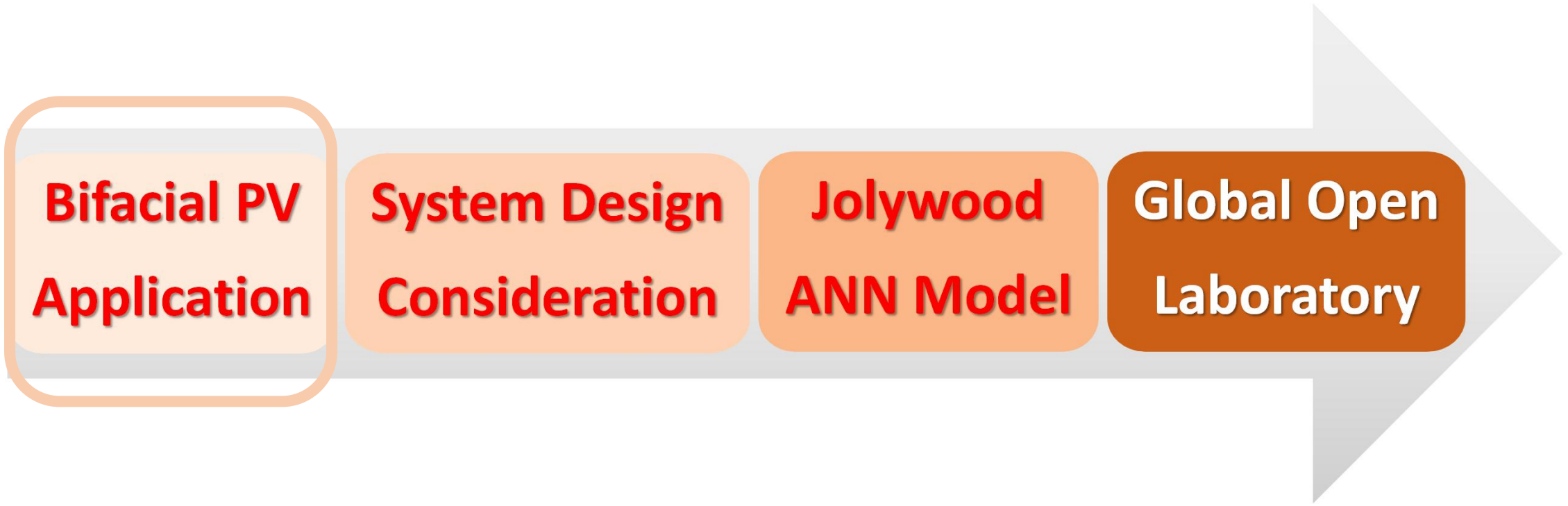
bifi^{n} PV System

基于人工神经网络模型的双面组件系统设计概念研究

Artificial Neural Network based Research in Bifacial PV System Design Concept

4 Dec. 2018, PVPMC 11th, Weihai, Shandong, China

中来股份 JOLYWOOD


Bifacial PV Application
System Design Consideration
Jolywood ANN Model
Global Open Laboratory

