

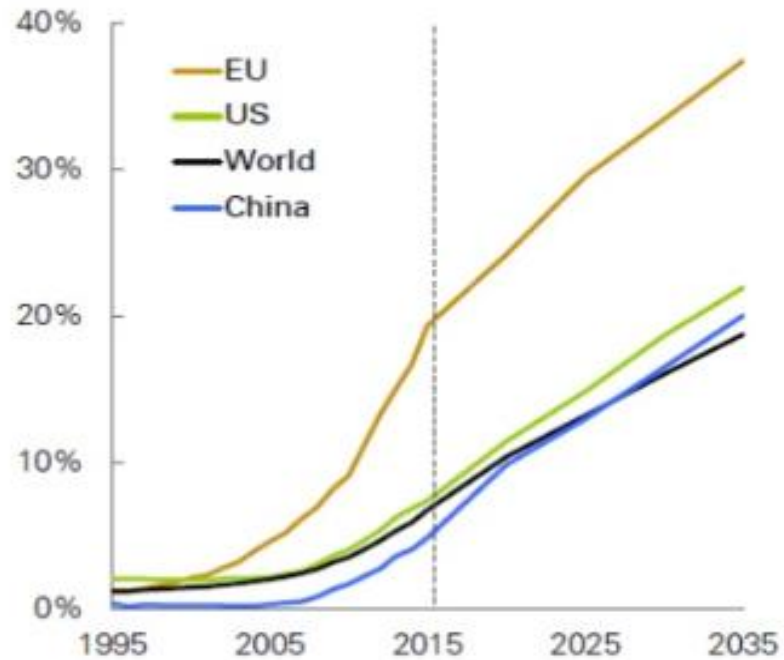
# An Overview of PV Market Scenario & Technology At A Glance

# Global Renewable Energy Scenario

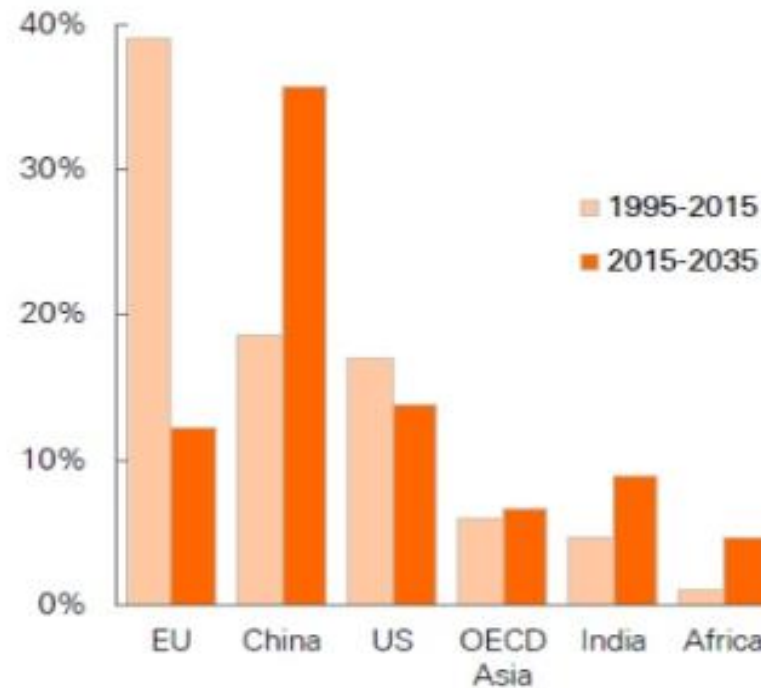


*Share of renewable energy in the global energy basket currently stands at 40% and it is expected to increase further. Going forward, China will be a major contributor to this growth by 2035.*

