



Enabling U.S. Solar Manufacturing

Laplace N-Type High-Efficiency Cell Solutions

Speaker:

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PVCellTech-USA Conference

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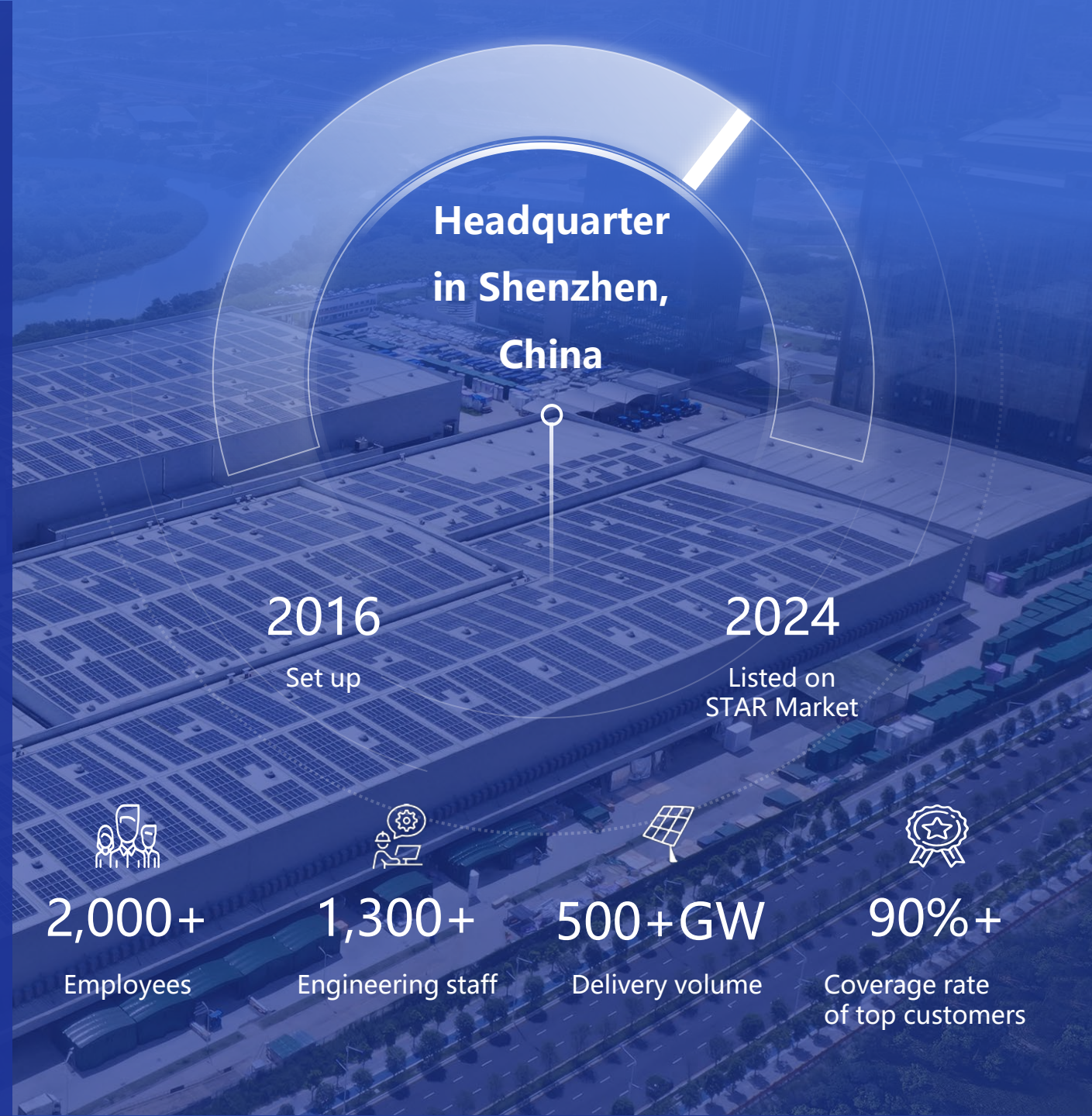
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LAPLACE Renewable Energy Technology Co., Ltd.

WHO IS LAPLACE ?

Multiple Breakthroughs in Solar Innovation:

- Pioneer of TOPCon for mass production
- Vanguard of TOPCon+
- Innovator of Back Contact (BC) with almost 100% market share
- New deposition platform for perovskite-based tandem





PROJECT EXPERIENCE



- >500 GW of TOPCon/P-IBC/N-IBC/PERC equipment delivered (CNY ~ 17 BN, USD ~ 2.4 BN)
- >20GW outside of China from USA, Southeast Asia, and Turkey
- Biggest project: 30GW
- 800+ people in support: extensive experience in manufacturing of TOPCon & BC technology with cutting-edge performance and IP



CUSTOMER RECOGNITION (SELECTED LIST)





