



# Building Services 1

## Building Integration of Solar Energy

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**THE SUN IS SIMPLY**



**ONE BIG BATTERY FOR US**

# Introduction

- one of the most useful renewable energy
- radiant energy emitted by the sun
- 90 million miles from the earth
- comes in abundant
- surface of earth receives 120,000 terawatts of solar radiation



# Introduction

- In 1839, Alexandre Edmond Becquerel discovered the photovoltaic effect
- claimed that "shining light on an electrode submerged in a conductive solution would create an electric current."
- In 1941, Russell Ohl invented the silicon solar cell, shortly after the invention of the transistor.



# Introduction

- Applications - heat up water, create warm environment, charge certain devices
- a solar panel needs to be installed to receive sunlight
- expensive installation fee
- last average from 20 to 25 years
- reduces the amount of electricity bill
- environmentally friendly

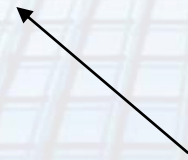


Evaluation

Selection

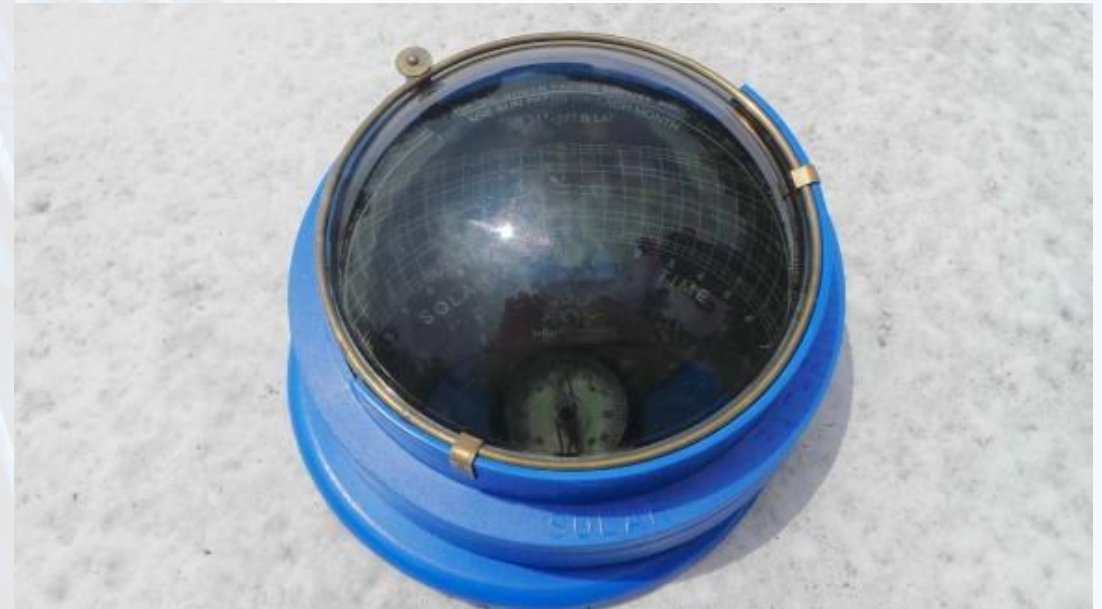
Pre-Installation  
process

Contract



# Evaluation

- suitability of the system
- Suitability of site
- Solar pathfinder
- Set up at 4 corners of the panel