**Renewable share of Power Share**



**Shares of Renewable Power Growth**



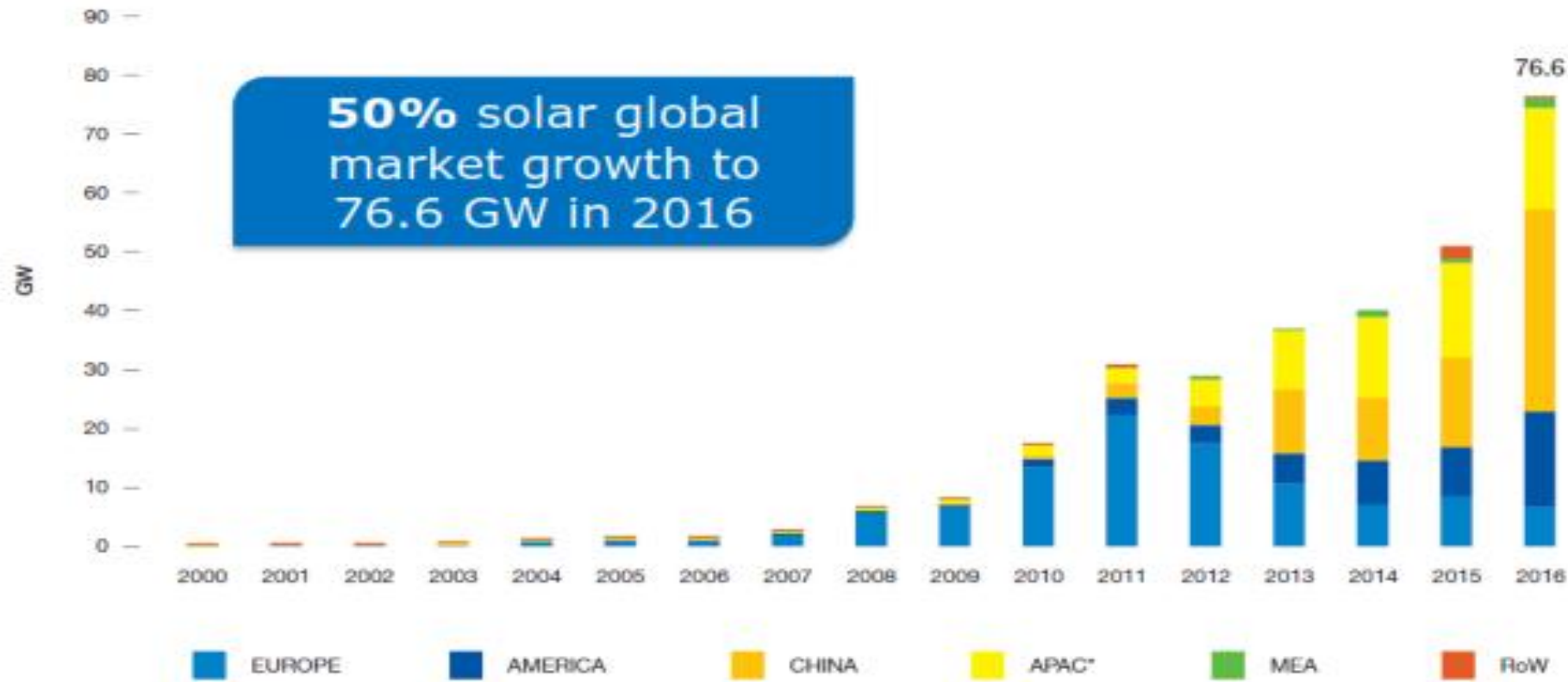
# Global PV Demand Scenario



## Global PV Demand, 2007-2022E

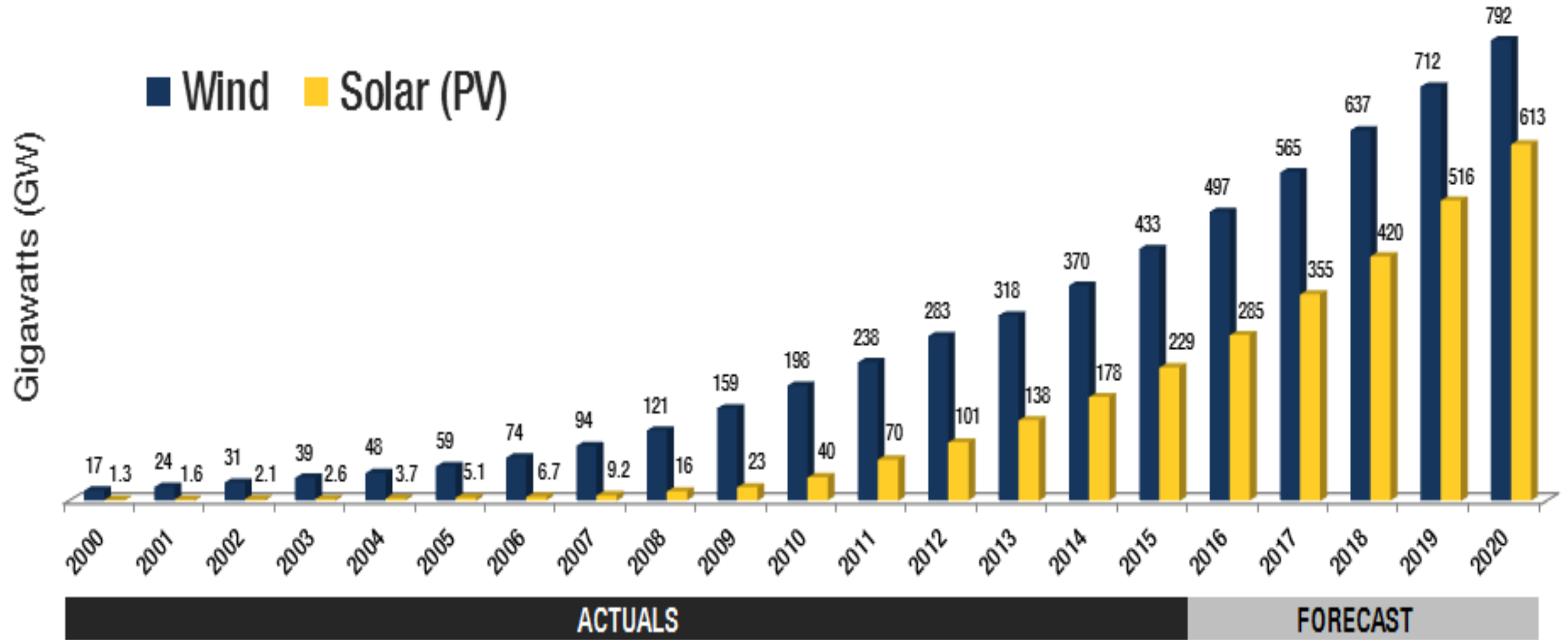


# PV Installation Up to 2016

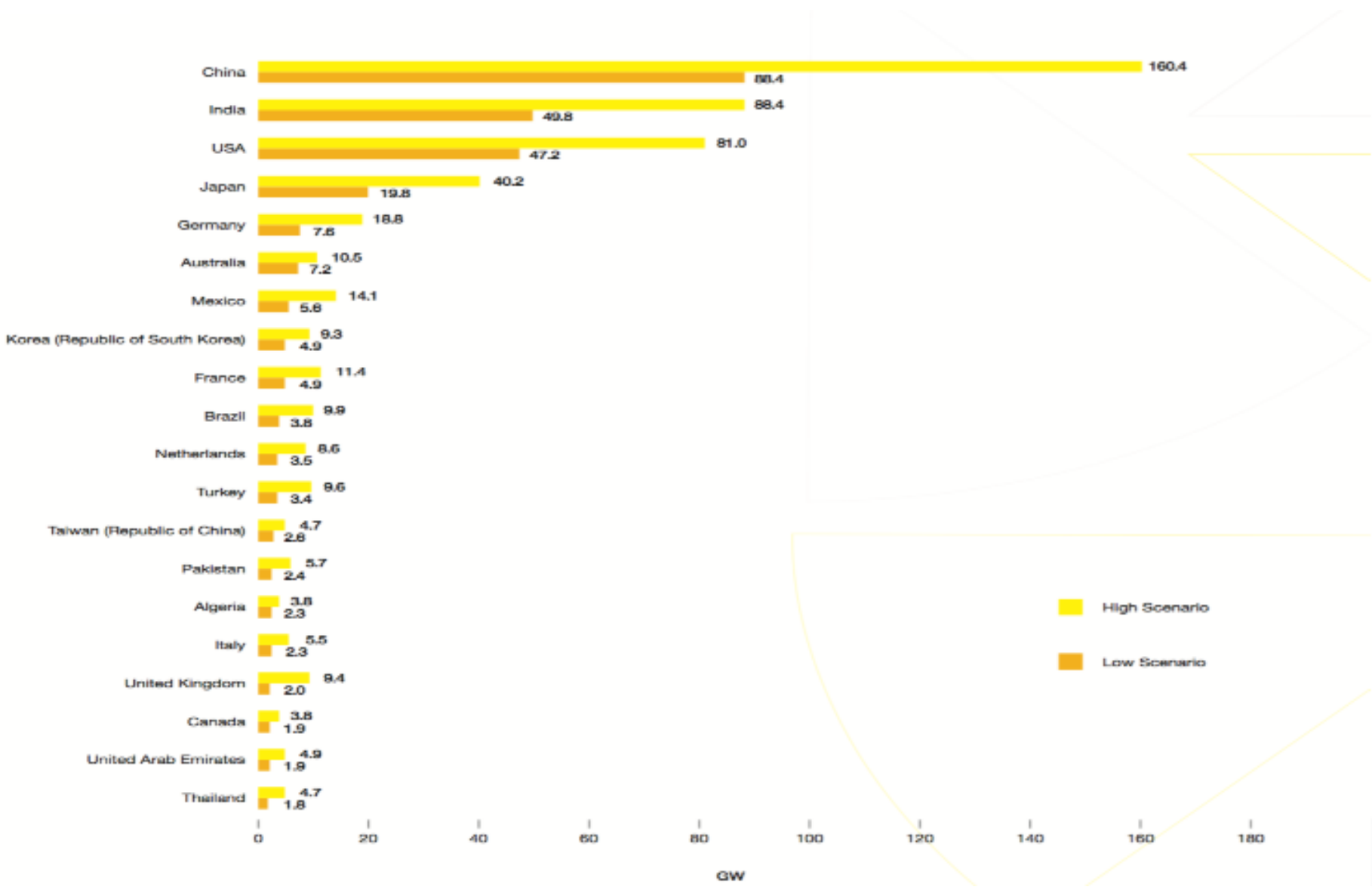


**GLOBAL MARKET GROWS OVER 50% YOY TO >76.6 GW IN 2016 - WITH CHINA COVERING 45%**

