

Faculty of Engineering
School of Photovoltaic and Renewable Energy Engineering

Harvesting photons using High Ground Coverage Ratio (GCR) approaches

December 2019



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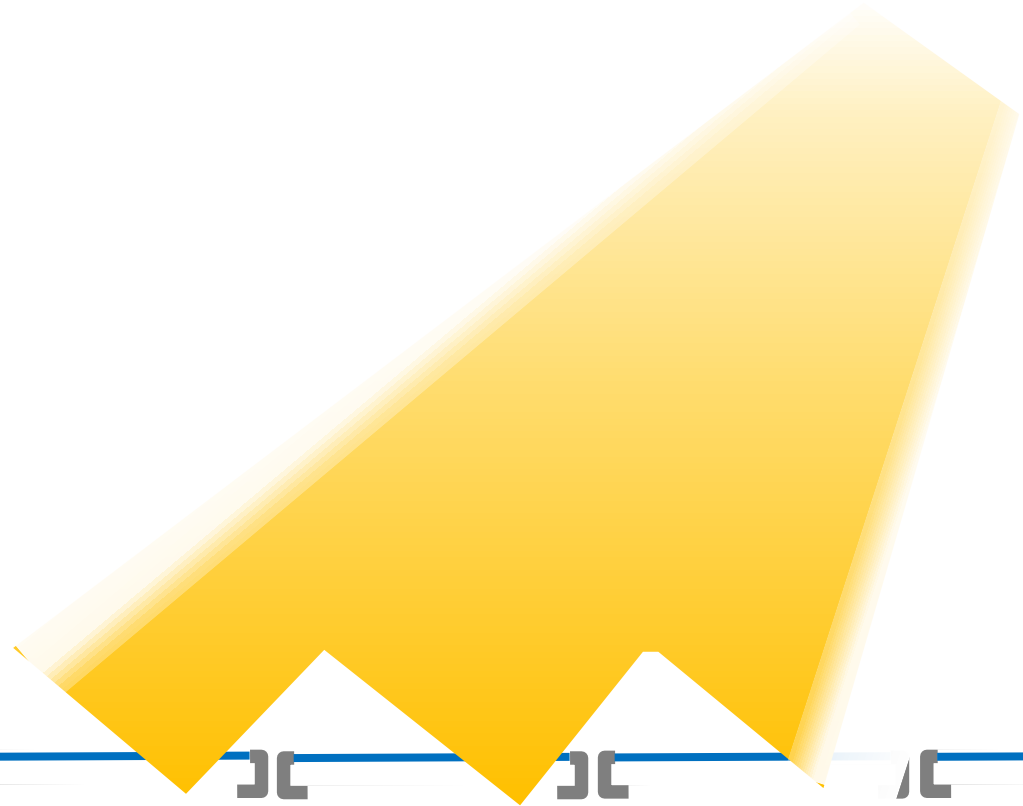
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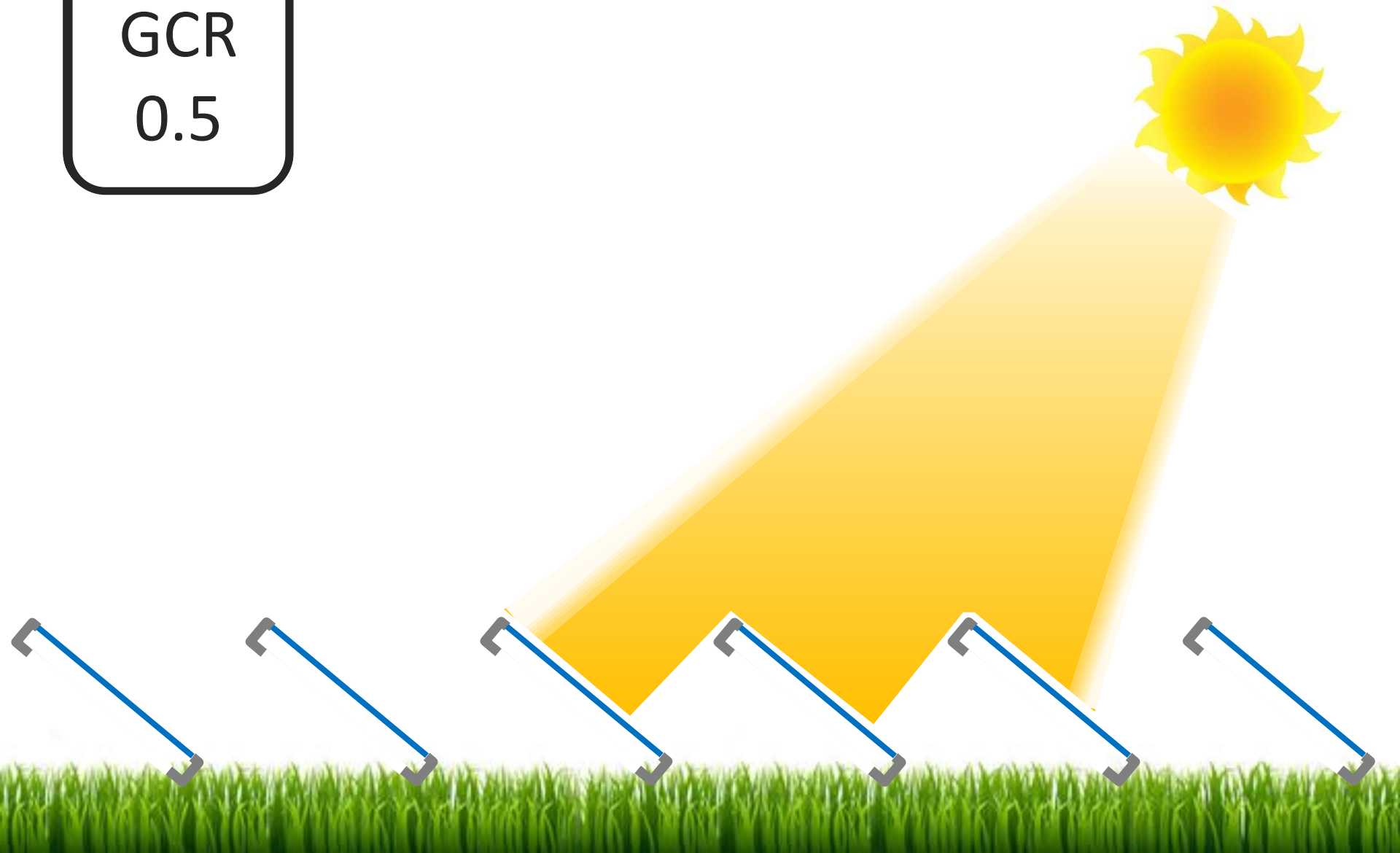