Jolywood, 3 Big Data

PV Module Back-Sheet: 25% global market share

N-type Solar Cell/Module: 2.4GW Capacity

Bifacial PV Application: 500MW+ bifacial PV projects

Jolywood, 500MW+ Project

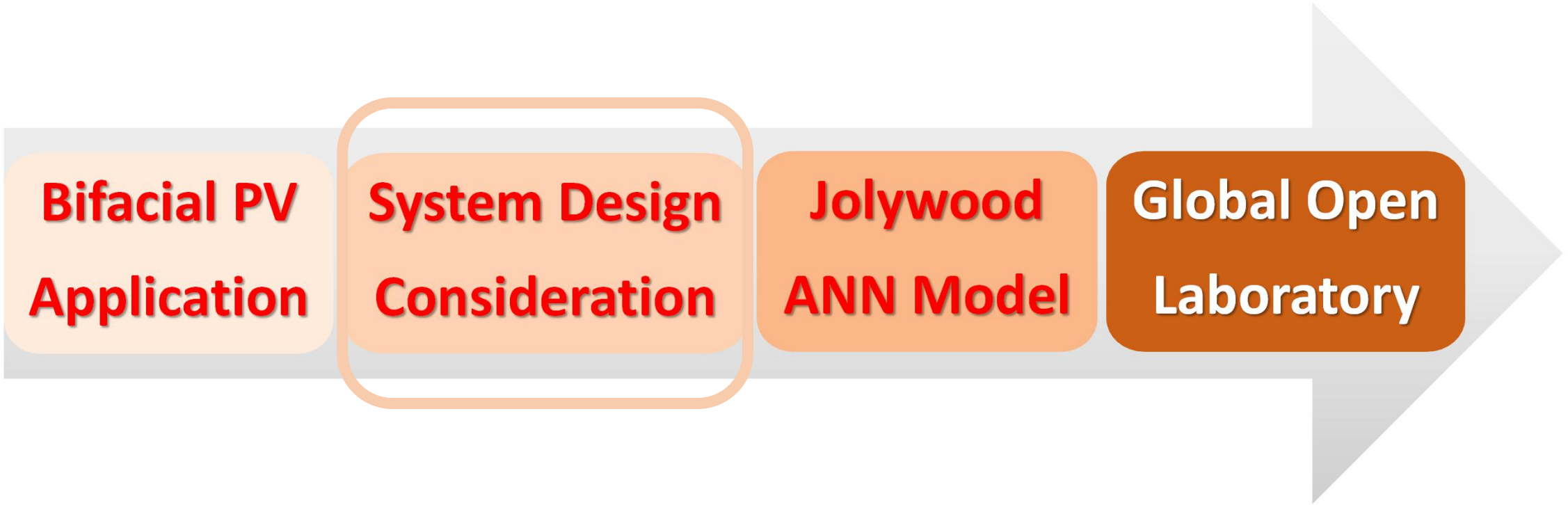
- Panda, 29.2MW, 2017

- TEBA, 30MW, 2017

- BG, 66MW, 2017

- SHANNENG, 44MW, 2018

- SPIC, PV-Fishing, 100MW, 2018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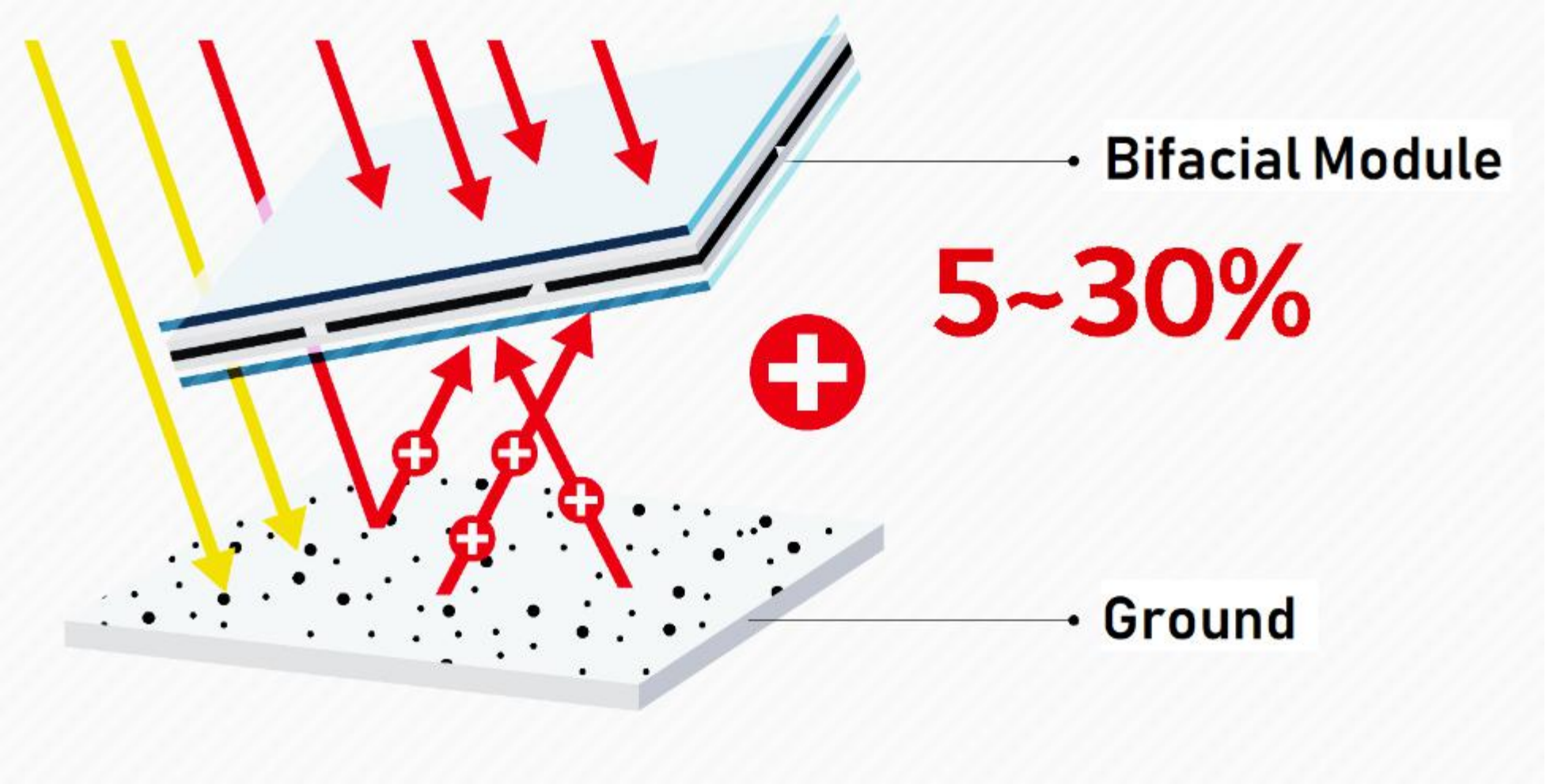
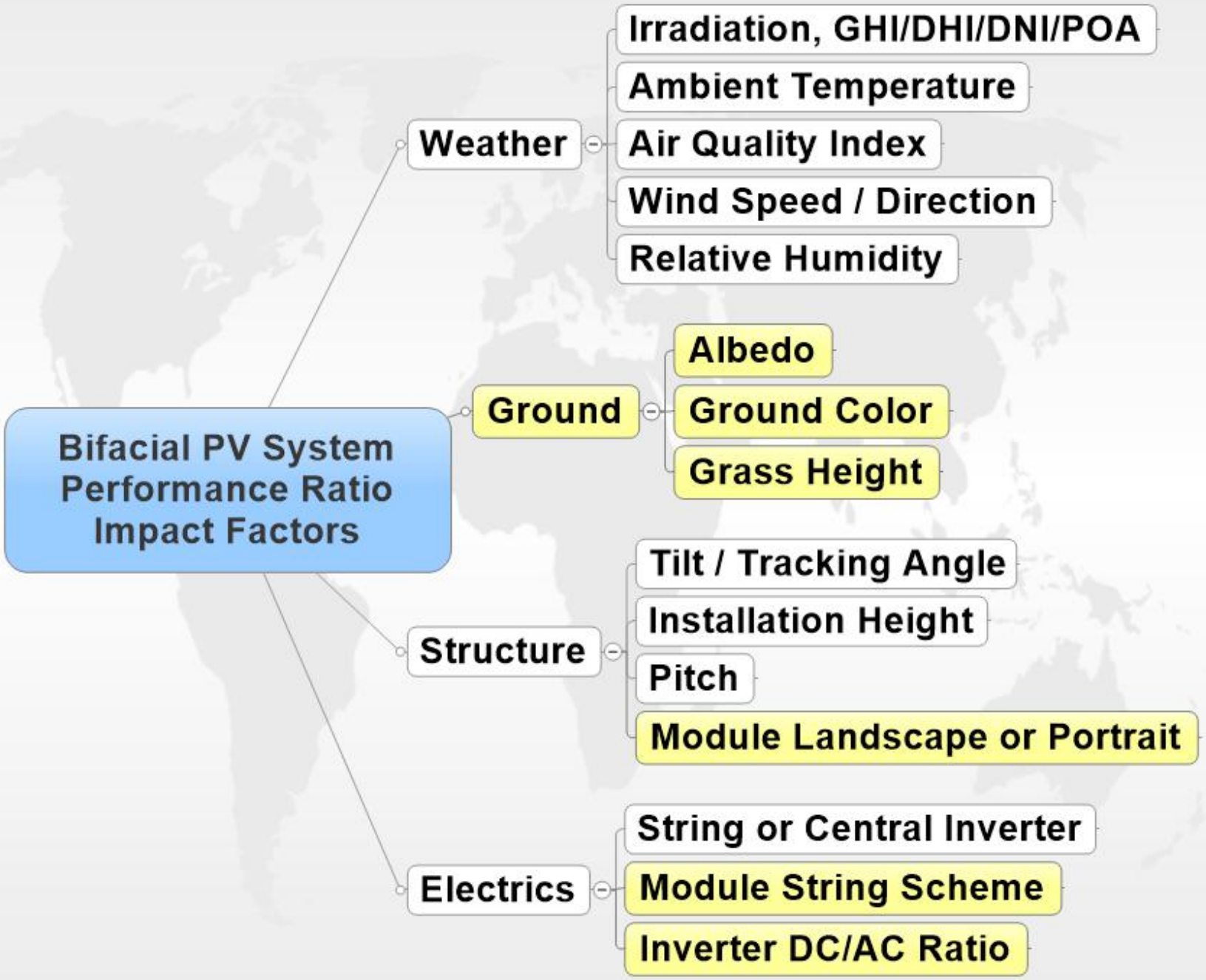
Bifacial System Modeling