Market protection

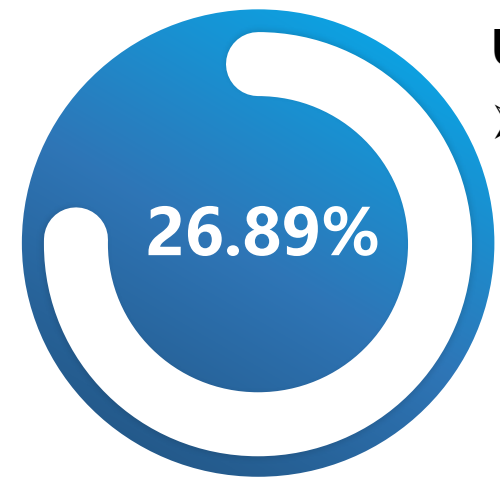
- **U.S. demand surge:** IRA incentives + FEOC compliance
- **Fast project execution:** drives market growth
- **Import barriers** create opportunities for local manufacturing

- Robust IP portfolio and FTO (Freedom-to-Operate) analysis
- Customers protected from infringement risks
- Continuous monitoring of patent landscape for added security



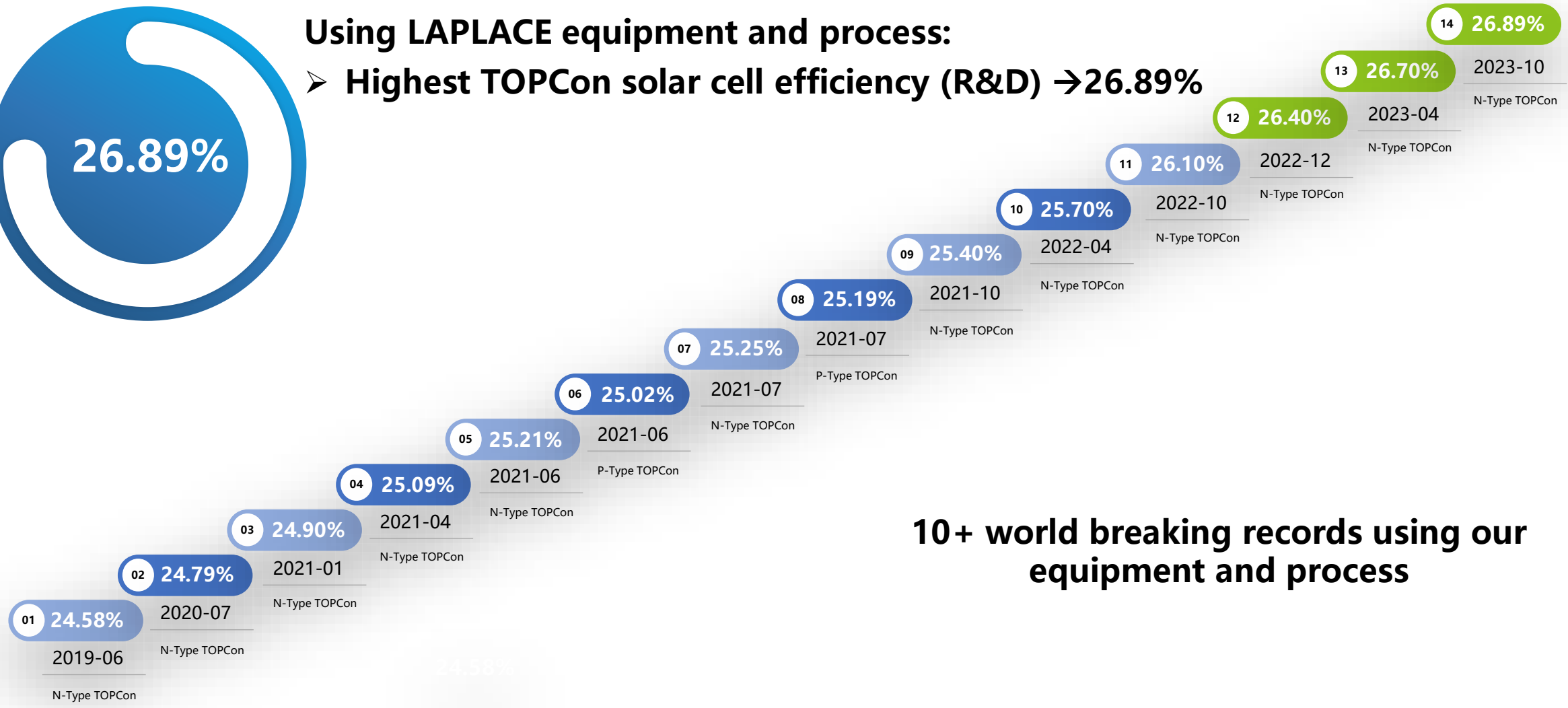
Technology: Leading equipment for TOPCon+ and XBC

- Proprietary TOPCon+ and XBC process equipment delivering >25.5% efficiency cells
- Reduced tool count and optimized fab layout for lower CAPEX/OPEX
- Smart factory: Implementation of AI powered tools including AI factory integration
- Proven global deployments worldwide including U.S. projects