# Global Total PV Installation Scenario



# Global Solar Market / Prospects 2017 - 2021



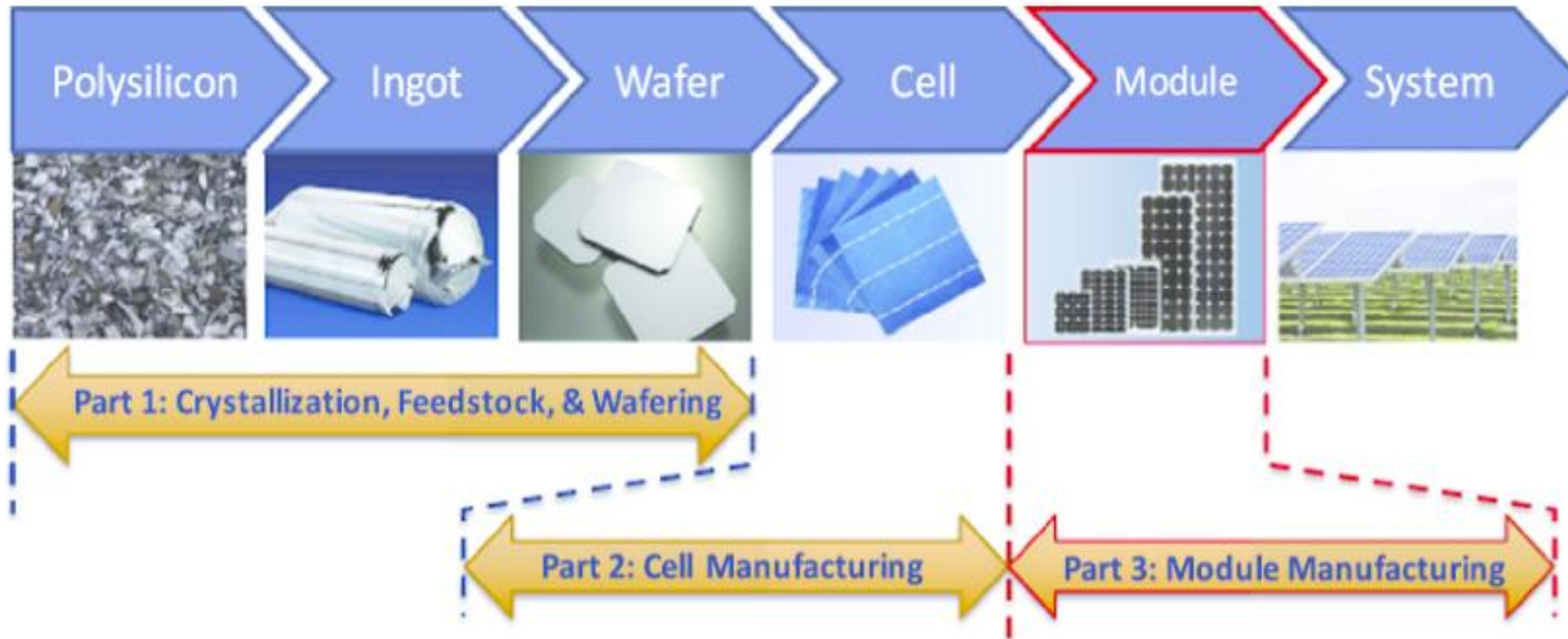


# PV Technology At a Glance

# PV Supply Value Chain



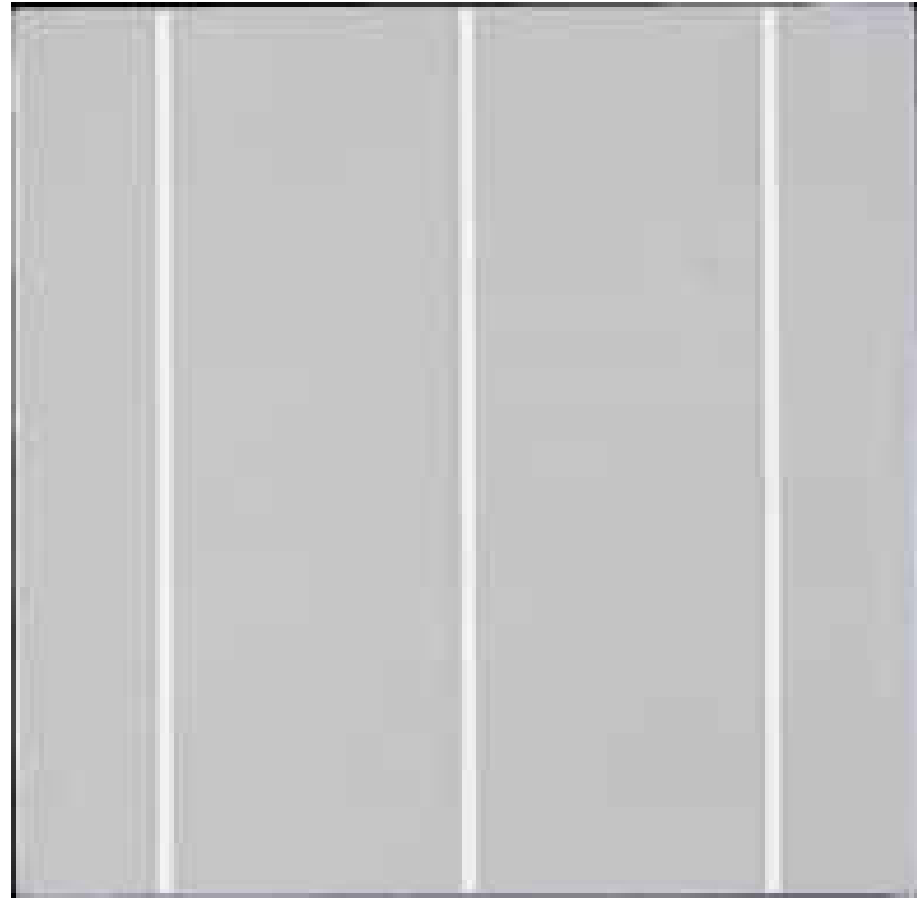
. Depiction of c-Si PV manufacturing production areas across the supply chain highlighting module manufacturing as the focus of this article.