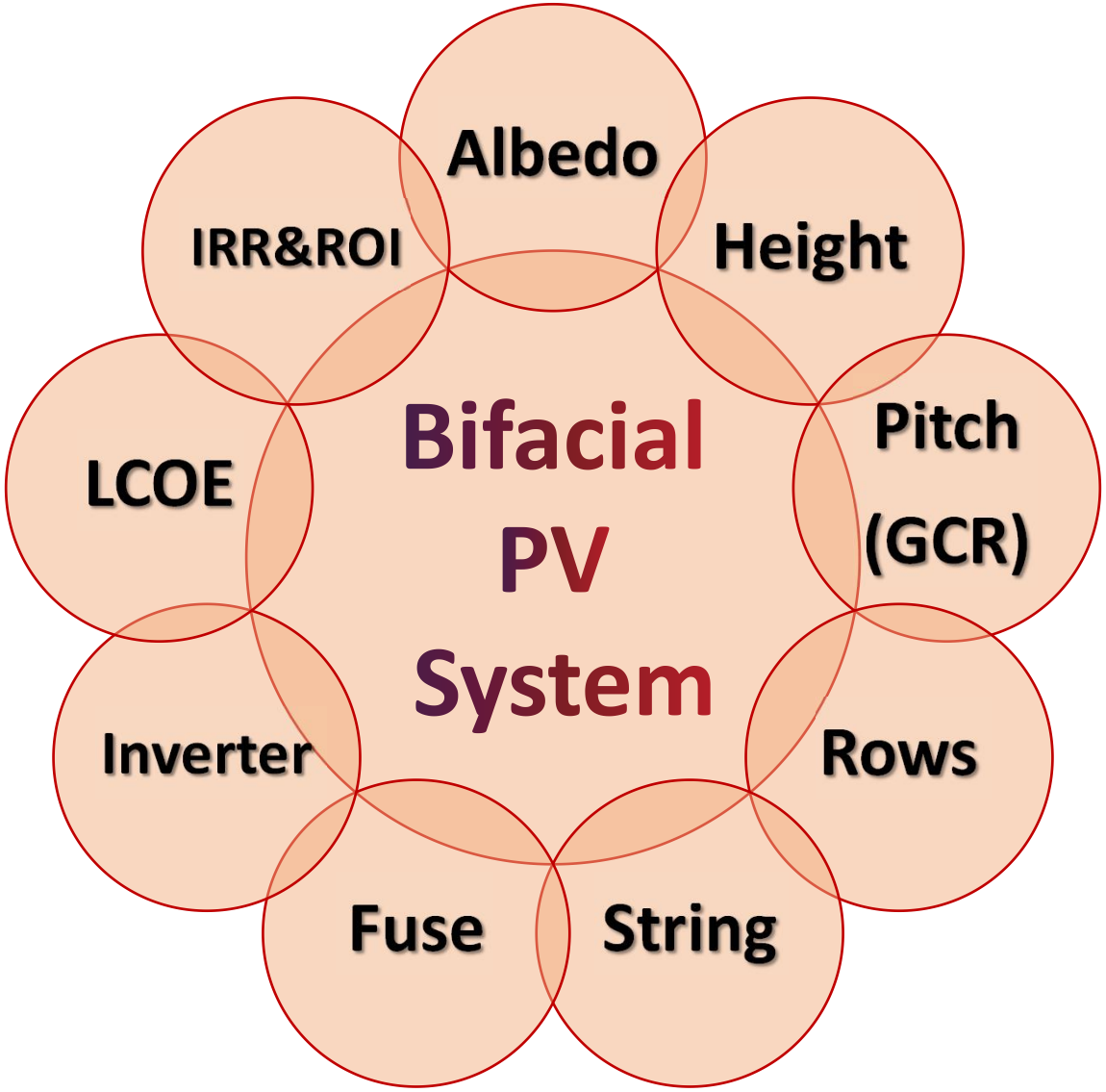


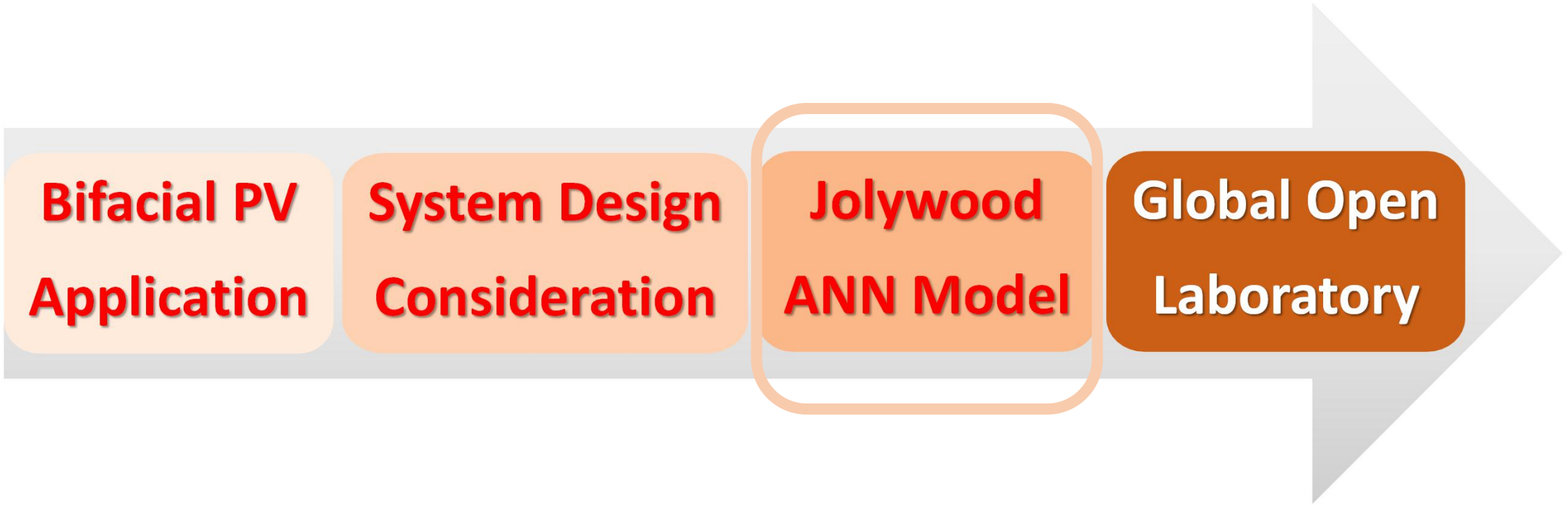
Factors

- [ ] Both
- [x] Bifacial



Nine Considerations

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