



Harvesting the Sun

Design for Solar Rooftop

Ashwini K Aggarwal

PhD Scholar, FMS&R/ AMU Roll # GJ-0186

Director- Government Affairs, Applied Materials India

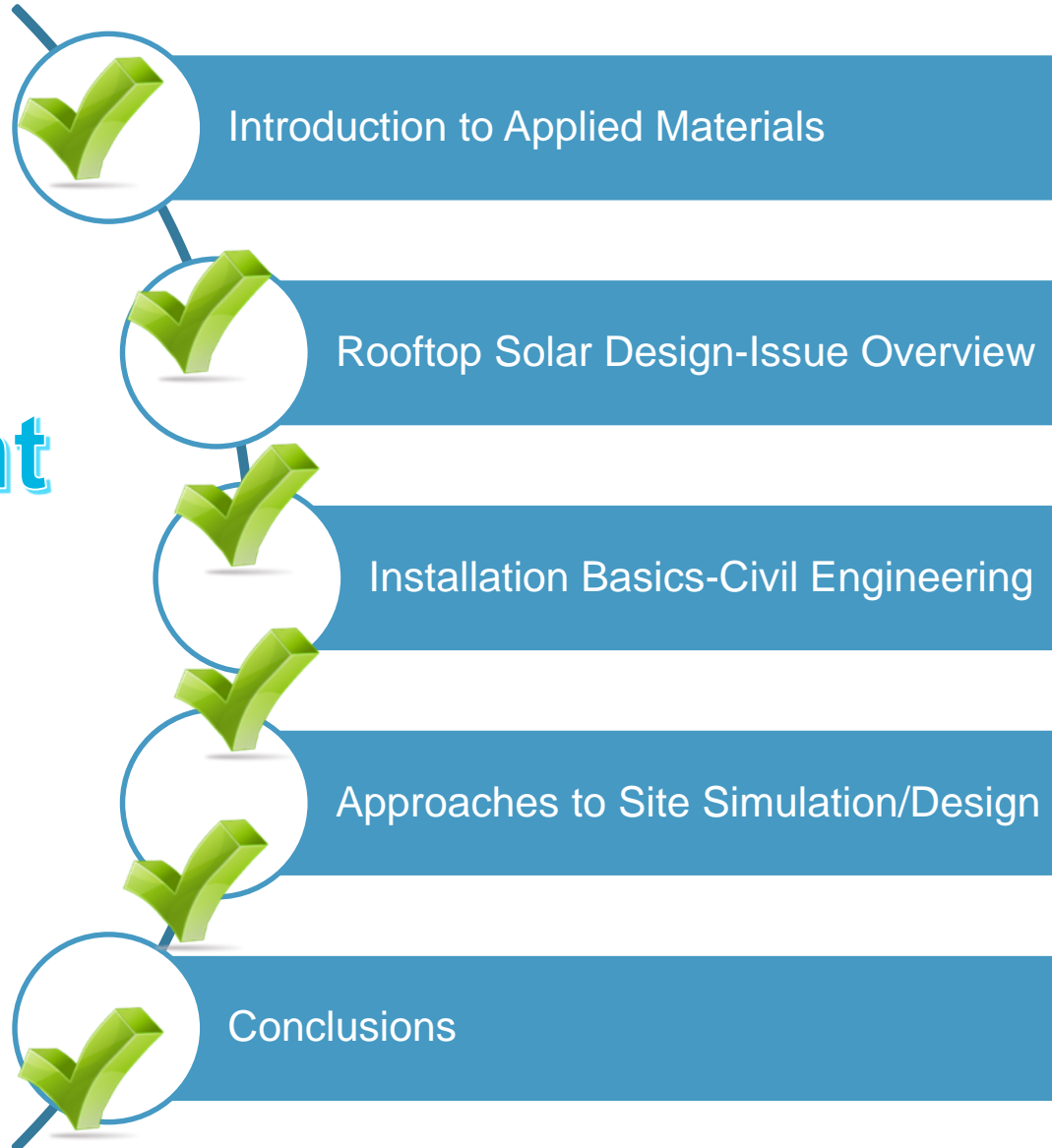
Advisor & Past Chairman, India Electronics & Semiconductor Association

AMU, 20 Dec 2018

Designing Successful Rooftop Solar Installations



Content Flow



Introduction

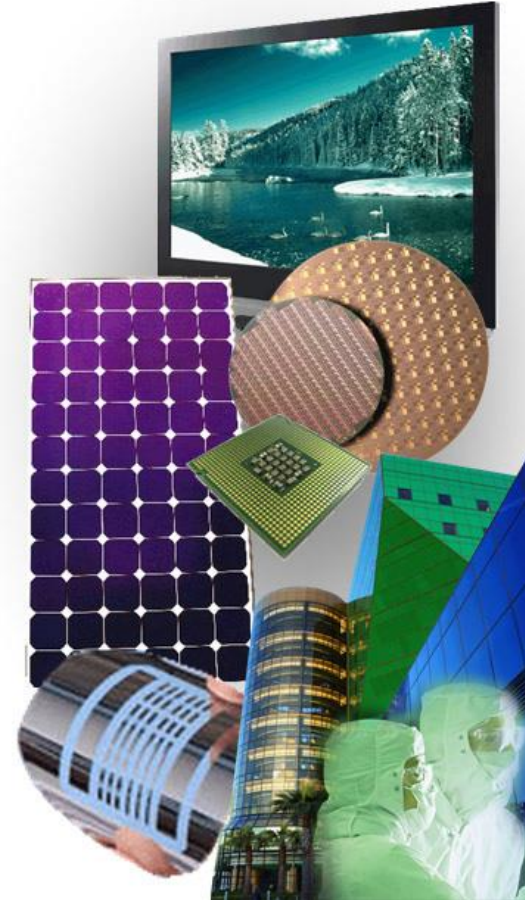
Introducing Applied Materials



Applied Materials – Who We Are

Applied Materials is the global leader in Nanomanufacturing Technology™ solutions with a broad portfolio of innovative equipment, service and software products for the fabrication of:

- Semiconductor chips
- Flat panel displays & Tests
- Solar photovoltaic cells and modules
- Flexible electronics
- Energy efficient glass
- Energy storage devices
- ...and more...





WHAT WE DO

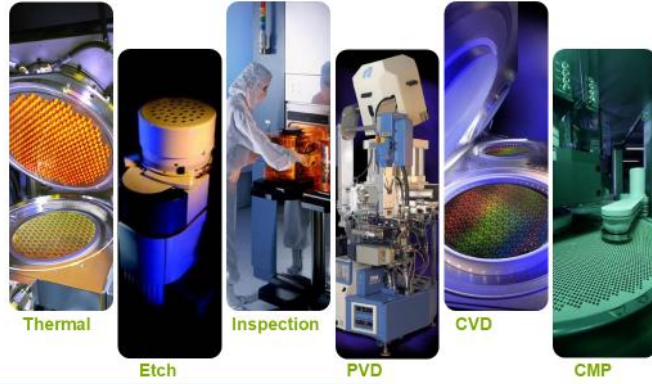
We make the **equipment** that makes the components that change the world.



We lead precision materials engineering...



