# INDUSTRY MARKET TRENDS (/IMT)



## New Research to Optimize Solar Energy's Effectiveness in Desert Environments

By Michael Lewis
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Credit: EpSCORpo.nevada.edu (http://EpSCORpo.nevada.edu)

The state of Nevada would seem to have a lot going for it when it comes to harnessing solar power. For example, there's lots of available parcels of land in which to construct solar systems, as well as several universities with strong research backgrounds in energy.

Oh, and a whole lot of sun. More sun than most states.

But the environment in Nevada also poses a great many challenges in the quest to harness more solar energy. Thankfully, with the help of a new $20 million grant from the National Science Foundation (NSF), some of Nevada's problems, and those of other states and countries with a similar climate, may be solved in the next few years.

Pulling together four different organizations and involving more acronyms than an SAT exam, the new grant from the NSF was announced in May and could lead to exciting breakthroughs.

Through a five-year, Nevada System of Higher Education collaboration, The Solar Energy-Water-Environment Nexus project will give the University of Nevada, Reno (UNR) $6.8 million, the University of Nevada, Las Vegas (UNLV) $7.4 million, and the Desert Research Institute (DRI) is receiving $3.7 million.

The project encompasses three main components, which are the solar energy-water-environment nexus, cyber infrastructure, and human infrastructure/workforce development. Sergiu Descalu of UNR's College of Engineering will lead the cyber-infrastructure component. Jacque Ewing-Taylor of UNR's the College of Education will lead the human infrastructure/workforce development component.

The solar energy-water-environment nexus component is led by Dr. Robert Boehm and Jacimaria Batista of UNLV, Dr. Markus Berli of DRI, and Dale Devitt of UNLV. The project director is Dr. Gayle Dana of the Nevada NSF's Experimental Program to Stimulate Competitive Research (EPSCoR) Office and DRI.

As many as 150 people will be employed by the project, and a new research center, called a NEW-STAR facility (pictured above) will be built near Boulder City, Nev.

At the heart of the massive project, Dana said, are five objectives:

1. Develop new technology to minimize water use when servicing solar panels and the plants that run them.
2. Develop sustainable wastewater approaches to support solar energy development.
3. Improve the reliability of renewable and solar energy supply, for use outside of Nevada and within the state.
4. Determine ecosystem responses in the desert; i.e. what happens to animals and natural habitat and wildlife when we build up these solar plants in the desert areas?
5. Identify and develope the cyber-infrastructure capabilities that can accelerate the above-mentioned research.

A new $20 million grant given to Nevada research institutions may help solve the problems facing solar power in the desert. Credit: UNLV/Bob Boehm

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Dana said that even though each part of the research project will be worked on independently, collaboration will be key.

"They each have their goals and objectives for their research and the building of the program," Dana said, "but we have an external evaluator, and she is really good at helping these kinds of programs, helping synergy and cross-collaboration."

One of the biggest concerns with operating renewable energy and solar panels in the desert is the lack of water, which is needed for many parts of the energy-generation process. Another challenge is keeping the solar panels clean and free of dust so that they can harness the sun's energy.



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The director of the water-based part of the NSF project, Dr. Berli, said that finding the balance of conserving water, and having enough to operate solar, is a major challenge.

"You need water to cool the solar plants, and here in the arid Southwest; if you create any solar energy that isn't photovoltaic, you need a lot of water to cool them down," Berli said. "There's the perception that if you need so much water to clean, then you shouldn't put the solar panel plant out there [in the desert] in the first place.

"But water is just part of the problem," Berli continued. "If you're building these solar facilities in the pristine desert environment, you could create a dust problem for the solar panels, over a wide area."

Berli also said his DRI team will be investigating the effect the solar power plants will have on the desert surface as well.

"You're going to disturb the surface and the desert crust that naturally holds down the soil," he said. "We don't know yet exactly what will be needed to stabilize the surface once solar plants are installed; what will the effect on the environment be?"

Berli added that he wanted to help create standards for what has to be known about the environmental impact of solar, "so these companies have clear guidelines on what they can research, and what they have to look at, without causing too much damage."

On the solar side of the prospect, the team led by Dr. Boehm at UNLV will be pursuing two major objectives.

First, the research will attempt to learn how to raise the temperatures at which you can harvest the sun in solar plants. The purpose would be to allow solar companies to use a higher-efficiency engine that would give you an efficiency boost, in effect getting the same power output for less energy. This would have the effect of increasing the field size and being more efficient.

Boehm and UNLV are also working to develop a non-water cleanser that could help remove dust and dirt from solar panels. With water shortages not likely to cease, the need for other chemical components, or a water-chemical mix, is immense.

There's also an economic component to the research, Boehm said.

"From the business element, we want to help companies who are in this business have a little easier time doing what they do, and making it more accessible," Boehm said.

In the cyber-infrastructure research led by Descalu, the project has four goals:

1. Develop advanced data processing and analysis, including data mining from the other research sites.
2. Provide new software engineering tools that can be used at the solar facilities to aid the software and data inter-connectivity processes
3. Build and utilize new communication networks.
4. Use data-based architecture and data management research that includes preservation of data quality and systems that will operate on cloud-level resources.

"We think our experience and the design we provide for the Nevada research data center is expandable," Descalu said. "We're expanding the cyber-infrastructure into solar energy, but we can also hopefully use some of the same processes to do wind and thermal energy."

As with all grants of this size, the NSF will be monitoring the five-year project closely, with progress benchmarks required, and annual full-scale progress reports and meetings held to ensure the collaborative efforts are not getting off-track.

"This project was unique because it put together a team of engineers, it's very multi-disciplinary, and it's great for the state of Nevada," said Jeanne Small, the program officer for the NSF's Nevada EPSCoR program. "We are funding research, and we expect the risks to be managed, and we



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expect at the end of five years to have conclusions based on the research that will inform energy, utilities, and the state of Nevada on what works and what doesn't."



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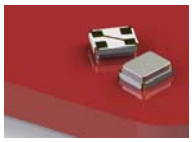

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