JINCHEN
PV Automation & RTG Remote

High-efficiency Solar Cell Manufacturing Turnkey Solutions

2025.01

Company Introduction

Yingkou Jinchen Machinery Co. LTD

01. Established in 1996, IPO in 2017, 4 production location, 2000 employees world wide

02. 28 years equipment manufacturing and process development experiences by PV industry, 4 R&D Centers with 400 R&D Workers cover all the key steps of Cell and Module Manufacturing, 700+ related national and international Patents

03. Customers from China, Indian, Europe and USA, total 500GW installations and 300 projects , an international technology leading company with world wide sales and service networks

04. One stop turnkey solutions provider for state of art Cell and Module technology and with professional cooperation partners provide life training by real production and additional consulting service of factory designing , building and financing etc.

Production Base and R&D Center

R&d center and production base-Cell


Yingkou

Beijing


Qinhuangdao


Suzhou

Production base-Module


Suzhou

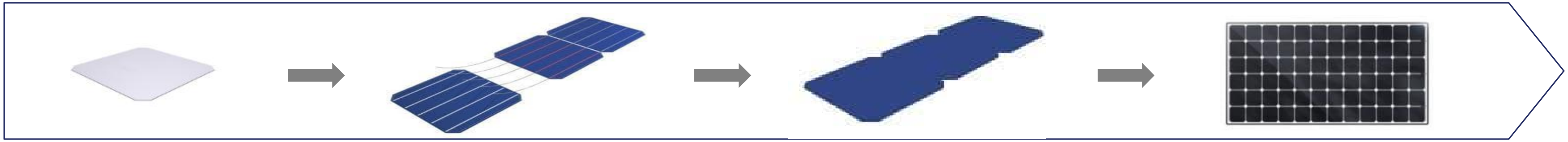

Yingkou

PV Technology Roadmap &Product Portfolio

Focus On Cell and Module Equipment and Process Development

Advanced cell manufacturing

Advanced module manufacturing



23.3-23.8%
PERC →
- Auto Loading
- Auto Unloading
- /
- Anti-LID

24.5-25.5%
TOPCon →
- TOPCon
- Tube －PECVD
- Dual Poly

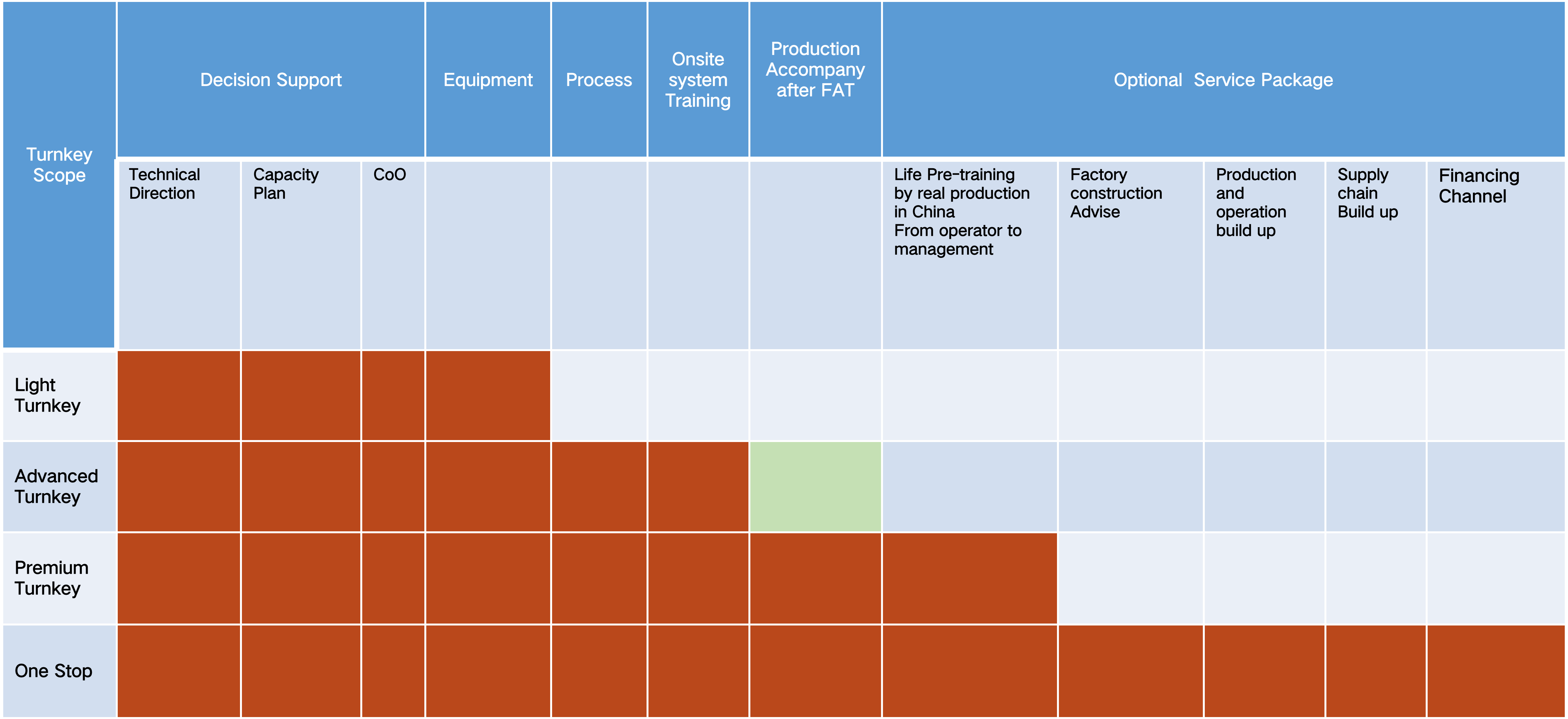
24.5-25.5%
HJT →
- HJT PECVD
- Linear Source
- PECVD
- Low cost
- Metallization
- Cu Plating

26%+
HBC／TBC →
- Back contact
- Graphical
- Tandem/Perovskite

Advanced module manufacturing
- Advanced interconnection
- Advanced lamination System
- Advanced line automation

Supporting automation equipment Intelligent visual inspection system

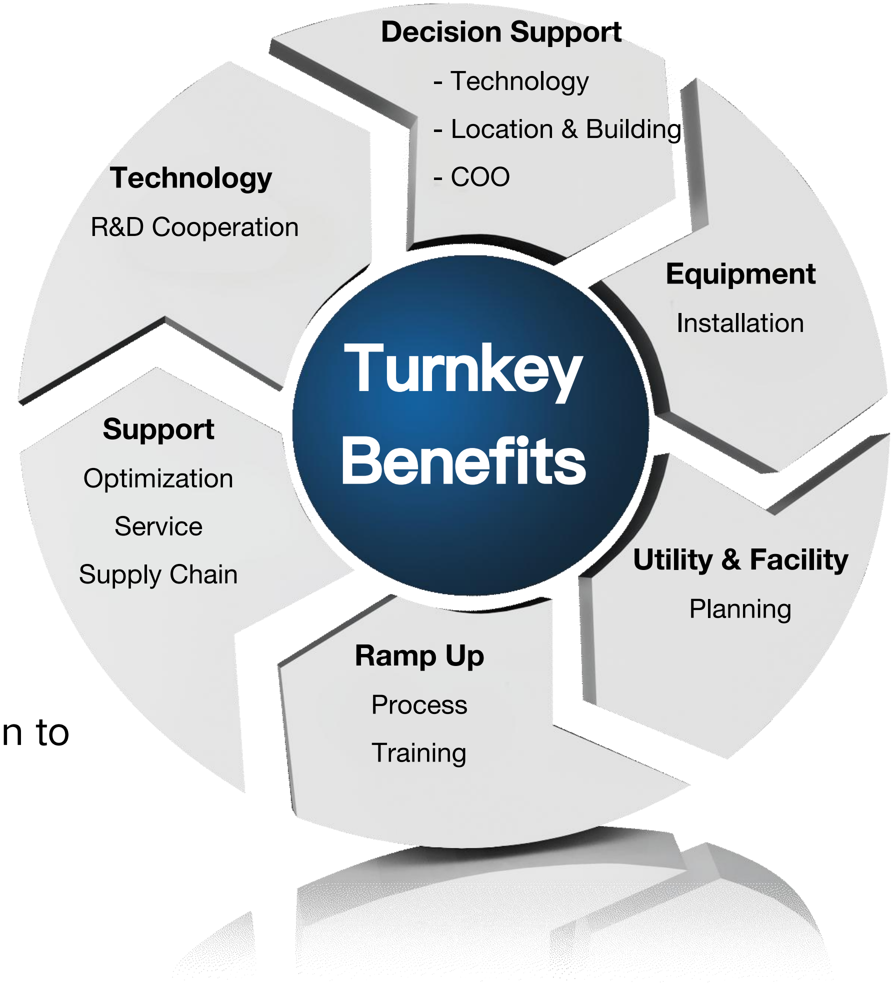
JINCHEN Turnkey Solutions for Cell Production



Turnkey Scope	Decision Support			Equipment	Process	Onsite system Training	Production Accompany after FAT	Optional Service Package				
	Technical Direction	Capacity Plan	CoO					Life Pre-training by real production in China From operator to management	Factory construction Advise	Production and operation build up	Supply chain Build up	Financing Channel
Light Turnkey	🟥	🟥	🟥	🟥								
Advanced Turnkey	🟥	🟥	🟥	🟥	🟥	🟥	🟩					
Premium Turnkey	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥				
One Stop	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥

Benefits of JINCHEN Turnkey Solutions for Cell Production

- Providing complete updated and reliable information and data for customers' decision making
- All process and equipment is proven market leading and high innovative
- 400 High educated R&D Specialist for Process and Equipment and 300 experienced Service and Project Management team
- Key Process Equipment (PECVD etc.) all from Jinchen
- State of the art whole factory automation complete from Jinchen
- Proven inline measurement equipment (wafer income inspection etc.)
- System training covers all level of employee
- Best cost-structure per Wp in the market
- Lowest cost of ownership
- Serious efficiency guarantees
- Optional service package provide customer all possibilities from construction to supply chain and financing



Turnkey Benefits

Decision Support
- Technology
- Location & Building
- COO

Equipment
Installation

Utility & Facility
Planning

Ramp Up
Process
Training

Support
Optimization
Service
Supply Chain

Technology
R&D Cooperation

Benefits of JINCHEN Turnkey Solutions for Cell Production

Updated and reliable Information and Data

Project Feasibility Study

- Detailed market overview on cell- and module level, with future trends and roadmap for next generation
- Product definition and raodmap along the planned value chain
- Cost of ownership model of envisaged production facility

Technical Pre-Engineering and Commercial

- Process-, Equipment-and evaluation/specifications
- Development of automation concept for vertical integrated produciton
- Process-, Equipment consumables specification
- Preparation of facility specification (FUM) and basic engineering

Fab Planning Installation, Ramp Up and FAT

- Overall Project Management (Commercial & technical)
- Cnsulting/Support on buliding related questions (for line integration)
- Equipment move in and installation (excl. facility-/utility structure)
- Process transfer and line ramp-up

After Sales Service and Support

- Performance audits on running line
- Quality monitoring
- Process-and Product technology roadmap for increase of cell efficiency and module power

System Training Plan

Adequate training is a critical success parameter: Ensure quickly a safe and efficient production

Courses are conducted by certified technical trainers and experienced specialists

