

A New Light: S. R. Crown Hall Retrofitted with Innovative Solar Power System

By **Andrew Connor**

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Solar panels have been placed atop S. R. Crown Hall on Illinois Tech's Mies Campus.

In 1956 when Ludwig Mies van der Rohe completed Illinois Institute of Technology's S. R. Crown Hall, widely considered the highlight of the iconic architect's career, photovoltaic solar panels were at their best a burgeoning technology, seeing limited use in the air and space industry but little else. The first building to integrate solar technology into its design wouldn't materialize for another 20 years.

In the decades that followed Crown Hall's christening, the building has ascended in status from a modern "one-room schoolhouse" to National Historic Landmark, a designation it received in 2001. Given that, renovations to the building, the last of which it received in 2005, are made with the utmost care to keep the building as close to original as possible.

Yet in a bold move, Illinois Tech has installed a system of photovoltaic solar panels on the roof of Crown Hall, home to the College of Architecture, as part of the university's long-term microgrid initiative. The entire Mies Campus comprises the nation's first functional microgrid, a self-sufficient and environmentally sustainable energy system.

"Crown Hall is a focal point on campus, so we wanted to demonstrate that by putting solar on it, we can bring the old and new together," says Mohammad Shahidehpour, Distinguished Bodine Chair Professor of Electrical and Computer Engineering and director of the Robert W. Galvin Center for Electricity Innovation, which oversees Illinois Tech's microgrid.

"Crown Hall was designed at a time when energy efficiency was not a critical subject for discussion, but now it's a common consideration in architecture design," he says. "The question is, 'Can an old building like Crown be refurbished using technologies like solar and battery?'"

More than just a part of Illinois Tech's microgrid, Crown Hall will be its own nanogrid, a self-sufficient island-within-an-island that can function independently of the university's microgrid in the event of a blackout. This is thanks to a 500 kilowatt-hour (kWh) lithium-ion battery from Tesla working in conjunction with the solar panels. Together, they're able to supply the building with enough energy to operate off the grid for up to eight hours.

"We wanted to work with Tesla because they have been very reliable," says Shahidehpour. "They were also able to supply lithium-ion, which is very versatile. You can charge and discharge very quickly. That's important on a daily basis."

On a daily basis the system reduces the building's reliance on electricity generated from emission-producing energy sources. Energy stored within the battery can be used during the building's peak hours, when the cost of electricity is at its highest and solar conditions are ideal. Not only is it a way for the building to better utilize green energy sources, it allows the university to save money by not using grid power when it's most costly—during the day. Additionally, ComEd credits consumers who reduce their energy usage during peak hours.

The battery pack is also capable of providing what Shahidehpour refers to as "peak shavings." That is, when the energy load of the building exceeds 100 kWh, the battery feeds power to the building to cover the usage beyond that point, up to 350 kWh.

Shahidehpour explains that the Crown Hall nanogrid is meant to go beyond the objective of bringing the building's energy system into the twenty-first century. He says the retrofitting is a case study in sustainable renovation of a landmark building and a message to students to consider the impact that their future designs may have on the environment.

“Buildings have an obligation to future generations to make adjustments to the use of energy and the production of CO₂,” says Mark Sexton (ARCH '80), founding principal partner at Krueck + Sexton architects in Chicago and a member of Illinois Tech's College of Architecture's Board of Advisors. Sexton headed the renovation of Crown Hall in 2005, and knows firsthand the delicate touch required in renovating the landmark.

“Adhering to modern standards and sensibilities is a reality that historic buildings across the globe are challenged with. It's not a matter of how well you do it, it's a matter of how sensitively it's done,” he continues.

Because the building is designated as a landmark, the National Parks Service had to review and approve the plans before the solar panels could be added. As a condition to the project, the panels cannot be seen from the street, so they are set 15 feet from the edge of the roof. Though this means fewer panels could be used, to the casual observer Crown Hall looks no different than it did in the 1950s.

Sexton also believes that, while some preservationists might question the changes, the solar panels are in a way aligned with Modernist ideals.

“I think Mies, being the technologist that he was, he would have totally endorsed it. He was always using the latest technology, energy just wasn't an issue then,” says Sexton. “It is a great opportunity to use it as a case study of how Modernism is adaptable for the current conditions of our world. Very few 63-year-old buildings would be as adaptable as Crown Hall would be.”

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Office of Marketing & Communications
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