Engineering report

Aim: To increase your understanding of photovoltaic applications and how they can benefit society.

Tasks

You will be allocated one of the topics listed in the table below. For this topic you are to research each of the following:

1. Description of how and why the application uses photovoltaics with reference to a case study (real life working example of the application)
2. Applications within society and how the technology has developed with time (this may include new electrical components or protective methods etc)
3. Identify how your application of photovoltaics affect society today
4. Would your type of photovoltaic application continue to be useful in the future? Explain
5. Possible system layout
6. Discuss the importance of correct system design and sizing in your application
7. How will the photovoltaic application be useful in the future for greenhouse gas emission reductions?
8. Explain why the application uses photovoltaics
9. Describe how (with assistance of diagrams) photovoltaics produces electricity
10. Is an inverter used in your application? If so, what is an inverter and describe the operation of pulse width modulation inverters. If not, describe the operation of a DC regulator and its purpose
11. Identify safety issues related to the use of DC electricity and the different safety concerns of AC electricity

Please use photographs, diagrams and tables where appropriate to support your answers. A sample report can be found here for the Water Pumping application.

Length

The report should be about 2000 words (for 6 tasks) and should include discussion of the questions above and figures or tables to add to the description.

Referencing

All material must be correctly referenced using the Harvard method (see sample report for methods required). You may find it useful to look at case studies in resource materials including websites, learning booklets, texts and books. Some good quality sources of information are provided here.

Topics

Each student or group of students is to choose a different solar application. A brief description for each topic and some information and resources that you should use to complete the report is included below:

Topic	Description and resources
Space	Use in space craft and satellites etc. USA has a large space program
Buoys and	These are measurement devices located in the middle and upper

meteorological applications	atmosphere as well as middle of oceans that record measurements for use in meteorological predictions. Sometimes called remote monitoring
Grid connected residential	Photovoltaic systems that are attached to the roof of a residential dwelling and feed their power into the current electrical grid network
Grid connected solar parks	These are large-scale solar plants where hundreds of kilowatts are installed into a single installation. Eg Singleton operated by Energy Australia. There are also a number of solar parks or solar cities in European countries such as England, Germany etc. These are also called Solar cities
Solar transport	There have been applications in boats, caravans, planes, cars and many others
Building integrated photovoltaics	Emerging technology where photovoltaics replace the building fabric of a building. For example the awning that covers the street out the front of shops can be made of photovoltaics to provide shade and also produce electricity
Remote area power supplies	These can include systems that power farms and homesteads in grid isolated areas. They are generally hybrid systems that sometimes have many renewable technology inputs including hydro and wind and usually have a diesel backup generator
Remote area telecommunications	In grid isolated areas (large portion of the area in Australia) photovoltaics provides a good way to transmit telecommunications signals. These systems have very large battery capacity and are generally over engineered to ensure they do not fail
Solar Home Systems in developing countries	Most of the people in the world have no access to electricity. Aid agencies and other organisations are installing Solar Home Systems into some remote areas where there is either no grid or an unreliable grid. These are simple systems and usually only consist of a solar panel, battery, lights and sometimes a community vaccine fridge, radio or television
Solar street and other lighting	These include channel markers in rivers, park and street lighting, parking meters, path lights, sign lights, lighthouses, garden and many other applications. They are a growing area of expansion and are common in many council areas in public parks and walkways
Cathodic protection of pipelines and bridges	Small photovoltaic systems are used at small intervals along gas and other pipelines in remote areas such as Australia. They are used to provide electricity to prevent the pipeline corroding and consequently leaking. These systems are also used on some bridges and aircraft to prevent metal weaknesses from corrosion