# Solar Cell Front & Rear Side View

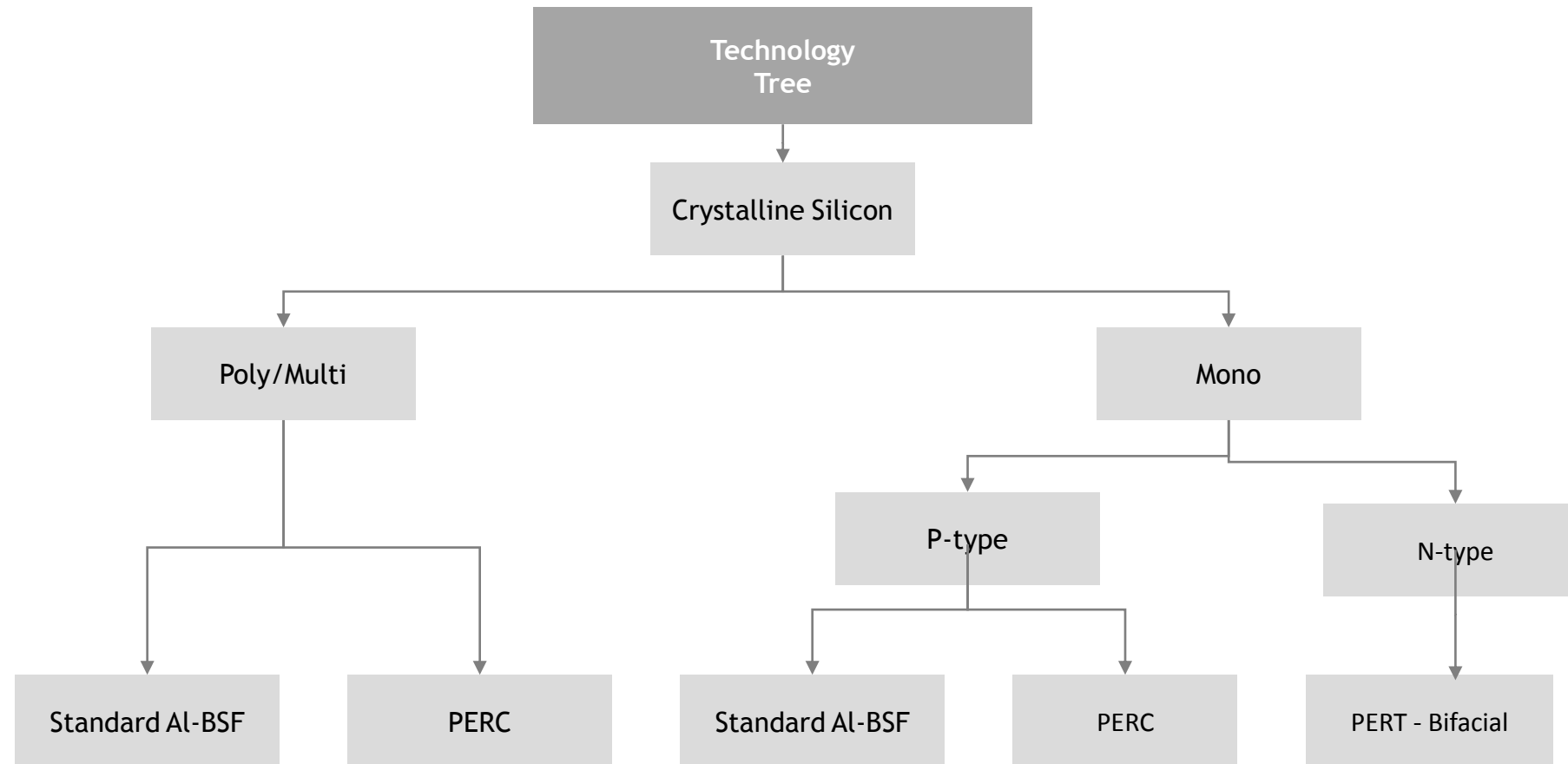


Front View



Rear View

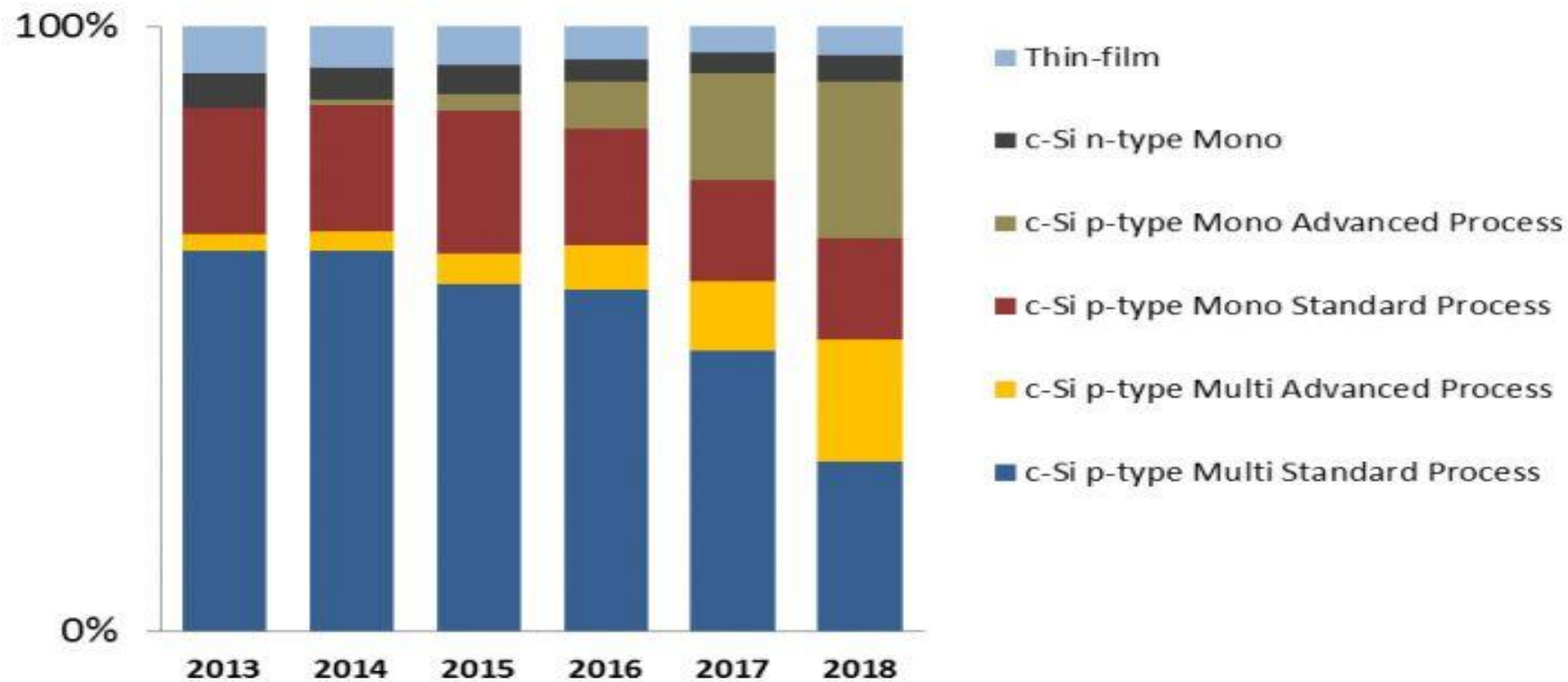
# Cell Technology Tree



# Cell Technologies Market Share



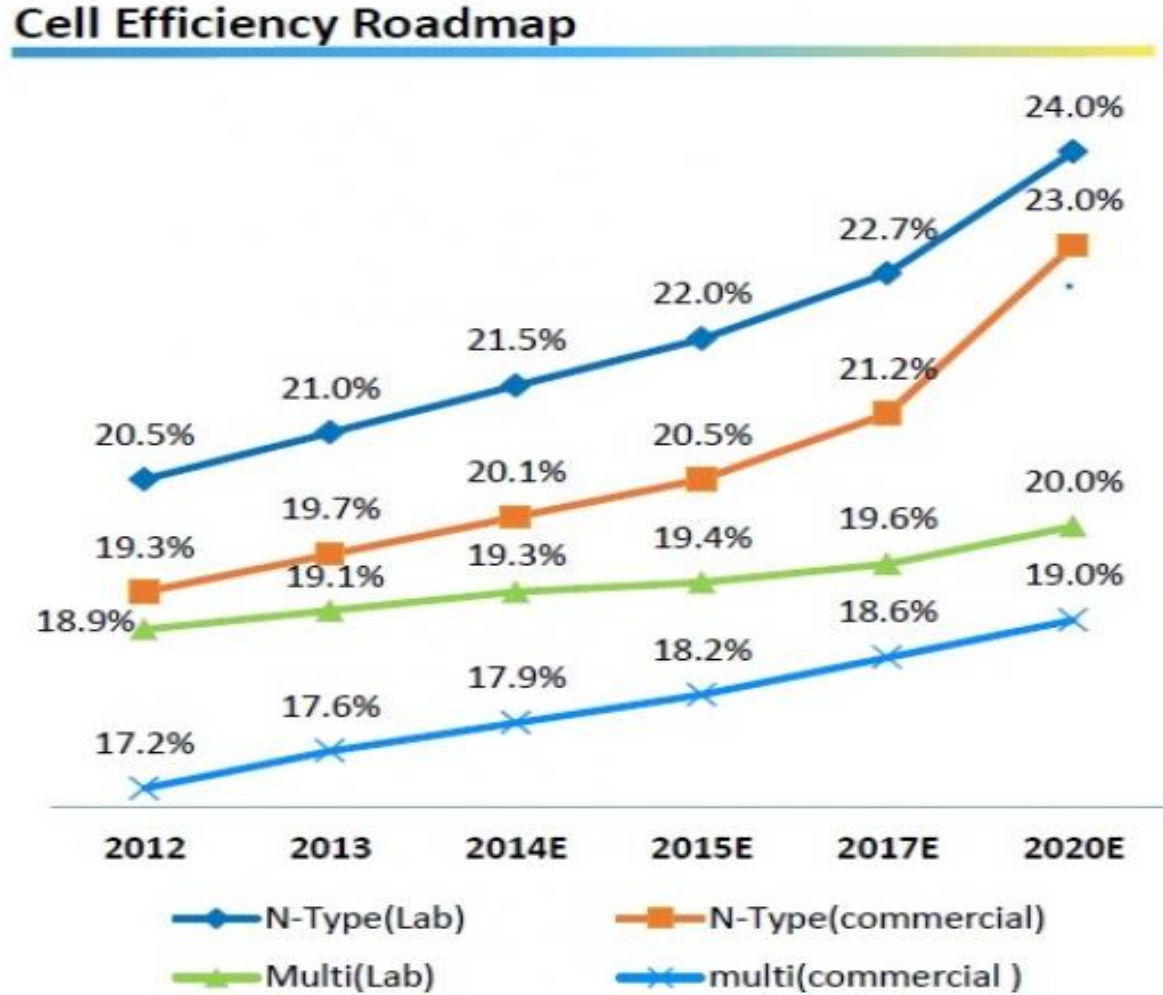
## PV Cell Production by Technology (MW)