Data

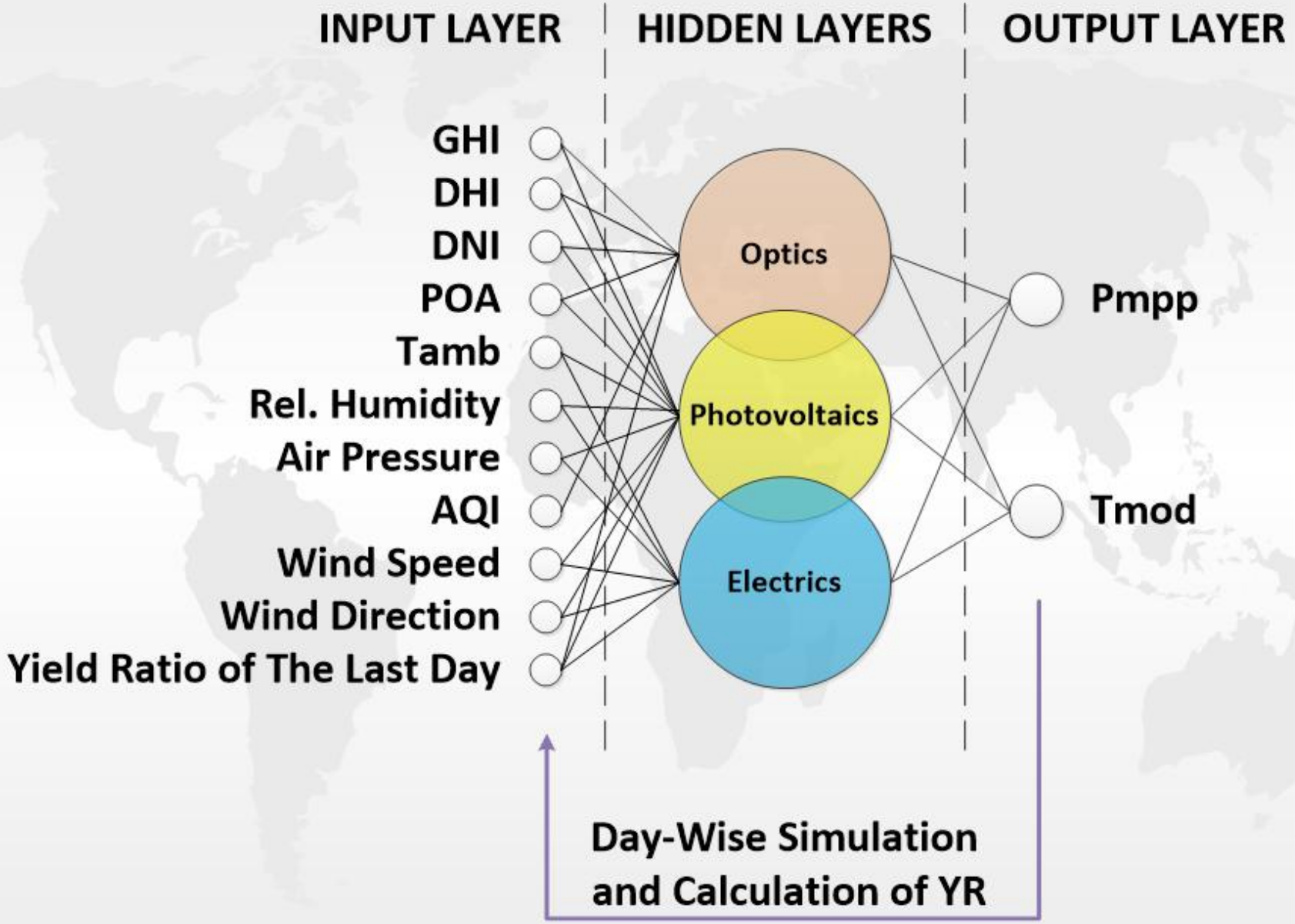
Algorithm

Model

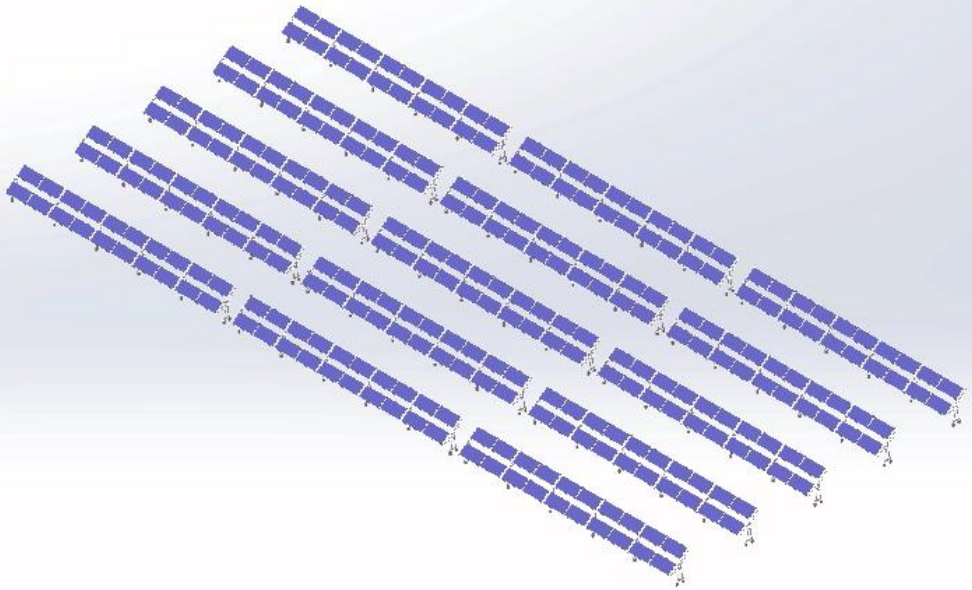
Artificial Neural Network Model
人工神经网络模型

