MAKE SOLAR MEANINGFUL

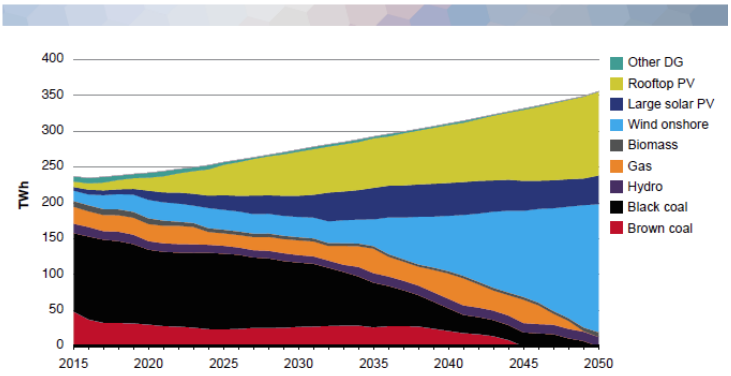
SOLAR POWERED KITS AND THE REAL WORLD

How can I relate fun projects, such as making the BASIC SOLAR CAR, to the real world, and make solar power more meaningful to students?

The CSIRO Report 2017 "Electricity Network Transformation Roadmap" examines the process that needs to happen for Australia to change the way it produces and distributes electricity in the next decade and beyond. Tomorrow's energy will need to be more sustainable and needs to have reduced greenhouse gas emissions / carbon neutral. (see Figure II). At present the most viable option is Solar but wind and other sources need development.

The report suggests that we will see more rooftop solar, energy storage and electric vehicles. Electric vehicles will become a viable option when improvements are made e.g. a reduction in battery costs (storage), increasing travel range, more public charging.

Figure II: Plausible projection of Australia's changing energy mix to 2050



REAL WORLD PROBLEMS USING PROJECT KITS

Engaging students in real world problems (in this case efficient solar energy) allows them to appreciate the choices and changes that need to be made to solve problems. Scorpio Technology kits provide solid examples of real world technology. Students are encouraged to be curious, to investigate, to plan, create, test and improve their designs while using a real world Design process.

https://www.scorpiotechnology.com.au/s/Newsletter-2015-07-Solar.pdf (https://www.scorpiotechnology.com.au/s/Newsletter-2017-03-enyj.pdf)

Solar projects allow students to:

- Gain an understanding of basic electricity with circuits
- Learn how solar cells work to convert solar radiation into electricity to power model cars, lights etc.
- Demonstrate solar power and its benefits.
- Experience the Design process and solve real-life challenges
- Work together in a group situation
- Foster the student's interest in the world around them

SOLAR IN YOUR ENVIRONMENT

Working with solar projects can lead into solar power generation in the real world. Students could look at:

a. Does the school have solar panels, or other companies or councils in the area?
b. How many families have solar panels on their roof at home?
c. How much did the panels cost? How much was the annual electricity spend before and after the solar panels were installed? What would be the payback period for the panels?
d. How much power is generated from a solar panel? Compare this to what is required to generate the same amount of power by hydro or coal fired generation.
e. Does the family get a rebate for power put back into the grid? Does the amount put back into the grid change? Compare the differences between summer and winter months.
f. In 2010, 14% efficiency solar cells were regarded as high efficiency cells. What efficiency cells are currently available?

INVESTIGATING SOLAR CELLS

To increase understanding of how solar panels generate energy your students may consider the following ideas:

a. What is a solar cell, and how is it made?
b. What are the differences between multicrystalline and monocrystalline cells?
c. What does a solar cell look like? How thin are they, how fragile and brittle are they?

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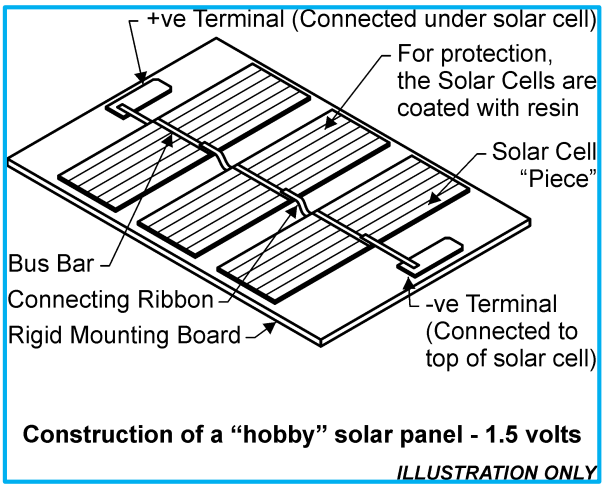
(Ask for a small sample pack with your next order).

d. How large are the cells? E.g. 156mm x 156mm. Are they made in different sizes (they used to be made in 125mm x 125mm – is that size still made?)
e. Have a look at how panels are constructed:

- Small or Hobby panels are made by mounting the cells on a mounting board (e.g. 0.8mm thick, 1.6mm thick) and covered with an epoxy for protection
- House panels are made differently – how are they constructed?

f. What happens to solar panels when they get hot? At what temperature do they start to lose efficiency? What can be done to take heat away from the panels / cells? (e.g. heat sink material).
g. The SOLAR10 panel when connected to a multimeter, which is switched to mA, shows the percentage of sunlight present.



