RESEARCH, DISCOVERY & INNOVATION

Institute for Energy Solutions

Institute for Energy Solutions Energy Talks
January 23, 2020
Summary Report

On January 23, the UA Institute for Energy Solutions kicked off its 2020 spring semester Energy Talks at Sky Bar. At this event, Dr. Peiwen “Perry” Li, Department Head of Aerospace and Mechanical Engineering at the University of Arizona, discussed a tool for improving the economics and reliability of solar power.

Dr. Li's talk, titled "Fully relying on solar energy to meet every day, year-round energy demands.—a study of how to achieve it", focused on the recent development of an algorithm designed to make solar power more economical. This algorithm, developed by Dr. Li and his colleagues, is designed to determine how many solar panels are needed, and how much energy storage capacity is required to maintain a steady, economical, year-round supply of solar-generated power.

In theory, it is simple to design a system capable of providing a constant year-round supply of solar power. All that would be required is a large number of solar panels, and a really big battery. In practice, however, the economics of such a system must also be taken into account. An oversized system which generates more power in a year than can be used in a year is less economical than a system which generates just the right amount of power, because the oversized system costs more without being any more useful. The difficulty with using an optimally sized system lies in accounting for nighttime and cloudy days. In order to provide a steady supply of power in winter months, when there are long nights and strings of overcast days, a careful balance between energy generation and energy storage must be established. Dr. Li's algorithm is able to find this balance.

The algorithm takes into account the past ten years of cloud cover data to determine how cloudy each day of the year is likely to be. The worst-case cloud cover on each day of the year is also determined. These pieces of information are then used to predict how much solar energy will be available each day over the course of a year. That information is in turn used to determine the minimum solar panel area and the minimum energy storage capacity needed to enable a constant supply of power even in the cloudiest months. The algorithm is also able to determine which day of the year is most optimal as a starting point for the system.

Renewable energy holds great promise, but must be made more economical if it is to be adopted on a global scale. Research being done here at the University of Arizona is helping to make that a reality.

For more information about energy-related research at the University of Arizona, visit energy.arizona.edu.