Knowledge control tests, certification of trainees

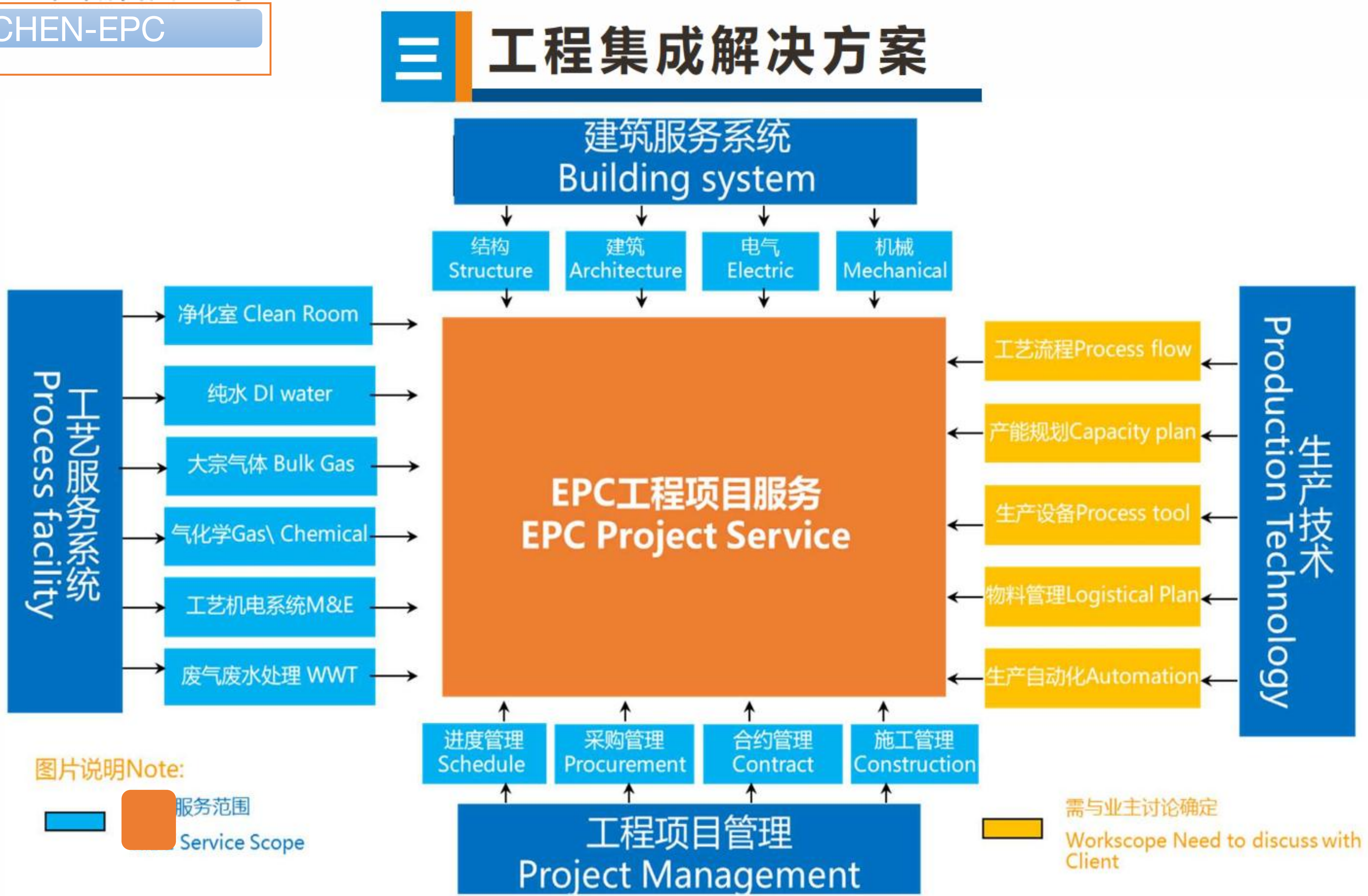
Optional life training by a real production in China

Training is organized according to a level concept:

- Basic, Advanced and Process Operation;
- Basic and Advanced Maintenance
- Operation / Maintenance know how for all equipment

JINCHEN Turnkey Solutions for Cell Production -utility solutions

JINCHEN-EPC



三 工程集成解决方案

建筑服务系统
Building system

- 结构 Structure
- 建筑 Architecture
- 电气 Electric
- 机械 Mechanical

工艺服务系统
Process facility

- 净化室 Clean Room
- 纯水 DI water
- 大宗气体 Bulk Gas
- 气化学Gas\ Chemical
- 工艺机电系统M&E
- 废气废水处理 WWT

EPC工程项目服务
EPC Project Service

生产技术
Production Technology

- 工艺流程Process flow
- 产能规划Capacity plan
- 生产设备Process tool
- 物料管理Logistical Plan
- 生产自动化Automation

- 进度管理 Schedule
- 采购管理 Procurement
- 合约管理 Contract
- 施工管理 Construction

工程项目管理
Project Management

图片说明Note:

🟦 🟧 服务范围
Service Scope

🟨 需与业主讨论确定
Workscope Need to discuss with Client

Project Carrying on and long term supporting Structure - Team Leaders

Senior experts

Dr. Baojie Yan, CTO

World Renowned PV scientist with over 35 years academic and industrial experiences in Europe, USA, Japan, and China

Dr. Baohai Yang, Technical Director

Expert in the design of vacuum system, PV module equipment and process, PV automation system, heat management

Dr. Ke Tao, R&D Director

Renowned PV scientist with the expertise in thin film physics, solar cell technology (HJT, TOPCon, IBC) and optoelectronic devices

Turnkey team leader

Xue Jinyuan
Deputy Director

- 16 years PV cell manufacturing experience, have worked as equipment manager and direcor by Jinko Solar, Trina Solar

Jiang Xiaosong
Director Assistant

- 18 years PV cell process experience, have worked as process supervisor and manager by GCL Solar, Canadian Solar

Feng Lin
Equipment Manager

- 16 Years PV Cell Equipment management experience, have worked as equipment supervisor and manager by Trina Solar, Aiko Solar

Project Carrying on and long term supporting Structure - World Wide Supporting

Jinchen **India**, Noida, Delhi

Singapore Service Centre
Team Members from
- Malaysia (ex. Jinko)
- Taiwan (ex. Big Sun)
- Vietnam (ex. Trina)

Jinchen **USA**
Groveport, Ohio

Jinchen **Germany** (JV)
Kahl Am Main, Bayern

Jinchen **Turkey**
Istanbul

Demo Running Plan by Jinchen Yingkou Pilot line

- **Location:** Yingkou City, Liaoning Province, China
- The headquarter of Machinery Co. Ltd

- Established in 2021 with initial investment of 100 million Chinese Yuan
- Over 70 scientists and engineers

Demo Running by Jinchen Yingkou Pilot line

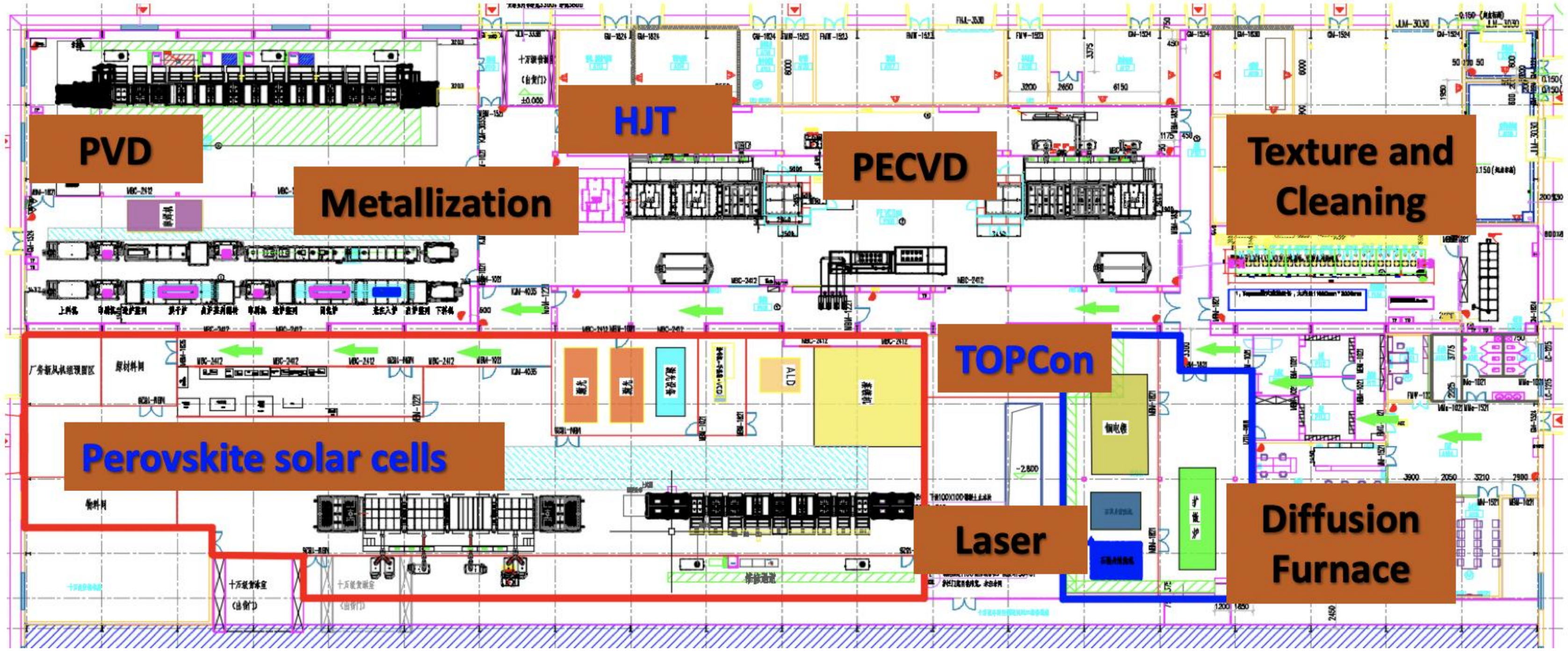
- As a common **innovation platform** for customer
- To **improve the technology** of customer
- To Support customer research on new industrial technologies of high-efficiency solar cells
- To **provide technical training** for the operators in the production line of customer

Collaboration with Universities and Institutes

- Ningbo Institute of Materials Technology & Engineering of Chinese Academy of Science （中科院宁波材料所）
- Institute of Microelectronics of Chinese Academy of Science（中科院微电子所）
- Fraunhofer ISE (tandem solar cells) （德国费劳恩霍夫太阳能研究所）
- HZB (tandem solar cells) 德国亥姆赫兹太阳能研究所
- Nankai University （南开大学）
- Dalian University of Technology （大连理工大学）
- Beijing University of Technology （北京工业大学）

…….