How to catch a photon



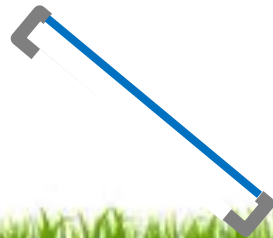
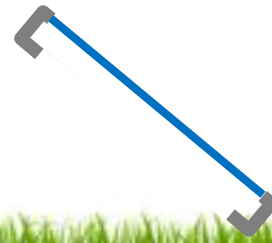
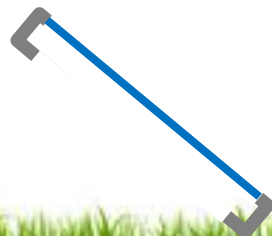
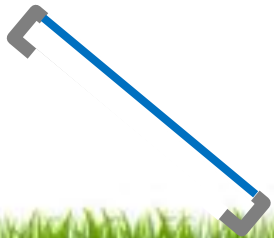
How to catch a photon

GCR
0.5

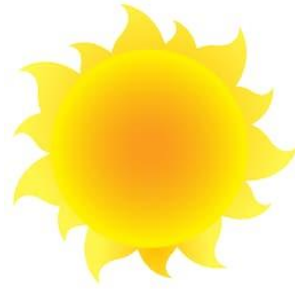


How to catch a photon

GCR
0.5



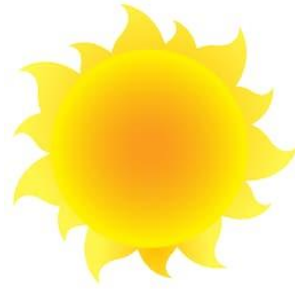
How to catch a photon



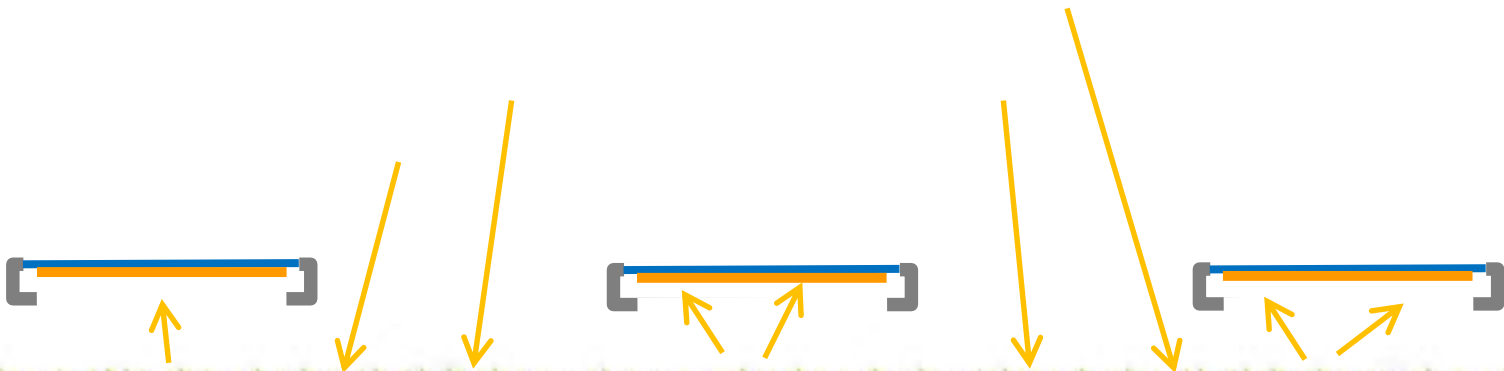
GCR
0.4



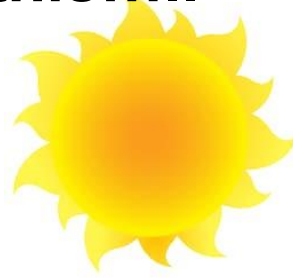
How to catch a photon



GCR
0.3

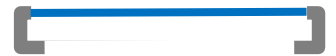
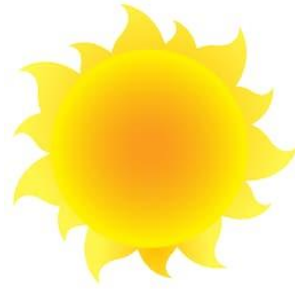


So how do we go from this.....



To this?