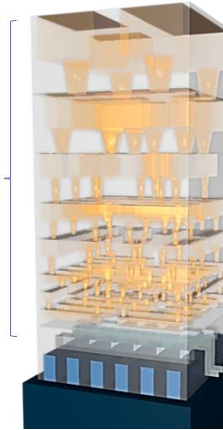
Silicon Systems



We make the systems used to produce virtually every new microchip in the world

Lowering Interconnect Power Consumption

Multilayer low-k films insulate the copper wiring



Interconnect power is $\sim 1/3$ of total chip power consumption*
Lowering the dielectric constant, κ , improves insulation and lowers device power use

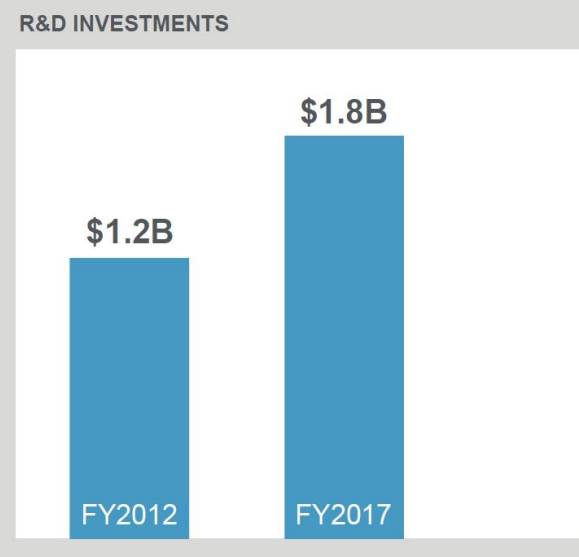
FMS&R_AMU/IAKA QJ-0106

7

Long-term Value Generation with IITB



Investment in Innovation



MAYDAN TECHNOLOGY CENTER

World's most advanced 300mm R&D lab
\$300M invested in past 3 years

APPLIED VENTURES

APPLIED VENTURES

>\$250M assets under management
>30 active companies

Intro- Ashwini (www.india-inspires.com)



- AMAT-Government Affairs
- Technical/Policy Research Role
 - ▶ Jumpstarting Electronics
 - ▶ Solar Supply-Chain
 - ▶ India Semiconductor Demand Estimation
 - ▶ Market Enabling Intervention strategies
 - ▶ More...
 - USISPF solar taskforce chair 2011-1
 - ELCINA EC member
 - CII ICTE / S&T task force member
 - ESSC Board Member 2016-17
 - & ESSC SME For Solar/Chair-Solar&LED NOS Committee
 - FICCI ICTE / mfg/renewable committee member...and more

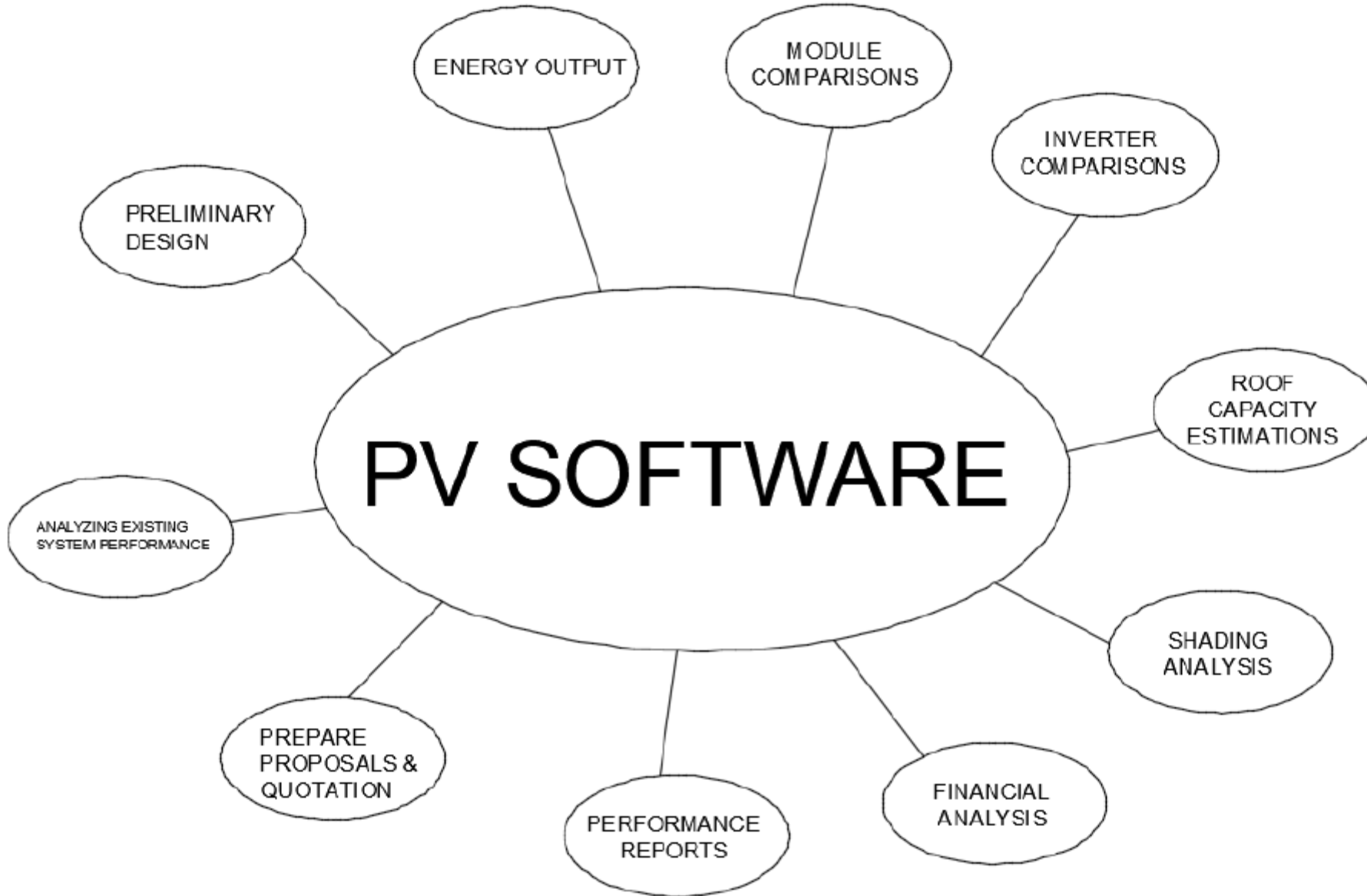


- Married with two brilliant daughters
- Younger daughter topped Class XII All India CBSE 2009
- Both daughters married, working in MNCs

- Self propelled, Very structured, soft-spoken, high values, high empathy
- www.india-inspires.com
 - ▶ Eye-care cause
 - ▶ Innovation/startup cause
- PhD, FIETE, SME Solar & Chair NOS-Solar, ESSC