Demo Running by Jinchen Yingkou Pilot line

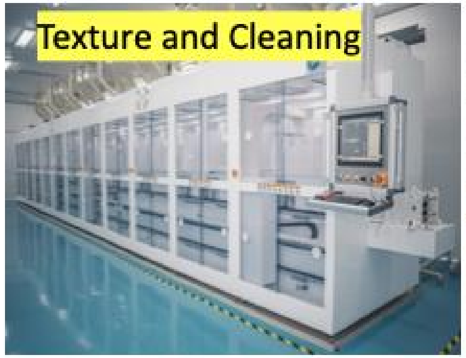


Total area： ~10000 m^2
Clean room： ~6000 m^2

- HJT
- TOPCon
- Perovskite

Demo Running by Jinchen Yingkou Pilot line

Pilot line for HJT and TOPCon solar cells

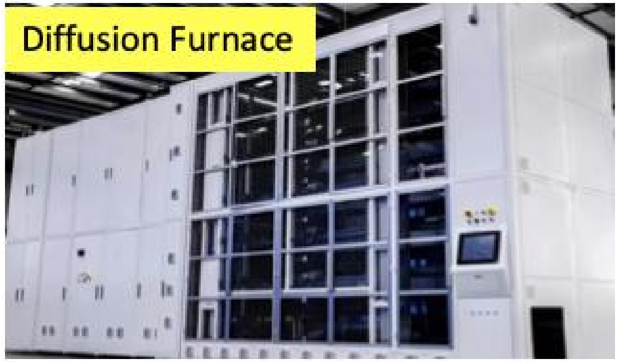

Texture and Cleaning

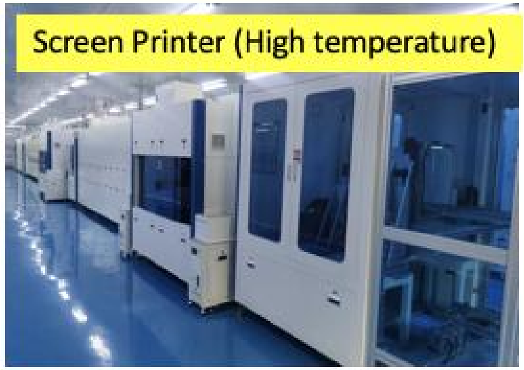

PECVD


PVD


Screen Printer (Low temperature)


Tube PECVD


Diffusion Furnace


Screen Printer (High temperature)

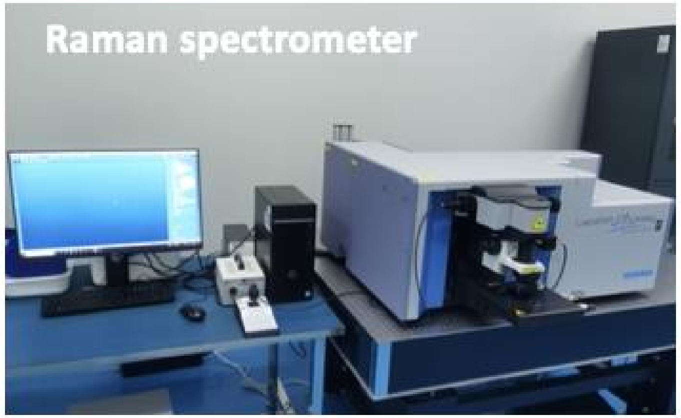

Laser System

Demo Running by Jinchen Yingkou Pilot line

Well-established Testing Platform (structural, optical and electronic characterization)


SE


WCT-120

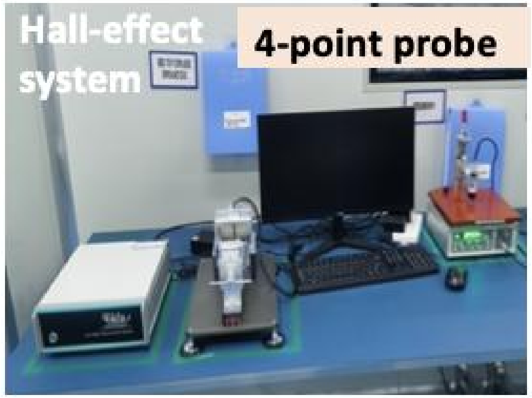

Raman spectrometer


FTIR


3D microscope


SEM


UV/VIS spectrophotometer

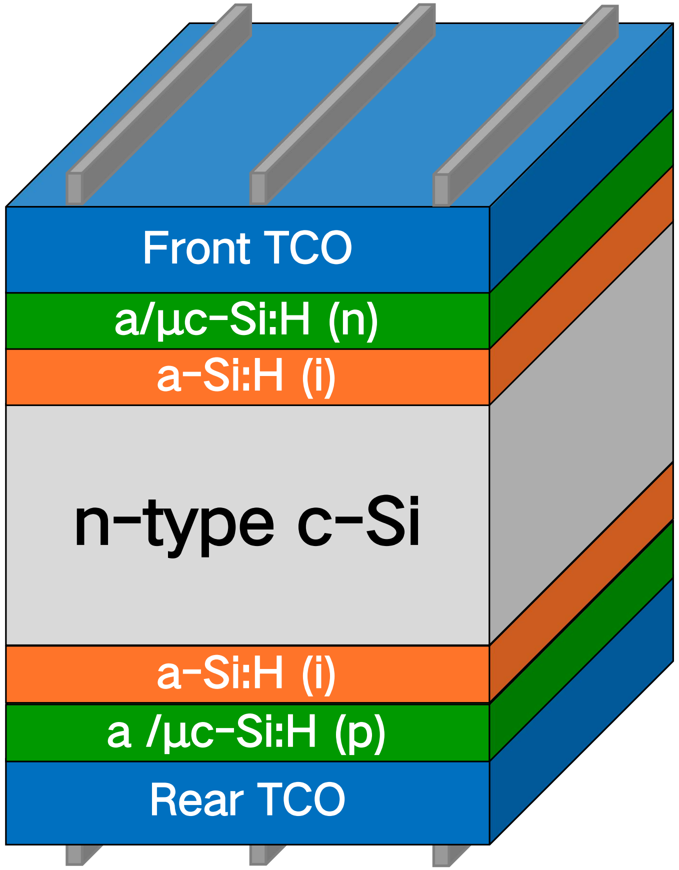

Hall-effect system

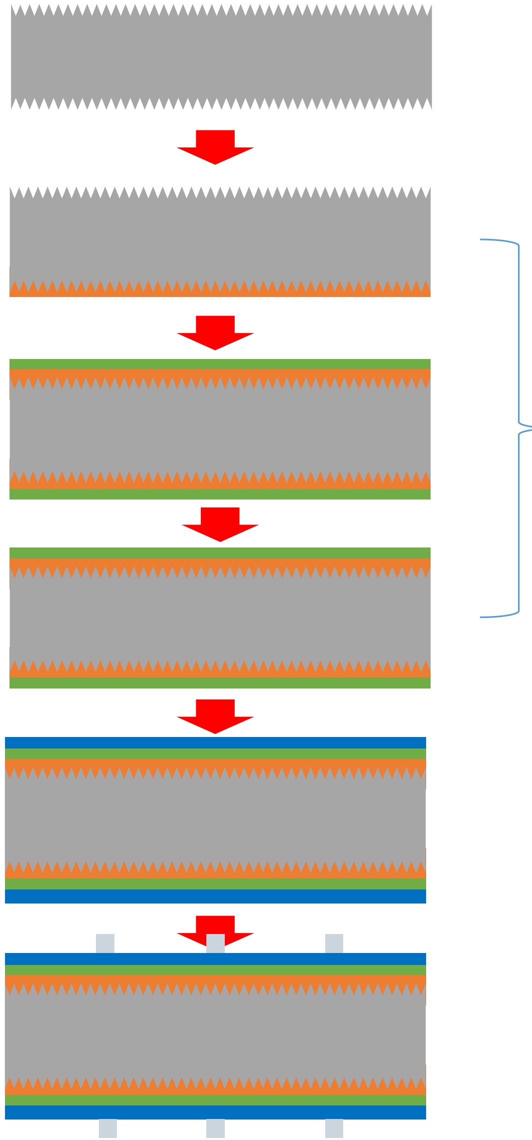
4-point probe

HJT Process and key equipment

制绒清洗 → PECVD → PVD → 丝网印刷

Texturing & Cleaning → PECVD → PVD → Screen Printing





Step1:制绒清洗
Texturing & Cleaning

Step2:非晶硅p-i
a-Si:H (p side)

Step3:非晶n-I &微晶n
a-Si:H(n side) & μc-Si-n

Step4:微晶p
μc-Si-p

Step5:TCO膜层
TCO film

Step6:丝网印刷
Screen Printing

Texturing & Cleaning

PECVD设备

PVD设备

Screen Printing

HJT PECVD Milestone

2019
- Started HJT PECVD project

2020
- HJT PECVD amorphous experimental equipment

2021
- HJT PECVD Microcrystallization Experimental Equipment

2022
- HJT PECVD microcrystalline mass production equipment

HJT PECVD Characteristics

- Chained static coating design/adjustable spacing of coating process/flexible adjustment of coating sequence
- High capacity design, based on 210 halves 14,000 wafers/hour, compatible with 166-230 wafers
- RF+RPSC dual power supply design
- Equipped with self-designed high-precision automated transfer equipment

Jinchen HJT R&D Support Resource

Jinchen innovation on HJT equipment

1GW expected line cost can be reduced to < 350 million

Low cost, high capacity

Jinchen HJT PECVD：

European team to help complete the prototype program validation;

Collaboration with overseas partner - H2GEMINI, Chinese and European team members all have rich experience in developing coating equipment related to HJT industry

First HJT PECVD mass production equipment based on microcrystalline process to enter the head customer in August 2022

Jinchen PECVD characteristics：

Chained static coating design / adjustable spacing of coating process / flexible adjustment of coating sequence

Large capacity design, based on 210 half wafer 13000 wafers/hour or more capacity, compatible with 156-210 wafers, lower cost.

RF+RPSC dual power supply design ensures that coating and self-cleaning do not interfere with each other and work in the best condition.

Equipped with self-designed high-precision automatic transfer equipment

Completely own intellectual property rights

Technical Specifications of HJT Solar Cell Turnkey Line

设备配置表:

工序 Process	设备名称 The name of the device	产能 Capacity (210半片)	台数 Quantity				
			600MW	1.2GW	2.4GW	3.6GW	5GW
硅片分选sorting							
1	硅片分选 Silicon wafer NG detection	18000	1	2	4	5	7
制绒清洗Fleece cleaning							
2	清洗+制绒Cleaning+ Texturing	18000	1	2	4	5	7
3	上下料自动化 Automatic loading and unloading	18000	1	2	4	5	7
CVD镀膜							
4	CVD（双面微晶） Double-sided micro crystals	14904	1	2	4	6	8
5	上下料翻片自动化 loading and unloading flipping automation	14904	1	2	4	6	8
PVD镀膜							
6	PVD	14400	1	2	4	6	8
7	上下料自动化 Automatic loading and unloading	14400	1	2	4	6	8
金属化							
8	印刷+光注入+IV Screen Printing+Light injection+IV	12000	1.5	2.5	4.5	7	9.5

辅助设备Auxiliary equipment	
1	整厂AGV系统Complete AGV system for the factory
2	MES系统MES system
3	离线TCO返工清洗机Off-line TCO rework cleaning machine
4	缓存

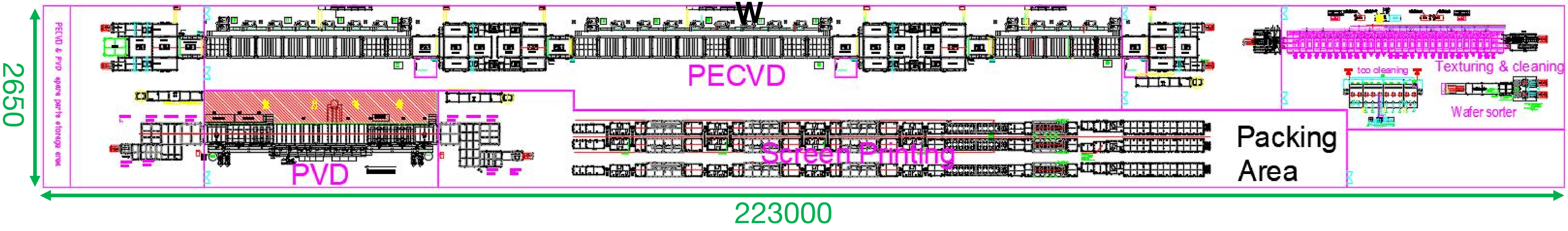
离线检测设备(客户自行购买)Off-line testing equipment (purchased by customers)	
1	氦检仪Helium detector
2	少子寿命测试仪Minority Carrier LifetimeTester
3	椭偏仪Ellipsometer
4	霍尔测试仪Hall tester
5	分光光度计spectrophotometer
6	3D显微镜3d microscope
7	臭氧检测仪Ozone detector
8	洁净度测试仪Cleanliness Tester
9	拉力计tension meter
10	电子天平Electronic balance
11	四探针方阻测试仪Four-probe square resistance tester
12	二次元影像测试仪Two-dimensional image tester
13	PL/EL红外一体机PL/El infrared integrator
14	大电阻测试仪High resistance tester

