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Performance of a bifacial solar module under different backgrounds

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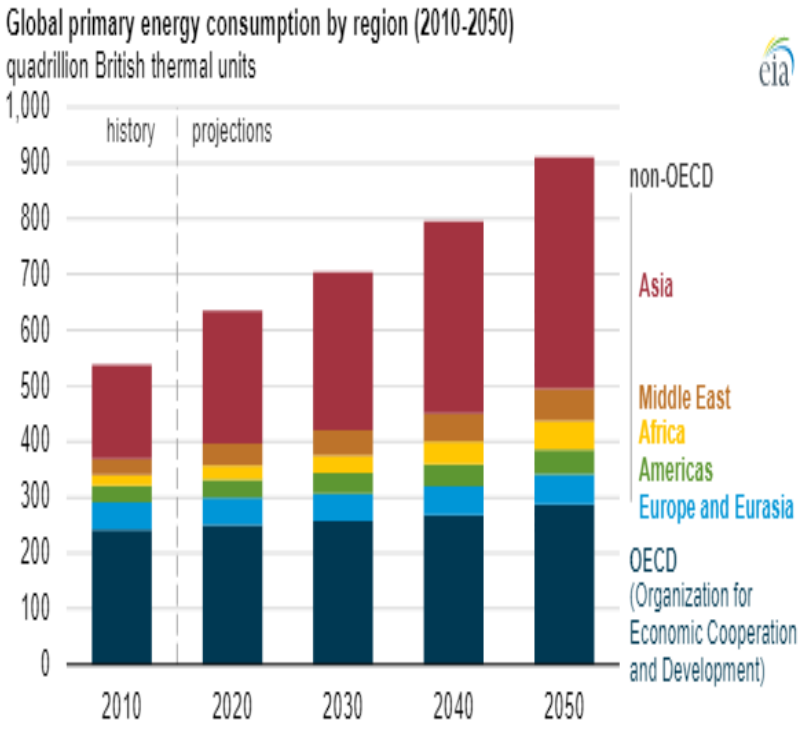
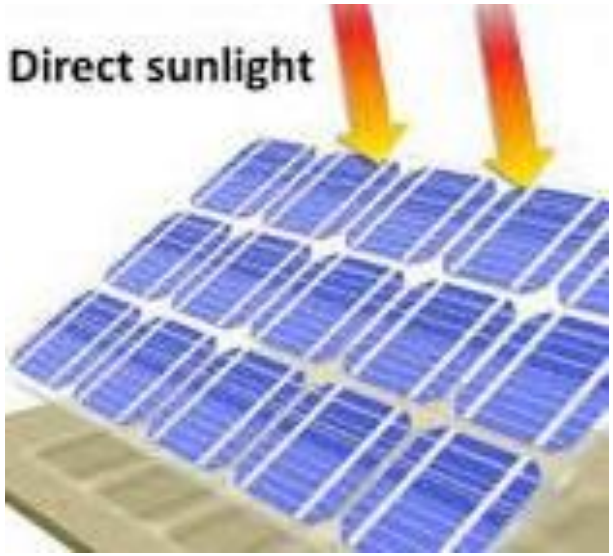
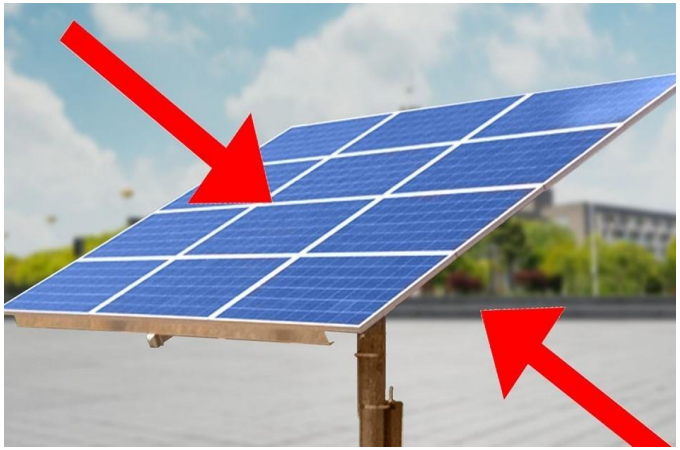
Introduction



- Population growth hence more energy demand
- Economic development e.g Agriculture
- Advances in technology e.g exploitation of fossil fuels from challenging environments

Introduction cont….