Rooftop Solar Overview of Issues

Need for Solar PV Site Simulation Software



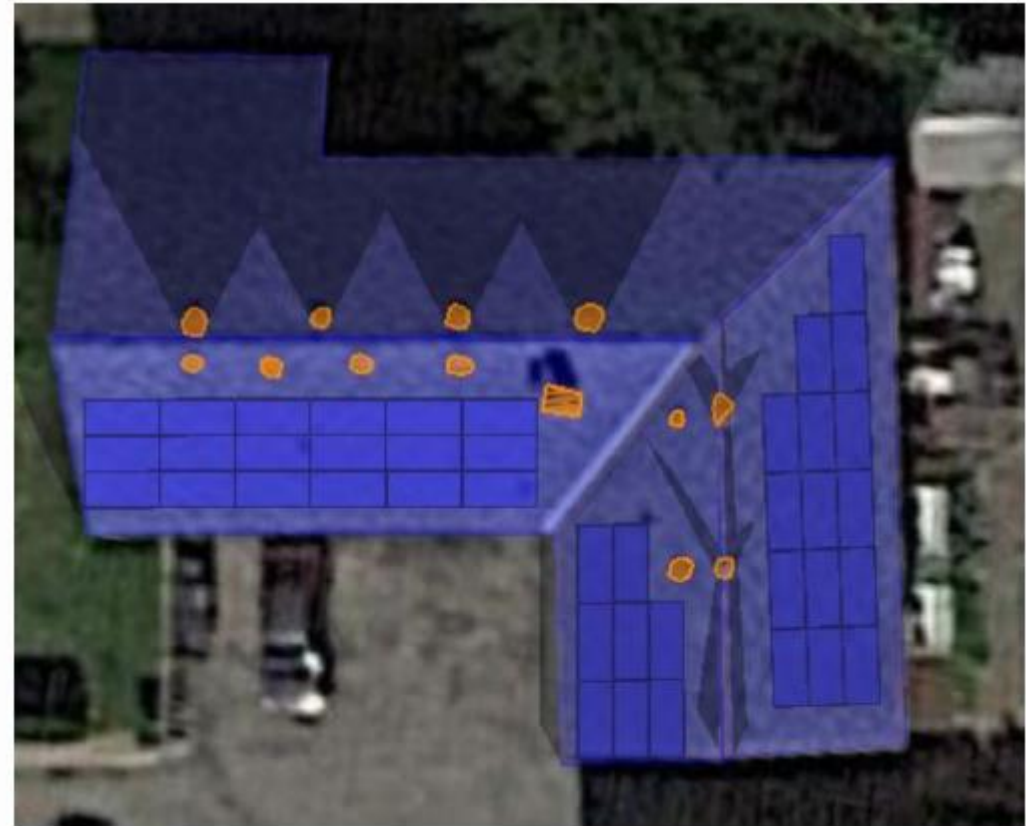
Major use of site simulation software



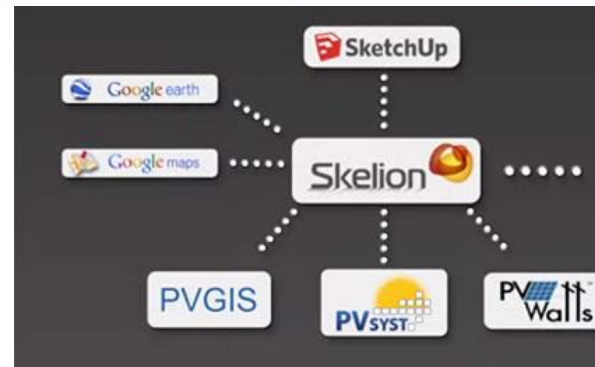
ENERGY OUTPUT	MODULE COMPARISONS	INVERTER COMPARISON
<ul style="list-style-type: none">• PREDICTION OF OUTPUT ENERGY kWh OF PROPOSED PLANT• PERFORMANCE RATIO (EFFICIENCY OF PLANT)	<ul style="list-style-type: none">• TRINA 330 W_p VS JINKO 330W_p• HOW DOES MONO COMPARE WITH POLY?	<ul style="list-style-type: none">• KACO VS FRONIUS VS SMA?• CENTRAL VS STRING VS MICRO-INVERTER

Major use of site simulation software

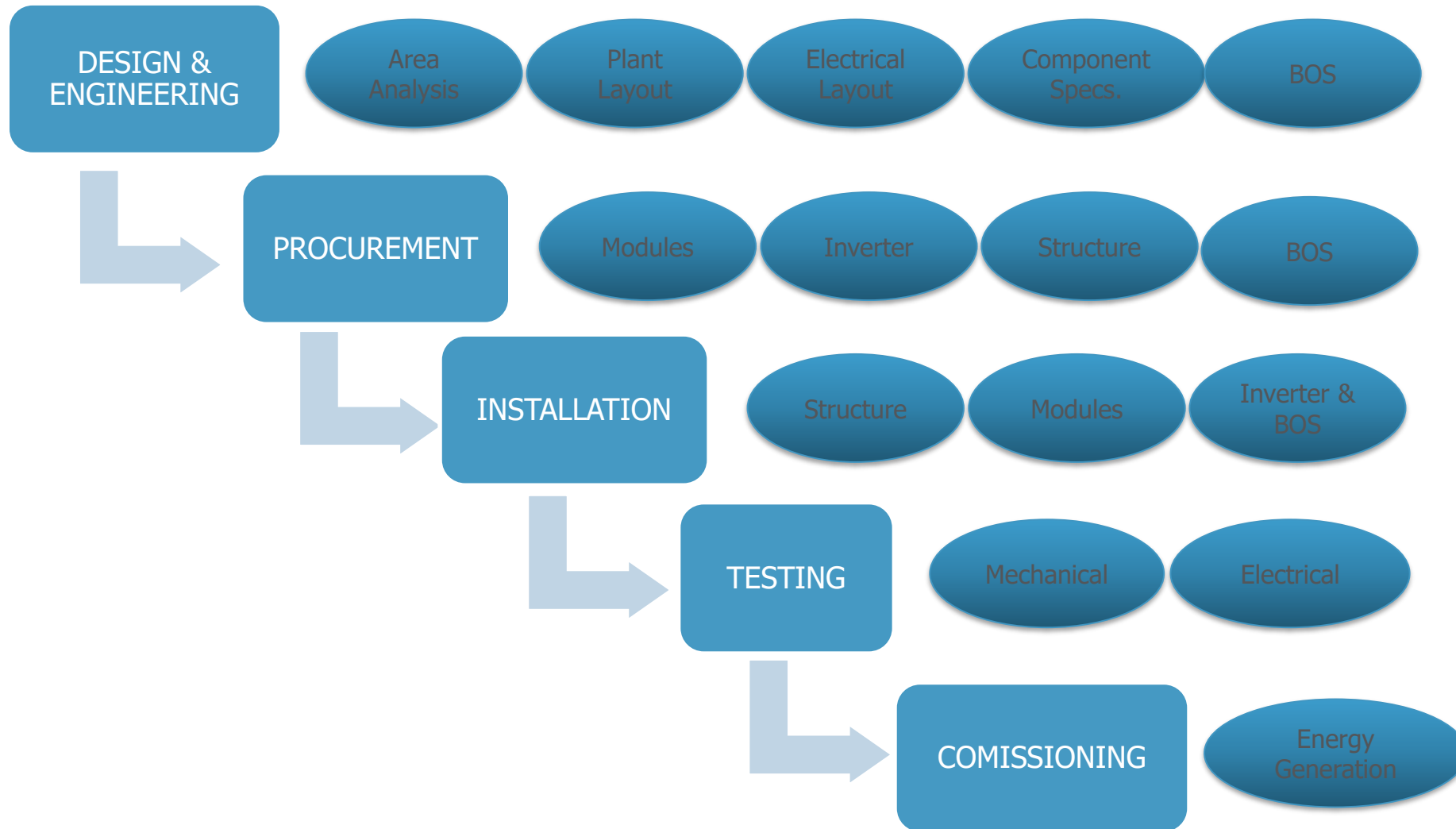
Rooftop Solar Capacity estimation



Various Software...