Technical Specifications of HJT Solar Cell Turnkey Line

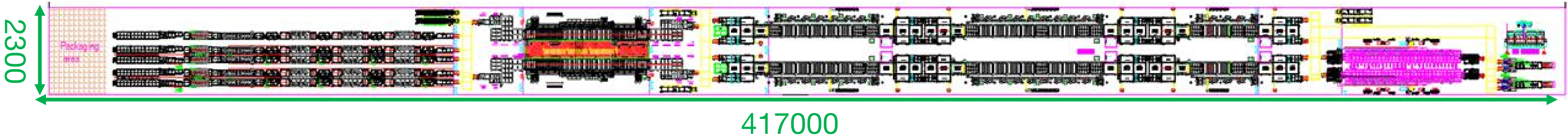
NO	Items	Technical specifications
1	Wafer dimensions	G12 (210mm * 105mm) , Tolerance ± 0.15 mm
2	Thickness of wafer	Meet the wafer thickness of 100-130 micron specifications, 110 micron is the standard for acceptance
3	Whole line uptime	⩾90% (Monthly calendar time - Monthly equipment failure time)/Monthly calendar time)
4	Average cell efficiency	⩾25.4% @G12 bifacial microcrystalline process
5	Overall yield (including fragmentation rate)	⩾98.2%
6	Whole line fragmentation rate	⩽0.87%
7	Consumption of silver paste per unit	⩽110mg (210mm*105mm)

HJT Solar Cell Turnkey Line Layout

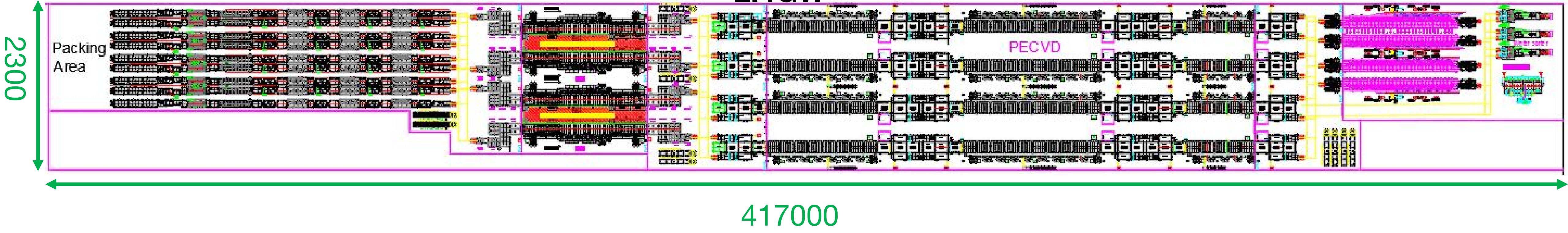
600MW



1.2GW



2.4GW



Basic Requirements on plant workshop

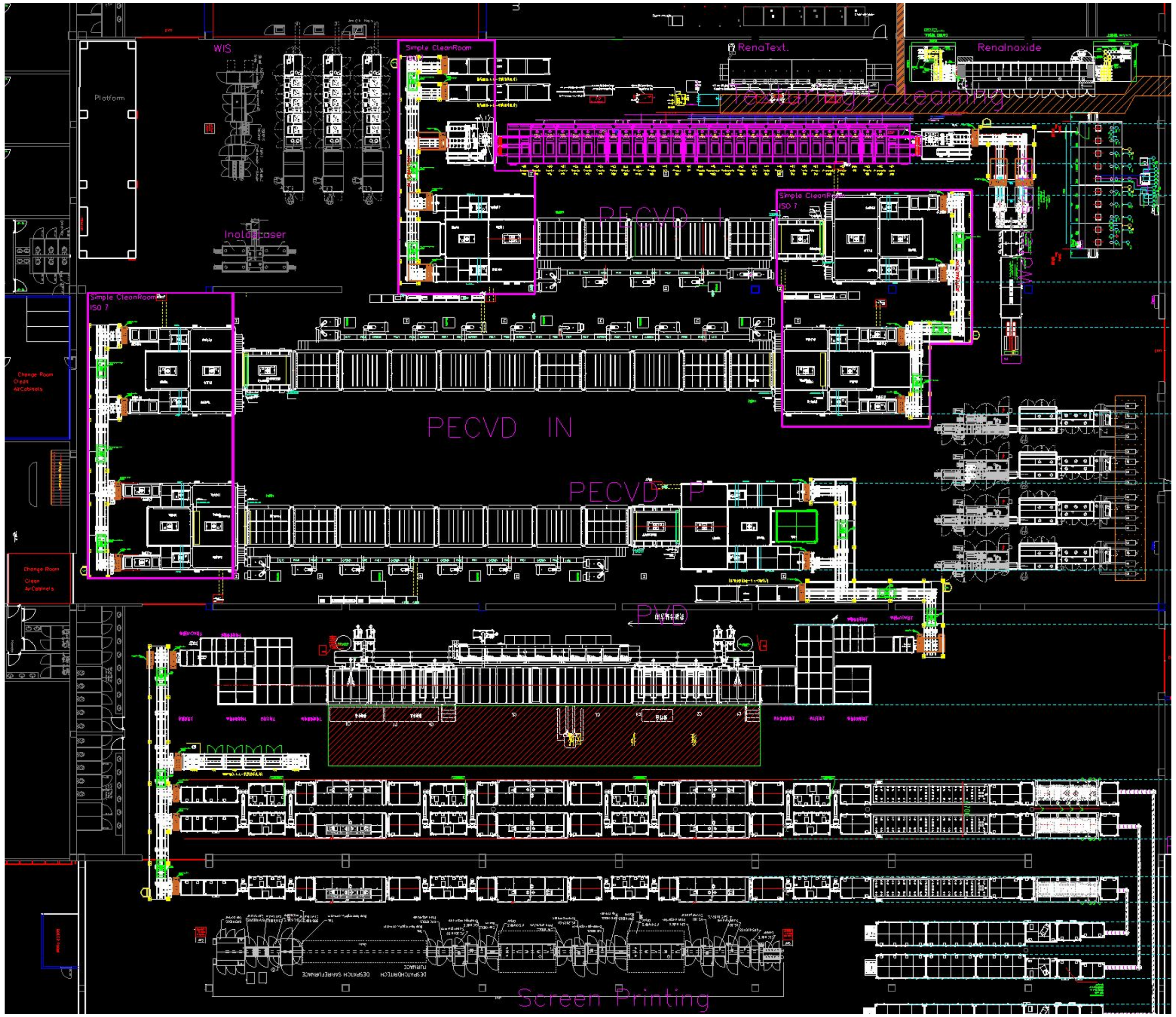
No.	Machine	Purification level	Temperature		Ground requirements	Height requirement	Ground flatness	Ground loading	Photochromic	Illuminance	Remark
		ISO Standard (US Federal Standard)	(℃)			m(the distance from the ground to the ceiling)		T/m2		(LUX)	
1	Wafer sorter	10000	23-27		Compressive strength of epoxy resin ≥80MPa	3.5	Holerance of height ±2mm within 3m	1	white	400	
2	Texturing+Cleaning	10000(for unloading layout is 1000)	23-27			4		1	white	300	
3	PECVD	10000(part of loading area is 1000)	23-27			5.5 (Ensure the hook height)		2	white	400	Hook height ≥4m, lifting weight 10 tons, 6 direction double speed frequency conversion, lifting high and low speed
4	PVD	10000	23-27			5 (Ensure the hook height)		2	white	300	Clean crane 8 tons/hook height 3m
5	Screen Printing	100000	23-27			3.5		1.2	white	300	
6	IV tester	100000	25 ± 2			3.5		1	white	400	

Segmental Cleaning Room Solution

Segmental Cleaning Room （ISO 7)

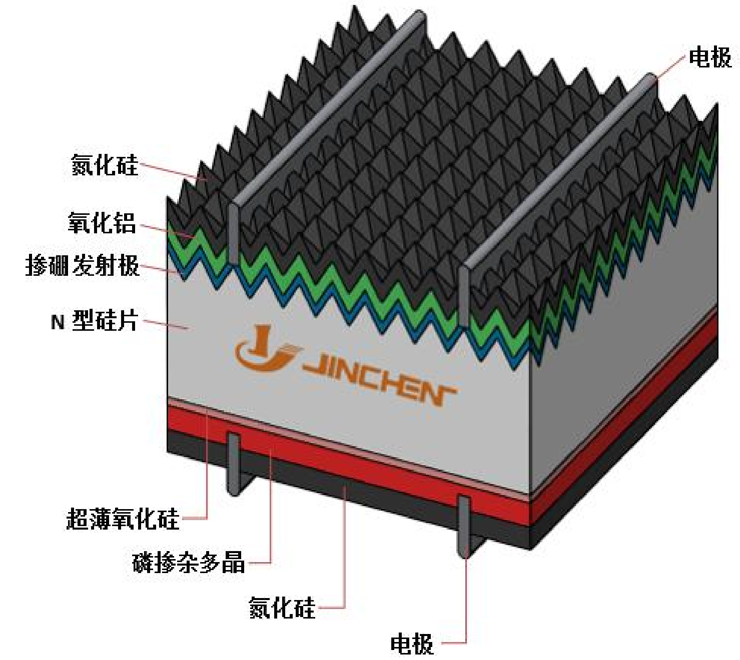
1. Texturing Unload and PECVD-i Load
2. PECVD-i Unload- PECVD-in Load
3. PECVD-in Unload-PECVD-p Load

Total Cost Saving >30%



PERTOP Process and key equipment

Key Process Equipment (PECVD etc.) from Jinchen



Low Pressure B-Diffusion

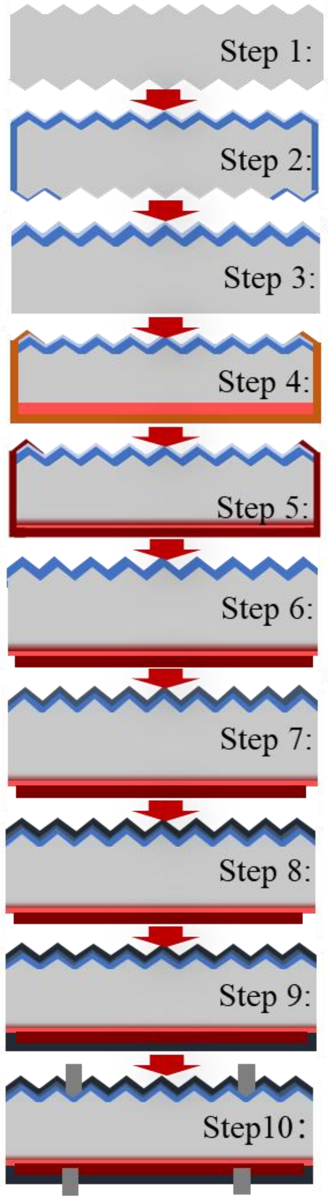
Tube-PECVD PE-Poly-Si

High T Furnace

PE-SiN_X Tube-PECVD

LECO

PET （Edge Passivation) (Optional)



清洗制绒
Cleaning and texturing

硼扩制备发射极
B diffusion for emitter

去BSG-碱抛
BSG etching and polishing

隧穿氧化硅-掺杂非晶硅
Tunnel SiO_x formation and P-doped a-Si:H deposition

晶化退火
Crystallization annealing

去非晶硅绕镀-碱抛
Cleaning for wrapping around deposition

正镀膜氧化铝
Front side Al_2O_3 deposition

正镀膜氮化硅
Front SiNx deposition

背镀膜氮化硅
Rear SiNx deposition

金属化-测试分选
Metallization-Regeneration -Test and Sorting

TOPCon电池生产工艺流程
TOPCon Solar Cell Production Process

PERTOP solar cell production core process equipment

Functional overview

Fabrication ofultrathin SiOtunnel layer and deposition ofin-situ P doped a-Si:H incubation layer for the n+-poly-Silayerin the full rear area passivation and carrier selection structurein high efficiency TOPCon solar cells.

