

Scientists propose new area of study in energy generation

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The growth of humanity is limited by our tools. Each era of human development, from caves to the Industrial Revolution to sending Curiosity to Mars, is marked by technological evolution. A collaborative team of scientists believe the next era of advancement will be defined by energy production and consumption and their related social costs. They have published their proposed methodology of establishing and investigating "social energy" in *IEEE/CAA Journal of Automatica Sinica*, a joint publication of the IEEE and the Chinese Association of Automation.

"Current research on energy systems is either focusing on the technical aspect, or the social scientific aspect, which may be sufficient for traditional energy system development. However, with society's rapidly growing demand on [energy supply](#) and the popularity of distributed [energy generation](#), we believe the best approach is to consider them together, so as to substantially improve energy's utilization efficiency," said Jun Zhang, an assistant professor of electrical and computing engineering at the University of Denver in Colorado. Zhang and his team also have an eye toward creating new management and control measures for energy systems.

To tackle this combined methodology, the researchers employed parallel intelligence and control, in which data from each variable informs and improves the other. The scientists conducted a [case study](#) on the University of Denver campus grid to demonstrate the concept of social energy, in which they included power system operation, smart building

modeling, a real-time pricing mechanism, and human behavior modeling. They selected one typical summer week and one typical winter week to study the social cost of energy in six target buildings. They studied work efficiency using indoor temperature as a variable, as it can affect such things as temperature comfort and perceived air quality—both of which affect work performance. They found that the change of the hourly energy consumption cost was influenced by both the number of people in the building and the amount of energy consumed, but that an increase of occupancy didn't necessarily increase energy use.

"The case study only provides an application scenario of a relatively small smart community, and our vision for social energy is that it can be applicable in different social and technical scales and it provides a multi-layered solution to benefit the socio-technical system," wrote Zhang.

Zhang and the scientists noted that while, "tremendous efforts and decades of research and development work," lies ahead, they believe even early stages of the socio-technical ecological system will help determine more efficient energy uses to the benefit and satisfaction of society.

"The next step is to deeply incorporate social computing into energy system analysis to build a standard form of social [energy](#)," Zhang said. "By doing so, our next goal ... is to find out how to seamlessly integrate social and technical [energy systems](#) into one unified scientific framework."

More information: Jun Jason Zhang et al, Social energy: mining energy from the society, *IEEE/CAA Journal of Automatica Sinica* (2017). [DOI: 10.1109/JAS.2017.7510547](https://doi.org/10.1109/JAS.2017.7510547)

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