Monofacial **Bifacial**

Intro' cont….

Why bifacial solar modules?

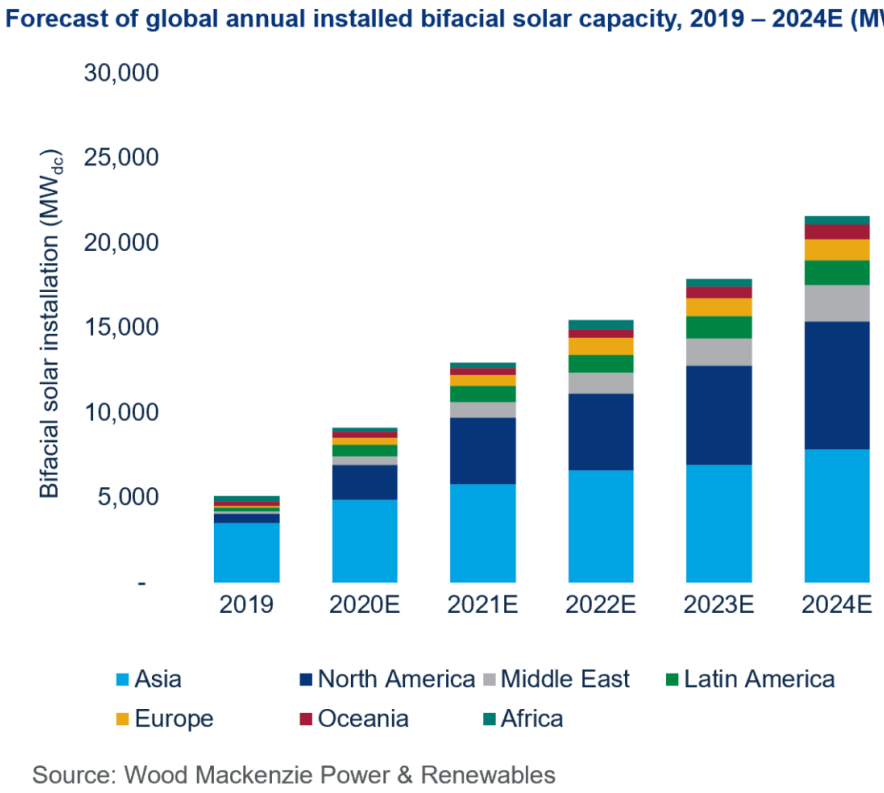
- Can capture sunlight from both sides
- Higher total energy generation
- Last longer than mono-facial panels
- Energy production during bad weather
- Have a low degradation rate etc…..

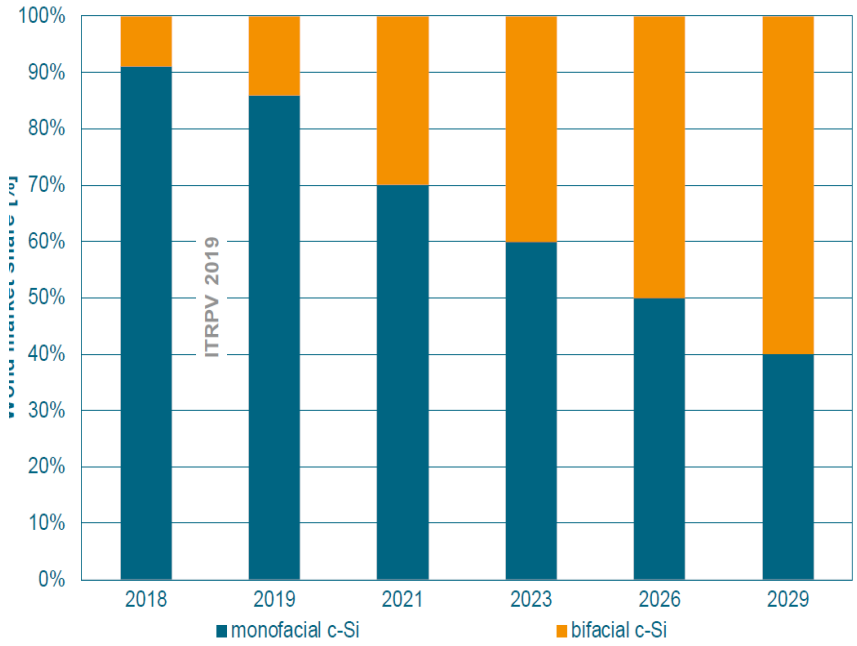
Disadvantages bifacial panels

* Expensive, installation costs are also quite high

Intro' cont.....