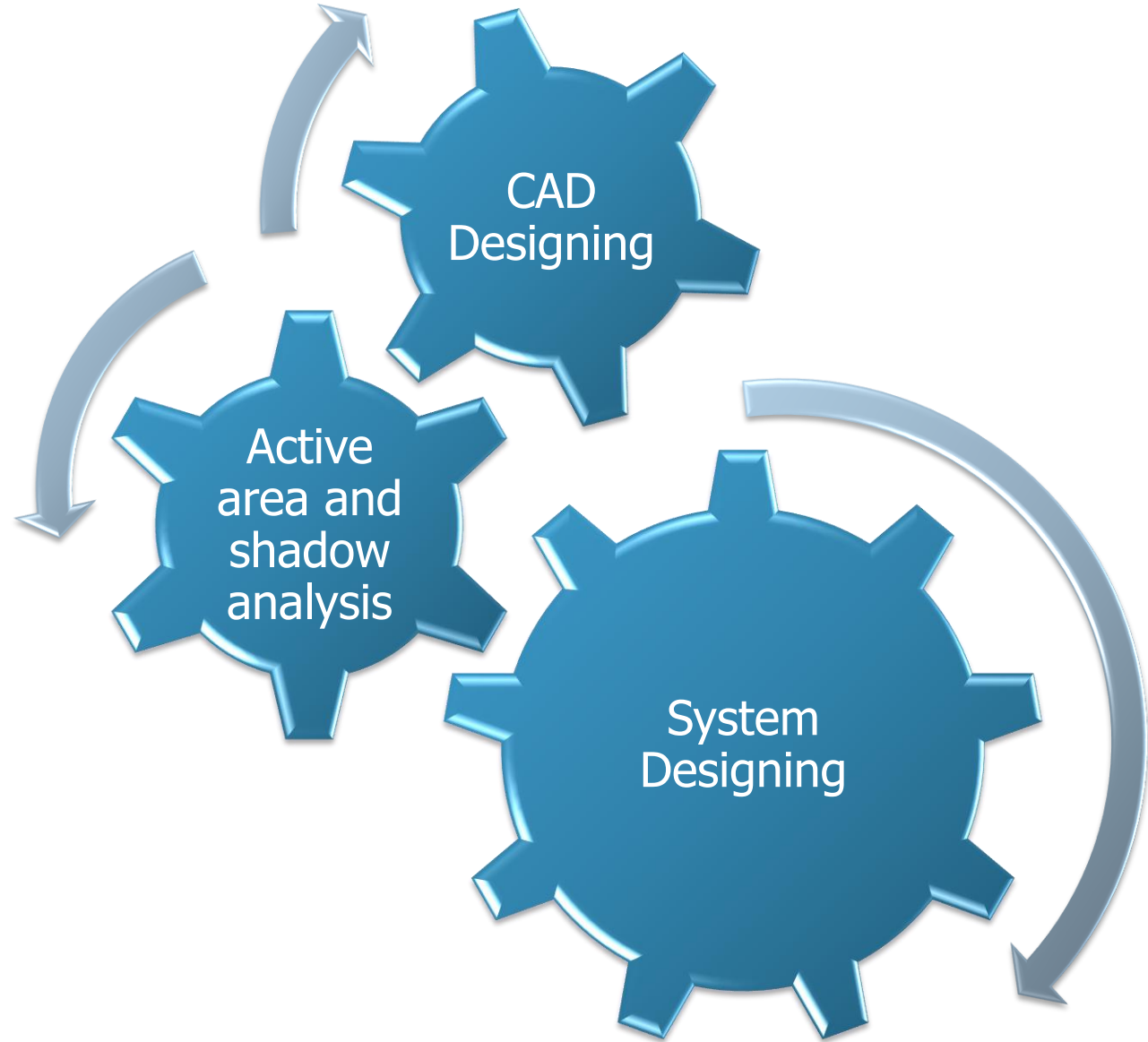


EXECUTION STRATEGY





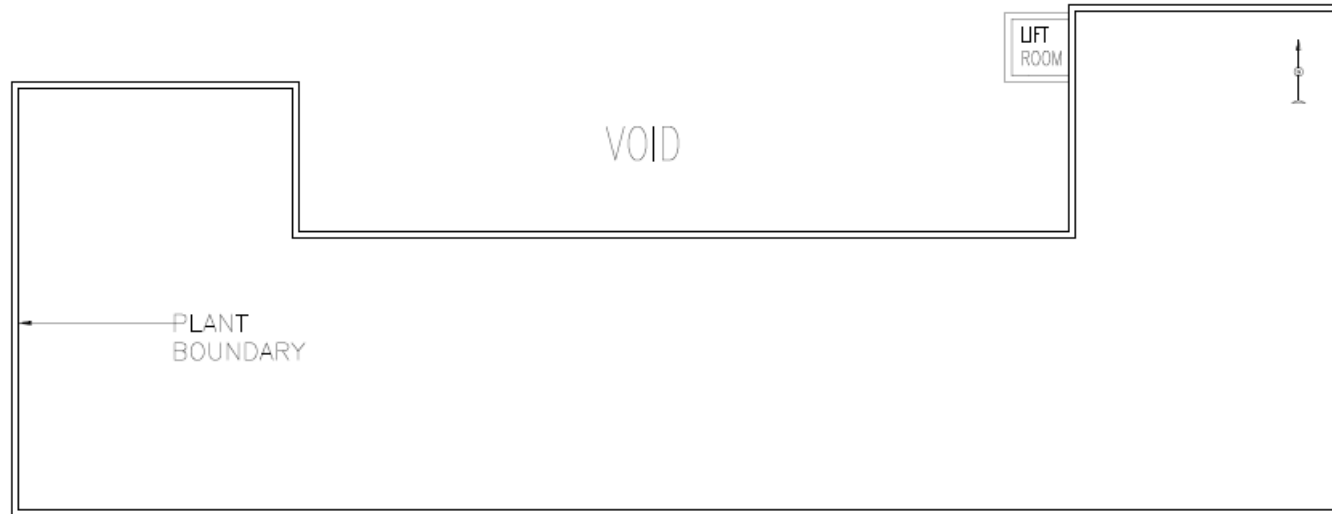
DESIGNING



DESIGNING



Available area for installation

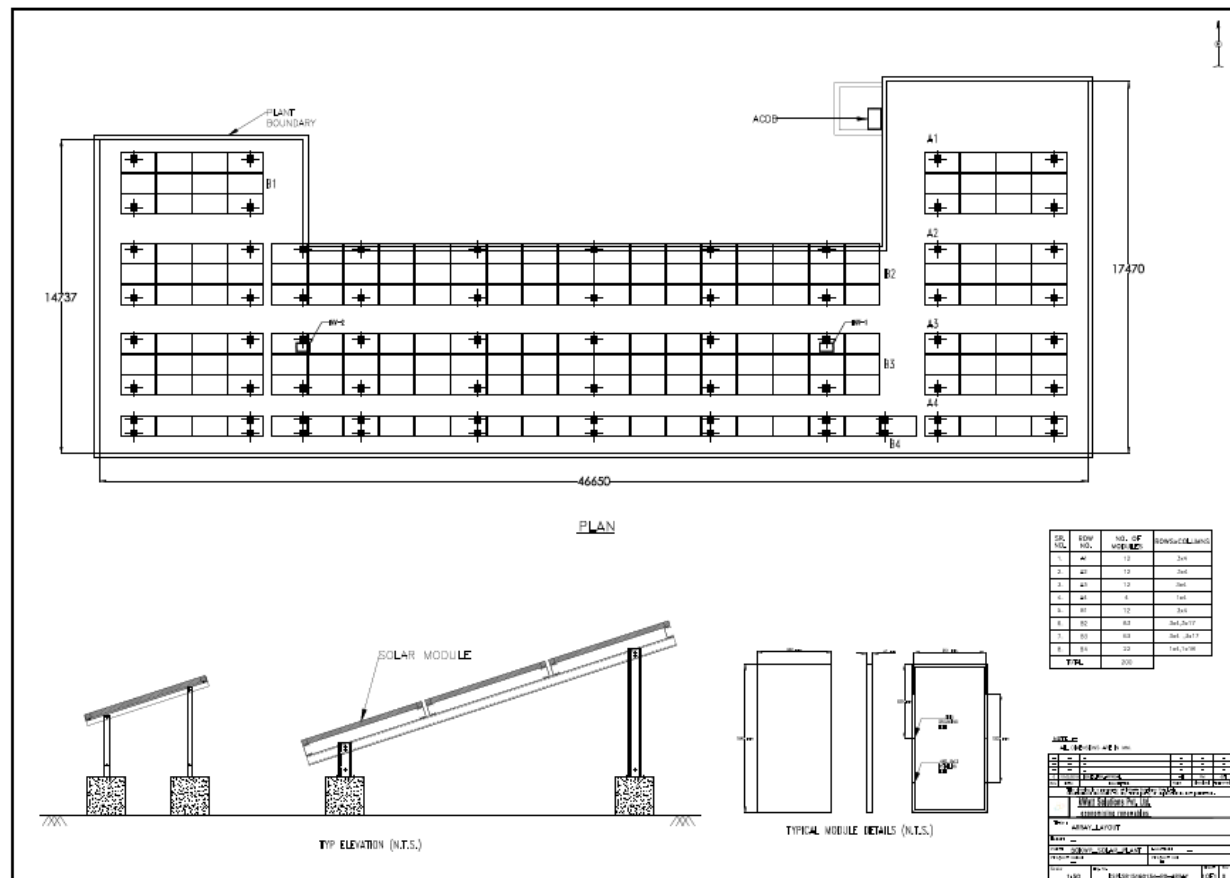


PLAN

DESIGNING



CAD Designing



Sample Project Proposals



- [Sanskriti – residential Helioscope](#)
- [Sanskriti- shading](#)
- [Sanskriti- electric schematic](#)
- [PV Syst](#)
- [DPR- Ambajagoai 50KW](#)
- [Feasibility Report-Ambajogai](#)





Ashwini K Aggarwal
Director-Government Affairs | Applied Materials India Pvt Ltd
Advisor- India Electronics & Semiconductor Association
Past Chairman 2017-18, IESA
Aggarwal.ashwini@gmail.com
Mobile +91 9910 555 970

