SOLAR INFRA, INC.

Extending the reach of clean, renewable solar energy with SolidWorks

Using SolidWorks design and simulation tools, Solar Infra developed a more rugged solar array for use in areas that used to be environmentally prohibitive.

The sun rises daily, bathing the earth in clean, dependable energy. Yet, harnessing this renewable resource presents challenges, especially when some of the sunniest regions have environmental conditions that preclude traditional solar modules. Standard solar arrays can usually only be installed 25 miles inland from the coast because of wind, humidity, and salinity exposure. Deep mountain snows and searing desert temperatures also limit solar module placement.

Solar Infra, Inc., a leading manufacturer of solar modules, sought to overcome these limitations and extend the reach of solar power, which is projected to become a $70 billion market by 2013. Working with Sandia National Laboratories and a DC-to-AC inverter manufacturer, the California company embarked on an effort to revolutionize the solar industry through the development of the Solar Infra AC-Enabled (ACE) solar module, a rugged module system with internal DC-to-AC inversion.

"Fulfilling the promise of solar energy requires modules that last longer and can be used anywhere," stresses Larry Holmberg, CEO and cofounder of Solar Infra. "We tasked our engineers to use whatever tools were necessary to overcome lifecycle and durability challenges quickly and efficiently."

The first step was choosing a design environment, according to Mechanical Engineer Elise Moss. "This project required iterations through which my chief scientist and I would create design concepts and work with specialists at Sandia to analyze performance within extreme environments," Moss recalls. "Solar Infra and Sandia had experience using the integrated SolidWorks® design simulation platform. Because of the collaborative nature of the work, integration between CAD and FEA (finite element analysis) was critically important."

"With SolidWorks, CAD and analysis are fully integrated, which means that FEA runs inside the SolidWorks window," notes Jason Strauch, Sandia engineering analyst. "That integration was vital for working with Solar Infra to incorporate the findings of our structural and thermal analyses into the design. It was much faster and easier to make the necessary adjustments to the model from within the CAD system."

Challenge:

Develop rugged solar modules for electricity generation that can withstand extreme environments, last longer due to improved DC-to-AC inversion technology, and extend solar power into previously prohibitive areas.

Solution:

Utilize SolidWorks 3D design and simulation tools to develop an innovative solar module frame that can handle higher temperatures and structural loads without increasing weight.

Results:

- Doubled strength of solar module frames
- Reduced manufacturing costs by 25 percent
- Saved $100,000 in prototype development costs
- Extended reach of clean, renewable solar power

SOLIDWORKS

Solar Infra chose SolidWorks 3D CAD and SolidWorks Simulation software because the full integration of design and analysis tools would save time, reduce costs, and carry the greatest potential for making a breakthrough in solar module design.

Overcoming design challenges

With SolidWorks solutions, Solar Infra was able to overcome two historic design challenges in solar module design. The first problem was sustaining environmental loads that range from hurricane-force winds to several feet of snow to the highest possible temperatures on earth, without increasing weight. The second challenge involved extending the lifecycle for DC-to-AC inverters from 10 to 25 years.

Solar Infra solved the DC-to-AC inverter dilemma by working with partners to incorporate a microinverter as part of the actual module, rather than as a separate component. As the company was developing an entirely new frame profile that doubled a solar module's strength, but increased its weight by only 4 percent, it validated its design ideas in models with Sandia National Laboratories.

"We were able to save time and money during development because we could do it all in software, using simulation to test our concepts instead of building prototypes," Moss points out. "Using this approach, I would estimate that we easily saved $100,000 on the development of our new ACE product."

Wind, snow, and temperature

Using SolidWorks Simulation software, Sandia National Laboratories replicated the structural and thermal loads associated with extreme environments to ensure that the new design could withstand rugged conditions.

"We analyzed 150 mph winds to simulate a hurricane; the weight of 35 feet of dry snow; and the worst-case temperature scenario on earth: 130°F at high altitude," Strauch recounts. "The ability to analyze stresses and thermal behavior allowed us to ensure that the module would continue to perform under even the most extreme conditions."

"I have used every analysis package during the course of my work," Strauch adds. "When I want the fastest path to an answer, SolidWorks Simulation is my top choice."

Manufacturing savings and improved communications

In addition to helping reduce development costs, SolidWorks solutions help Solar Infra realize manufacturing savings and other business efficiencies. "Overall, SolidWorks saves about 25 percent of operating expenses when it is implemented properly," Moss notes.

Using photorealistic renderings created in SolidWorks software allowed Solar Infra to begin marketing prior to production. "We saved time and money getting our collateral together," says Director of Marketing Christy Hurlburt. "We were able to use renderings to create data sheets preprototype, which allowed us to seed the market and get the word out on this exciting extension of solar potential."

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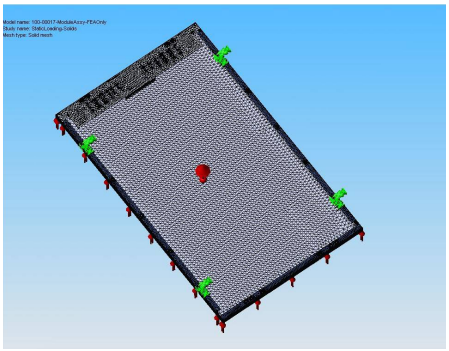
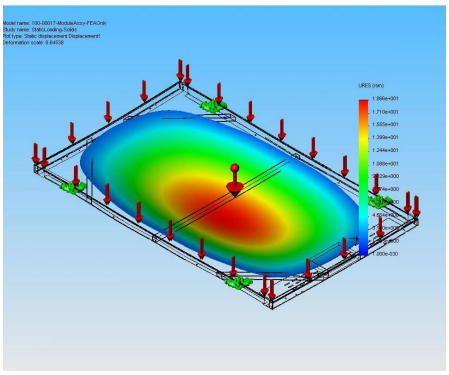
Engineering Analyst
Sandia National Laboratories





Working with Sandia National Laboratories, Solar Infra leveraged SolidWorks Simulation technology to accelerate development of a solar module that can be used in extreme environments.

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