RESEARCH, DISCOVERY & INNOVATION
Institute for Energy Solutions

Institute for Energy Solutions Energy Talks
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Summary Report

On October 17, the Sky Bar hosted one professor, two students, and a number of interested community members for the latest presentations in the Energy Talks series, organized by the University of Arizona's Institute for Energy Solutions. At this Energy Talks event, Jonathan Bean, PhD, Assistant Professor of Architecture, Sustainable Built Environments, and Marketing, CAPLA, gave a presentation on the links between building practices and climate change, followed by a presentation by Tim Kilpatrick, a graduate student in the Master of Real Estate Development program, and Alec Kelly-Jones, a graduate student in the Master of Architecture program, who discussed the SunBlock concept for sustainable, self-sufficient neighborhoods.

Jonathan Bean's Energy Talks presentation, titled "Climate-Positive Buildings: What's Next?", outlined three ways in which buildings could be improved to reduce the severity of the climate crisis. According to Architecture 2030 data, buildings are currently responsible for approximately 43 percent of global greenhouse gas emissions, accelerating climate change more than any other category of human activity. By systematically addressing deficiencies in building practices, that 43 percent could be reduced to a much lower number, thereby making the Earth a better place to live.

The first of the three improvements outlined by Prof. Bean concerns refrigerants - fluids which move heat from one place to another. Air conditioners use refrigerants to move heat out of buildings. The refrigerants most commonly used in air conditioners today are also potent greenhouse gasses, and though most air conditioners do not leak refrigerant very quickly, there are a vast number of air conditioning units in the world. Together, those air conditioners release a significant amount of refrigerants into the atmosphere. By outfitting buildings with air conditioners that use more environmentally friendly refrigerants, this major cause of climate change would be largely eliminated.

The second improvement discussed by Prof. Bean was airtightness. The air inside most buildings, even modern buildings built according to code, is often exchanged many times per day with outside air, primarily due to a large number of small air leaks present throughout the exterior walls and roofs of buildings. If the air inside of a house is being heated or cooled, that temperature-controlled air will be lost as it leaks out and outside air leaks in. Energy must then be used to heat or cool the air that leaks in. When the air inside of a building is continually exchanged with outside air, then the temperature control systems inside that building are, as Prof. Bean points out, essentially trying to heat or cool the outdoors – a clear waste of energy. Therefore, in order to be truly energy efficient, buildings must not only be well-insulated, but also airtight. Through the application of specially developed sealants, airtightness can be improved in

both old and new buildings, allowing those buildings to be kept at a comfortable temperature while using far less energy than most current buildings.

The potential to share abundant energy – the third improvement outlined by Prof. Bean, was discussed more in depth by Tim Kilpatrick and Alec Kelly-Jones, as part of their presentation titled "Advancing Equity in Tucson with Net-Zero SunBlock Neighborhoods".

Buildings which are built or retrofitted to be energy efficient, and which produce their own electricity through rooftop solar panels can produce more energy as they consume, achieving a state of net-positive energy usage. Surplus energy can be economically converted to thermal energy, and then shared with neighboring houses, thereby increasing the overall energy efficiency of that neighborhood. This model of energy sharing is central to SunBlock, a concept for a net-zero energy neighborhood which could be implemented in Tucson or elsewhere. Any house, school, or other building which joined this system within a neighborhood would still have access to traditional utilities, but those utilities would be augmented by a distributed district loop system, which could distribute surplus thermal energy from any given building in the system. This system would increase equity by decreasing utility costs for everyone in the neighborhood. It could also increase the safety of those living in the neighborhood by keeping temperature control systems running in the event of a power outage during dangerously hot or cold weather. Ultimately, the SunBlock concept would be built on the idea that, as Prof. Bean put it, "Saving energy can't be the name of the game" – the idea that sustainability is not just about how much your energy bills can be lowered, but also about how much you can share with your neighbor.

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