© PV-Tech &  
Solar Media Ltd,  
Jan. 2017



# Cell Efficiency Roadmap

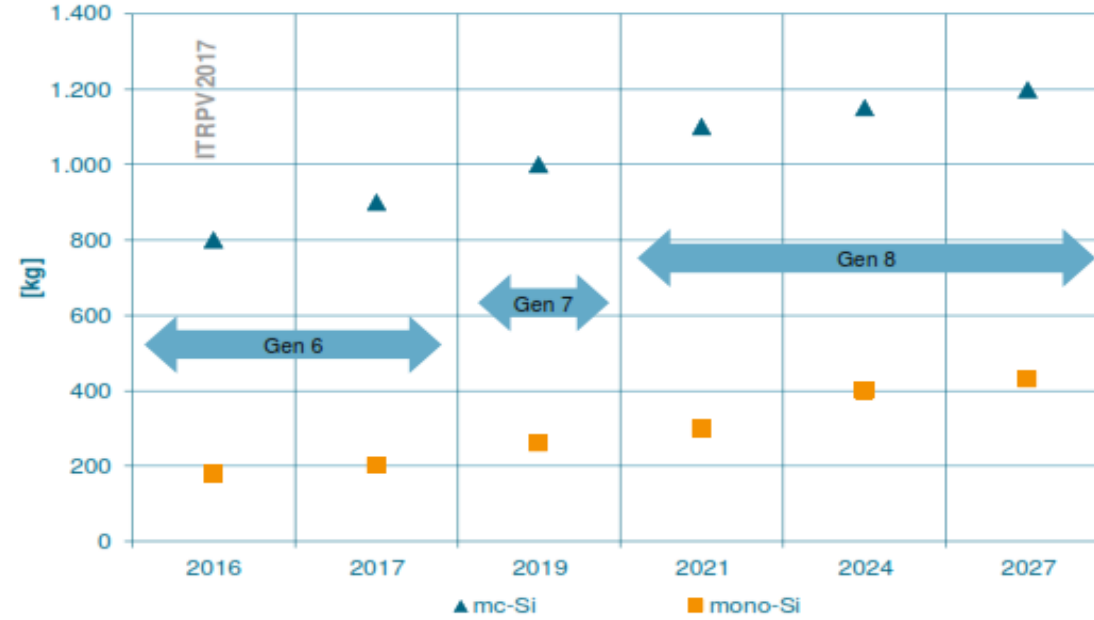


Note: All the efficiency numbers above refer to the average level

# Silicon Ingot Mass in Crystal Growth



Ingot mass in crystal growth

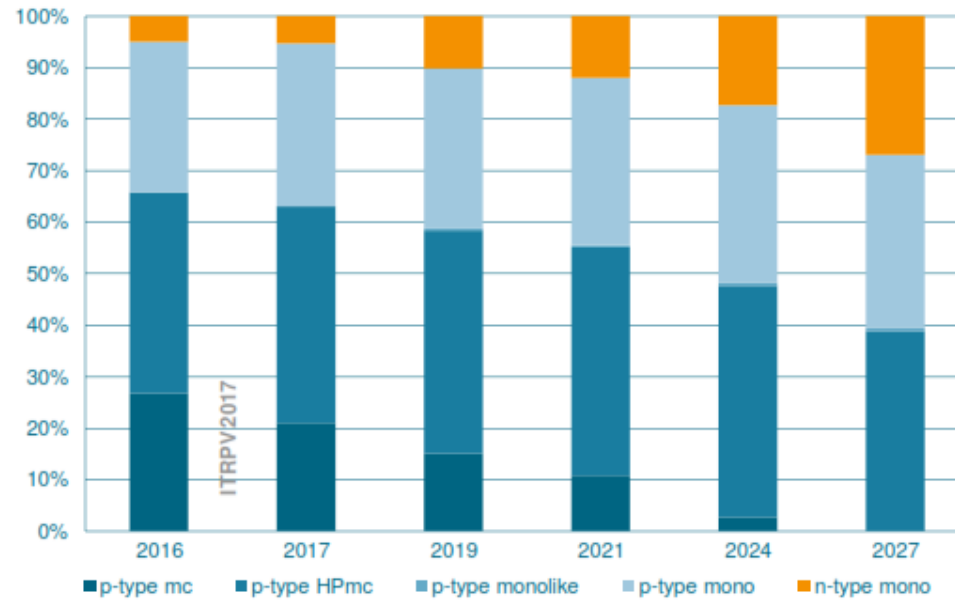


# Wafer Type Market Share



## Different wafer types

World market share [%]

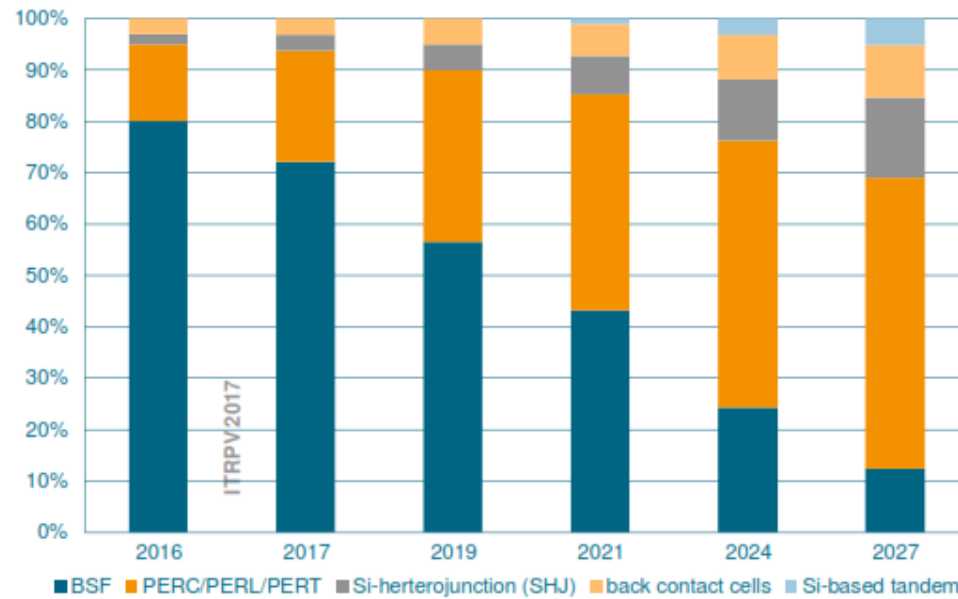


# Different Cell Technologies Roadmap



## Different cell technology

World market share [%]

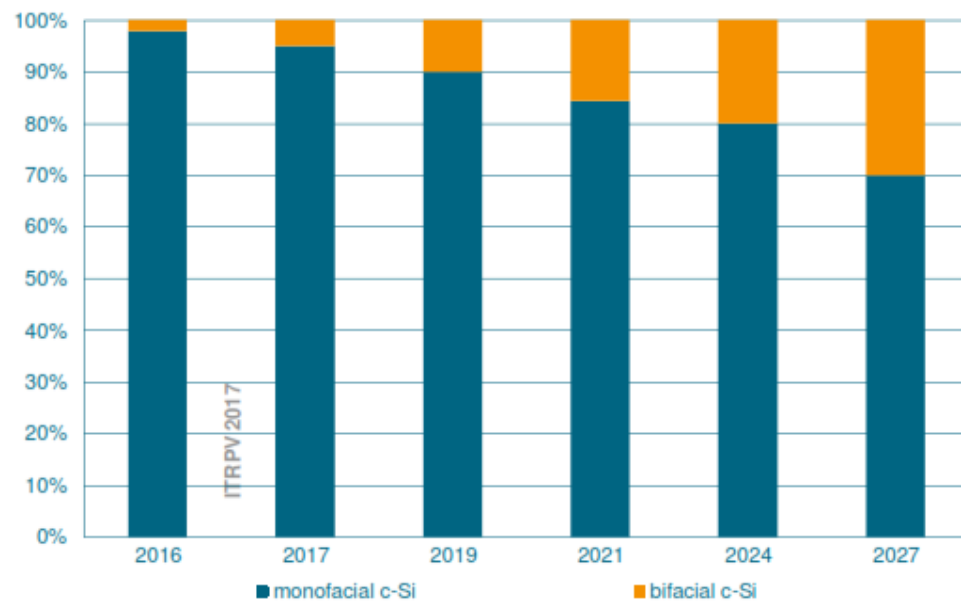


# Bifacial Cell Technology



## Bifacial cell technology

World market share [%]

