



Lavena Primary School Solar Project

Supplying power to achieve a range of outcomes including capacity for computer education and establish on-going cash flow for the purchase of computers.



October 2013



Lavena Primary School

Location: Island of Taveuni.

Google Maps search: Lavena, Northern Division, Fiji

The school draws students from the local village. Four teachers provide classes for 106 students from Year 1 to 8. Four teachers quarters are located in the school precinct. There is also one kindergarten teacher who lives in the village (the kindergarten was not powered by the solar system as there was little need to do so).

The school generator is used for limited periods during the day to supply the school office, photocopier and teachers' computers – via extension leads.

The teacher's quarters have individual generators to supply their power at night.

Click for project photos:

<http://www.flickr.com/photos/itstimefoundation/sets/72157636645327203/>

Click for project videos (titles "Lavena"):

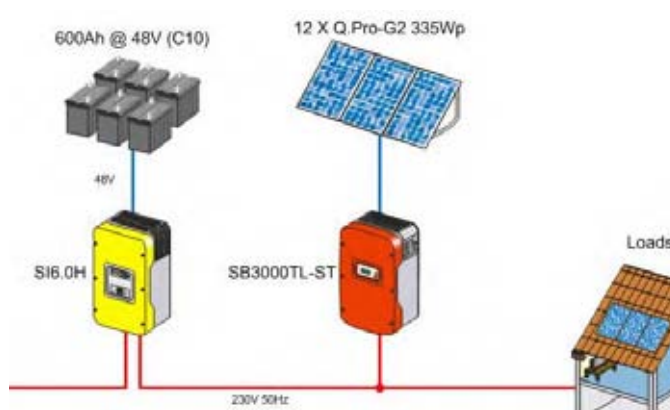
<http://www.youtube.com/user/itstimefoundation>





Project Details

It is not uncommon in the islands, including schools, that poor quality and/or underpowered solar systems are installed, resulting in underperforming and short lasting installations. The 2820W solar system supplying Lavena Primary School includes premium components to withstand island conditions and deliver the objectives of the project for decades¹. The design of these systems (AC Coupled²) means, whilst initially more expensive, it is a better performing system and allows for lower cost expansion (solar, wind, mini hydro) in the future if required.



The system exceeds current daytime demand, therefore giving the school capacity to increase its power consumption when the use of computers at the school increases, as is expected.

The system was installed between the 8th and 11th October 2013 and is performing as expected. Key system components include:

12 x Hanwah Q.Cells Q.PRO 235 G2 panels³

1 x SMA SB 3000TL grid inverter⁴

1 x SMA SI6.0H remote inverter⁵

4 x SB1800 PowerStack 12V 1350Ah battery banks⁶

1 x Clenergy PV-ezRack Roof mounting system⁷

LED light replacement



¹ With the current system settings the target battery life is approximately 10 years before needing replacement. It is expected the other components will last decades.

² <http://www.iitime.org/new/accoupling.pdf>

³ http://www.q-cells.com/uploads/tx_abdownloads/files/Q-Cells_QBASE-G2_Data_sheet_2011-06_Rev02.pdf

⁴ http://www.sma-australia.com.au/en_AU/products/solar-inverters/sunny-boy/sunny-boy-3000tl-4000tl-5000tl-with-reactive-power-control.html

⁵ http://www.sma-australia.com.au/en_AU/products/off-grid-inverters/sunny-island-60h-80h.html

⁶ <http://www.electusdistribution.com.au/productView.asp?ID=11870&CATID=Search all Categories&keywords=SB1800&SPECIAL=&form=KEYWORD&SUBCATID=>

⁷ <http://www.clenergy.com.au/product-detail.php?id=23>



LED lighting

The school was fully wired and teachers' quarters existing dangerous wiring was replaced.

LED lighting was used throughout to provide a lighting load 75% less than tube lighting typically used in the schools. Along with behaviour change we expect power demand from lighting to drop by as much as 90% of what would otherwise be the case. Therefore significantly enhancing the effectiveness of the solar system and the amount of fuel saved.

Energy efficiency education

Energy usage behaviours by students, staff and their families will significantly influence the effectiveness of the solar system. At the time of installation everyone in the school community was educated about the efficient use of electricity. Posters (see Appendix 2) are installed in all teachers' quarters, the office and classrooms.