# Selection

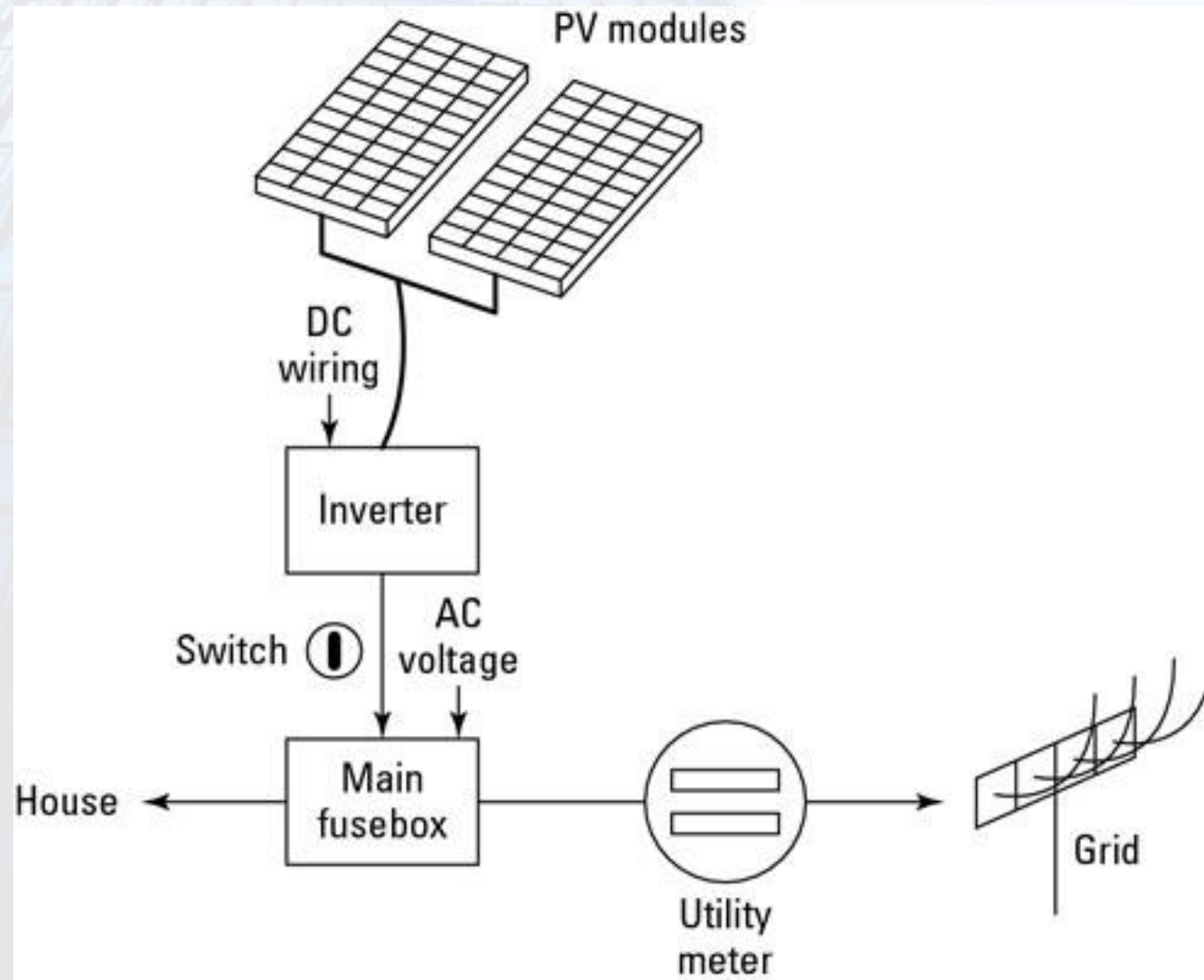
- Size and weight of roof
- Size and weight of Solar Panel



# Contract

- Contract between electrical companies
- Allows there resell of electricity
- Ensures efficient management

# Installation



# Introduction to Mounts



# Flush Mounts

Flush mounts are designed for fast and easy installation because no grounding lugs or copper wire needed.

It also has a in-house engineering services which provides easy maintenance and custom options for nearly any roof type so it is a very flexible system.

System advantages includes 100% aluminum rails, which is lightweight and corrosion resistant.



# Ground Mount

The advantages of a ground mount system is high level of pre-assembly for fast installations and easily accessible for ground and system maintenance.

Besides that, the ground mount system also provides a larger area and weight load to rest the panels upon.



# Pole Mount

Pole mounts are being distinguished by how the pole mounts are placed on the pole. The uppermost part of the pole mounts contained of a metal rack and rail unit that is secured to a huge sleeve that rests ahead of the pole.

The mount will then simply slips over the top most of the pole, and the solar unit can be placed into place by welding the solar panels or bolting them. It is important to take into account of wind load as the pole might be less stable when compared to the flush mount and the ground mount.



# Management

- A few times a year, the panels should be inspected for any dirt or debris that may collect on them. The dust and debris on the system may cause the system to reduce the intake on sunlight and generate less electricity. Therefore, general cleaning may be important to keep the system going.