Non-Linear
非线性
Non-Locality
非定域性
Non-Stationary
非稳定性
Non-Extremum
非极值性

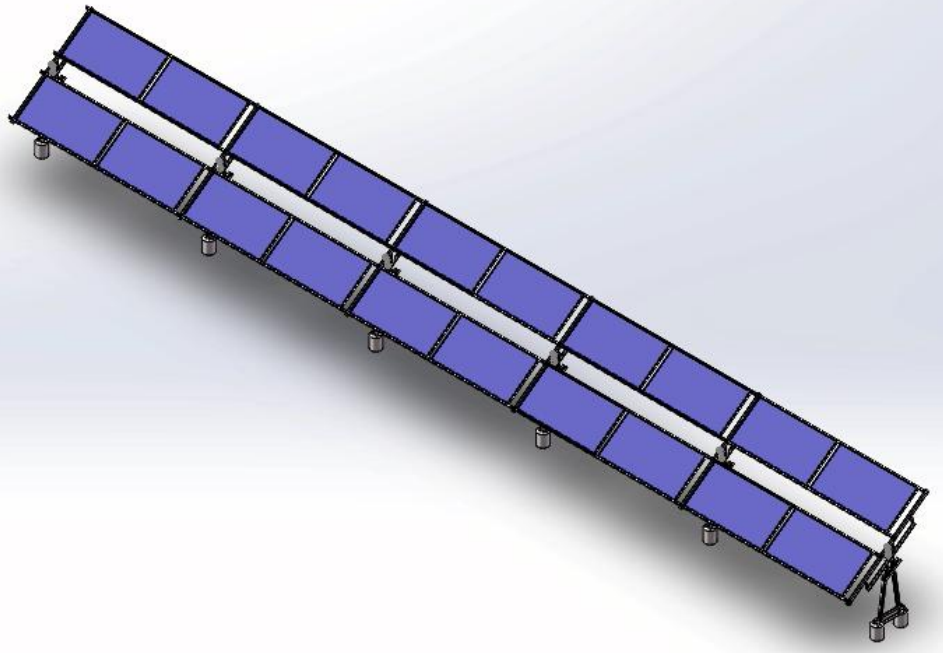
Jolywood bifi-ANN Model



3D Model – Project Level

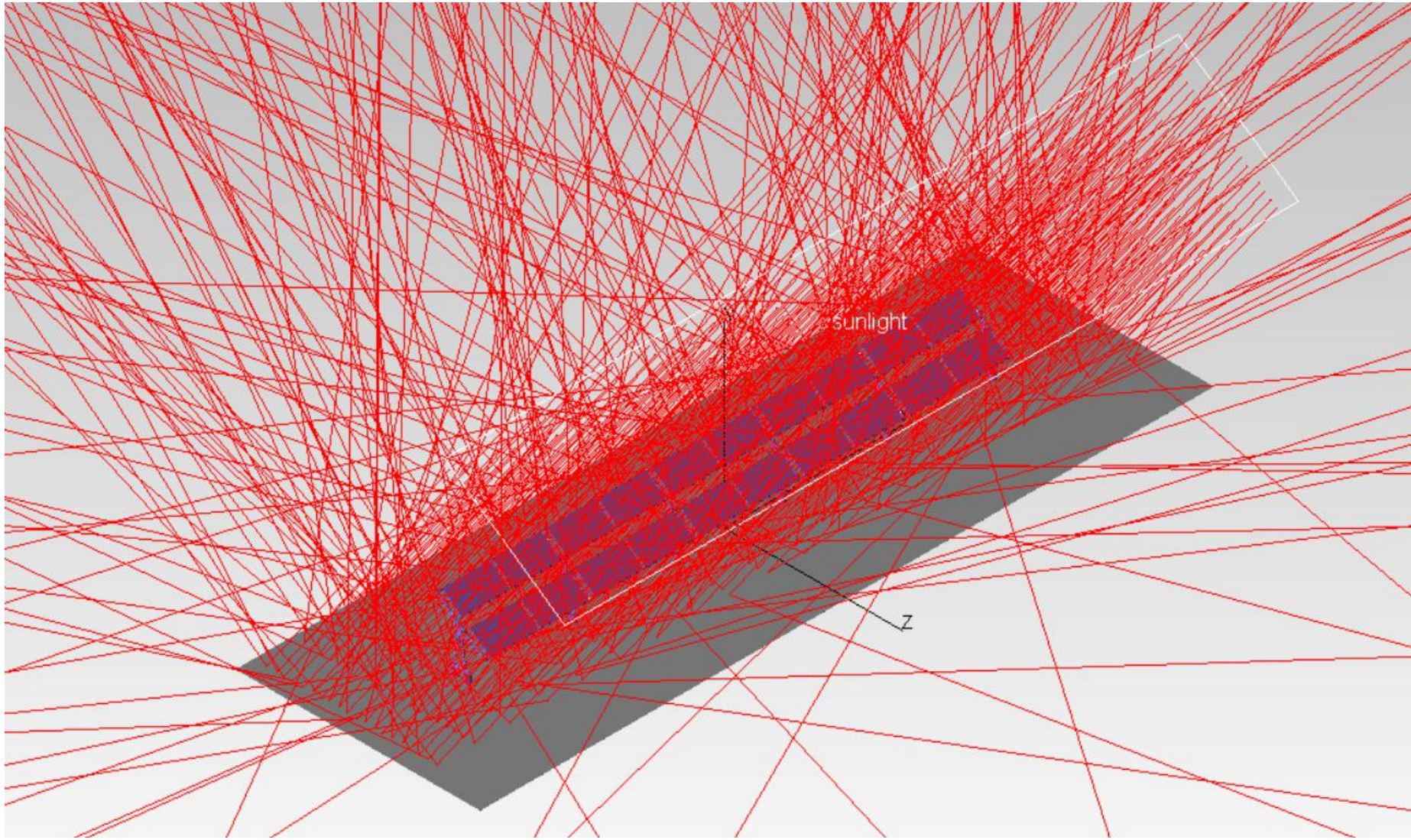


System – String – Module 3D Model



Optical Model – System Level

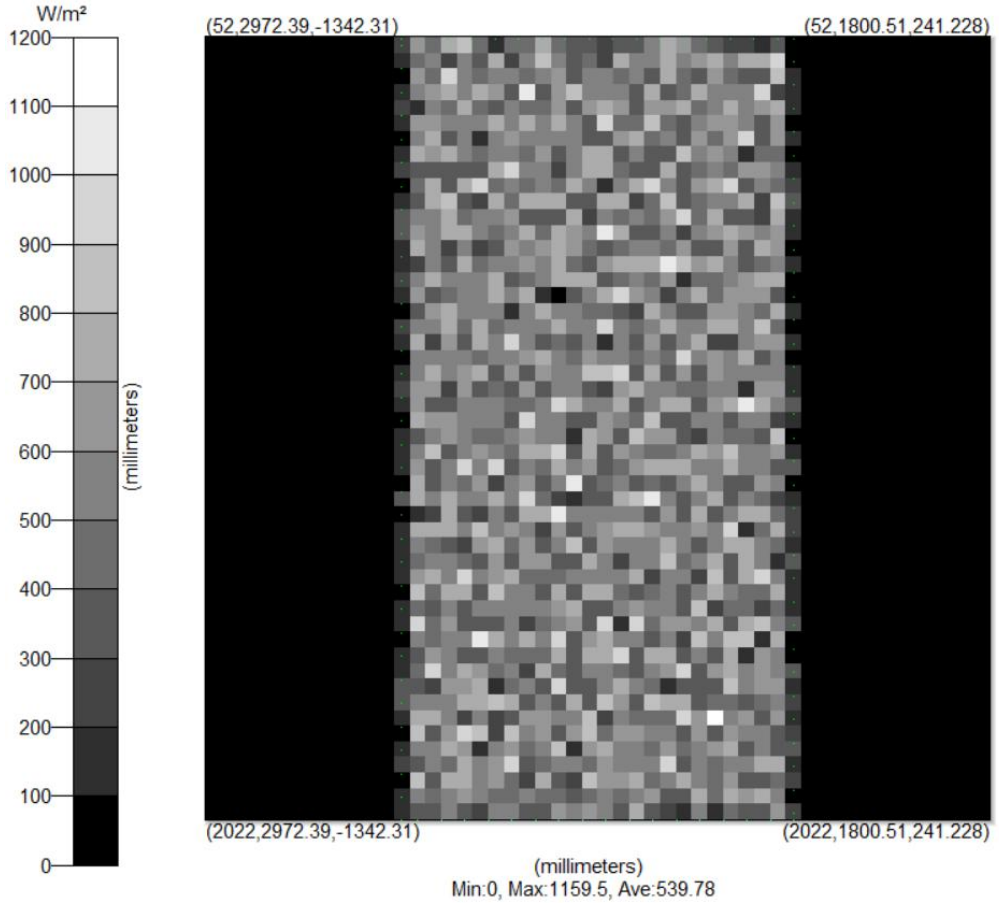
Sunlight
Ray Trace



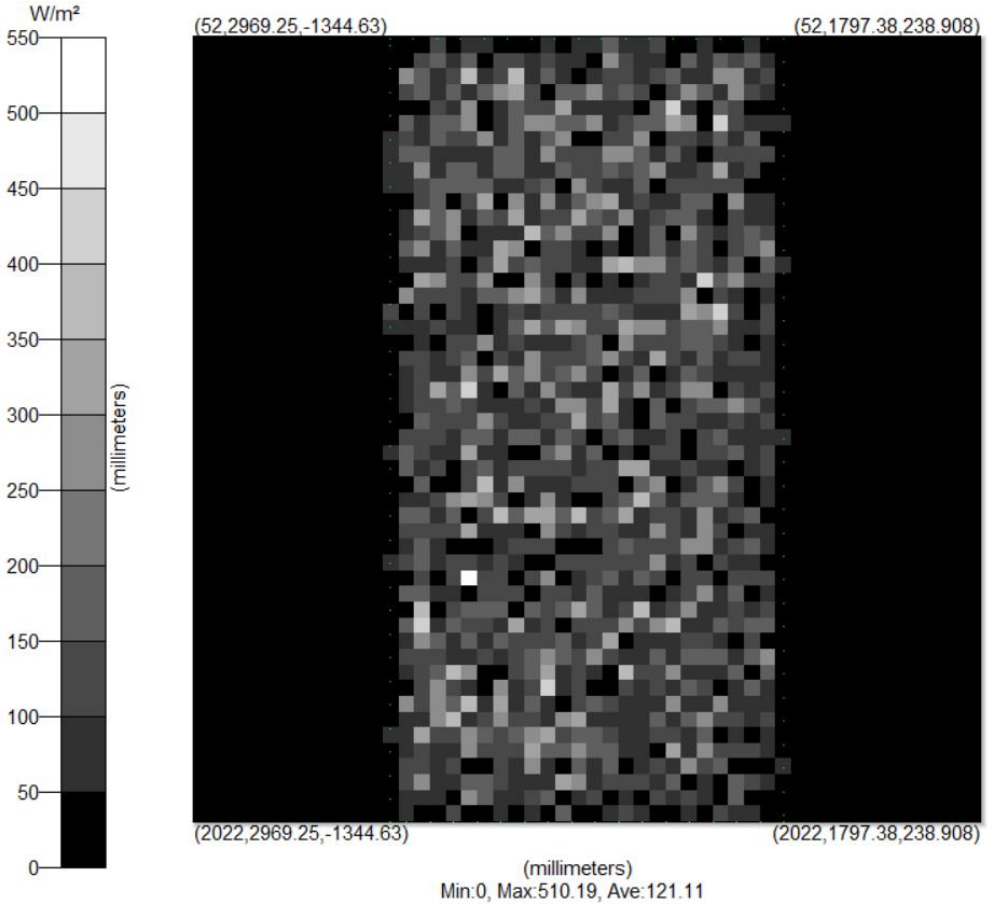
Module Optical Model, 12:00 pm

Irradiance Map

Front Side
(539.78)