Three-in-one process tube PECVD equipment

Solving the cell carrier graphite inter-sheet electric field conduction problemduring the process is the key technology that enables tube PECVD to be usedfor a-Si:H amorphous silicon film deposition

Develop the process of amorphous silicon film preparation by tube PECVD, andsolve the intra- and inter-sheet uniformity problems of mass-producedamorphous silicon films, and the bursting problem of amorphous silicon films

Develop the process of simultaneous deposition of amorphous silicon film andp-doped (in-situ p-doped) by tubular PECVD, and control the concentration ofp-doped in mass production

Development of ultra-thin silicon oxide thin film production process by nitrousoxide pulse oxidation in tube PECVD, and solving the problem of uniformity ofultra-thin silicon oxide film in mass production

Achieved the three-in-one process technology of "ultra-thin silicon oxidetunneling film +in-situ p-doped amorphous silicon film" by tube PECVD formass production

Achieved an average efficiency of 25% for the high-efficiency TOPCon solar cellR&Dline

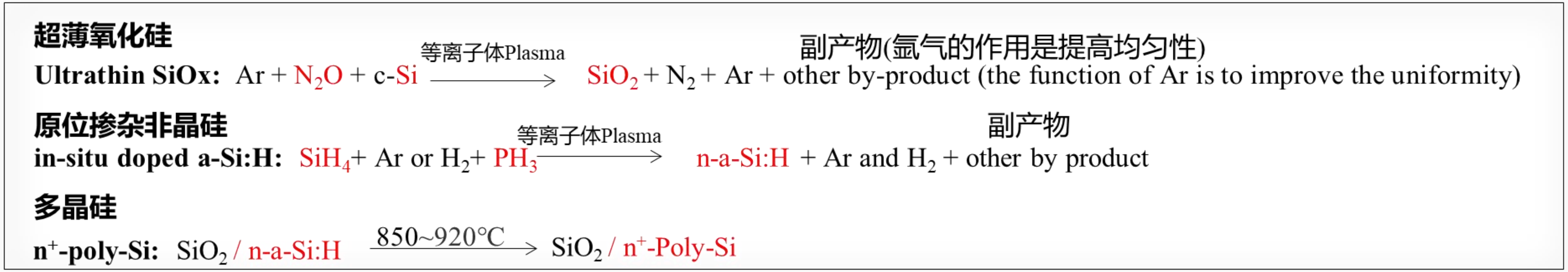
3-in-1 Tube-PECVD: The Core Technology for PERTOP Production Equipment and Process

Patented technology for resolving the electrical shortage problem between graphite electrodes during the a-Si:H deposition, enabling the tube-PECVD for semiconductor thin film deposition

Patented technology for resolving the issues in tube-PECVD a-Si:H deposition process, including film uniformity and film blustering
Developed the in-situ P-doped a-Si:H deposition process with precisely controlled active dopant concentration

Patented technology for the ultrathin SiO_x tunnel layer using in-situ oxidation with N_2O plasma in the same tube-PECVD system, resolving the nonuniformity issue of ultrathin SiO_x to achieve uniform passivation and carrier transport

Production line proved the manufacturing capability of the tube-PECVD 3-in-1 process for TOPCon solar cell manufacturing



超薄氧化硅
副产物(氩气的作用是提高均匀性)
Ultrathin SiOx: $Ar + N_2O + c\text{-}Si \xrightarrow{\text{等离子体Plasma}} SiO_2 + N_2 + Ar +$ other by-product (the function of Ar is to improve the uniformity)

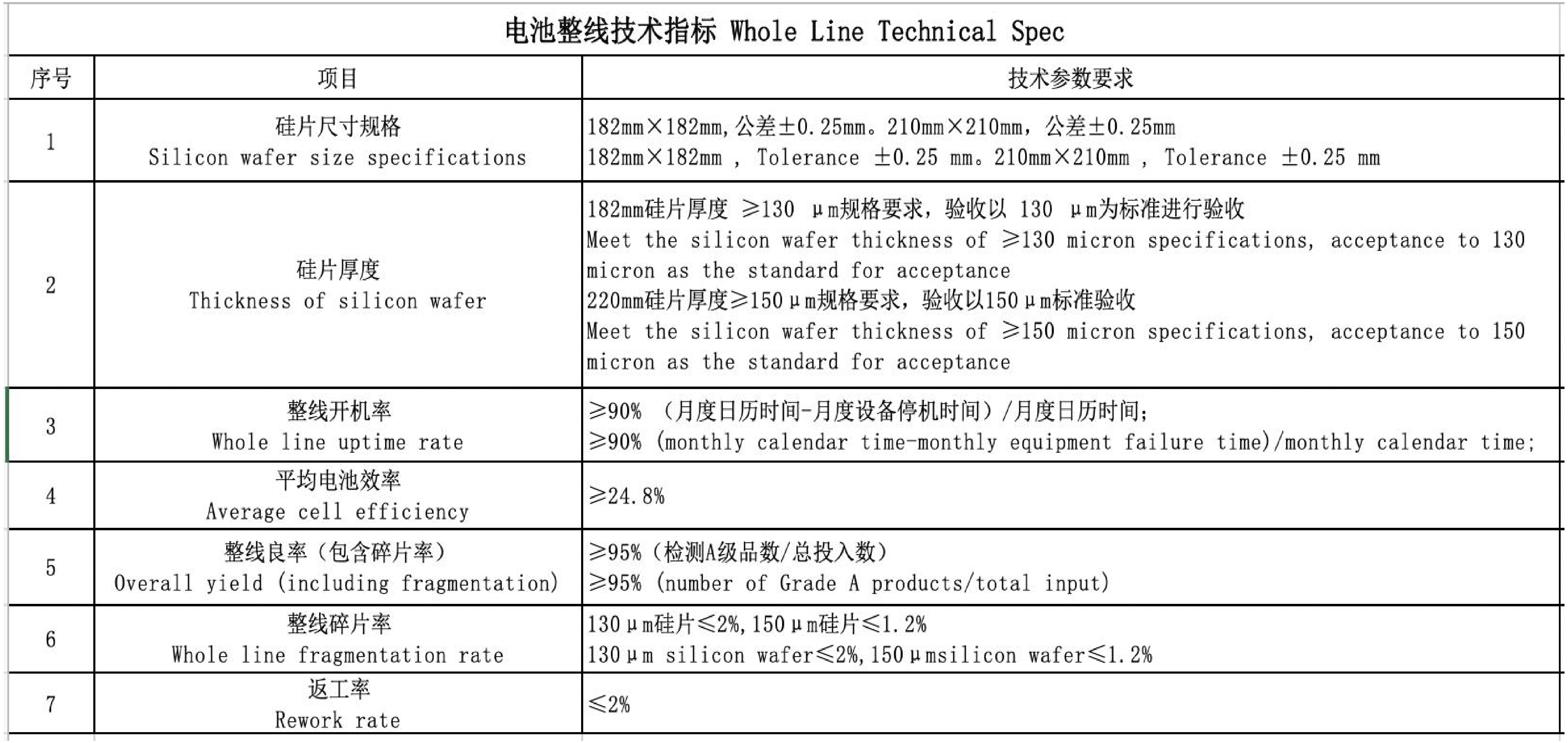
原位掺杂非晶硅
副产物
in-situ doped a-Si:H: $SiH_4 + Ar$ or $H_2 + PH_3 \xrightarrow{\text{等离子体Plasma}} n\text{-}a\text{-}Si{:}H + Ar$ and $H_2 +$ other by product

多晶硅
n^+-poly-Si: $SiO_2 / n\text{-}a\text{-}Si{:}H \xrightarrow{850\sim920^\circ C} SiO_2 / n^+\text{-}Poly\text{-}Si$

3-in-1 Tube-PECVD: The Core Technology for PERTOP Production Equipment and Process-Full Patent

- ➢ Patented technology
- ✓ Filed 16 invention patents, 2 are granted and 14 in the evaluation process
- ✓ File 34 practical application patents, 29 are granted and 5 in evaluation
- ➢ Covering system design and fabrication process:
  - ✓ Special graphite boat designed for a-Si:H deposition, preventing the electrical shortage between graphite sheet electrodes
  - ✓ Ultrathin SiOx uniformity
  - ✓ Non-blustering in-situ P-doped poly-Si deposition

PERTOP Cell Line Technical Specifications



电池整线技术指标 Whole Line Technical Spec

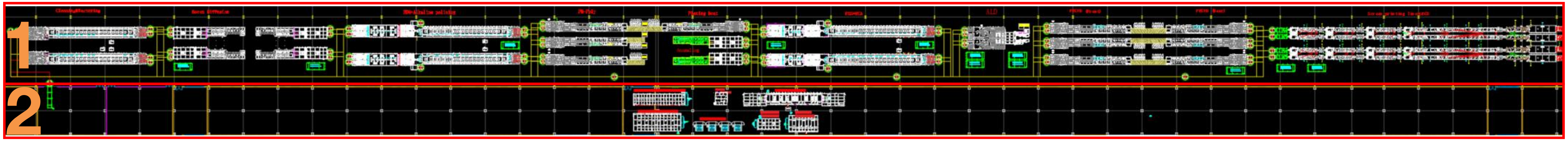
序号	项目	技术参数要求
1	硅片尺寸规格 Silicon wafer size specifications	182mm×182mm,公差±0.25mm。210mm×210mm，公差±0.25mm 182mm×182mm , Tolerance ±0.25 mm。210mm×210mm , Tolerance ±0.25 mm
2	硅片厚度 Thickness of silicon wafer	182mm硅片厚度 ≥130 μm规格要求，验收以 130 μm为标准进行验收 Meet the silicon wafer thickness of ≥130 micron specifications, acceptance to 130 micron as the standard for acceptance 220mm硅片厚度≥150μm规格要求，验收以150μm标准验收 Meet the silicon wafer thickness of ≥150 micron specifications, acceptance to 150 micron as the standard for acceptance
3	整线开机率 Whole line uptime rate	≥90% （月度日历时间-月度设备停机时间）/月度日历时间； ≥90% (monthly calendar time-monthly equipment failure time)/monthly calendar time;
4	平均电池效率 Average cell efficiency	≥24.8%
5	整线良率（包含碎片率） Overall yield (including fragmentation)	≥95%（检测A级品数/总投入数） ≥95% (number of Grade A products/total input)
6	整线碎片率 Whole line fragmentation rate	130μm硅片≤2%,150μm硅片≤1.2% 130μm silicon wafer≤2%,150μmsilicon wafer≤1.2%
7	返工率 Rework rate	≤2%

