

When a Lighted Classroom Seems Like a Dream:

A Case Study of How Solar Energy Can Transform Lives

*"...you have no idea how much of an impact you and your group
have made on the community here. This has changed their lives."*

Ian Strachan

*Senior Electrical Inspector
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Ok Tedi Solar Power Project

Western Province • Papua New Guinea

The Goal:

To provide standalone solar power systems to two schools in a remote area of Papua New Guinea

The Providers:

- Ok Tedi Mining Company Limited – funding for solar systems
- Ok Tedi Development Foundation Limited – system implementation
- Provincial Department of Education – construction coordination
- Solari Energy – design, engineering consulting, supply of solar system equipment, desktop-based technical assistance during planning and construction

System Configuration

- 4.95 kW Ground Mounted PV Array (22 Hyundai 225 W modules)
- 4 kW SMA Sunny Boy PV Inverter, AC coupled with
- 2.2 kW SMA Sunny Island Off-Grid Inverter/Charger, with
- 12 no 900 Ah BAE VRLA Gel batteries, to provide
- 3.5 kWh per day to lights, a computer, printer, projector and a small fridge
- Three days of battery autonomy in case of poor weather



Solar is soaring. A 2013 report from the International Energy Agency states that total global solar photovoltaic capacity is fast approaching the 100 gigawatt (100,000 megawatt) milestone. Millions of homes and businesses now run on solar energy.

But perhaps the most rewarding aspect of being in the business of solar is the opportunity to power remote communities – areas that could never be served by standard electrical networks.

Consider the Nakaku Primary School in Middle Fly, Western Region, Papua New Guinea, where nearly 300 students can, for the first time, study in lighted classrooms and use computer equipment. This education-altering advancement was made possible by Ok Tedi Mining Company as part of their effort to bring sustainable social, educational and economic improvements to the regions in which they operate. The work to plan, design, build, deliver and install two standalone solar systems for these schools was a collaborative effort among Ok Tedi Mining Company, the Ok Tedi Development Foundation, community leaders, the school district and Queensland-based Solari Energy, a renewable energy company equipped to serve small through large-scale project needs.

The grand opening for the solar-powered Nakaku school took place on 26 July 2013. The school's head teacher, Mrs. Babola, summed up the impact: "We have longed for such a project, which will not only help our students learn, but help our teachers prepare better materials. I believe that from now onwards, we will do great things in teaching to improve learning for our students."

A second solar power plant is being commissioned at Kuem Primary School in South Fly and will be installed later this year.

Here's a look at the "before" and "after" of the Nakaku school project, the partners involved, the challenges faced and resolved – and the rewarding end result for students, teachers and the community as a whole.

Dark Before the Light

The Middle and South Fly regions where the two schools are located are part of the country's Western Province, which encompasses 99,300 km² and is the largest region in Papua New Guinea. There are several major rivers that run through the province including the Fly River and its tributaries.

Due to their remote location, these schools have had very limited access to power. Both had small 1 to 2 kW petrol generators, but since petrol is scarce and expensive, power generation was limited to two or three hours per week.

This extreme lack of power affected the ability of teachers to teach and students to learn. For example, although Nakaku School possessed a portable laptop and a printer/scanner, these devices had not been used in months. Kuem School also had a laptop but due to the unstable nature of the generator, the computer's power supply had been damaged.



Making it Happen – The Partners

As part of its Community Mine Continuation Agreement, Ok Tedi Mining Limited in PNG (named after one of the Fly River tributaries), works to supply tangible and self-sustaining improvements to villages that are a part of the agreement. Recognising the plight of these schools, the company decided to donate a solar standalone system to each school. The Ok Tedi Development Foundation was called upon to work with school and community officials to implement the systems. The missing piece was the selection of a solar vendor who could supply high-quality products and provide the engineering expertise and technical support to make the project a success.

Australian Solar Company Joins PNG Partnership

Ian Strachan, Senior Electrical Inspector for the Ok Tedi Mining Limited working with the OK Tedi Development Foundation, was charged with locating the right solar vendor. Ian had past experience with SMA products and had been pleased with the intuitive nature of the operating platform. He decided to contact SMA Australia, asking them to recommend a local supplier. Their choice was Solari Energy, a subsidiary of Solar Inception Pty Ltd.