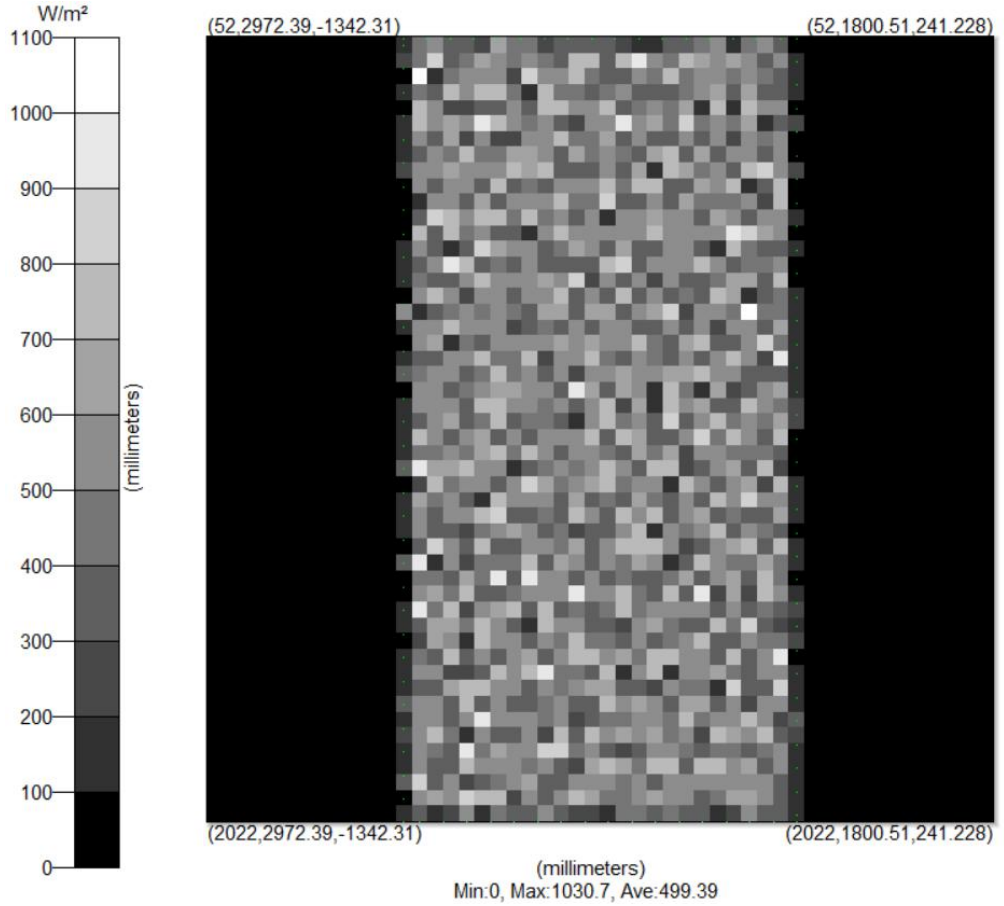
Rear Side
(121.11)



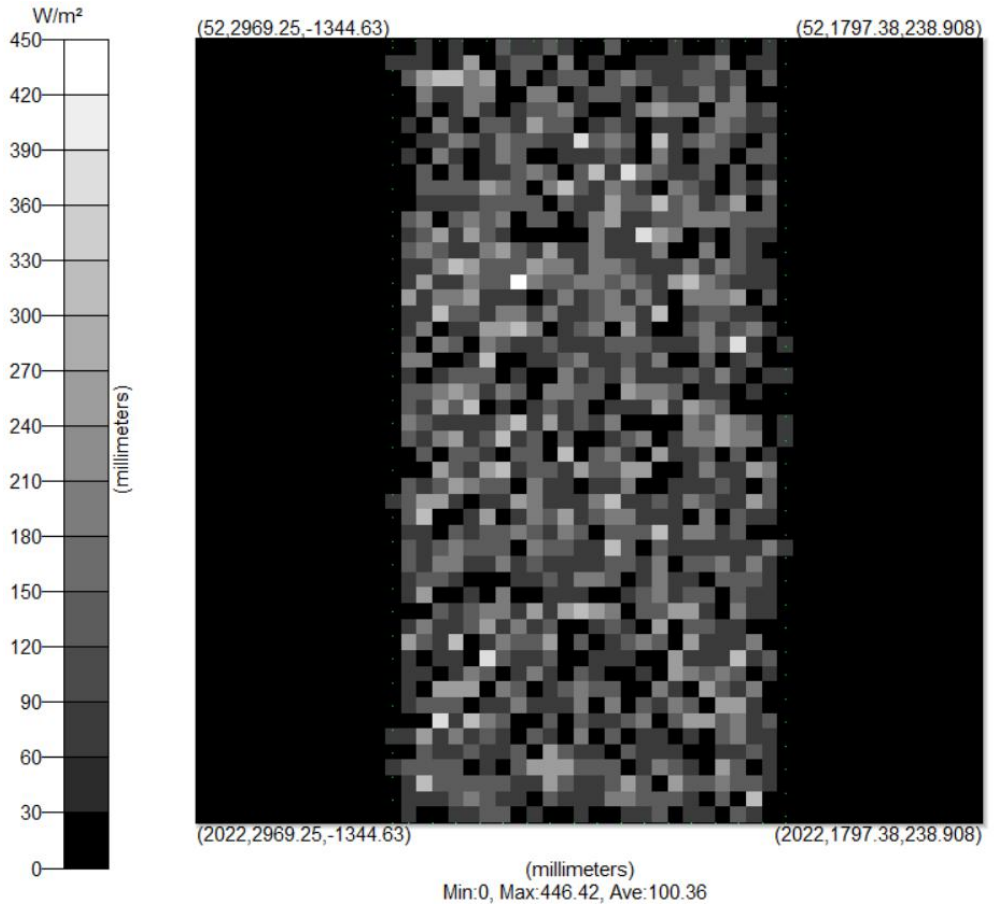
Module Optical Model, 14:30 pm

Irradiance Map

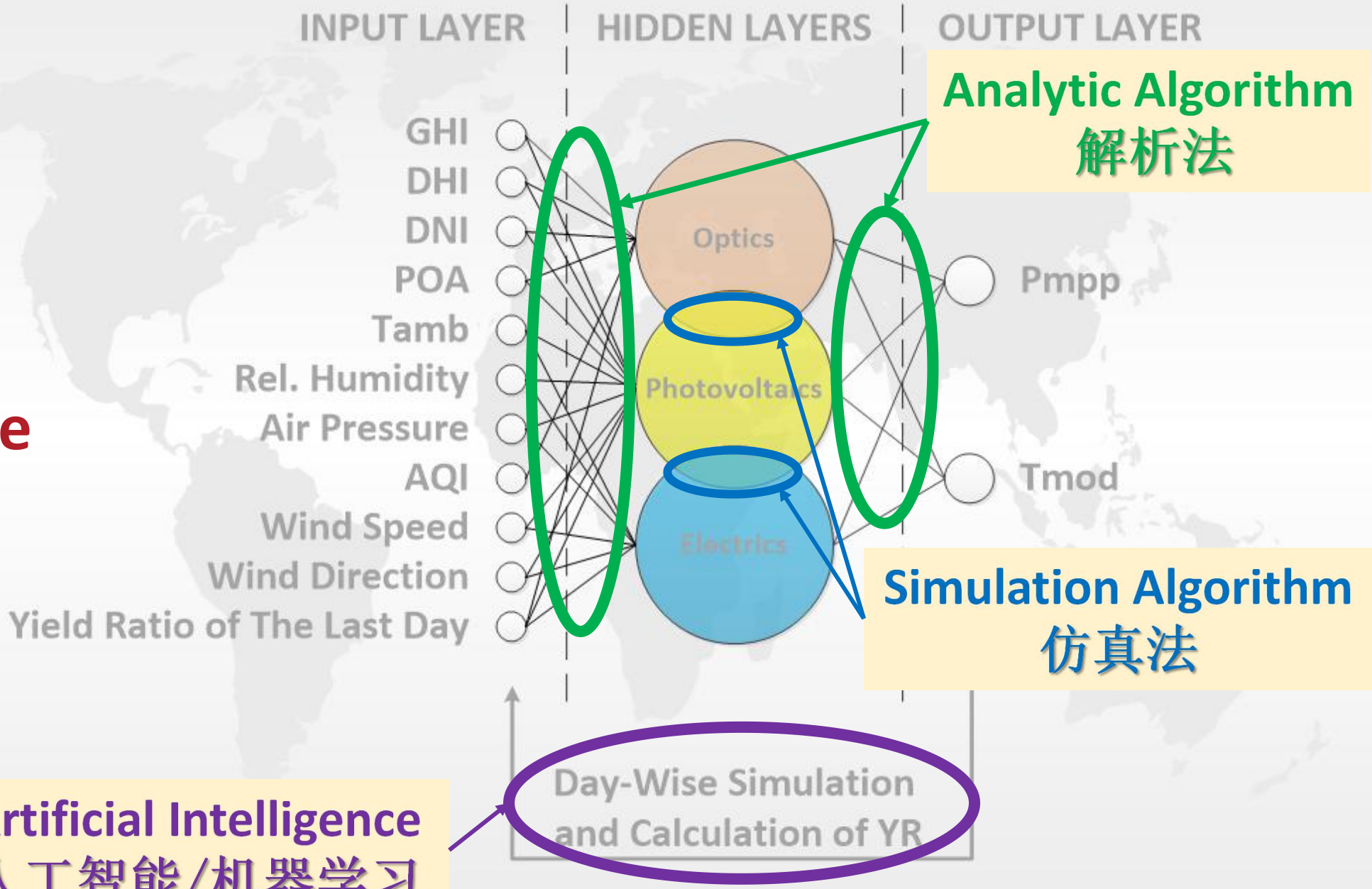
Front Side
(499.39)