Throughput Capacity Calculation

JINCHEN

NO	Item	Technical specifications
1	Capacity Planning	1.0GW
3	Number of working days per year	330 days
4	Hours worked/days worked	24 hours/day
5	Cell power	8.28W/Pcs (25% efficiency)
6	Number of cell produced per year	408000x0.93x330/1000= 125215 Kpcs/Year
7	**Annual output power**	1036MW≈1GW

1 GW PERTOP Cell Line Layout



Throughput over 1000MW per year

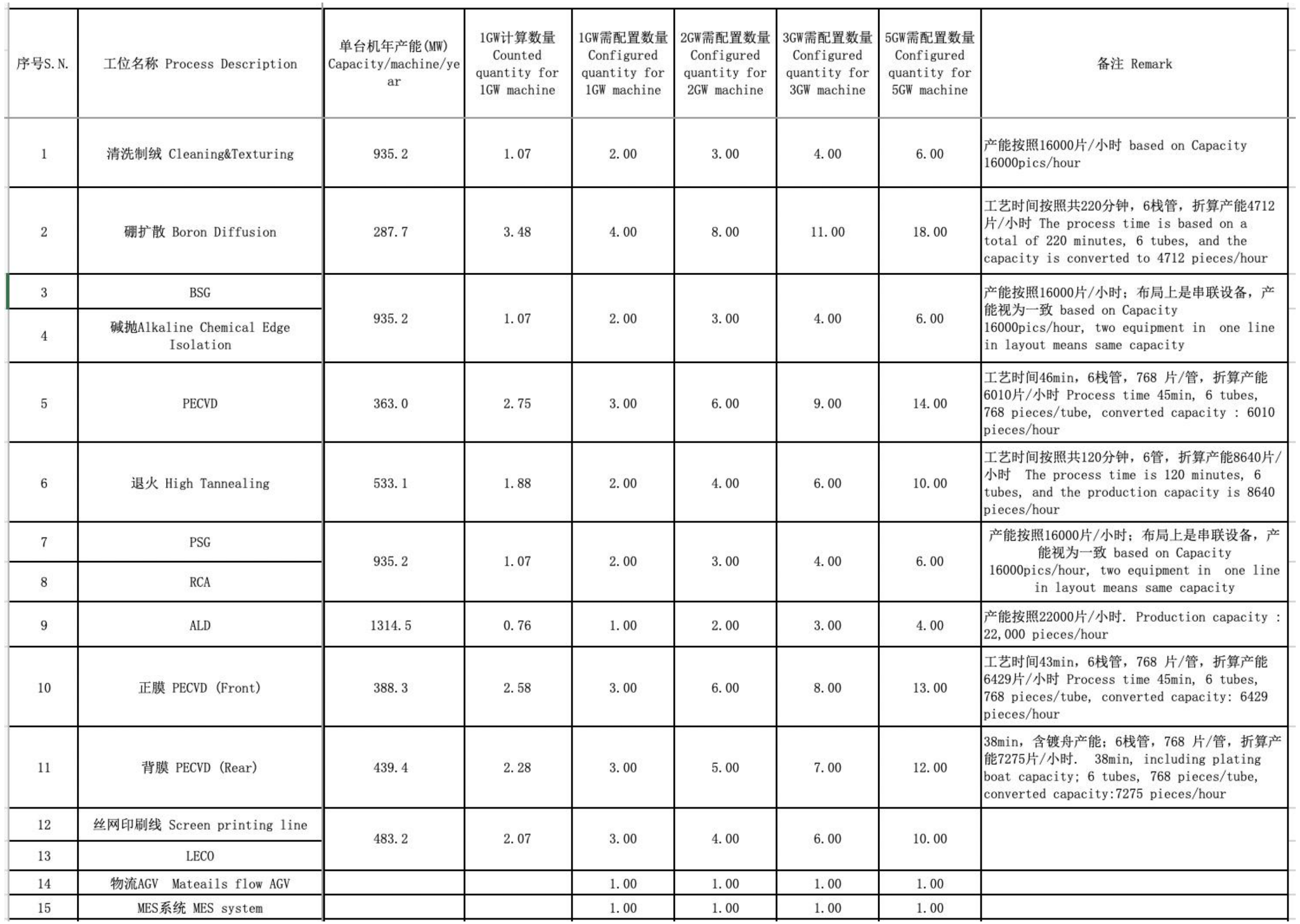
1. Floor space： 9200㎡（ Length 460m x Width20m=9200㎡ ）

2. Raw Material、Wafer Warehouse、Product Storage、Testing Room、Packing、Auxiliary tools .
   Space：3000㎡

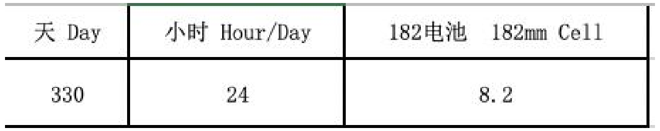
3. The line requires total 140 employees

*详情请参阅技术建议书
Please refer to the technical proposal for more details

GW level PERTOP Line Configuration



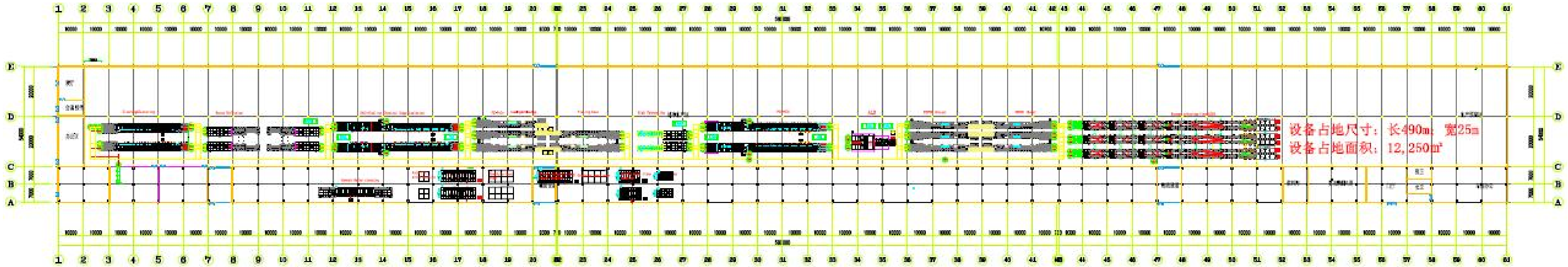
序号S.N.	工位名称 Process Description	单台机年产能(MW) Capacity/machine/year	1GW计算数量 Counted quantity for 1GW machine	1GW需配置数量 Configured quantity for 1GW machine	2GW需配置数量 Configured quantity for 2GW machine	3GW需配置数量 Configured quantity for 3GW machine	5GW需配置数量 Configured quantity for 5GW machine	备注 Remark
1	清洗制绒 Cleaning&Texturing	935.2	1.07	2.00	3.00	4.00	6.00	产能按照16000片/小时 based on Capacity 16000pics/hour
2	硼扩散 Boron Diffusion	287.7	3.48	4.00	8.00	11.00	18.00	工艺时间按照共220分钟，6栈管，折算产能4712片/小时 The process time is based on a total of 220 minutes, 6 tubes, and the capacity is converted to 4712 pieces/hour
3	BSG	935.2	1.07	2.00	3.00	4.00	6.00	产能按照16000片/小时；布局上是串联设备，产能视为一致 based on Capacity 16000pics/hour, two equipment in one line in layout means same capacity
4	碱抛Alkaline Chemical Edge Isolation							
5	PECVD	363.0	2.75	3.00	6.00	9.00	14.00	工艺时间46min，6栈管，768 片/管，折算产能6010片/小时 Process time 45min, 6 tubes, 768 pieces/tube, converted capacity : 6010 pieces/hour
6	退火 High Tannealing	533.1	1.88	2.00	4.00	6.00	10.00	工艺时间按照共120分钟，6管，折算产能8640片/小时 The process time is 120 minutes, 6 tubes, and the production capacity is 8640 pieces/hour
7	PSG	935.2	1.07	2.00	3.00	4.00	6.00	产能按照16000片/小时；布局上是串联设备，产能视为一致 based on Capacity 16000pics/hour, two equipment in one line in layout means same capacity
8	RCA							
9	ALD	1314.5	0.76	1.00	2.00	3.00	4.00	产能按照22000片/小时. Production capacity : 22,000 pieces/hour
10	正膜 PECVD (Front)	388.3	2.58	3.00	6.00	8.00	13.00	工艺时间43min，6栈管，768 片/管，折算产能6429片/小时 Process time 45min, 6 tubes, 768 pieces/tube, converted capacity: 6429 pieces/hour
11	背膜 PECVD (Rear)	439.4	2.28	3.00	5.00	7.00	12.00	38min，含镀舟产能；6栈管，768 片/管，折算产能7275片/小时. 38min, including plating boat capacity; 6 tubes, 768 pieces/tube, converted capacity:7275 pieces/hour
12	丝网印刷线 Screen printing line	483.2	2.07	3.00	4.00	6.00	10.00	
13	LECO							
14	物流AGV Mateails flow AGV			1.00	1.00	1.00	1.00	
15	MES系统 MES system			1.00	1.00	1.00	1.00	

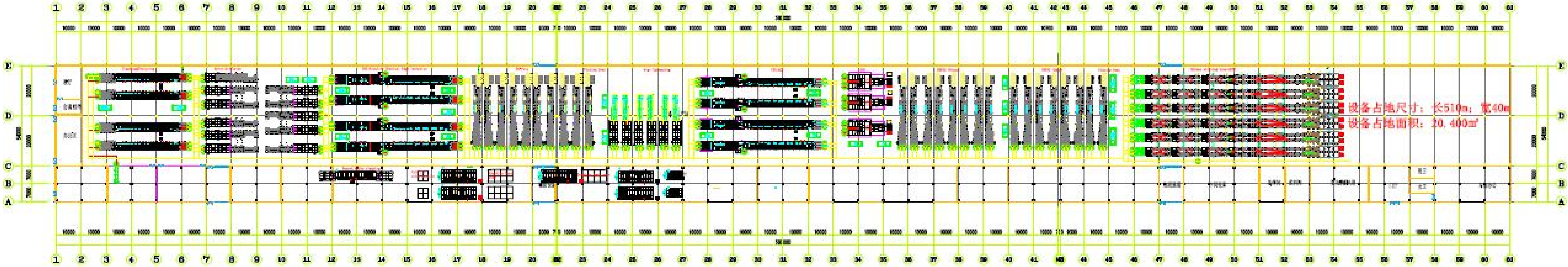


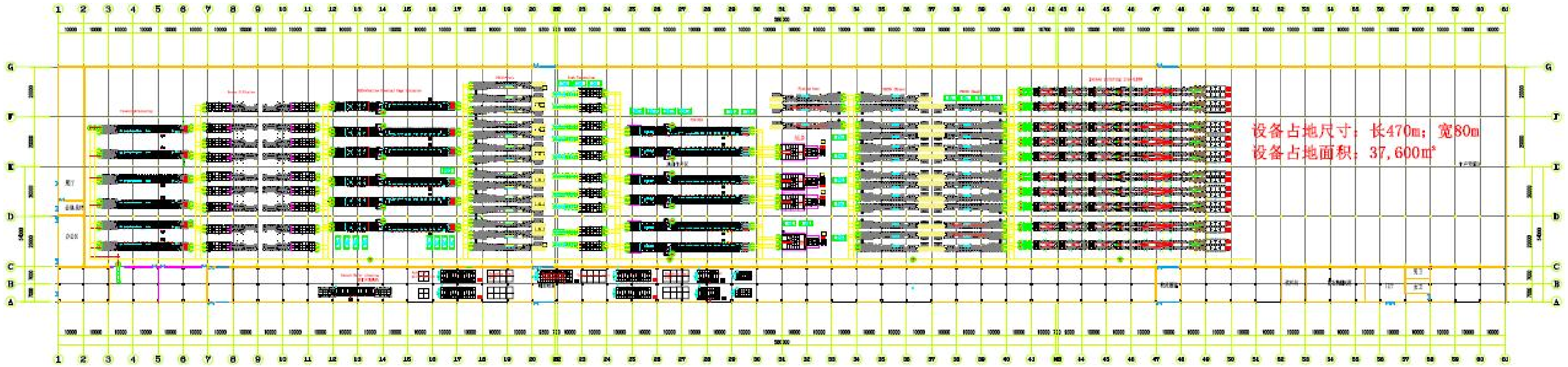
天 Day	小时 Hour/Day	182电池 182mm Cell
330	24	8.2