Market projection of the Bifacial solar cell





Objective

- To determine how reflective surface affects the performance of a bifacial module.

Statement of the problem

In the solar sector, bifacial modules are clearly a game changer since they can generate electricity from both sides of the module. However, there are limitations in measuring the backside output which is obviously shaded. To increase the backside output, the use of reflective surfaces is suggested and that is why this part of my research investigated the performance of a bifacial module under various backgrounds.

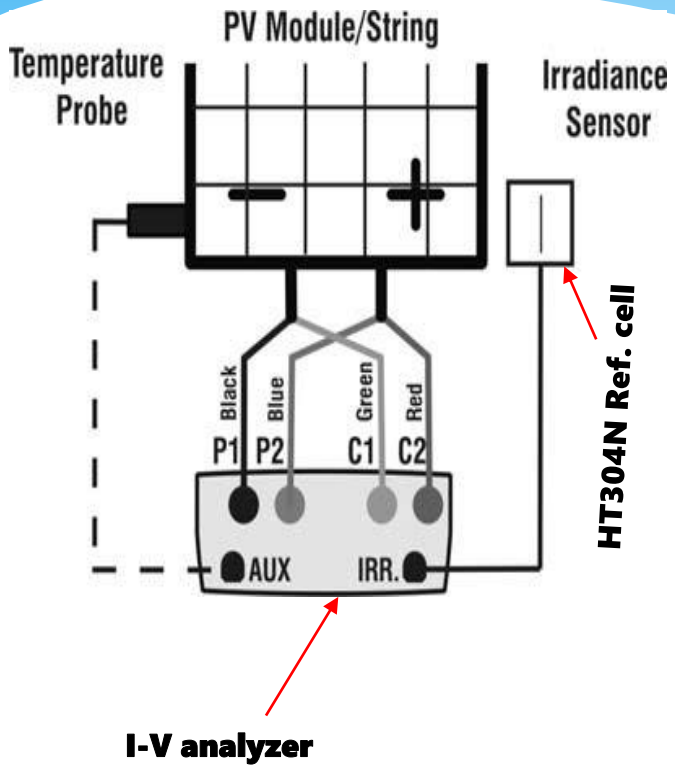
Literature review

- A study by Lo et al. 2013 used light scattering beads or powder adjustable mirror arrays and prisms to improve the rear side incident.
- A study by Riedel (2020) investigated the use of reflectors as a means of increasing power yield on bifacial solar modules
- *Rueter et al*., (2021) also did a study on the use of reflectors as a way of complementing other sources of light reaching the backside of the module.

Methodology

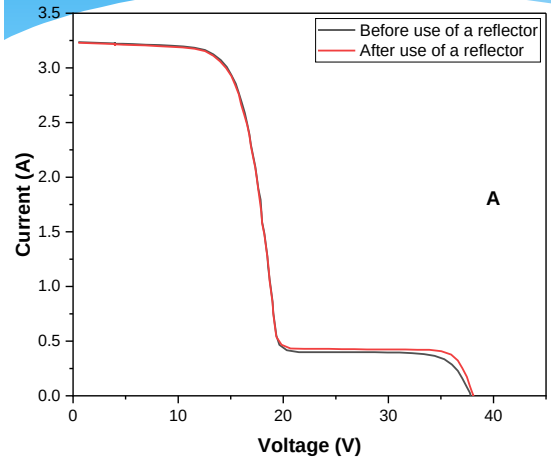
- Two Solar modules were mounted back-to-back to form a double-sided panel (bifacial solar cell configuration)
- A HT304N Ref. Cell was mounted alongside the panel with the same inclination and orientation.
- Using a clean wet cloth ,both the panels and the HT304N ref cell was be cleaned before taking the data.
- The positive and the negative terminals of the panels are connected to the I-V analyzer
- The irradiance probe from the HT304N Ref Cell is connected to the I-V analyzer.