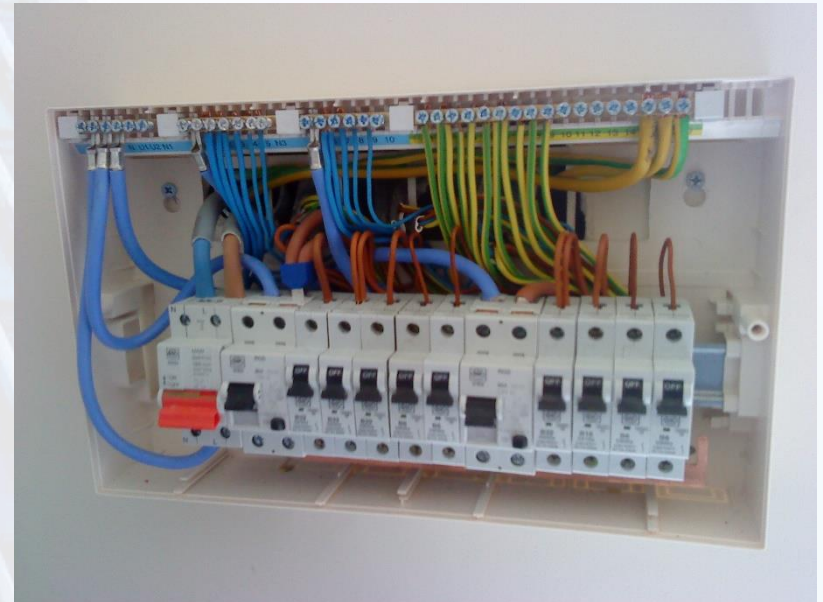


# Management

Regular checking of roof

Regular checking of  
inverters

Regular checking of fuse  
box





# Elithis Tower, Dijon - France

Case Study



- The first energy-positive building (French nZEB)
- Houses various facilities
- An experimental building
- The energy production/usage is so impressive that it is showed to the public on a board



# Integration of Solar Energy

- It uses solar energy as a main source of energy
- To heat water
- To light up the building
- To heat up the building



Horizontally tilted solar panels

- To help with the use of solar energy, various methods are experimented on the building
- Using solar shield
- Using double glazed bay windows



- As mentioned before, it is an experimental building
- Many buildings have learnt from this experiment and has improved from it
- Examples are:-



Heliotrope - Germany  
5x energy



Dragon-Shaped Solar Stadium - Taiwan  
8,844 solar panels

**SOLAR PANELS!**

**SOLAR PANELS EVERYWHERE!**

# Advantages

## 1.) Renewable Energy Source

- Will not be depleted when used
- Can be used without limitation

## 2.) Low Maintenance Cost

- Because there are no moving parts in the solar panel
- Average lifespan is 20-25 years
- Requirement: keep clean



# Advantages

## 3.) Diverse Applications

- Can be used to generate electricity
- Used for space heating and produce hot water.

## 4.) Does not cause Global Warming

- Solar energy is clean, reliable and non polluting.
- Does not release toxic gases.
- No storage of radioactive wastes.





# Advantages

## 5.) Easy Installation

- Does not require many wires, cord and etc unlike geothermal energy.
- Normally installed at the roof top of houses.



## 6.) Can be used in rural or remote location

- Can be used in area where there is limited access.
- Can be used as long as it can receive sunlight.



# Disadvantages

## 1.) Initial Cost is Expensive

- Cost is higher as compare to other alternatives energy
- Due to the part. Eg: inverter

## 2.) Location & Availability of Sunlight

- Nearby object such as trees, buildings and landscape.
- Will reduce the rate or require more panels.



# Disadvantages

## 3.) Installation Area

- Normally installed at the rooftop for normal house
- While for bigger building or industrial, need to be installed on ground.
- Which can cause obstruction.



# Disadvantages

## 4.) Poor Reliability

- Rely mainly on the local grid utility to generate power.
- Or solar batteries for storage to store the excess power.



## 5.) Polluted Environment can caused damages to panel

- Photovoltaic panel are made from mercury and other toxic materials which are easily damaged.
- As results reduce the efficiency and quality of the cell.



# Possible problems with the system

- Weather-dependant
  - It need the sun to generate heat or electricity
  - Won't work effectively in bad weather countries
- Lack of effectiveness
  - It is not a 100% efficient
  - Only takes a range from 20%-40%



# Possible problems with the system

- Problem of the semiconductor
  - High temperature will burn the semiconductor
  - Decrease the efficiency
  - Necessary to repair
- Surface of the solar panel
  - Clean
- Solar water heating system
  - Antifreeze sensor must be maintained
  - Pipe rupture

# Recommendations for Future Improvements

- Use multi-cell gallium arsenide with three-junction concentrator
- Develop a large energy storage system
- Establish subsidies for solar deployment and provide subsidies for purchasing solar panel



# Conclusion

- Although solar energy is very useful in many applications, scientists conclude that the sun will be extinct after billions of years
- Even though the size of the sun is 109 times the diameter of the earth, its energy will still come to an end in the future
- humans should appreciate this free source of energy



# Conclusion

- solar energy may have some imperfections
- For instance, sunlight cannot be collected at night & not every places receive the similar amount of sunlight
- Humans do seek improvement to fix all this issues, for example sunlight can be collected in a storage device such as battery so that the solar energy can still be used at night.



# Conclusion

- Even until today, the most efficient solar cell technology is only able to convert 20% of the sunlight into electricity, but with the increasing advancement of humans in solar cell technology, the number is likely to increase in the future.
- all houses in the world will be installing solar panels in their houses and reduce the amount of electricity
- More people should invest on solar panels to realize its full potential
- humans should depend on solar energy and stop relying on non-renewable energy

# Learning outcome

- benefits and disadvantages of solar energy
- gained more knowledge by researching the information online
- improved our skills in doing work with my groupmates
- Better communication skill