工位名称 Process Description	GW需配置数量 Configured quantity for 1GW machine	2GW需配置数量 Configured quantity for 2GW machine	3GW需配置数量 Configured quantity for 3GW machine	5GW需配置数量 Configured quantity for 5GW machine
镀舟机 plating boat	2.00	2.00	2.00	3.00
返工片清洗机 Rework wafer clean machine	1.00	1.00	1.00	1.00
石英舟清洗机Quartz boat clean machine	2.00	2.00	2.00	2.00
石英管清洗机（半自动）Quartz tube clean machine (Semi-Auto)	1.00	1.00	1.00	1.00
石墨舟清洗机Graphite boat cleani machine	2.00	2.00	2.00	3.00
PE-poly石墨舟清洗机PE-poly Graphite boat cleani machine	1.00	1.00	1.00	2.00
石墨舟烘箱Graphite boat oven	3.00	3.00	3.00	5.00
全自动卡点机 Auto fix point machine	2.00	2.00	2.00	2.00
花篮清洗机（干花篮）Cassete clean machine (Dry cassete)	2.00	2.00	2.00	2.00
花篮缓存机	12.00	18.00	24.00	30.00
返工片上下料 Rework wafer load & unload	1.00	1.00	1.00	1.00

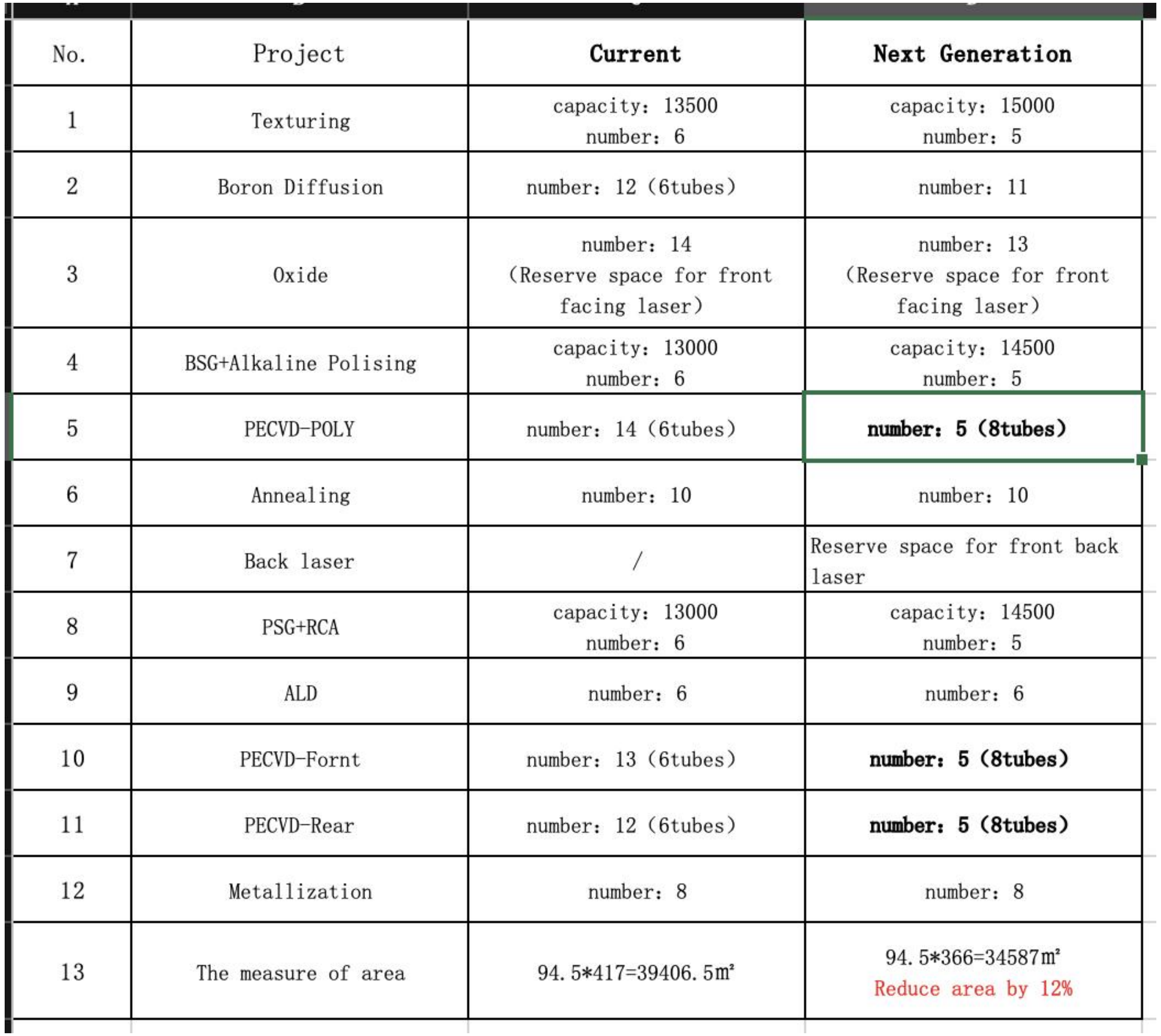
PERTOP Cell Turnkey Line Layout of 1GW， 3GW and 5GW (incl. AGV Road)







New Design for cost saving



No.	Project	**Current**	**Next Generation**
1	Texturing	capacity：13500 number：6	capacity：15000 number：5
2	Boron Diffusion	number：12（6tubes）	number：11
3	Oxide	number：14 （Reserve space for front facing laser）	number：13 （Reserve space for front facing laser）
4	BSG+Alkaline Polising	capacity：13000 number：6	capacity：14500 number：5
5	PECVD-POLY	number：14（6tubes）	**number：5（8tubes）**
6	Annealing	number：10	number：10
7	Back laser	/	Reserve space for front back laser
8	PSG+RCA	capacity：13000 number：6	capacity：14500 number：5
9	ALD	number：6	number：6
10	PECVD-Fornt	number：13（6tubes）	**number：5（8tubes）**
11	PECVD-Rear	number：12（6tubes）	**number：5（8tubes）**
12	Metallization	number：8	number：8
13	The measure of area	94.5*417=39406.5m²	94.5*366=34587m² Reduce area by 12%