GCR
0.3



Several people are onto the high GCR approach

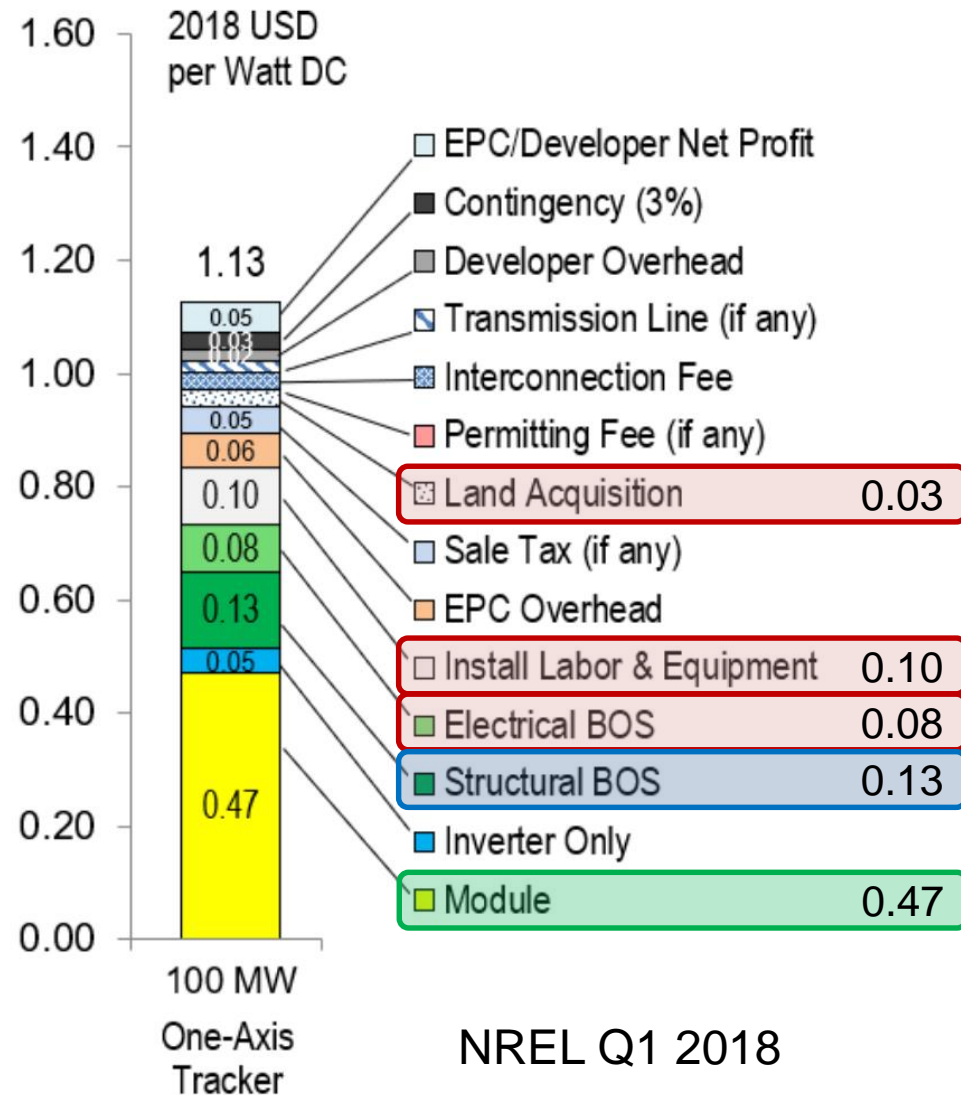


- Three current approaches that have in common a high GCR in their design.
- It is not the only value proposition of these approaches, but just one feature.