The school has signed an agreement committing to an energy efficiency strategy at the school (see Appendix 1). Of course enforcing the agreement is difficult, but the school council understands that Its Time Foundation will not be available to assist with maintenance needs (albeit a very low maintenance system) if they do not comply. Also the system can be easily disconnected until they do comply. *It's a great school community so let's hope those steps will not be required.*

Power rationing strategy

The system size is selected to give maximum benefit to the school within a reasonable budget. Central to achieving this objective is rationing power periods to the teachers' quarters – but still providing them with greater power access than before the solar system was installed.

Power stored in the batteries during the day is supplied at night until the batteries are 40% drawn down, at which point the solar system shuts down (a siren sounds at 35% to alert). If further power is required that evening the generator can be used. This strategy is an effective balance between supplying evening power and extending battery life.

A hardwired timer is installed to supply power to the teachers' quarters from 6.00 PM to midnight every day and from 11.00 AM to 2.00 PM on weekends. Whether or not the batteries supply power for that full evening period largely depends on 1. the community's compliance with energy efficiency strategies; 2. Weather conditions -- extended cloudy periods are likely to require limited generator use.

Reporting

The school is required to report to Its Time Foundation each school term. See Appendix 3 for report instructions and content.



Benefits

The estimated savings are approximated based on current fuel prices and with the assumption that the solar system is supplying 90% of the school's power needs.

- The school now has all day power (instead of a few hours per week). This allows the school to now deliver computer education.
- Due to reduced fuel consumption the school will save up to FJD3000 per year (includes the maintenance provision). The school has agreed that these savings will be directed to student education resources with a preference for developing the school's stock of computers and other electronic education resources.

Included in the above calculation is that teachers will contribute \$10 per week (less than their previous fuel costs) to the school's Electronic Education Fund that will be used exclusively to build the school's stock of computers and related resources.

The school is now shielded from expected increases in fuel prices. Therefore the real financial benefit will increase with time.

- The school can now provide zero cost night study (previously the generator was used for 1.5 hours per night for night study (very few community homes have light appropriate for the kids to study at night))
- The reduced generator usage will reduce future generator maintenance costs.
- Less use of kerosene lanterns in teachers' quarters reduces fire and health risks. Also additional fuel savings for those individuals.
- Generators often supply 'dirty' power that damages equipment such as computers. The solar system delivers high quality power therefore extending the life of computers and other electronic equipment -- and indirectly saving money.
- Prior to the solar system teachers did most of their report writing, photocopying etc. in the evenings when the generator was running. They now have the flexibility to do that work as part of their daytime routine.
- The extended and cheaper power supply to the teachers' quarters improves the quality of life for teachers and their families.
- As the school now has the capacity for electronic education this may create a greater attraction for quality teachers to stay at the school.
- Approximately 3000kgs of carbon dioxide emissions will be abated annually due the replacement of diesel with renewable power.
- We encourage the school to engage students in learning about renewable energy and climate change. With the hope that the presence of the solar system will result in more environmentally aware and proactive school leavers.



Project partners

The generous support of our equipment and service sponsors allowed donated funds to be spent approximately twice over. Direct supporters who supply equipment or services at favourable pricing (some free of charge) include:

Primary funding:	Art Building Children's Dreams (Australia) Inc., Rotary Club of Templestowe, Rotary Club of Manningham, Deakin University Global Citizenship Program.
Solar panels:	Hanwah Q.Cells
Mountings:	Clenergy
Batteries:	Tech Brands
LED Lighting:	VIRIBRIGHT
International freight:	Mainfreight
Installation and electrical services:	CBS Power Solutions
School wiring/rewiring project:	Gordon Macdonald Clipsal Schneider Electric Australian Plastic Profiles Olex Omega Electric

Rotary Club of Taveuni provided 30% of the funding, labour, tools, transport and accommodation for the wiring project.

For other general supporters of Its Time Foundation: <http://iitime.org/supporters/>

See Appendix 4 for general information about Its Time Foundation

Thank you to all for enhancing the lives of a generation of children at Lavena.

A handwritten signature in black ink that reads 'Rob'.

Rob Edwards
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Appendix 1: Agreement text (the signed agreement is laminated and displayed in the school office)

Agreement for the acceptance a school solar system by Lavena Primary School

These guidelines insure that the solar system provides the greatest possible benefit for the longest possible time. In accepting the solar system the school management committee agrees to comply with the following.

