

# Shunya

ready to shine

Team Shunya from IIT Bombay has been selected for Solar Decathlon Europe 2014 in France, where the students will build the solar house for the Indian middle class.



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With the number of urban middle class houses expected to increase from 22 million today to 91 million in 2030, there is a pressing need to design and build homes that are comfortable, cost-effective and sustainable. The energy requirement associated with this projected housing demand is one of the biggest challenges that India needs to face in order to maintain its growth rate.

This challenge has been up by Team Shunya, a collaboration of Rachana Sansad's Academy of Architecture and IIT Bombay- to build a sustainable, cost-effective, solar-powered house for the Indian middle class in urban areas.

Team Shunya is one of the 20 international teams selected for Solar Decathlon Europe (SDE) 2014 in France. The Solar Decathlon was started as a biennial event by the US Department of Energy in 2002 and has since expanded to Europe and China. Collegiate teams

from across the world are invited to design, construct and demonstrate full scale houses powered entirely by solar energy, complete with all amenities from a dish washer to a building automation system. The houses are judged on 10 extensive criteria, including architecture; house functioning; engineering and construction; communication and social awareness; energy efficiency; urban design, transportation and affordability; electrical energy balance; sustainability; comfort conditions; and innovation.

In the 18-month long designing process, the teams interact with various industry leaders and conduct a multitude of events to raise awareness about renewable energy and energy efficiency. The teams will construct the houses on their own premises, disassemble them and transport them to France where the final phase of the competition, a two week exhibition typically with more than 300,000 visitors, will take place. The site for the SDE 2014 is in the grounds of the

famous Palace of Versailles, featuring 41 universities from 16 nations.

IIT Bombay and Academy of Architecture joined hands in November 2012 to form interdisciplinary teams of architects and engineers working hand-in-hand to find the perfect synergy for our house. The team, named Shunya to reiterate the goal of a zero-energy house, became the first team from India to ever be selected in the Solar Decathlon, whose previous participants include MIT, Purdue, Cornell, CMU, TU Darmstadt among others. Our team consists of over 70 students and has received constant involvement and support from faculty and authorities of both institutes. The entire project is a largely student-driven initiative, with faculty members and institute authorities providing guidance in key matters.

To be able to justify the decision to create a house for the Indian middle class, a large number of decisions were made to ensure that the house appeals



to the sensibilities of the widest range of Indian home owners. This has also been balanced with the need for staying within the stringent rules and standards imposed by the competition. An active attempt has been made to provide as much functionality as possible at the lowest cost while staying within the competition limits.

The house has a 70 square meter floor area. In order to promote sustainable living at an affordable price, we have provided for six people to be accommodated in a relatively small area. This economy in space helps offset the fixed land and material costs per head. Through the use of multi-functional spaces and modular furniture, we have maximised the comfort and functionality the house provides to its residents.

The house is based around a load bearing steel frame, with insulated wall panels to significantly reduce the construction time as compared to a conventional concrete house. The materials have been chosen to have the least environmental impact, yet be affordable in the Indian context. The overall aesthetic of the house creates a balance between elements of traditional Indian culture along and modern ones that clearly depict the “green”-ness of the home.

Passive solar architecture is another central design tenets. With the aim of reducing the requirement for artificial thermal and lighting control as far as

possible, the cost can also be brought down. Scientific principles from Vastu Shastra have also been employed for arriving at the spatial arrangement of various rooms according to the time of the day.

The house has five KWp (kilowatt peak) solar PV panels, but is also connected to the grid. Using a FPC (flat plate collector) system with phase change material, the hot water requirements of the house will be met on the rooftop. Other innovations include the use of cold form steel frame, a novel solar powered dryer and a smart home energy management system. The home energy management system will also match the PV generation with grid peaks to minimise the peak load on the grid. It would also provide the owners the opportunity to control the appliances through a simple application run on their cell phones or tablet devices. These measures will work together to create a net-zero energy house, that supplies more to the grid than it draws.

The construction of the house is expected to begin in January 2014. The final competition is scheduled in June-July 2014. A site has been allocated to the team on the IIT campus and material has been ordered and is starting to arrive. The house will be shipped to the final competition in the month of April. A contingent of 30 students and faculty from the two institutes will spend a month in France during the final phase of the competition, showcasing the house

to the local population and various members of the industry and media.

In November 2013, a contingent of 10 members travelled to Paris to participate in a workshop with all other selected teams. The organisers gave crucial information, instructions and suggestions for the final phase of the competition. One of the highlights of the workshop was a presentation of a few selected teams, including Shunya, to Cecile Duflot, the Minister of Housing in the Ayrault Cabinet.

Apart from the construction of the house, the team is also engaging in awareness activities to promote sustainable construction in India. These include a website, social media platforms, lectures, workshops, and active participation in various conferences. The team is looking towards academia and industry to provide assistance to successfully accomplish its mission.

Team Shunya is supported by a host of industry and academic partners and sponsors, including Jet Airways, Saint Gobain, Ingersoll Rand, ONGC, ISHRAE, Electrotherm, L&T, etc. Terre Policy Center, Pune, a sustainable developmental platform that supports environmentally responsible activities, is also a knowledge partner of the team. It has lent support in the form of media outreach and giving a platform to the team to generate a discourse about its activities and their impact on sustainability in the Indian context. ■