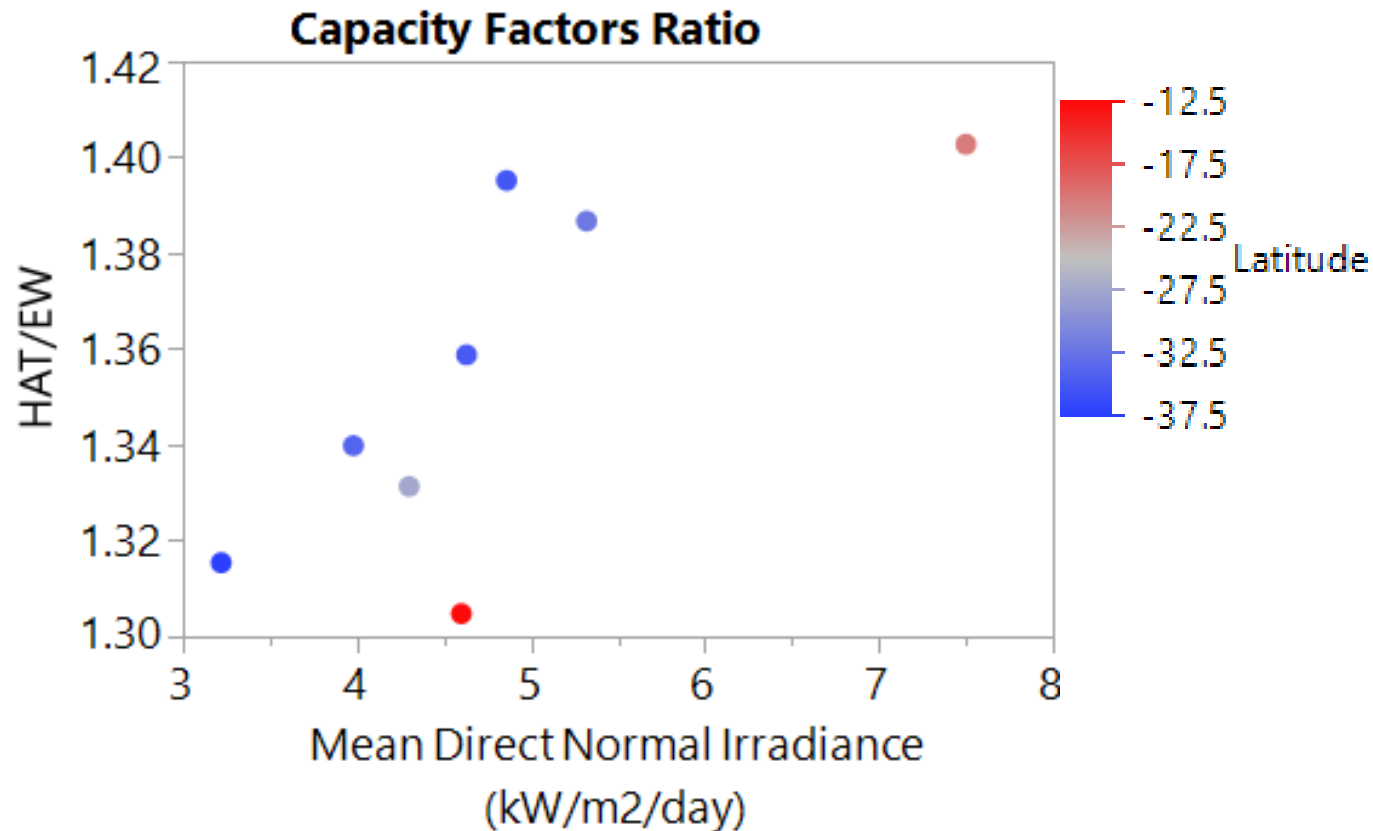
How do we make this decision?

- Start with the cost stack
- Some of these costs have a component that scale with land area.
- Most high GCR technologies are also trying fundamentally to remove structural costs.
- A single-axis tracker style installation has a higher **capacity factor** compared to a high GCR style installation.
 - This means each module makes more power
- When is it worth it and when isn't it?



