TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON
https://www.victoria.ac.nz/sustainable-energy-systems

KAITIAKITANGA WHAKAPAPA MAURI

ENGR111 and ENGR110 – Sustainable cabin assignment/project

Source: http://ecotiny.co.nz

Affordable housing, which is optimally designed for comfort, but is also sustainability-oriented, is a priority in New Zealand, and elsewhere. The notion of living 'off-the-grid' is also gaining traction.

You are to work in a group to design and model an off-grid solar energy system for a 40 square metre cabin, which is off the grid. A three-person family will be living in the cabin full time. You get to pick the location – anywhere in the Wellington area.

For simplicity we will begin with separate calculations for two days:

- Average sunshine for December 21, roughly the summer solstice.
- Average sunshine for June 21, roughly the winter solstice.

You will need to:

- Make a model of your power/energy needs. What appliances will you be using? How much electric power and energy will they require?
- Estimate the available sunlight and what fraction of that energy you will be able to capture. You will find the SolarView webpage to be very useful for this.
- Design your solar panel system: panels, batteries, controllers, etc. You can find a great many companies offering these components. Your job is to

assemble a compatible, adequate, reliable, and reasonably inexpensive package for the cabin's electricity needs.

You have the following milestones:

Milestone	Date	Comments	Mark
1	Weeks 1 & 2	Form a group of 3-4 students. Give your group a name.	20%
2	Week 2	Decide on a location, with GPS coordinates. Establish the available solar energy profile. Do a power/energy load characterisation.	20%
3	10h00 Monday 29 July	Establish the solar PV electricity generation potential. Design the solar PV/battery system to meet the load. Undertake an uncertainty and cost analysis. Each student must submit the assignment in the required format by the due date.	60%

Additional notes:

We have assumed average sunshine on both days, but we have to account for the possibility of a few cloudy days in a row. Therefore, assume you need to store up an entire extra day's worth of energy in case there is cloudy weather. In other words, when the sun rises you should still have a full day of energy in your batteries. Based on this decide how much battery storage you need. You will also need to estimate the maximum power draw and thus decide what rated inverter you need. You can now submit a draft design: solar panel area, inverter power rating, battery storage capacity. Show your calculations with explanations. Again, each member of the group submits a copy of the provided template. In the latter, describe your system, which should include specific solar panels, inverter, and batteries that are available in NZ. There are many types of each available so you should discuss your reasoning for your selections. You will need to include prices for all of these items. Just use retail prices you find on line as you would be ordering from similar suppliers. You can estimate $10,000 for labour and $2,000 for minor supplies. If there are any major changes in the specifications from your previous calculations note these changes.