1. This agreement is referred to at all school management committee meetings and compliance to below is confirmed.
2. The school will create a new "Maintenance Account" (held by the school) and deposit FJD60 per month from the money saved on fuel. That will gain interest and be available only for future maintenance needs of the solar system. Its Time Foundation makes no commitment to maintenance funding, but will consider requests for assistance. If the "Maintenance Fund" is not maintained, requests for assistance will not be considered. The major maintenance cost to be aware of is replacement of batteries (used correctly the target life will exceed nine years).
3. Teachers commit to pay, to the school committee, FJD10 per week for power (this value has been determined based on being less than 50% of reported current expenditure by teachers for fuel).

The solar system will supply power to the teachers' quarters from 5.30 to 11.00 pm every day and from 11.00 am to 1.00 pm on the weekends. In cloudy periods the school and teachers may need to fund some fuel for the generator in the evenings. Note: the system's ability to supply evening power is very much influenced by the energy efficiency actions of the teachers and their families – see posters ("Saving electricity; Saving money")

4. Other than the maintenance provision, all money the school saves due to reduced need for generator fuel plus the teachers' contribution will be spent only on education resources for the use of students. This will be referred to as the Electronic Education Fund. The committee will discuss each month how this fund will be used to advance computer education at the school. (The money is not for expenditure on administrative items or equipment for teachers' personal use).
5. The school and teachers quarters will adopt a strong energy efficiency policy to minimise the amount of electricity used. This will reduce the need to use the generator to supplement the solar system. Remember: the solar system only provides a limited amount of power! The committee will assign a responsible person to report to each committee meeting about how well the energy efficiency policy is being applied in the school and the teacher's quarters.

The energy efficiency policy will include all points listed on the posters.

6. Where appropriate take opportunities to teach students about climate change and renewable energy.
7. Where possible support attempts by Its Time Foundation to establish communication between an Australian school and Lavena Primary School to gain mutual benefits from sharing learning experiences.
8. Report to the Its Time Foundation, by email, once per term the following (on the form provided):
 - The maintenance and security of the solar system and any other donated equipment.
 - How the fuel savings are being spent or expected to be spent.
 - The functioning of the energy efficiency policy.
 - Supply bank statement for the maintenance account as per item 2.
 - Instructions and a card reader are provided to download a file from the solar inverter once every term. The file is emailed to Its Time Foundation reports@iitime.org. This provides a summary of the system's performance.

Signed:

Name:

Date:

On behalf of the school management committee

6/9/2013

Rob Edwards

Its Time Foundation



Saving electricity saves money. It is everyone's responsibility

Turn lights off every time you leave the room

Turn all power devices off and switches when not in use

Set computer preferences to maximum power saving

School night study: use as few rooms as is necessary

Use as few corridor and outside lights as is necessary

Do electrical activity in the daytime if possible:
photocopying, printing, scanning, power tools.

Where possible do ironing, charging and other power
activities between 11 AM and 1 PM on weekends.

When replacing lights use only LEDs

If possible purchase laptops rather than desktop
computers as they draw less power

Avoid freezers, electric cook tops and air
conditioners. They significantly reduce the capacity
of the solar system to deliver power for everyone.



Appendix 4

Its Time Foundation

What we do

Most remote Pacific Island schools depend on diesel generators for their electricity. We install solar power so, instead of spending their very limited money on fuel, they can buy computers, books and other desperately needed education resources. That means decades of new education opportunities and less carbon dioxide entering the atmosphere.

General benefits we strive for

These projects can increase school resources budgets by more than 20%.

We encourage schools to invest in computer education and for some schools that creates their first opportunity to have computer classes.

In most schools the high cost of fuel limits electricity supply to only a couple of hours each day. They can now enjoy reliable all-day power and no cost night study is a bonus!

Less noisy generators running near classrooms.

Usually teacher's quarters are located on the school property and receive generator power a couple/few hours each night. The improved power supply enhances their quality of life.

Remote schools are better able to attract quality teachers.

Less use of kerosene lanterns in boarding houses and teachers' quarters reduces fire and health risks.

To a small degree these systems contribute to poverty proofing the communities by partly shielding villages from rising oil prices.

Hundreds of tonnes less carbon dioxide will enter the atmosphere.

"Inreach". For those of you who join us on this journey we hope you'll see we can create a better educated and more sustainable world. You are making a real difference.

Who we are

Its Time Foundation is a privately established Australian charity registered with the Australian Department of the Environment and is bound by item 6.1.1 of the Australian Income Tax Assessment Act. Constitution: <http://www.iitime.org/documents/Constitution.pdf>

More education



Less carbon emissions



An investment in the future



*"Kids are 20% of our world, but
100% of our future"*

(A. Wood)