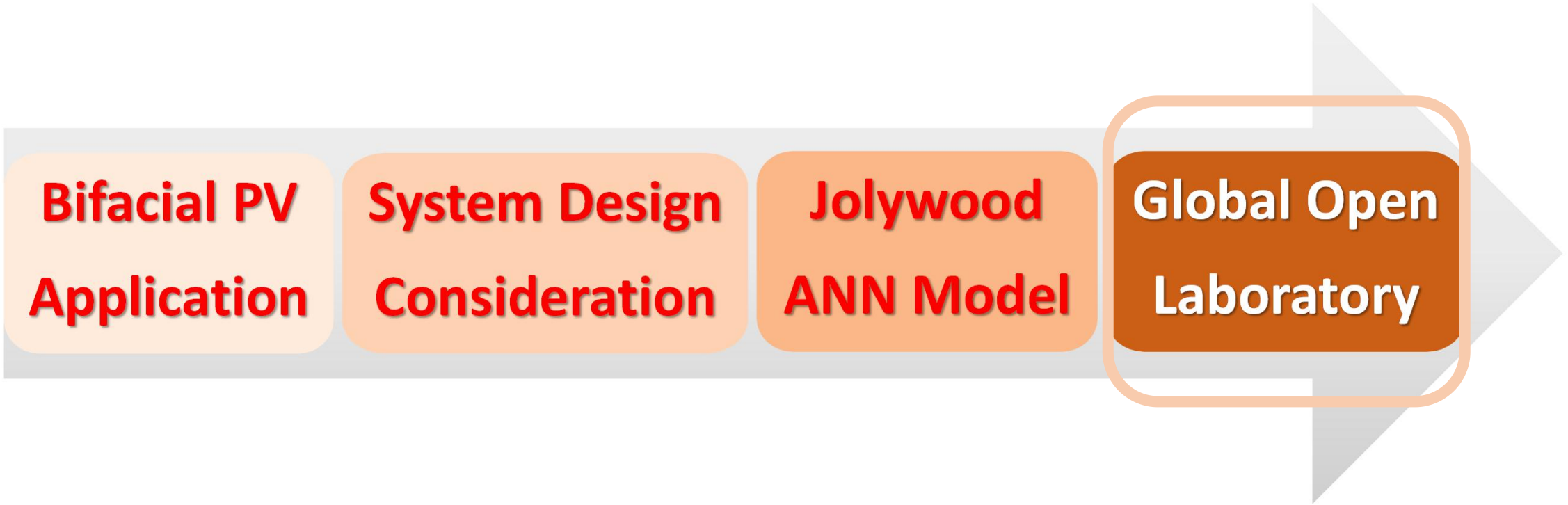


Rear Side
(100.36)



Algorithm Architecture Overview

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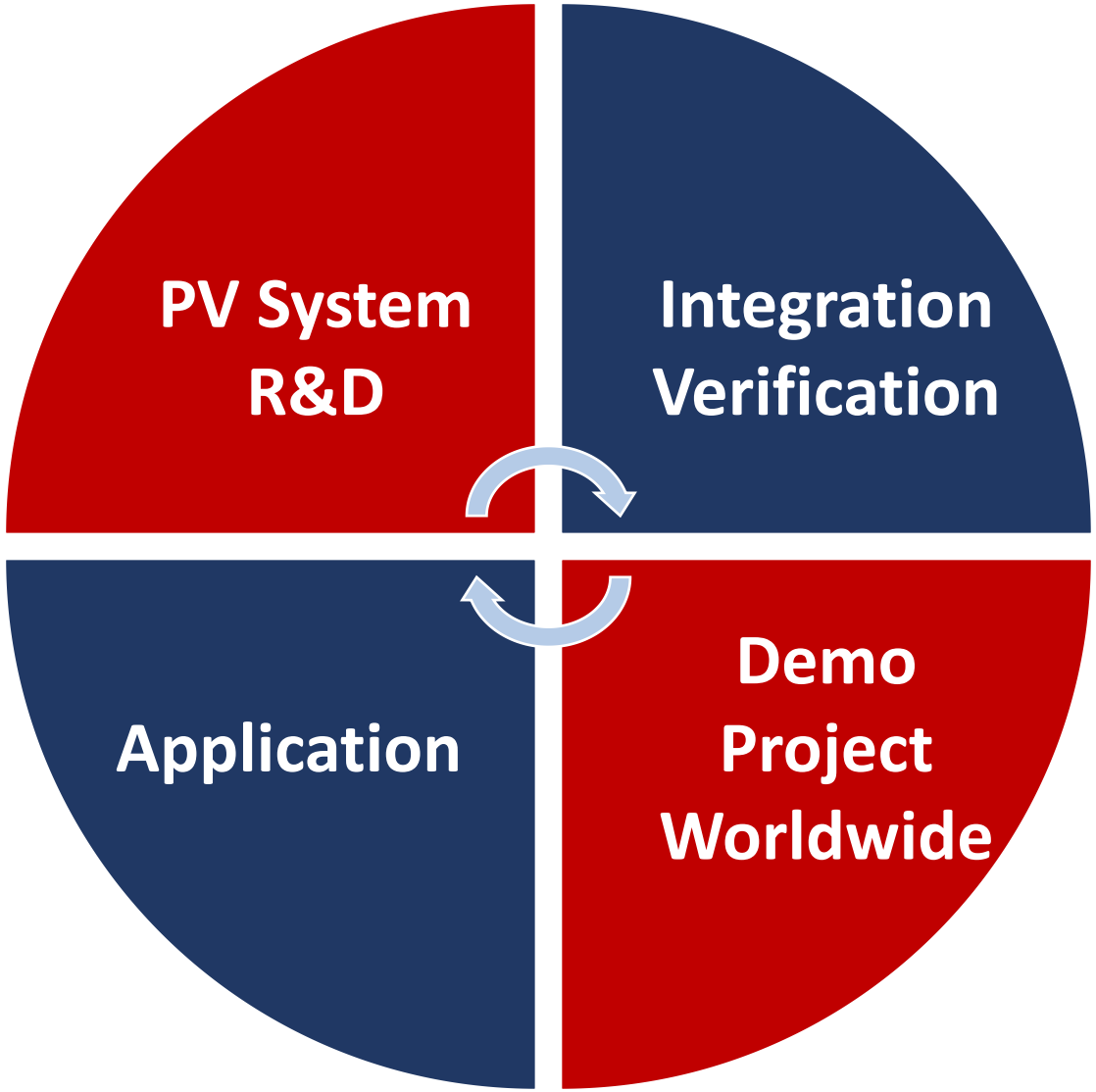
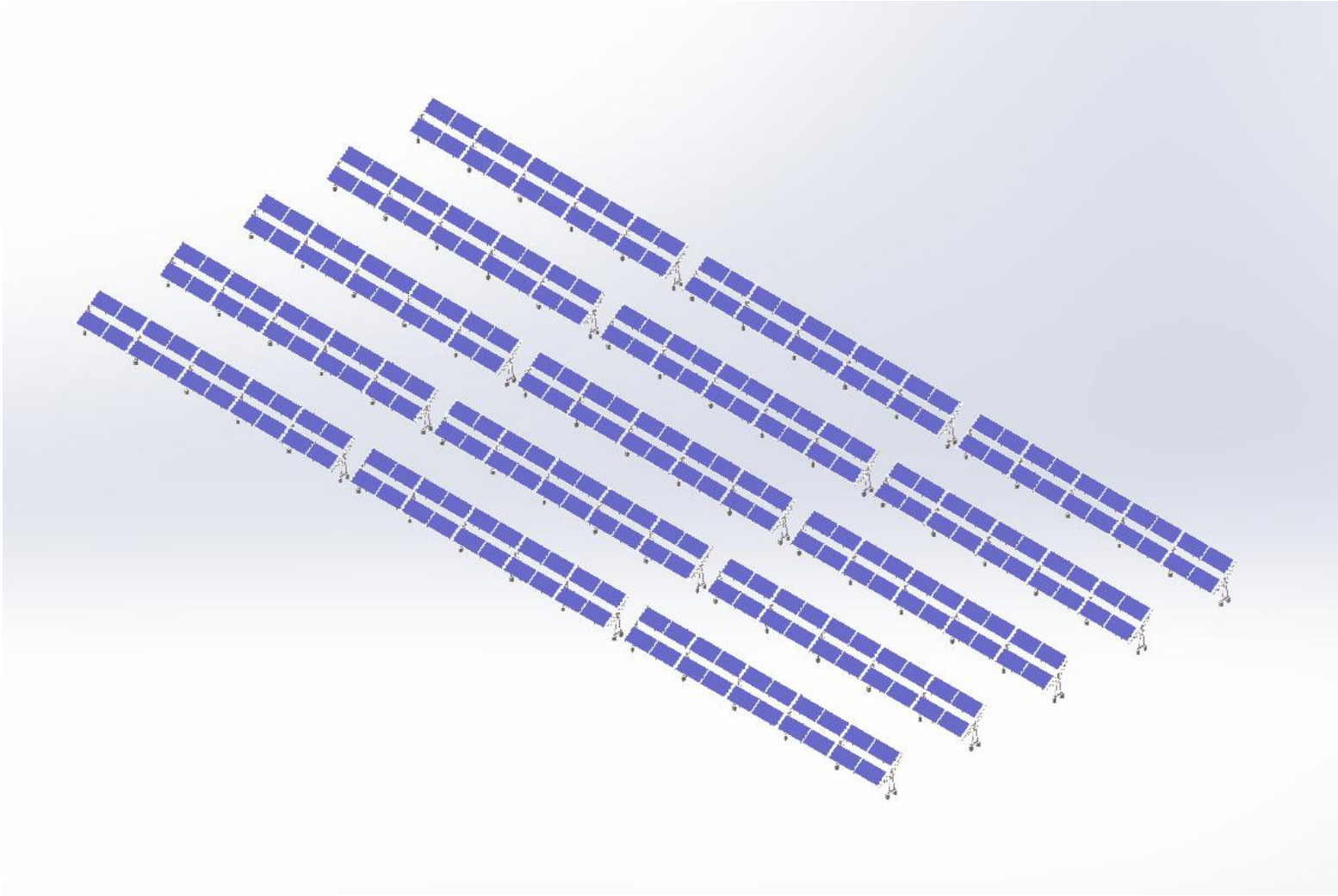