Construction of a "hobby" solar panel - 1.5 volts

ILLUSTRATION ONLY

REAL WORLD SOLAR VEHICLES

Measuring performance and durability testing is conducted in manufacturing. Car companies conduct many trials prior to a model release. These include: hot / cold running conditions (desert and snow), durability testing (run the engine for extended periods), performance testing. These results are used to further improve the vehicle.

In the last decade Solar vehicles have improved. Students may investigate these.

- Examine design, performance, problems encountered during development and during use.
- Investigate if current solar vehicles are practical. If not, why not? (consider shadows and shade in large cities).
- Does it look like solar powered cars may be available in the foreseeable future? What are the hurdles to prevent them being a practical alternative?
- What about solar powered aircraft? https://www.scorpiotechnology.com.au/s/Newsletter-2016-07-Dream-of-Flight.pdf

SOLAR PROJECT KITS

Scorpio has developed solar cars, boats and solar house projects solar projects of varying complexity.

Solar car projects such as Challenger (new kit coming soon) and Sheridan Kit are designed especially for Model Solar Competitions performance. Keep in mind that competition rules change yearly and each state has different rules.

BASIC SOLAR CAR
(CODE:SOLARB / SOLARB-NS)

This kit is useful for junior students as an introduction to solar power. Students may try these:

- Tests can be carried out with the solar car, timing it over a given distance. Record the elapsed time and the percentage sunlight at the time.
- Carry out the timing over both a flat track and an upwardly inclined track (or even better, some different inclines) and record time and sunlight level, and whether the solar car was able to climb the inclines (don't make them too steep).
- Repeat this testing on days with different sunlight levels.

SOLAR CAR (V2)
(CODE:SOLARV2)

This is a 4-wheeled vehicle driven by an electric motor, which is powered by a solar panel with 2 arrays, which can be connected in series or parallel. Useful for looking at current and power generation.

INTRO SOLAR CAR KIT
(CODE: SCRINT)

This is a basic 4-wheeled vehicle which is powered by 2 no. 4 solar panels. Suitable for introducing the concept of solar power and low friction to students.

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SHERIDAN KIT CAR
(CODE: SHERIDAN

This kit contains all of the parts needed to construct one Sheridan Car Challenge competition vehicle EXCEPT for the Solar Panels and wiring.

The Sheridan kit car was designed by Don Sheridan. Don wanted students to experience the joys and challenges of solar. Don, an engineer, used his knowledge and skills to so they could actively learn and experience solar power. Model Solar Vic runs an annual race with the Sheridan kit car as one of the categories. (DATTA Vic Tech Notes Journal Vol. 26 / June 2017 has an informative article about Don Sheridan.
https://www.scorpiotechnology.com.au/s/Newsletter-2016-05-Design-Creativity-Solar-Challenge.pdf

INTRO SOLAR BOAT KIT
(CODE: SBTINT)

This kit introduces the concept of solar powered boats, by building a simple solar powered boat. It contains a no. 4 solar panel and the required electrical and mechanical parts.

JUNIOR SOLAR BOAT KIT
(CODE: SBTJUN)

This kit contains the required components (except a solar panel) to build a solar powered boat for competing in the Junior division of the solar challenges.

SOLAR PROJECT (HOUSE)
(CODE: SOLPROJ)

This kit allows you to build a solar powered house, with a “ceiling fan” and 2 “down lights”.

- The solar powered house can be put in the sun to demonstrate solar power generation.
- Put the house in the sun on a number of days, both on bright and overcast days. Observe the speed of the ceiling fan – does it change on overcast or bright days?
- Are there overcast days when the down lights operate, but the ceiling fan doesn’t? If so - why?
- Record sunlight levels over a number of months (summer to winter)

SOLAR PROJECT BOARD KIT
(CODE: PROJBRD)

A corflute project board that allows students to observe electricity produced by a solar panel. For use with the components supplied in the Solar House Project Kit (Code: SOLPROJ) . This kit can be used as an alternative to the complete Solar House.

CORFLUTE HOUSE KIT
(CODE: SOLHOUSE)

Different sized corflute sheets that can be cut and made into a house (with one side left open) for students to observe solar power in action using the components supplied in the Solar House Project Kit (Code: SOLPROJ).

REFERENCES:

- http://www.need.org/files/curriculum/guides/Photovoltaics%20Teacher%20Guide.pdf
- https://www.nrel.gov/workingwithus/re-photovoltaics.html
- http://www.thesolarco.com/teaching-kids-about-solar-power/
- http://www.communitypowernetwork.com/node/1100
- http://www.nrel.gov/docs/gen/fy01/30927.pdf
- http://www.edutopia.org
- http://www.nsta.org/publications/freebies.aspx
- http://www.letsgosolar.com/consumer-education/how-solar-panels-work/

Excite your school community by participating in **DATTA Australia’s DESIGN & TECHNOLOGY WEEK**.

Students may like to try one or more of Scorpio’s exciting project kits or they could design and make their own invention using the parts and components in our range.

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