Challenges Met and Conquered

Design Considerations and System Construction

A roof-mounted system was considered, but since both buildings had some years on them, the roof sheets could have been easily damaged. A ground-mount system was clearly the right choice – even though this meant significant logistical challenges due to the requirement for large steel members and concrete.

The system is designed to be primarily powered by the solar system under a variety of environmental conditions. In the event of poor weather or reduced solar energy input, the system is capable of storing enough energy for up to three days of operation. The design also includes a charging input for a portable generator to be connected if required.

Equipment Delivery by Banana Boat

Logistics, i.e., getting the solar equipment to the school sites, was the biggest challenge. Because of the remote location of the schools, all components had to be delivered by banana boat along the Fly River. Both systems had been packed originally into one shipping container and transported to Aiambak (Ironbark), a laydown area central to both sites. However, extremely low water levels in the Fly River restricted shipping movements. Only essential cargo, such as food, fuel and spare parts were making it up stream.

The equipment was removed from the original shipping container, and then tools and material were carefully repacked, loaded onto banana

boats and shipped three and a half hours downstream to the Nakaku site and an equal amount of time upstream to the Kuem site.

Cement and sand/aggregate also had to be carted in as these items are not available locally. The task was daunting based on weight involved: 20 x 40 kg bags of cement per solar system plus 72 x 40 kg bags of sand/aggregate.

Carrying the solar system batteries in the banana boat also posed a problem. Senior Electrical Inspector Ian Strachan explained, "We made a purpose-built cradle for the batteries to sit in for the trip up river. The same care was taken with the solar panels as they were unpacked. The empty box was then loaded onto the banana boat and the panels carefully repacked for the three and one-half hour trips up and downstream."

Installation at Nakaku Primary School

System installation proceeded efficiently, as Solari Energy had provided electrical schematics of the system along with all manufacturer documentation. Jeremy Tranter, Solari Energy's Electrical Project Engineer and Engineering Manager said, "We provided Ian with technical and logistical support throughout the process, from packing the shipping containers at our warehouse to comply with Marine Dangerous Goods Codes, to assisting with the final commissioning and programming of the inverters and system startup."

Most of the communication was conducted via email as phone service was limited, but a phone call was arranged when it came time to configure the inverters.

Reaping the Rewards of Solar Power

Once solar energy had been installed (at a total cost K83,500 - ~AU\$38,000), the school had consistent power for the first time. Classrooms and the administrative area were lighted, the laptop charged, and printer software loaded to the printer/scanner. (Sadly, the school had also run out of paper, but the supply was quickly replenished.) Teachers regained the confidence to use these devices once again, and the students are now benefiting.

More than 750 people attended the July 2013 official opening at the Nakaku School, most travelling some hours by dugout canoe. Over 400 school children and their families stayed on to watch outdoor movies that night – a memorable first-time experience for many and one that can now be repeated.

OTML Managing Director and Chief Executive Officer Nigel Parker, who attended the opening, remarked on his company's commitment to more development, "Power in this day and age is a necessity for education development. My vision as Chairman of Ok Tedi Development Foundation is to work along with the people of the CMCA regions and other donor partners to bring development to the people of Western Province."

The Future

Bringing Solar to More Model Schools

The Nakaku Primary School was first selected as a model school in 2012. The Model School Concept aims to develop a particular community school to a standard that other communities and schools can work to emulate. The Ok Tedi Development Foundation, working with the Western Province Education Steering Committee, will replicate the solar energy installations to other schools if officials are willing to look after school infrastructure and support their teachers and students.

Based on the success of the first standalone solar system installation at Nakaku Primary School, Foundation senior management are also investigating the cost of a 100 kW system to support a small community hospital, medical centre and clinic and staff housing. Solari Energy stands ready to assist. "We consider these projects both an essential and immensely rewarding part of our business," said Doug Fletcher, owner/CEO of Solari Energy. "The ability of solar energy to bring light and power to communities in the most remote areas of our world is perhaps its most exciting application."

