

**Report of March 2014 Meeting
Royal Society
Southern Highlands Branch**

**Speaker: Professor Paul Cooper
Director, University of Wollongong's Sustainable
Building Research Centre (SBRC)**

Topic: Illawarra Flame House

Prior to joining University of Wollongong (UOW), Dr Paul Cooper was research fellow in the Research in Building Group at the University of Westminster. His research interests over the years have included the development of large solar heating schemes for municipal housing in London, modeling of energy and ventilation systems in buildings and renewable energy systems, including small scale wind and ocean wave energy. Paul was head of the school of Mechanical, Materials and Mechatronic Engineering at UOW until 2010, when he took up his appointment as Director of the SBRC.

Paul's exciting lecture described the development and extraordinary success of the Illawarra Flame House, a project under the auspices of SBRC to form "Team UOW" to compete in the Solar Decathlon (SD) competition in China in 2013. In SD competitions, university students design, build and operate sustainable, net-zero energy, attractive and affordable homes. The objective is to accelerate the development and adoption of advanced building technologies. Since 2002, there have been 8 competitions, 5 in the US, 2 in Europe and 1 in China. The teams have totaled 164 and involved more than 8000 team members. More than 1 million people have visited SD finals.

Dr Cooper demonstrated the novel process developed by Team UOW for retrofitting an existing building for the first time in SD history. The rationale for this surprising decision was that of the 8 million homes existing in Australia today, 4.8 million of these (60%) will still exist in 2050. Life cycle emissions analysis of a building shows that the emissions can be categorized as embodied emissions, operational emissions and destructive emissions, with operational emissions being about 9 times the embodied emissions. For a retrofitted net-zero energy home, the operational emissions can be brought close to zero.

Team UOW set themselves very high retrofit design criteria. There had to be significantly decreased energy consumption, and PV on-site generation with net-zero energy. There had to be decreased water consumption and improved thermal and acoustic comfort. There also had to be improved functionality, improved occupant well-being and provision of domestic food production.

The materials used in the Flame House included recycled Australian hardwoods removed from houses demolished locally, and E-zero board for joinery items. For wall linings, reconstituted recycled timber was chosen. Paints were zero and low VOC. As a replacement for PVC pipe, HDPE pipe was chosen. Based on a typical Australian fibro home, the design of the retrofitted home makes the most of Australia's natural environment by emphasizing water efficiency, solar energy harvesting, passive design and advanced ventilation systems.

Dr Cooper described the daunting task of dismantling the Illawarra Flame House and transporting it to China where it had to be reconstructed for the competition under extremely difficult conditions. Despite these challenges and discomforts, Team UOW enjoyed the fruits of their labor to the full. In addition to being awarded the distinction of Grand Champions, the team scored first or second in eight of the ten juried and measured contests. First place was awarded to them in Engineering, Architecture, Solar Application, Energy Balance and Hot Water. Second place was granted in the categories of Communications, Market Appeal and Appliances.

Dr Cooper was kept long after the lecture by the numerous questions posed by the 55 person audience.

Anne Wood