New Design for Higher Capacity

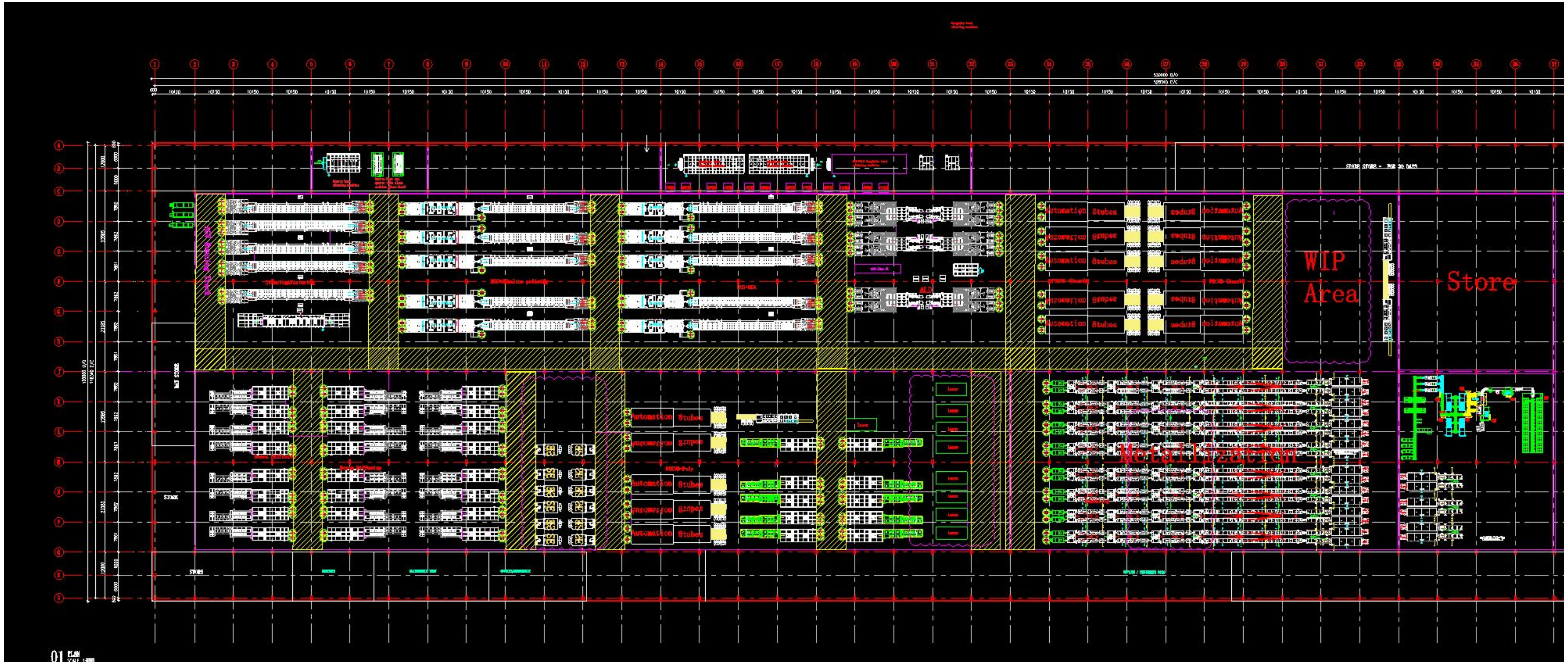
Less Equipment Quantity

Less Facility and Utility

Less Space

Less Capex

New Design for cost saving



Double-side poly-Si technology

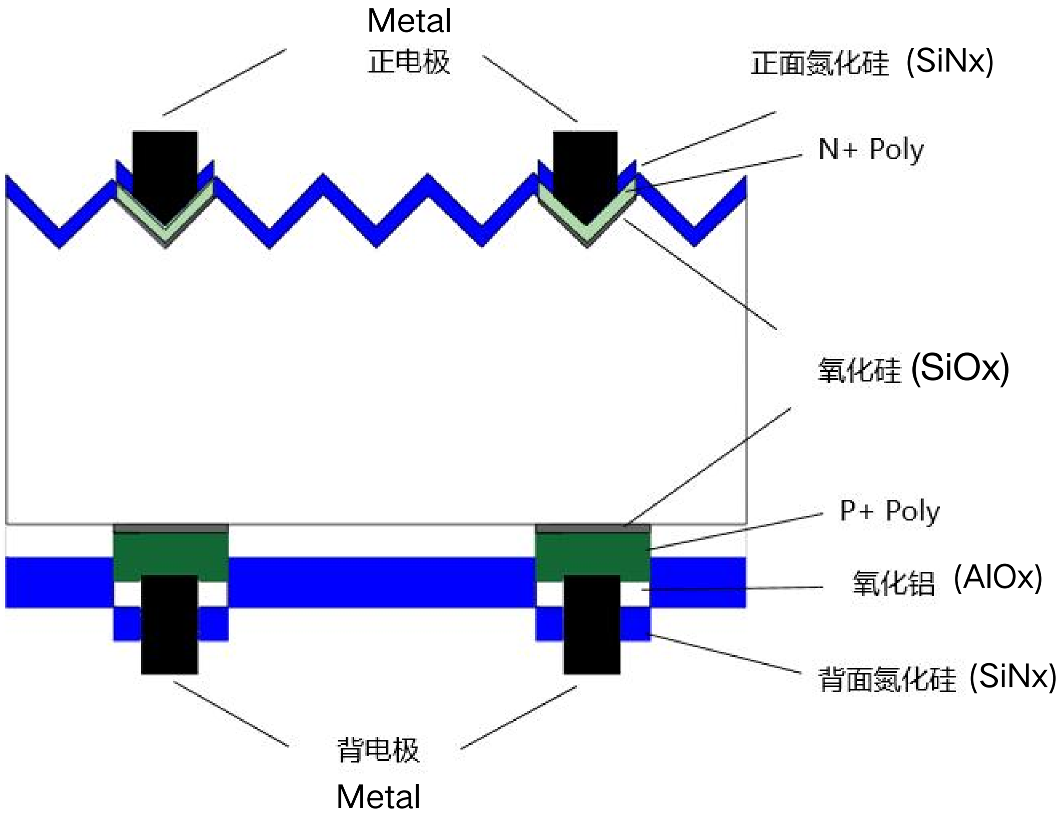
- polishing & cleaning
- rear side deposition of SiO2、P+ Poly、Mask-SiOx
- wrap around etching and texturing
- Front side deposition of SiO2、N+ Poly、Mask-SiOx
- Annealing and crystallization
- rear side wrap around etching
- laser opening Mask on both sides
- chemical etching of P+、N+ Poly Si and Oxide at the non-contact regions
- rear side deposition of AlOx/SiNx
- front side deposition of SiNx
- screen printing/light soaking/testing and sorting
- scribing and edge passivation

Tube PECVD

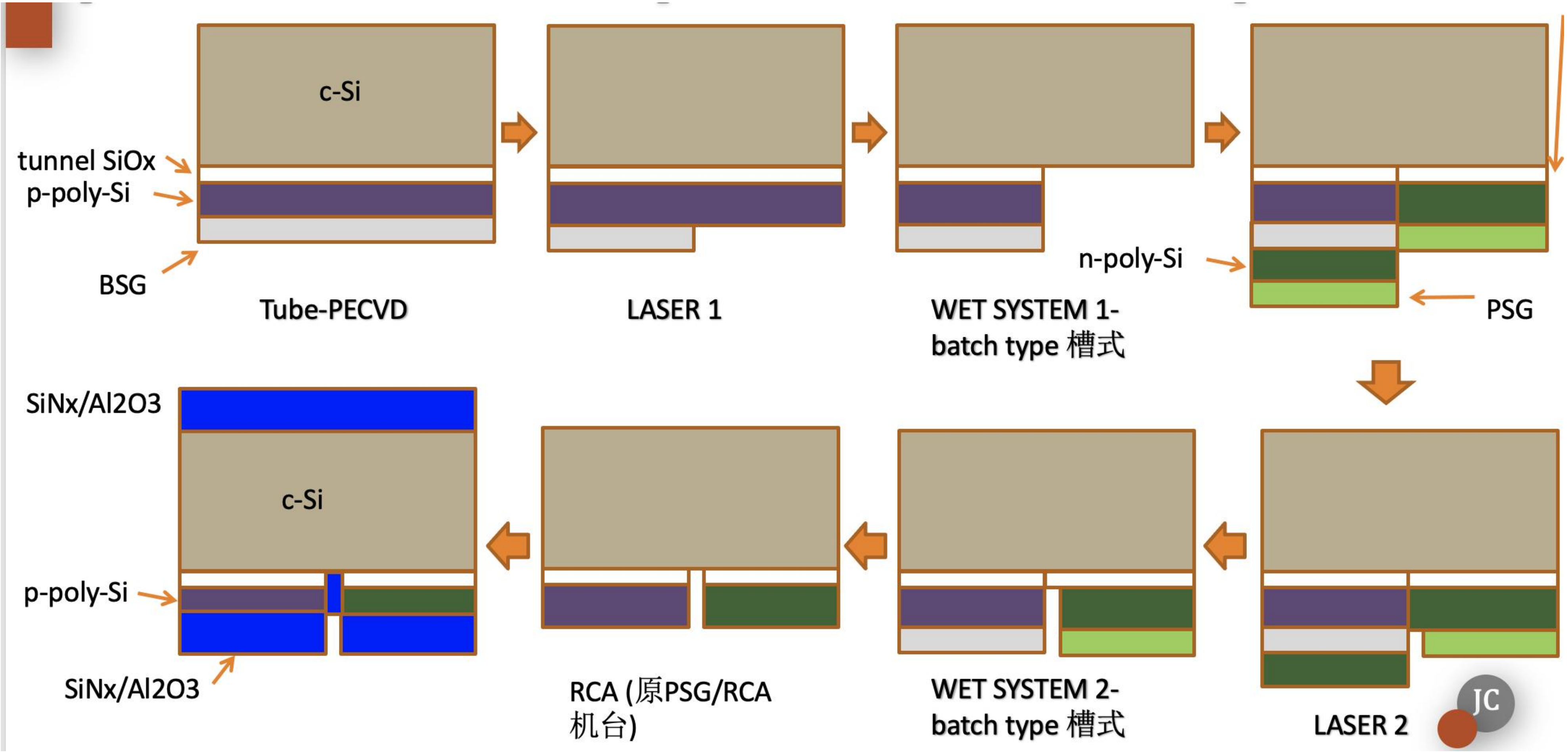
Laser system

Wet system

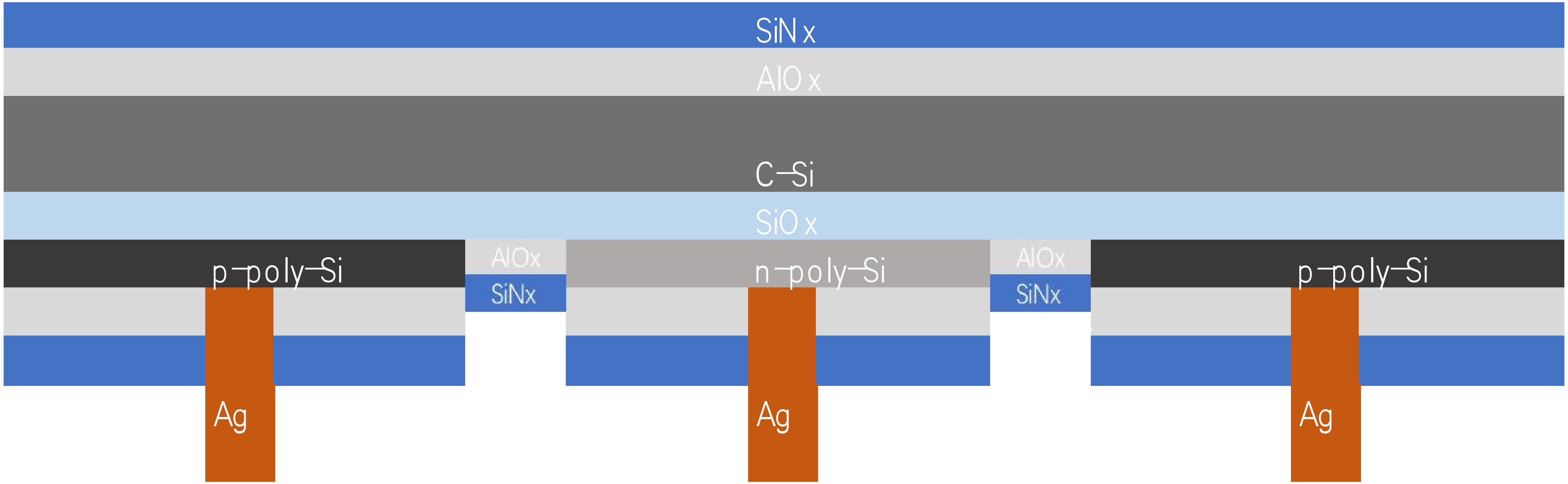
Scriber and PET



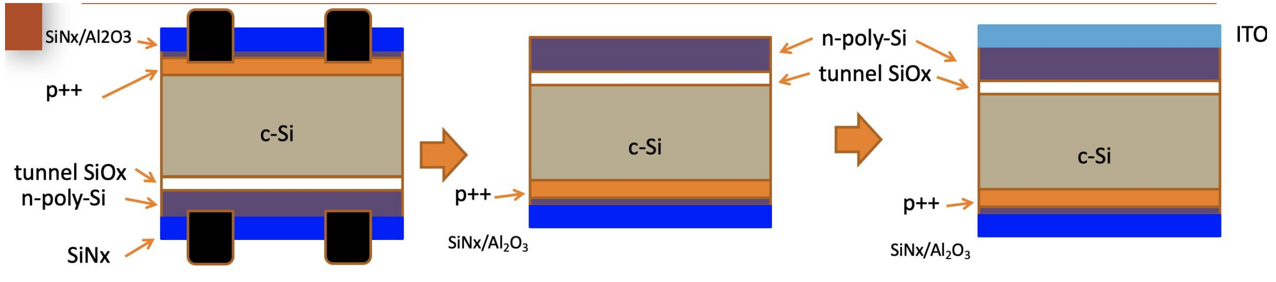
Prepared for TBC technology



TBC Structure



Prepared for Tandem solar cell



Structure for conventional TOPCon solar cell

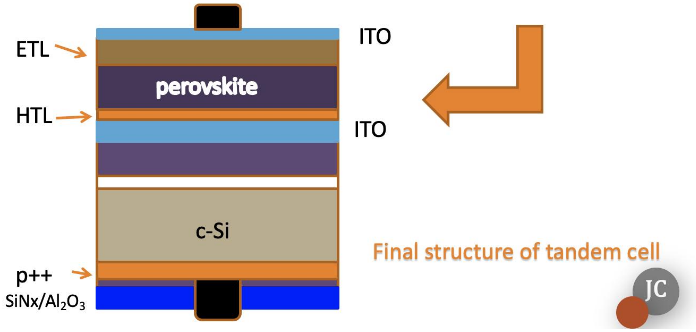
Equipment list:

(Dry process is recommanded for top perovskite cell fabrication)

① Evaporator（perovskite, c60,LiF ）

② ALD (SnO$_2$)

③ PVD（NiO$_x$, ITO,Metal）



Final structure of tandem cell

电子束蒸发镀膜机

多弧离子镀

磁控溅射镀膜机

卷绕双面磁控溅射

大面积卧式磁控溅射

磁控蒸镀复合镀膜机

多曲率扫描镀膜机

大尺寸光栅镀膜机

点源蒸镀机

线源蒸镀机

谢谢观看

Thanks

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