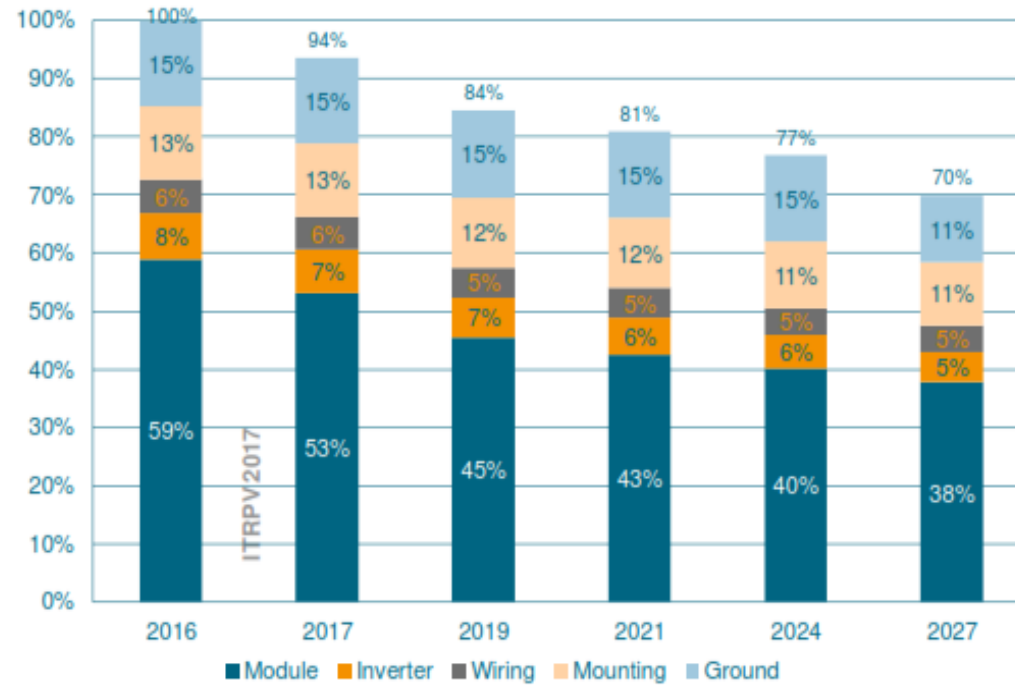


# Cost Structure of PV System Roadmap



## Cost elements of PV System in Asia

For Systems > 100 kW

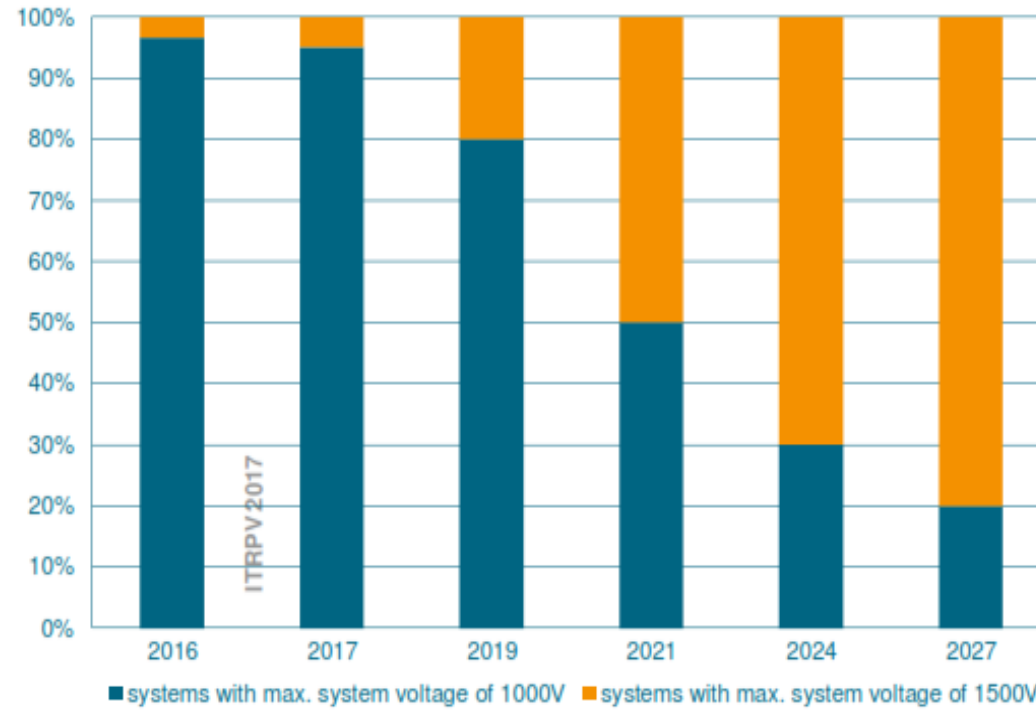


# Module System Voltage Scenario



## Maximum system voltage of new PV systems

World market share [%]

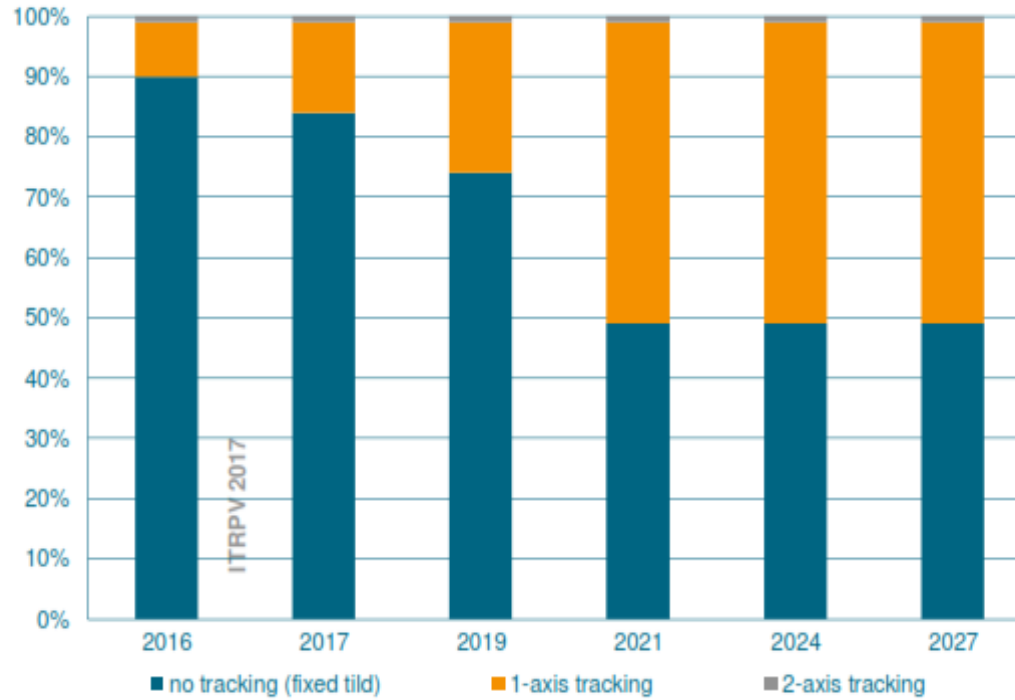


# Tracking System Scenario



## Tracking systems for c-Si PV

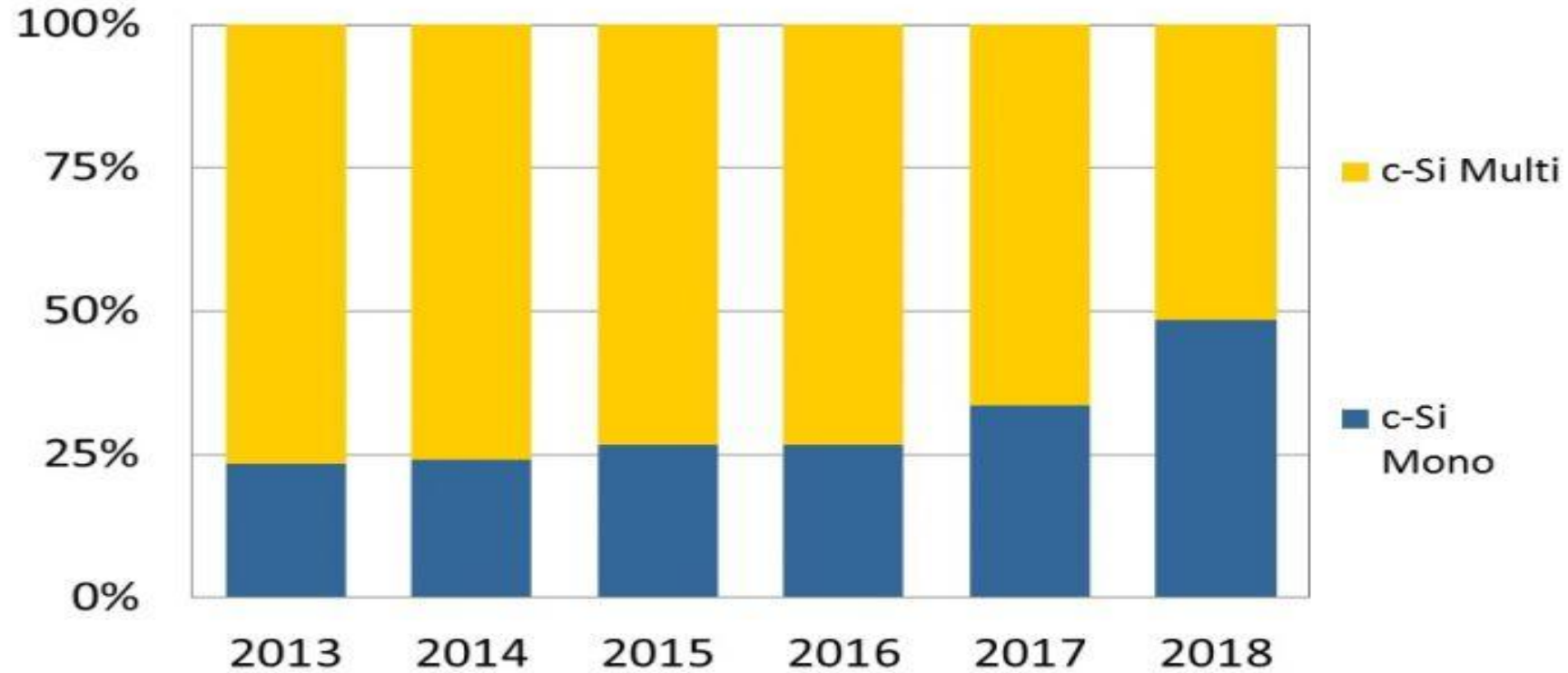
World market share [%]