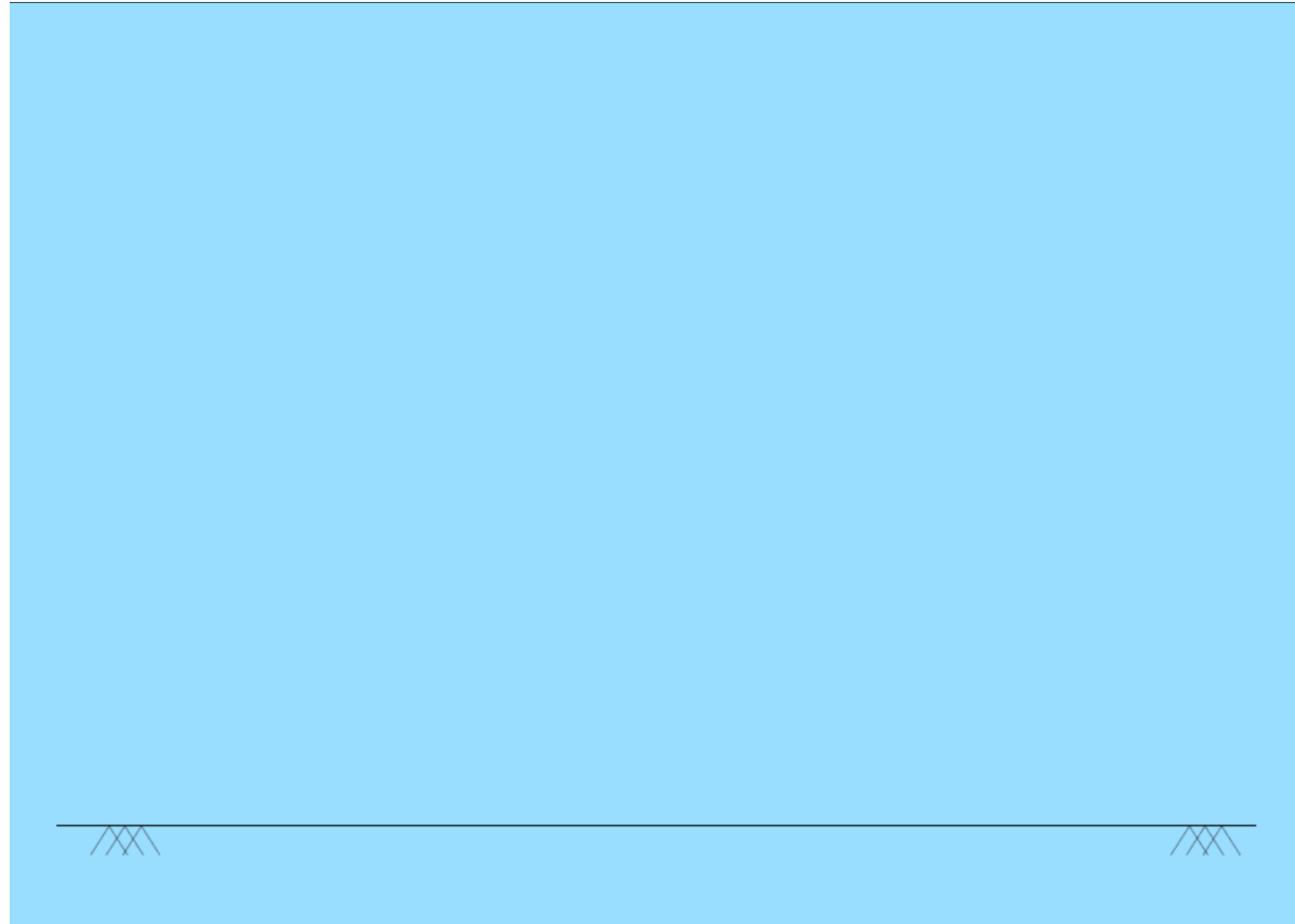
 /xlashwini  /xIAshwini

<http://www.India-inspires.com>
<https://orcid.org/0000-0001-9503-7874>

Installation steps



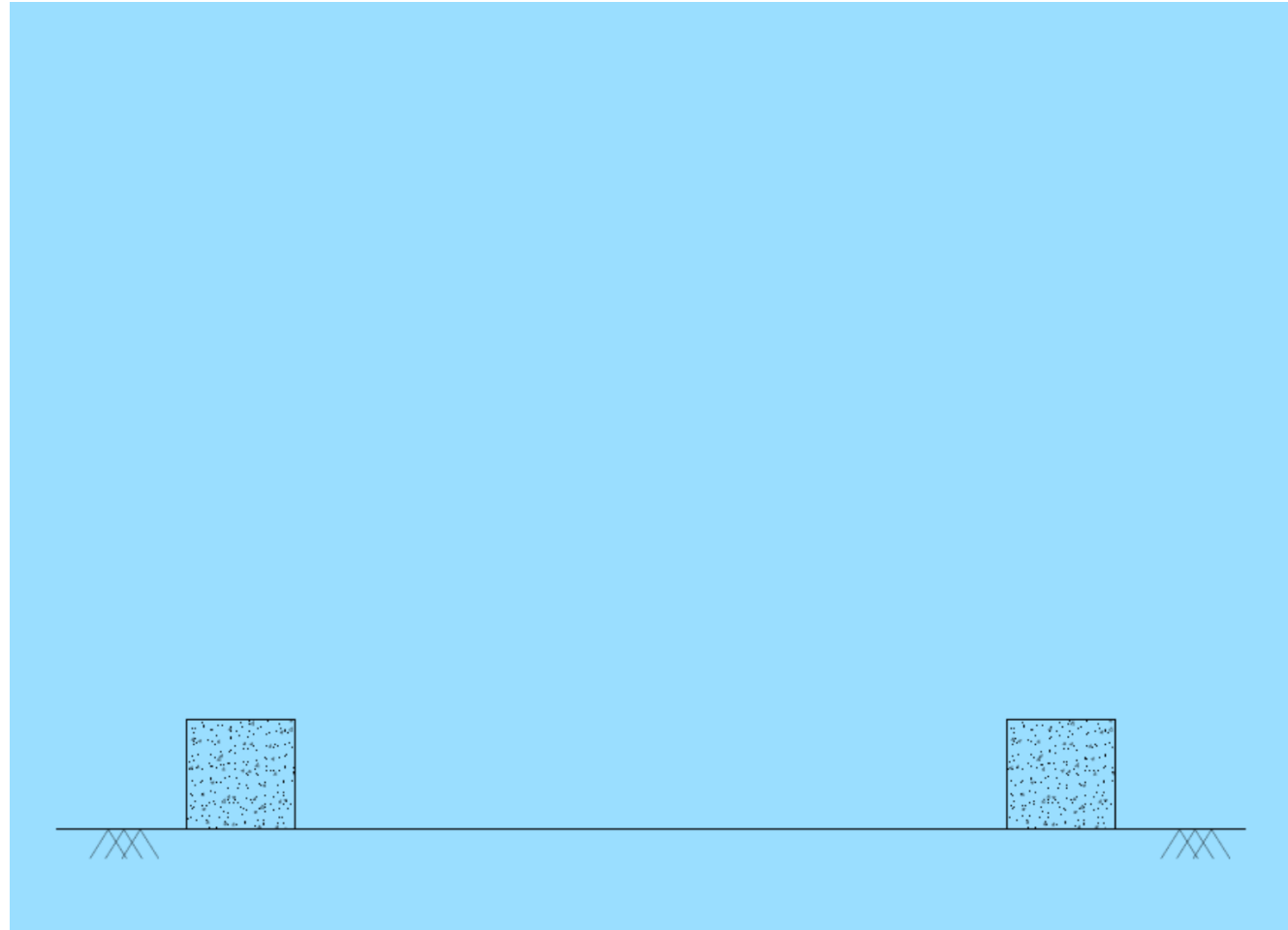
Ground



Installation steps



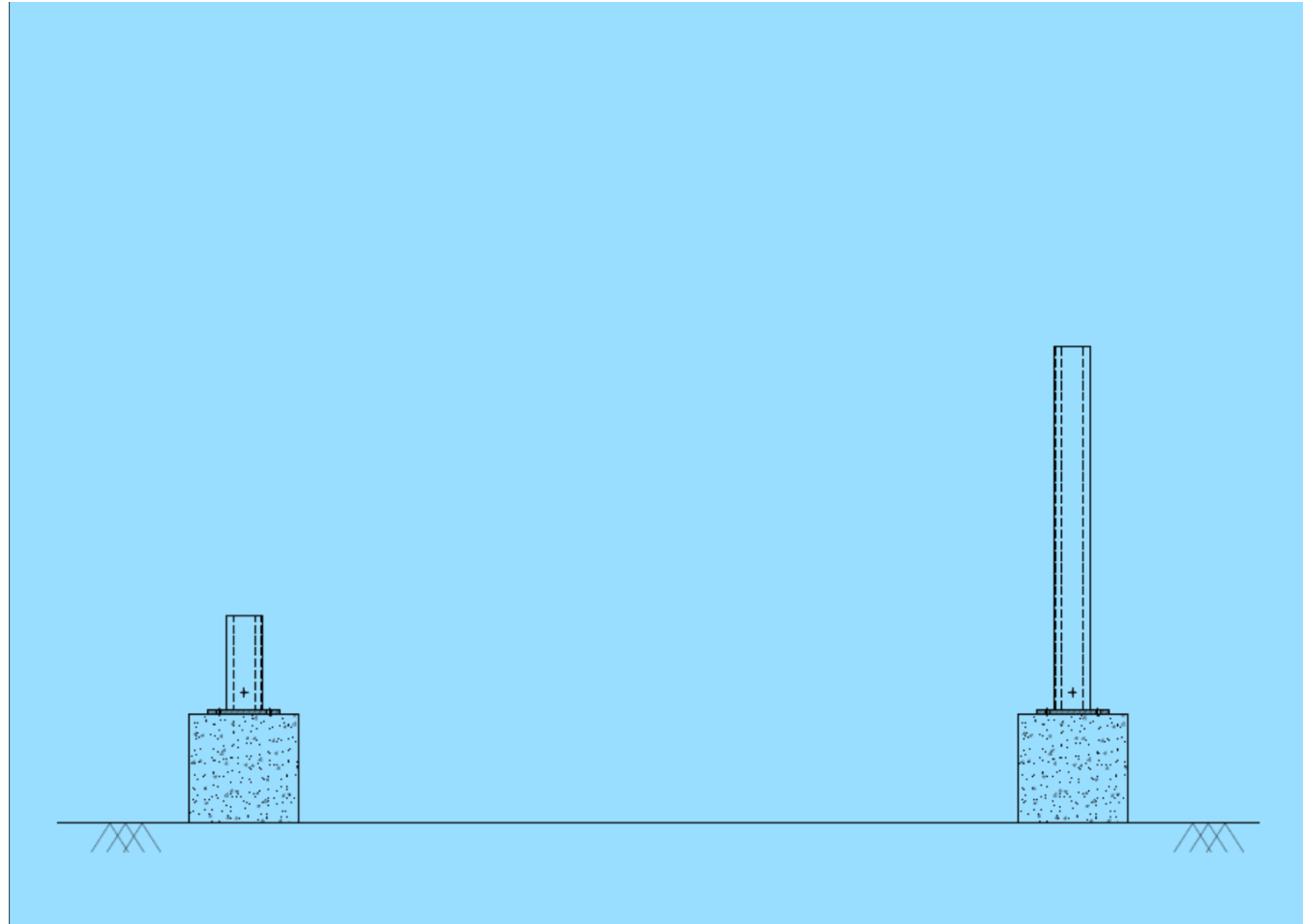
Foundation



Installation steps



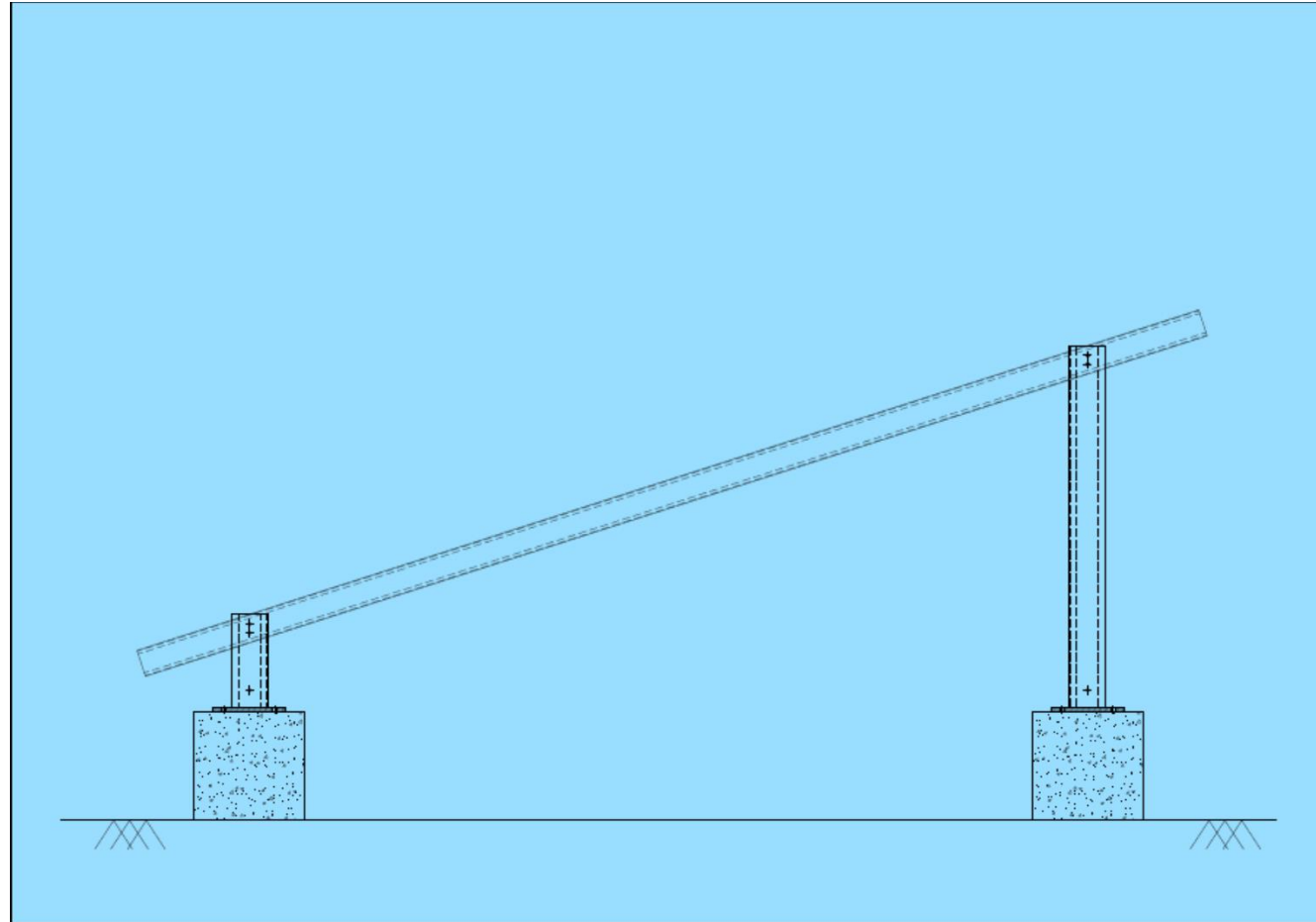
Column post



Installation steps



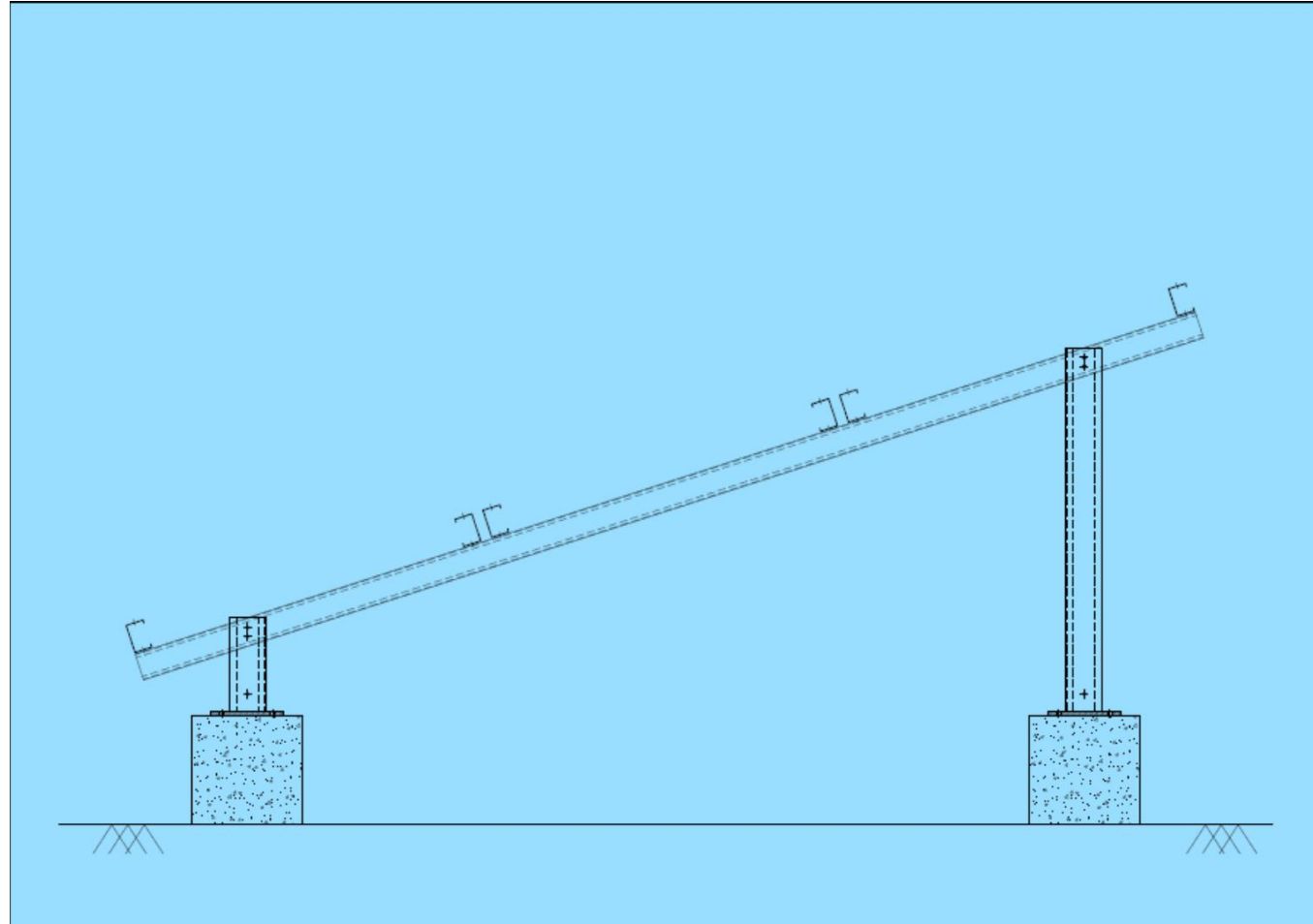
Rafter



Installation steps



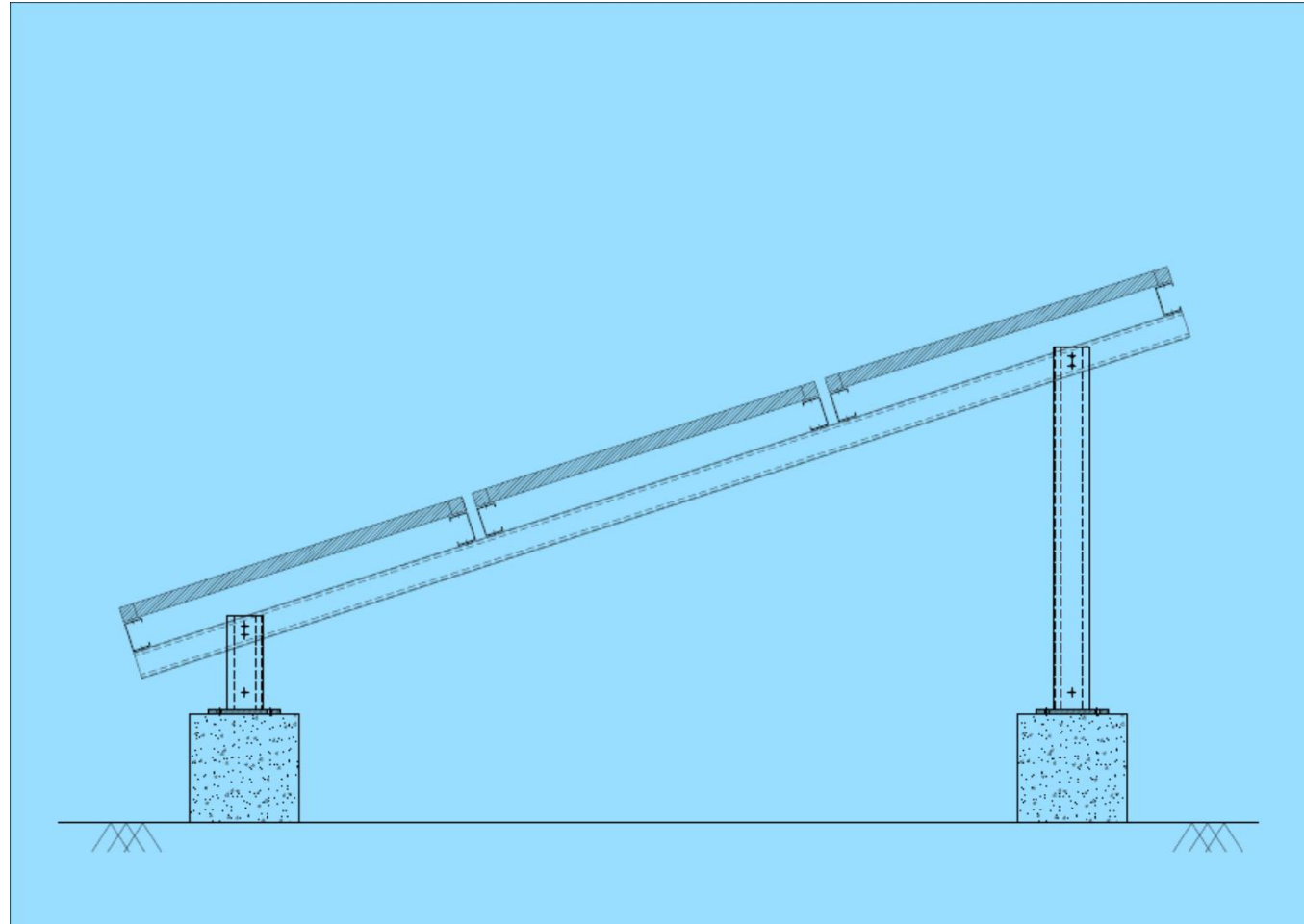
Purlins