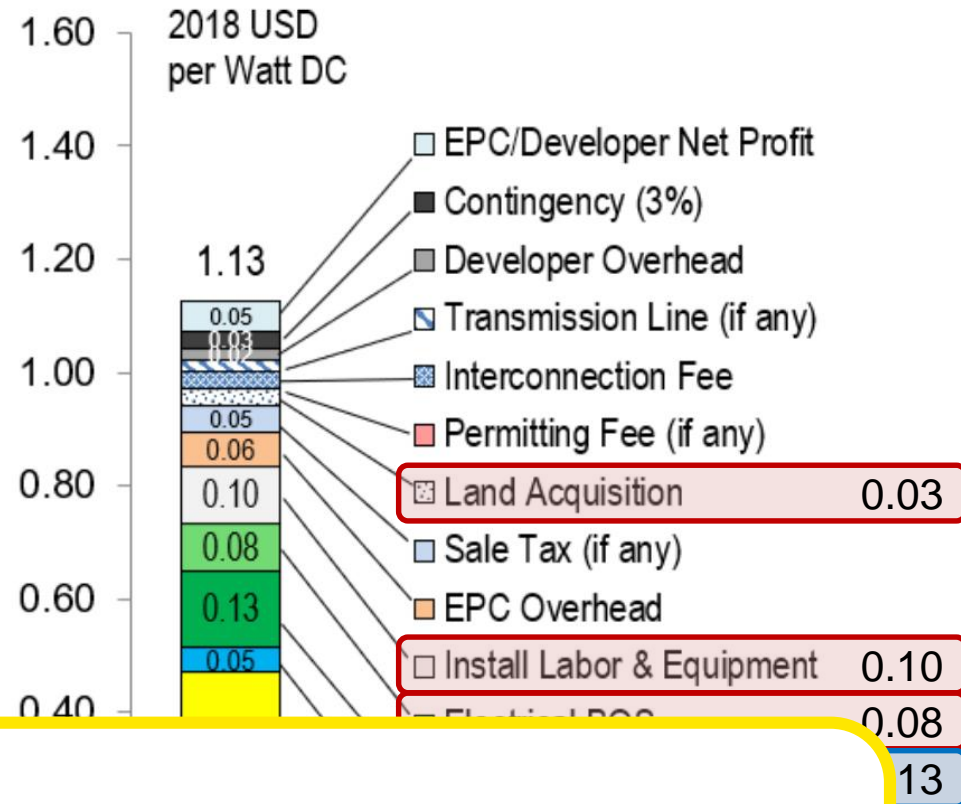
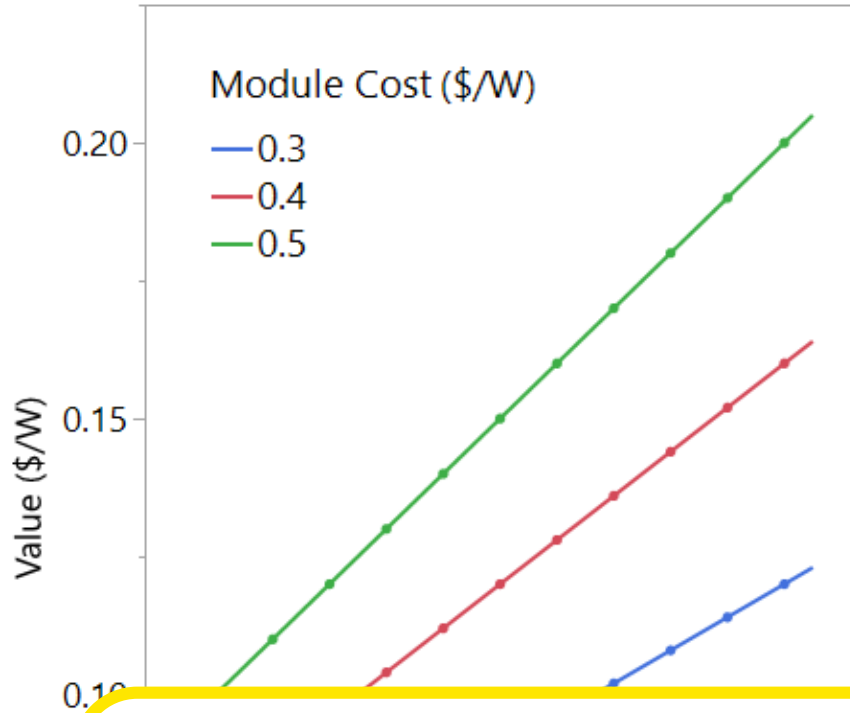
Capacity Factor Simulations

- Use SAM to model capacity factor of a 5B-style E/W array (EW) compared to a bifacial modules on horizontal single axis tracker (HAT) that are popular in Australian utility installations right now.



What is a capacity factor gain worth?

Value of Capacity Factor Improvement



And the winner is.....!

High GCR approaches are highly competitive and the best approach is context driven

Requires a high level of accuracy and confidence in your models

Capacity Factor Improvement

Tracker

But it can get even more complicated

- Land has cultural significance that can sometimes be irreconcilable with monetary values.
- Module technology and tariff structure changes will also impact on the equation.



Conclusions

- Purely from a cost perspective, high GCR approaches are highly competitive with dominant low GCR approaches
- Some aspects of bifacial technology will also suit High GCR approaches
- The best approach is very site and situation dependent and requires modelling accuracy beyond what has been shown here.
 - Further refinement is required on my introductory modelling.
- The balance is shifting further to low GCR approaches as module prices drop and as high GCR approaches mature and strip out other installation costs
- Land costs alone will only be a significant driver in some cases, but what other “value” will be placed on land as our energy system transitions.

Thank you

QUESTIONS?

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