

# Solar power system helps protect forest resources in Yunnan Province, China

DuPont™ Tedlar® polyvinyl fluoride (PVF) film-based backsheets provide stable and sustainable electricity for Niuda forest farm



**20-year-old solar panels power communication radar network and employee residences**



**Significant reduction in communication costs thanks to solar power system**



**Tedlar® PVF film offers optimal protection, even in extreme environments**



**Selected as “China’s Most Beautiful Old Solar Panel”**

## SUMMARY

Protecting its forests and biodiversity is an important goal for China<sup>1</sup>, which aims to increase national forest cover (20% in 2008) to 23% by 2020 and 26% by 2050<sup>2</sup>. The 287,000-hectare Niuda forest farm, located in Shiping County within China’s Yunnan Province, is protected against forest fires and other threats by a monitoring network powered by an off-grid solar power system, built using advanced photovoltaic materials from DuPont.

<sup>1</sup> Effectiveness of China’s National Forest Protection Program and nature reserves, US National Library of Medicine National Institutes of Health, [www.ncbi.nlm.nih.gov/pubmed/26171762](http://www.ncbi.nlm.nih.gov/pubmed/26171762)

<sup>2</sup> Protecting China’s Biodiversity, The Nature Conservancy, page 8 of Executive Summary <http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&sqi=2&ved=0CCMQFjABahUKewiVt6e5ho7JAhUJIR4KHxvCnA&url=http%3A%2F%2Fwww.nature.org%2Fmedia%2Fchina%2Fchina-book-wholebook-lowres.pdf&usg=AFQjCNG1oDDyHveZSlgpaw7AkETXI90dw&sig2=mpnzzGuSIPQ79hs9fGrYgQ&bvm=bv.107467506,d.dmo>

“China’s public-interest research program, ‘Searching for China’s Most Beautiful Old Solar Panels,’ highlighted the importance of using highly durable and reliable materials, such as DuPont™ Tedlar® polyvinyl fluoride film to ensure the long-term supply of solar energy.”

### Challenge

The challenge was to provide safe, sustainable and cost-effective power for the radar monitoring center and multiple sub-stations across the 287,000-hectare forest farm.



20-year-old panels powering the radar monitoring station at Niuda forest farm, Shiping County, Yunnan Province, China

The high altitude (1,550+ meters above sea level) and terrain made it difficult to install electricity access or a cable telephone network. Mobile telephones were also not a viable option, because of unstable signals and the high cost of use in this remote area.

### Solution

In the late 1990s, two pioneering solar panel manufacturers in China, Sun Earth Solar Power Co., Ltd. (formerly Ningbo Solar Electric Power Co., Ltd.) and Yunnan Tianda Photovoltaic Co., Ltd. (Yunnan Semiconductor Device Factory), developed an off-grid solar power system for the Niuda forest farm. The system, consisting of photovoltaic components, batteries, a radar intercom system and a lighting system, remains in operation today, providing communication and power for the 287,000-hectare forest. Solar panels made using DuPont™ Tedlar® polyvinyl fluoride (PVF) film are key to the 20-year stable operation of the system.

### Results

For Sun Wanfu, the Party branch secretary of the farm, the solar power system significantly enhanced the ability of the 125 employees at Niuda to safeguard the forest. “Before, it was a big challenge for farm management to prevent fires because of poor transportation service and power and communication facilities shortages,” he said.

The longevity and performance achievement of the Niuda solar power system was recognized in June 2015, when the China Photovoltaic Society (CPVS), the Institute of Electrical Engineering (IEE), and Solar Photovoltaic Power Generation System and Wind Power System Quality Inspection Center jointly organized a public scientific research activity named “Searching for China’s Most Beautiful Old Photovoltaic Modules.” As part of this initiative, the solar panels used for more than two decades in the fire tower at the Niuda forest farm underwent on-site testing, using Fourier transform infrared (FTIR) spectroscopy to help verify the type of backsheet shielding the panels.



The technical team tested the old modules using an FTIR spectrometer and found they were all based on DuPont™ Tedlar® PVF films.



The frame and rack are rusty, but the DuPont™ Tedlar® PVF film-based backsheets are in excellent condition after 20 years of outdoor exposure. The PVF film on the back of the modules shows minimal yellowing, illustrating the excellent weatherability of the film



Mono-crystalline modules in use for more than 20 years remain in excellent condition.

The solar panels, protected by DuPont™ Tedlar® PVF film-based backsheets, showed no apparent visual damage after 20 years of exposure in the harsh environment of the Niuda forest. Further tests with portable devices found that, compared with brand-new DuPont™ Tedlar® PVF film, the changes of the PVF film on the back of the modules were minimal, proving the excellent weatherability of the Tedlar® film.

The power output of the 20-year-old modules was reduced by 14.5% in total, with an average annual degradation rate of about 0.7%, well within industry standards for expected degradation rates.

### PROJECT LOCATION

Niuda forest farm, Shiping County, Yunnan Province, China



### PROJECT DETAILS

<b>Project</b>	Safe, sustainable solar power system at Niuda forest farm
<b>Milestone reached</b>	20-year-old solar panels still fully operational
<b>Benefits</b>	Long-lasting, high-performing solar energy system output
<b>Material specified</b>	DuPont™ Tedlar® PVF film-based backsheets

To learn more about DuPont Photovoltaic Solutions, visit [photovoltaics.dupont.com](http://photovoltaics.dupont.com)