Installation steps



Modules



INSTALLATION

SURFACE MARKING

- To ensure alignment of the blocks



SURFACE ROUGHNING

- For better adhesion with concrete block



INSTALLATION

REBAR CAGE

- To increase strength of concrete block



CONCRETE BLOCK TEMPLATE



INSTALLATION



CONCRETING

- Embedded anchor bolts in the concrete block



ERECTION ON FOUNDATION

- Column post erected ready for module mounting



INSTALLATION



MODULES

- Mounted on the Purlins using fasteners



INSTALLATION



COMPLETE PLANT INSTALLATION



INSTALLATION

STRUCTURE EARTHING

- To ground leakage current from the structure



EARTHING ELECTRODE



INSTALLATION



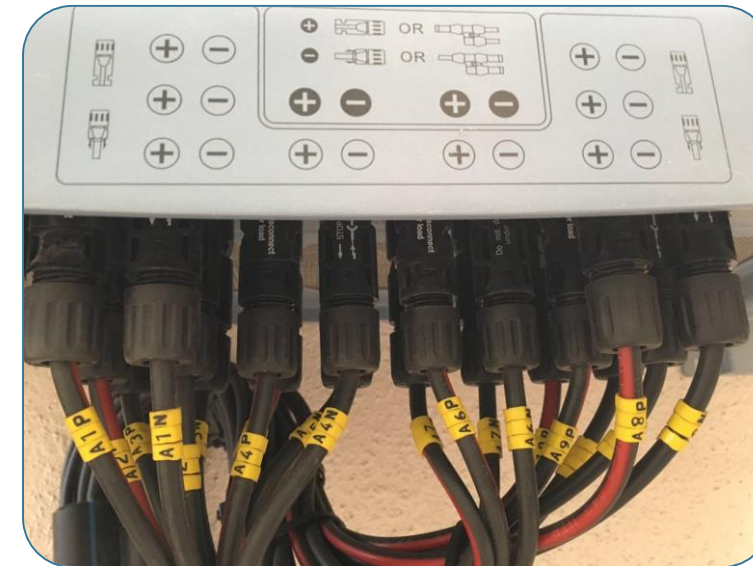
MODULE INTERCONNECTION

- X number of modules interconnected in series to form a string



CABLE ROUTING UP TO INVERTERS

- Output from string is connected to the inverter



INSTALLATION



Connecting string output to the inverter



INSTALLATION



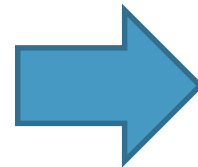
INVERTER

- Converts DC power coming from modules into AC



AC Distribution Box

- Combines inverter output and feeds to the grid



Testing

Structural/ Mechanical Checks

- Structural alignment check
- Orientation and tilt check
- Tightness of fasteners
- Alignment of the modules
- Tightness of module fasteners



Testing

Electrical Testing

- String Voltage
- Continuity
- Cable insulation resistance (megger)
- Earthing resistance
- Module interconnection tightness
- Cable termination tightness
- Cable dressing



Commissioning



Energy Generation

