

Universidad de Puerto Rico

The Universidad de Puerto Rico 2007 Solar Decathlon project is called the Cell House, because the team took inspiration from a single cell, which embodies the essence of self-sufficiency. The house fosters a sustainable lifestyle within the considerations of modern living. Transportable, livable, and efficient, the house can evolve to satisfy the changing needs of its inhabitants. The role of the Cell House is to be a generator for sustainable design education on the island of Puerto Rico.

What's Different?

- Three Colleges, One Goal: The team comprises students from the College of Business Administration and the College of Engineering from the Mayagüez campus and the School of Architecture of the Río Piedras campus.
- Nature as a model for Design: The design uses the vegetable cell as the primary generator of form.
- Sustainable Materials for a Sustainable Solution: Sustainable materials are used throughout the house, making this house not only efficient, but also environmentally friendly. 3-Form Ecoresin is used in the nucleus, studio, and bathroom and Plexwood sustainably harvested wood materials cover the walls and floors. Recycled plastic is used in an exterior screen that transforms to let light and ventilation in at different points, performing in the manner of the front wall of a cell. Also, the structural frame of the house is made of Extren Fiberglass members, which are recyclable and lightweight.
- Half and Half: The house will be transported in two modules that measure 8 feet x 47 feet and that will be joined on site to create the single structure that is the dwelling.

Architecture, Interior Comfort

- The Cell Analogy: The Cell House merges all of the components of a solar house into one efficient living module. The wall and membrane, made up of a transformable screen and translucent wall, help ventilate and illuminate the house so that the inhabitant can adapt the house to any climate. The "nucleus" houses all of the things the cell needs to survive. The nucleus is divided into two sub-modules, which include accommodations for electricity and water. Each module will be transported separately, which facilitates the assembly process. The bathroom, control panel, battery and inverter banks, and laundry and kitchen are all part of this core. From this nucleus, the living spaces emerge.
- The Power of Transformation: The bedroom can be transformed into a large office space, and the living room merges with the exterior terraces to help create external living spaces.
- A Pergola as a Building-Integrated PV Solution: The solar panels create a pergola that covers the entire footprint.
- Living Green: A "living machine" uses aquatic plants to purify water from the bathroom and kitchen sinks, and a reflecting pond serves as a collector for rainwater, giving life to the terrace. The front garden permits the inhabitants to grow herbs and spices.

Heating and Cooling Systems

- The most efficient, market-available heating and cooling system from Daikin has been incorporated into the house.

Lighting (including Daylighting)

- Transparency: The front façade is made up of KalWall translucent panels, which minimize light pollution and also help reflect the light back into the house. Daylighting is maximized using skylights around the house.
- High-Tech Lighting: Many LED lights have been included to achieve greater efficiency.

PV

- "Plug and Play" Design Approach: This was used to reach an optimization level that will allow the required flexibility for this solar house. At the same time, this approach allowed the team

to meet the safety and quality levels that are required for both the competition and for everyday life.

- The Match Game: To incorporate the best of seemingly incompatible arrangements, both stand-alone and grid-tie PV designs were used. When working in tandem with the stand-alone inverters, the grid-tie system produces a 95% efficiency path between the panels and the house. During periods of low solar radiation, the stand-alone system provides an 87% efficiency path to the load, which is similar to that of conventional charge-controlled systems.
- The PV system is rated at 7.7 kW and comprises 35 SunPower modules.

Communications

- Green Marketing: The team decided to keep its “no paper waste approach” from the 2005 competition and will not print excessive marketing materials. The team will promote the power of electronic media as an eco-friendly alternative to communicate effectively.

Budget

- The Universidad de Puerto Rico has estimated that the cost of the entire project to date is approximately \$625,000. This amount includes project management and support, construction materials and equipment, the labor for transport, and assembly and operation of the house in Washington, D.C.
- Of those costs, 59% (\$369,000) is related to the construction of the house. The use of specialty materials and labor are the main factors that increase the cost of construction.

Future Plans

- The Cell House will return to the island of Puerto Rico for education and research purposes.

Kid's Corner

- Puerto Rico is one of the six universities that have participated in the previous two editions of the Solar Decathlon.
- Puerto Rico is known for its festive and friendly spirit during the competition. Be ready to sing and dance with us!

Team Information

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