

# The smart microgrid: an efficient city in miniature



By: Margarita M. Llano G. / margarita.llano@upb.edu.co

**Respect for the environment  
and integration  
of distributed generation  
and self-management:  
a big benefits proposal.**

**T**he Greek myth tells about the Titan Prometheus that against the will of Zeus, he stole and gave the fire to humans with the purpose of improving their living conditions. Even though it meant a punishment for him, it also meant the solution of many problems for the human race, while the interest in finding better alternatives for power generation for the development of civilizations. Fire is a symbol of life and intelligence that leads us. And so, gradually, the man came to the construction of large power plants generators we know today and that move the world.



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But, those huge infrastructures lead to think smaller proposals with equal or better results and, above all, more environment-friendly. The motivated professors Idi Amin Isaac-Millan and Gabriel Jaime Lopez-Jiménez, members of the research group in Transmission and Distribution of Electric Power (T & D), in their doctoral thesis developed similar themes that led to the consolidation of designing a intelligent Microgrid which already operates in the Pontificia Bolivariana University and integrates 10 centrally managed subsystems.

### Central monitoring from a desktop

The Microgrid is an interconnected system with the ability to feed itself and operate in an standalone operation system islanding operating mode if it is necessary. It includes both the generation and the storage, also the electric transport, in addition of the equipment to optimize the intelligent energy management by the end user (public lighting, automatizing of buildings, etc.). In various parts of the world operate such networks. After serious studies and knowing different experiences

in countries like South Korea, Germany and Chile, the researchers conducted a first stage involved three phases: infrastructure construction, performance testing of prototypes and, design of micro scaled networks, tailored to the needs of each client.

Today, they fulfilled these phases, the University has the more complete capacity Smart Microgrid of the country, with 10 integrated subsystems: three rooftop solar photovoltaic generators on buildings on campus; three meteorological stations to assess the availability of solar and wind resources, and measurement of solar radiation, temperature and wind speed, and other variables; automatic temperature control and lighting system in a building; a bio-digester that processes organic waste product of the University restaurants and pruning of trees, with the aim of obtaining methane gas for cooking, or as an energy source to produce electricity. The residue from this process becomes organic fertilizer; a public LED lighting circuit; a charging station for electric vehicles; and the control center that can display temporarily the variables of each subsystem and, for next

year is expected to manage the Microgrid remotely and therefore intelligent. This is domed, i.e. with the use of internal elements in a confined space, through mobile devices such as a tablet, a cell, or fixed stations, such as a touch panel on a wall, to mention only three of the many possibilities, you can control the lights on and off; to bring up or down a curtain; turn on and off equipment; adjust the air conditioning. But above all, monitoring the external subsystems mentioned that work on campus. No longer is a huge central, as we know, but a network that turns on the environment in which it operates, in a smart miniature city.

## Versatility and advantages

Besides its size, the possibilities and advantages of this system are very ample. When considering our topography and difficult access to conventional proposals Smart Microgrids can be installed in remote areas of low population density. They served in the generation of non-conventional renewable energies such as wind or photovoltaic like the ones operating in the institution. They are easy to install in places of natural disasters. Also appropriate in the mining, gas and oil industries. They may feed telecommunications stations, environmental monitoring and measurement. The tourism industry would be widely benefited because their complexes could be operated locally without having to rely on outside plants. They would be very useful in the military field for mobile battalions, high mountains and rapid deployment, as well as beneficial in conventional military installations. So you might think once

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reached the post-conflict actors, might be involved in the installation, operation, monitoring and maintenance of these micro networks.

In this versatility, they add more advantages. In operation, control becomes easy, uninterrupted supply of power feeders minimizing congestion and loss reduction. As it pertains to power quality, there is a better balance between generation-load and voltage local support. In relation to the market, there would reduce costs and speed up the construction of generation and transmission infrastructure. But above all, environmental, ongoing concern of the research group, there is a significant reduction in emissions and lower fuel consumption, in addition is not necessary large tracts of land.

## Allies and projections

Strategic alliances with different sectors are fundamental. Already they have formalized, between national and international: five commercial, three academic and one organizational multilateral ally, and they also have approaching other potential partners. The researchers also articulate to this project, thesis from the Master degree in Engineering, from the subject of Transmission and Power Distribution (T & D). But there are more goals. It worth mentioning their interest in reducing, gradually, the dependence on network operators; achieve increasingly clean production; be more efficient in energy use; expand clean water and waste management and, of course, controlling energy losses. In short, they expect to achieve a sustainable campus.

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to watch  
the video.



## Data sheet

**Project´s name:** Development of comprehensive and sustainable solutions to human communities based on the concept of Smart Microgrids, Laureles campus pilot, Pontificia Bolivariana University.

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**Research Group:** Electric Energy Transmission and Distribution Research Group  
**School:** Engineering.

**Project leaders:** Idi Amin Isaac-Millán  
Gabriel Jaime López-Jiménez.

**Email:** idi.isaac@upb.edu.co; gabriel.lopez@upb.edu.co