# Poly/Multi & Mono Cell Technology Share



## c-Si Cell Production by Substrate



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Solar Media Ltd,  
Jan. 2017



# Module Line Shop Floor



# Module Reliability Lab



**Hail Test**



**Environment Test**



**UV Test**



**Reflectivity after etching**



# Module Reliability Testing Set-up



**Mechanical Load Test**



**Outdoor Setup**



**Spectral response testing**



# Front & Rear View of Module

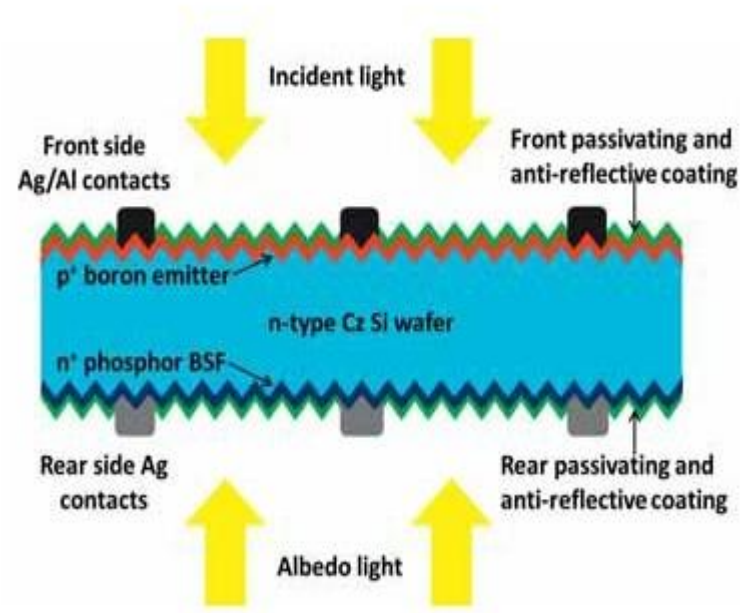


Front side of the Module



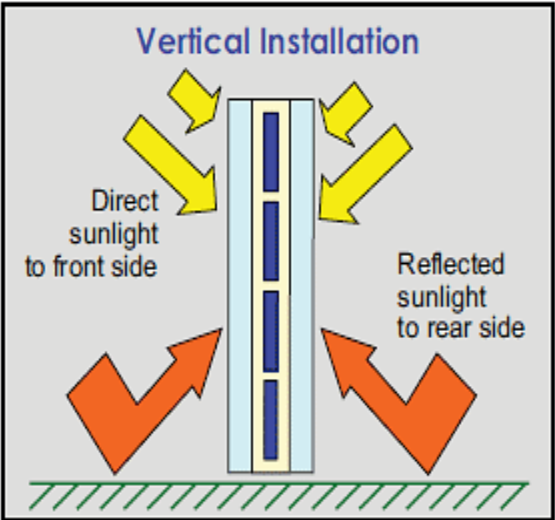
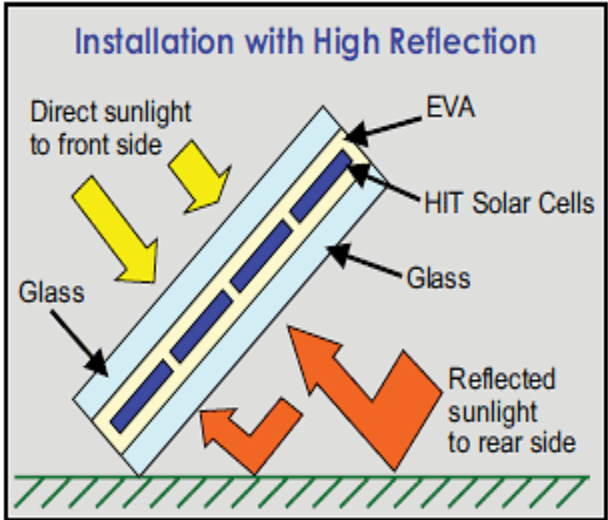
Back side of the Module

# Bi-Facial Cell Device Structure



- ✓ Convert sunlight to electricity on both sides of the modules
- ✓ Modules are made in standard poly/mono, PERC poly/mono & HIT technology
- ✓ Modules are available with glass-glass or glass-transparent back sheet
- ✓ Rear side modules power can be utilized up to 10-30% of front with different installation

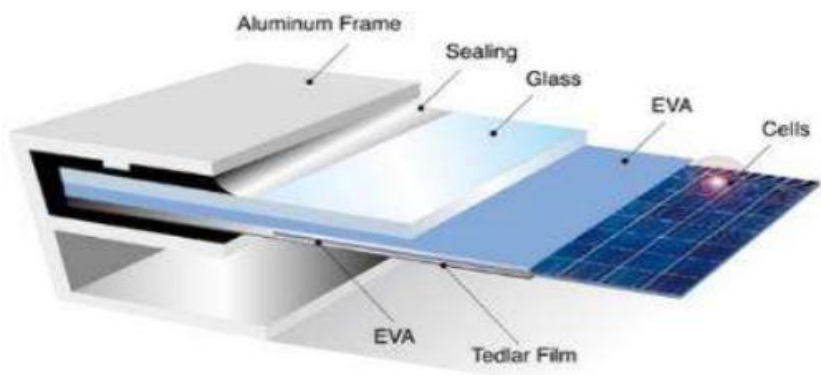
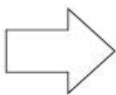
# Bi-Facial Module Installation



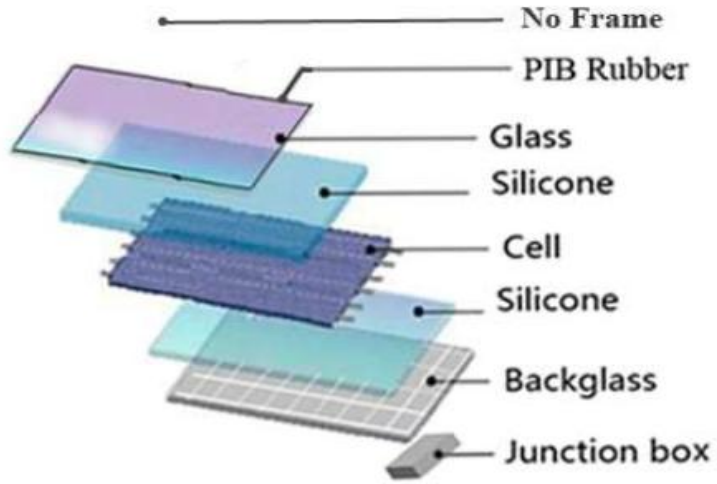
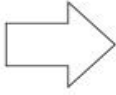
# Double Glass Module Technology