Test Base Configuration

- N-type bifacial PV module
- Tilt angle-adjustable rack
- Total power 108kWp
- String inverter
- Soil/grass/cement ground
- Test from Jan to Dec in 2019



Demo Project & Test Base Worldwide

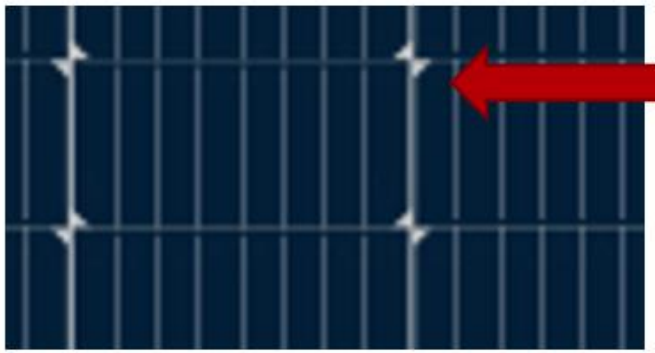
Summary

- Future of the bifacial PV technology is promising.
- 双面光伏发电技术的发展前景值得期待。
- Extra gain varies from 5 to 30% due to the system design.
- 系统设计优劣会影响背面增益从5%到30%变化。
- ANN model may be a good way of bifi-PV system design.
- 人工神经网络模型用于双面组件系统设计是有益尝试。

New product-1

N-Type TOPCon
Ultra-high efficiency PAVING bifacial modules

	Feature	
High Eff	High efficiency	Ave. cell eff 22.5% ， 78-cell front power 420W
	Bifaciality	80%
High performance	No LID	N-type cell no LID
	Low NOCT	NOCT: 3~5℃ lower than standard modules
	Low Temp coeff.	-0.32%/K
	Excellent weak illumination response	Better performance at low illumination environement
	30 years lifetime	30 years lifetime for glass-glass module

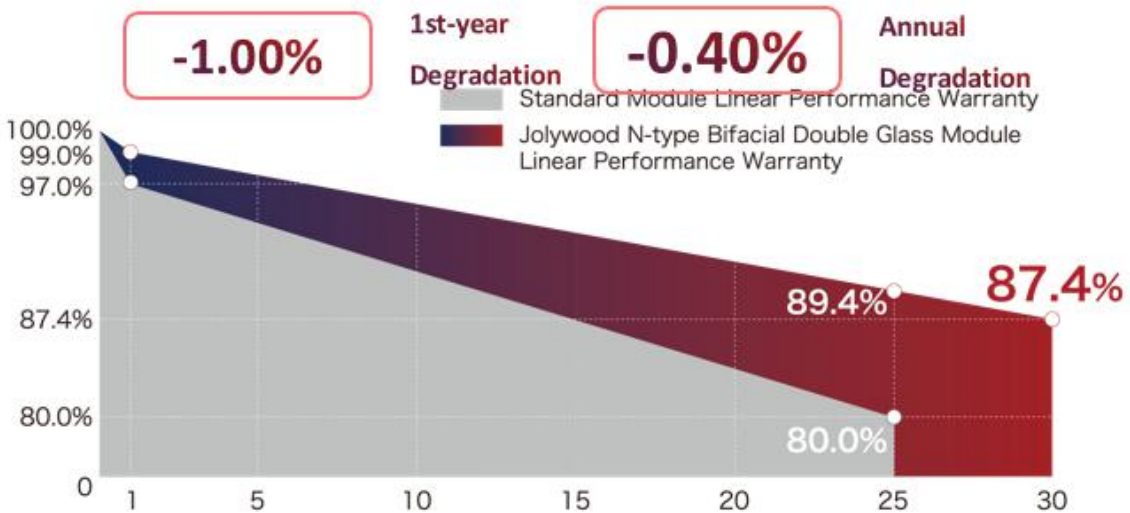


1.No spacing between cells

using super-soft ribbon in the rear side

2. Front side using Non-visible ribbon, which can increase optical total reflection •

JW-HD156Nseries



Flexible Module
Multi-functional, easy-access

中来股份 JOLYWOOD

Light weight new product-2

Super light

70% weight reduced
4-4.5Kg/m2

Flexible

Compatible with curved surface

Easy to install

Installation cost reduced by 50%

Transportation Cost low

Logistic cost reduced

Wide application

No bottleneck on mechanical load

Durable

Reliable material and process

JW-HF120 flexible module
280W—300W

THANK YOU

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