Project Deliverable D: Conceptual Design GNG1103 - Solar I

Concept 1(Shawn Kuang) Solar panels

For the support of solar panels, we choose the tripod which is stable easy disassembly. In order to let the sunlight directly point to panels, the tilt angle of solar panels should be adjusted along with seasonal changes so that we can maximize solar energy conversion rates. Also, sometimes, sunlight only comes from one side of the roof, and the other side is blocked. Therefore, we decided to make two holders, which is more flexible to adjust the angle separately.

Adjustments should be made around March 1, April 19, August 23, and October 14th for the Northern hemisphere.

In winter, to calculate the tilt angle, multiply the latitude by 0.9, and add 30 degrees. For spring and autumn, latitude minus 2.5 degrees. For summer, 52.5 degrees less than the winter angle.

(For your information, the latitude of Ottawa is 45 degree.)

So, the tilt angle of solar panels in Ottawa in winter is 70.5 degree and 18 degrees in summer.

Season Winter Spason Angle : 70.3 Ang le Solar Ponnel Solar Jamel supports Supports Season: Spring on Fall Angle: 42.5° Solar joinel 42.50

Asupports (Youf

Considering the terrible weather in Ottawa in winter, we want to connect a retainer plate on the top of the holder, and then we can insert the solar panel to fix it and prevent it from falling out.

Steps of installation:

- 1. fix the tripod to the roof
- 2. calculate the Right Angle depends on the season
- 3. place the fixation plate on the support
- 4. install the panel inside the groove of the plate

As for adjusting the angle

We prefer automatic adjustment or remote control, but considering the cost and technology, we decided to install a turning handle at the connection point between solar panel holders and the retainer plate to change the tilt angle by directly changing the angle of the retainer plate.

Support Support A pound Jination plate	There is a groove on the fixation plate so that we can install the panel inside.
La Leg	

Battery, solar charger controller and inverter

These should be put somewhere safe and dry indoors, away from fire and other electrical appliances.

Wires and connections

In order to function, all of these must be connected into the circuit. We need to connect solar panels from the roof with solar charger controller, battery and inverter.

 In this case, wires must be anti-freezing, insulating and uneasy to break.

We are going to drill a small hole in the wall and let the wire from solar panels go into the house to connect other three parts.

Steps of working:

- 1. solar panels collect sunlight
- 2. transfer into energy
- 3. store the energy into the battery
- 4. plug in for use

The circuit is below.



Concept 2(Sulei Yue) Solar panels

Similar with concept 1, solar panels are set up on the roof and adjustable, but it can change to more different tilt angles, which is more flexible. In addition, the angle can be adjusted through the turing handle inside.

We want to move the turing handle in the house by adding an axle on the holder and connecting it and the turning handle with iron wire. Therefore, the tilt angle can be adjusted inside.

solar panols A holders voor ivon vine house

To achieve that, we need to drill a small hole on the roof for iron wire to go through.

Steps of installation:

- 1. set up the holder
- 2. add axle on it
- 3. connect axle and turing handle
- 4. connect solar panels and axle

Concept 3(Lydia Huang) Solar panels

Unlike concept 1 and 2, we chose to put solar panels on the ground instead of on the roof.

In order to make solar panels work efficiently, the fixed leg must enough high and then they will not be obscured by the shadows of surrounding high buildings or trees.

If people want to change the tilt angle of solar panels, they just need to use remote controller which means people do not need to climb to roof to adjust the tilt angle. Fixation frame is to fix the solar panel.



Steps of installation:

- 1. insert solar panles into the frame
- 2. connect frame and pole
- 3. connect remote control and frame
- 4. set up the pole

Global concept 1

Generally, we can adjust the tilt angle by turning the handle on the holder. Solar panels are fixed by a retainer plate. It is strong and can hold for a long time.

Global concept 2

Compared with concept 1, solar panels are more flexible with more different angles. It is easy to adjust the tilt angle of polar panels by turning the handle in the house.

Global concept 3

Convenience is its most important point. We can adjust the tilt angle by the remote controller. It won't cause any burden to the roof.

General	Global Concept 1	Global Concept 2	Global Concept 3
Easy to install and disassemble	Yes	Yes	No
Easy to adjust	No	Yes	Yes
Stable and wind-proof	Yes	No	A little
Work efficiency	Highest	High	High
weight	Normal	Normal	Heavy
cost	Low	Low	High
user friendly	Troublesome to adjust angle	No influence	No influence

Comparison mong all 3 global concepts

Analysis and conclusion

In summary, after considering all the factors, we decide to use **Concept 1**. In fact, the Concept 2 is a great design, except it is not durable under high wind. Considering the weather in Ottawa is windy all through the year, Concept 2 is not suitable in this case. For Concept 3, it is not only the most expensive one, but also not easy to disassemble. However, Concept 1 seems to be the only one that is durable and efficient, which is perfect for this scenario. The only problem is user need to climb up to alter the angle of the solar panel a couple of times each year, which is ignorable compare to other problems.