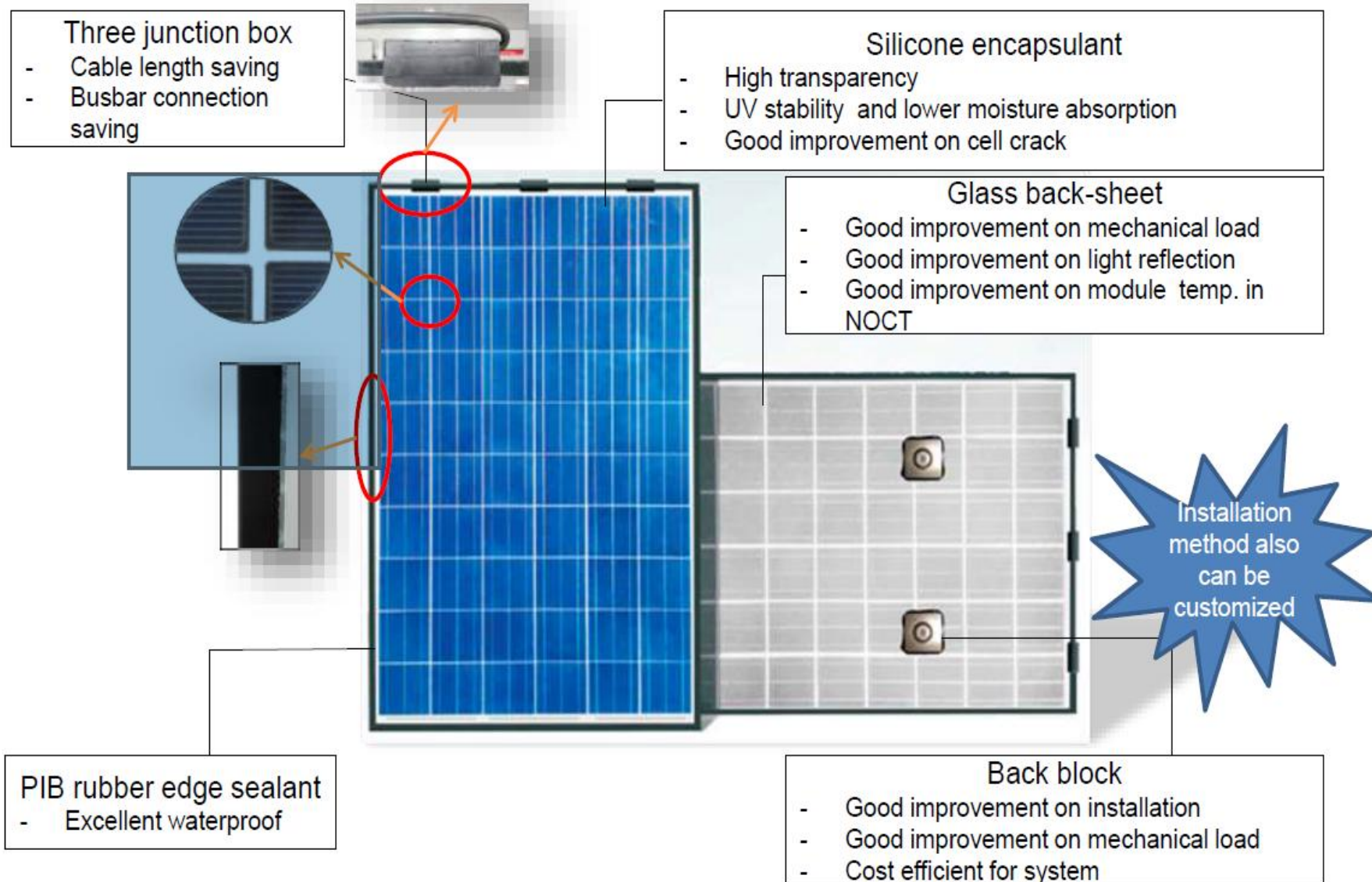
Conventional Module



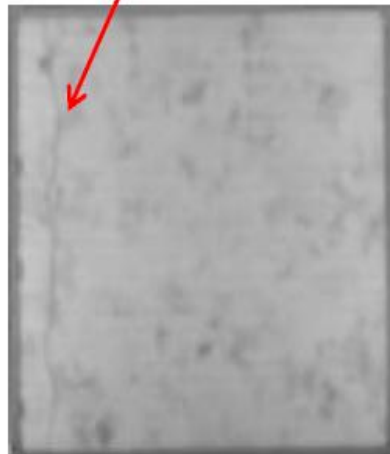
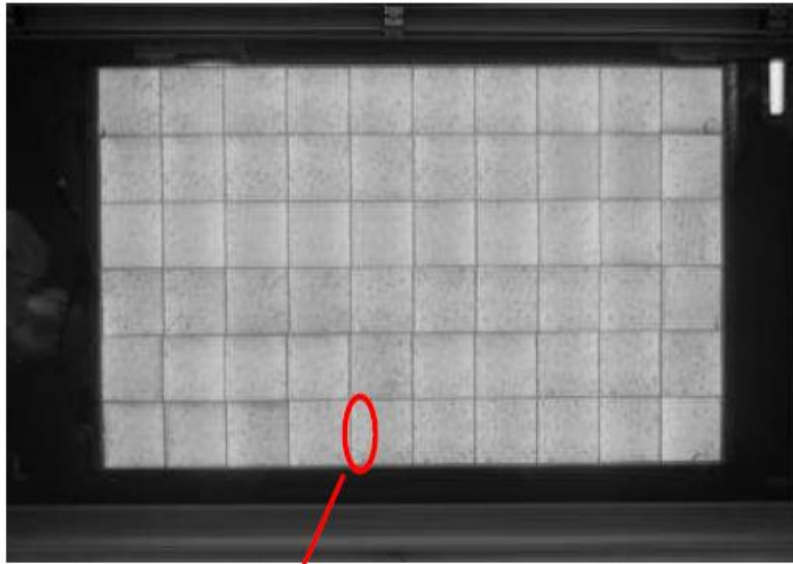
Double-glass Module



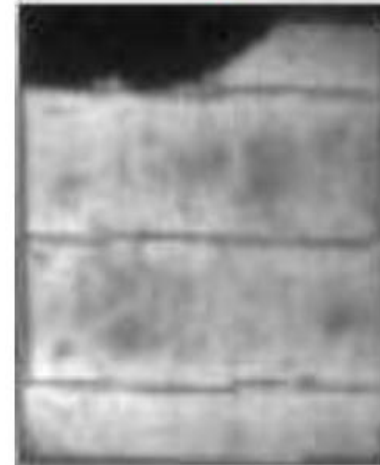
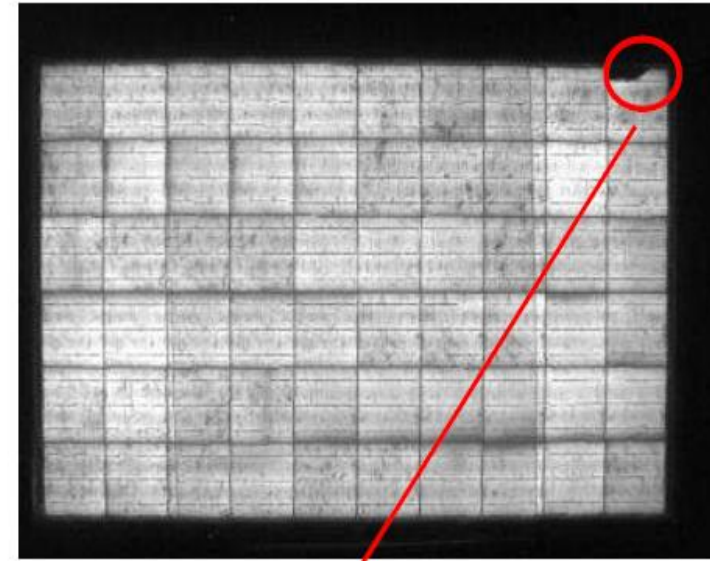
# Advantages of Double Glass Modules



# Enhanced Life & Reduced Micro-Cracks of Modules



There is no dark area even the micro crack penetrate the whole cell.



There is dark area due to micro crack, which could cause power loss

# Double Glass Module Package & Installation Photo



Double-glass module package



Double-glass module installation





INTELLIGENCE



End