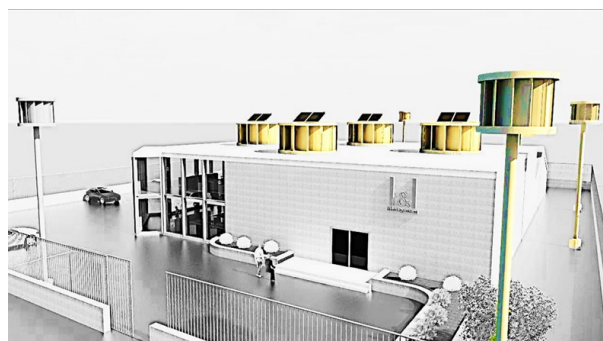
The aim of these measurements is mainly to contrast the acceleration produced in the flow sections located opposite the wind source. The results show a strong correlation with the CFD simulations performed, which justifies the feasibility of designing the wind concentration structure for vertical axis wind turbines.



### MARKET APPLICATIONS

The possibility of being built in architectural volumes promotes carrying out designs which seek autonomy in energetic terms.

EOLIA can be integrated in all types of architectural volumes, from housing, industrial buildings, logistic centres, mountain lodges, schools to roofs of petrol stations, water tanks, control towers, tolls, etc.



Also, it must be added urban equipment as the case of street lights, water tank height, pergolas, etc. Any structure is open to EOLIA installation as long as it is located in open spaces.



#### COLLABORATION SOUGHT

We are looking for companies interested in acquiring this technology and its commercial exploitation through patent license agreement.

#### INTELLECTUAL PROPERTY RIGHTS

This technology is protected by granted **patent**:

- *Patent title: Concentrator interface of wind flow, calculation method for the concentrator interface of wind flow, interface blade and wind microgeneration system to electricity generation for domestic use.*
- *Número de solicitud: P201630128*
- *Fecha de solicitud: 04/02/2016*

#### MARKET APPLICATION (4)

Construction and Architecture  
Pollution and Environmental Impact  
Computer Science, Language and Communication  
Engineering, Robotics and Automation