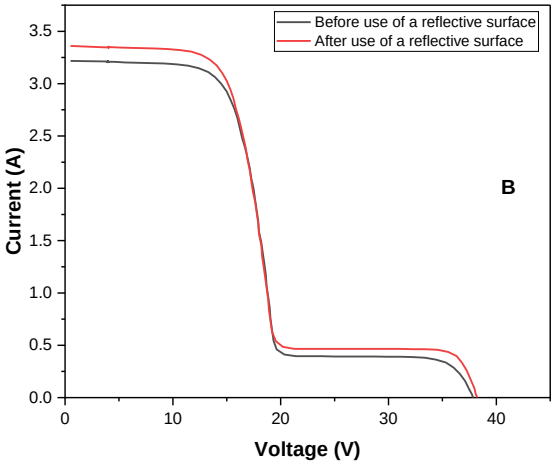
Methodology….

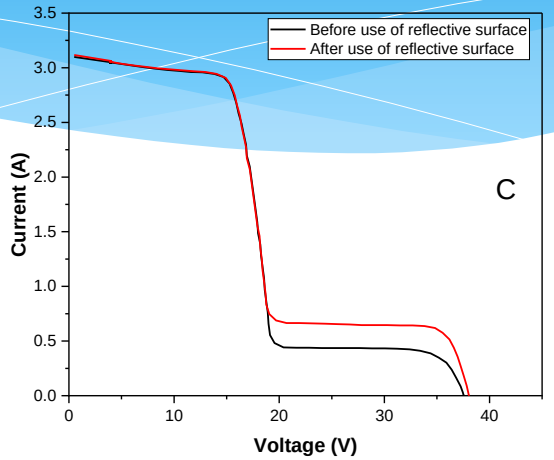


- The temperature sensor was fixed at the backside of the module and then connected to the HT304N Ref. Cell
- The sample reflectors were then put underneath the module one at a time
- The connection was then used to measure current-voltage data, irradiance, and the temperature of the module.
- Collected data was analyzed using both Python and Origin software.

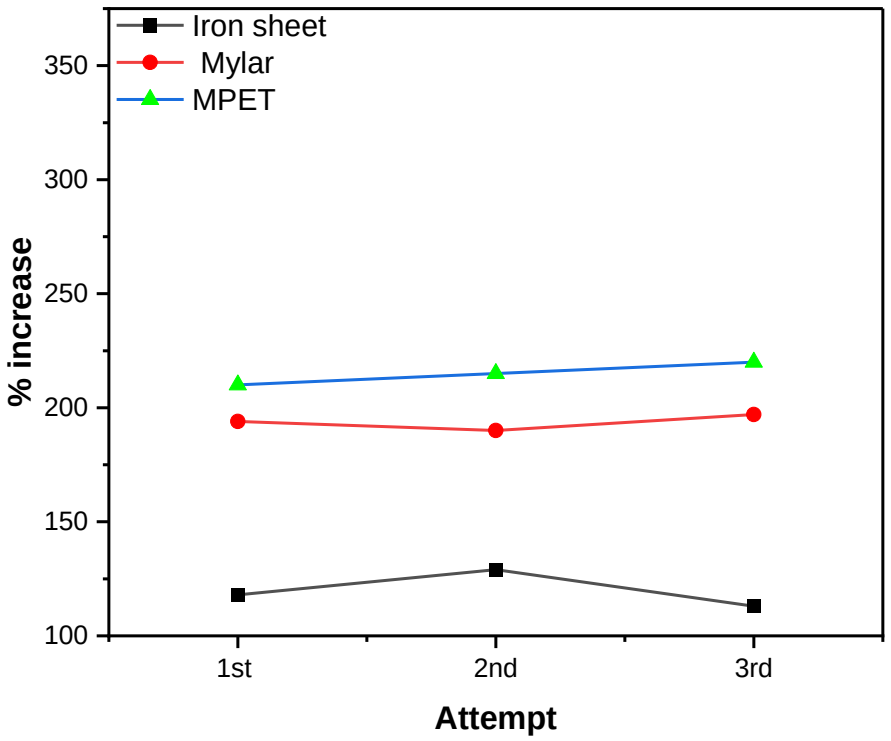
Results and discussions







Results and discussions cont.....



Conclusion

The use of reflective surfaces to improve backside power generation has been studied. The surfaces contribute positively to the total power output of the module with some reflectors contributing more than others. From this study, the MPET reflector was highly recommended to be used as a reflector when compared to the others.

Thank you for listening!!