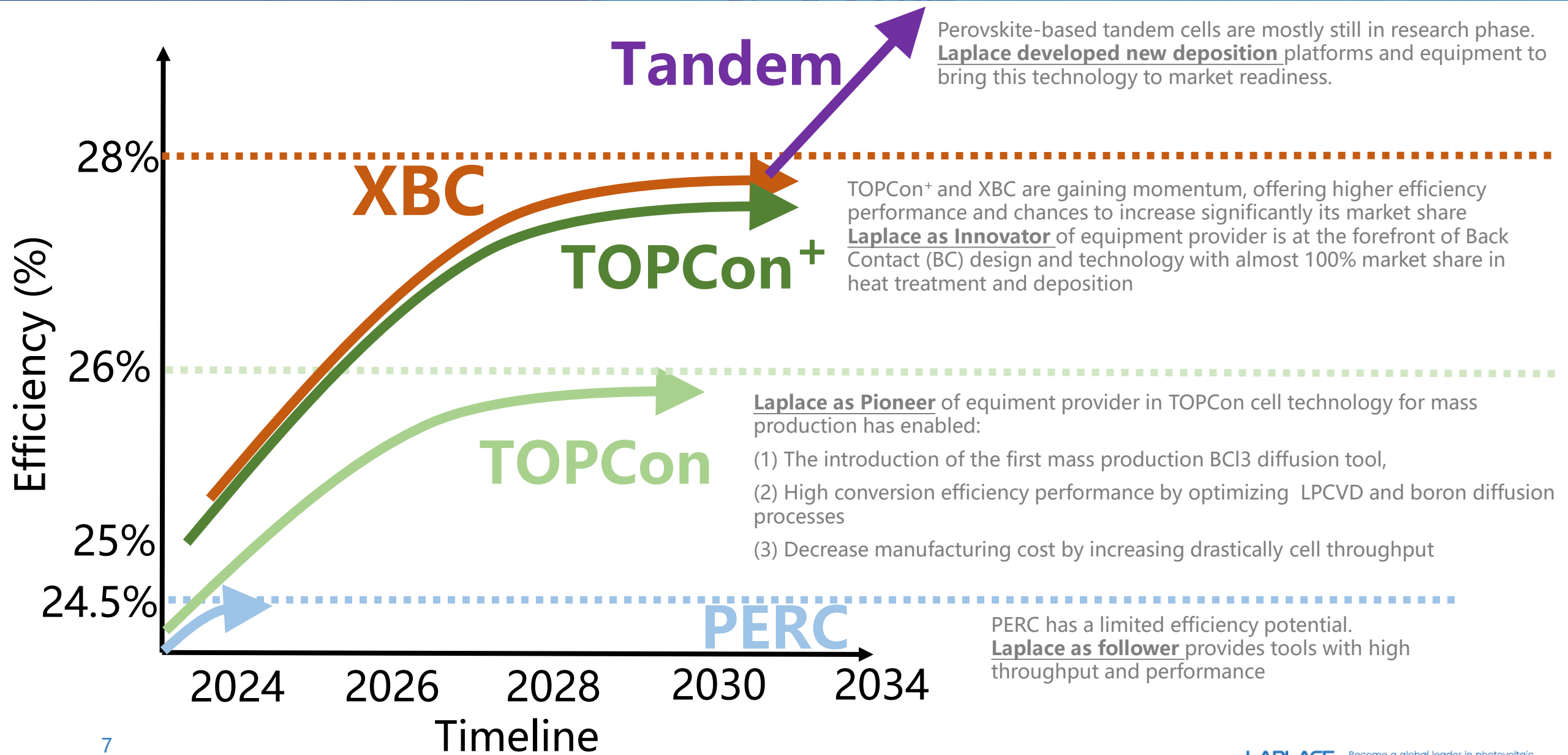


Using LAPLACE equipment and process:

➤ Highest TOPCon solar cell efficiency (R&D) →26.89%

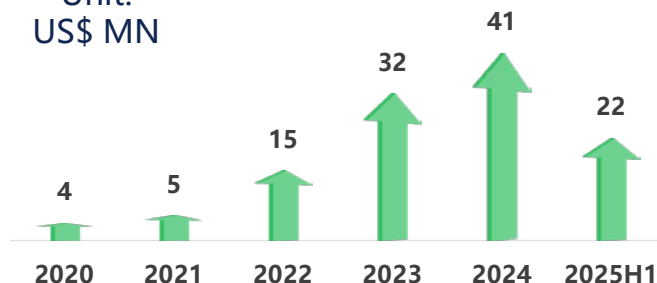


10+ world breaking records using our equipment and process



R&D Investment

Unit:
US\$ MN



120+
Million US\$
Cumulative R&D expenditure

01

Pioneering transition from BBr_3 to BCl_3

- > 70% cost reduction

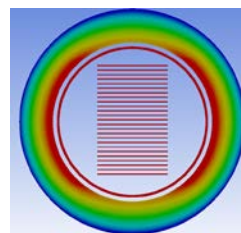
02 Double-loading (back-to-back wafers)

- Diffusion, Oxidation and LPCVD
- Doubled throughput without need of change in process flow
- Highest throughput for LPCVD, much lower CoO in comparison with PECVD

03

In-House Heating elements

- Improved thermal uniformity, shorter processing time
- Longer quartz parts lifetime



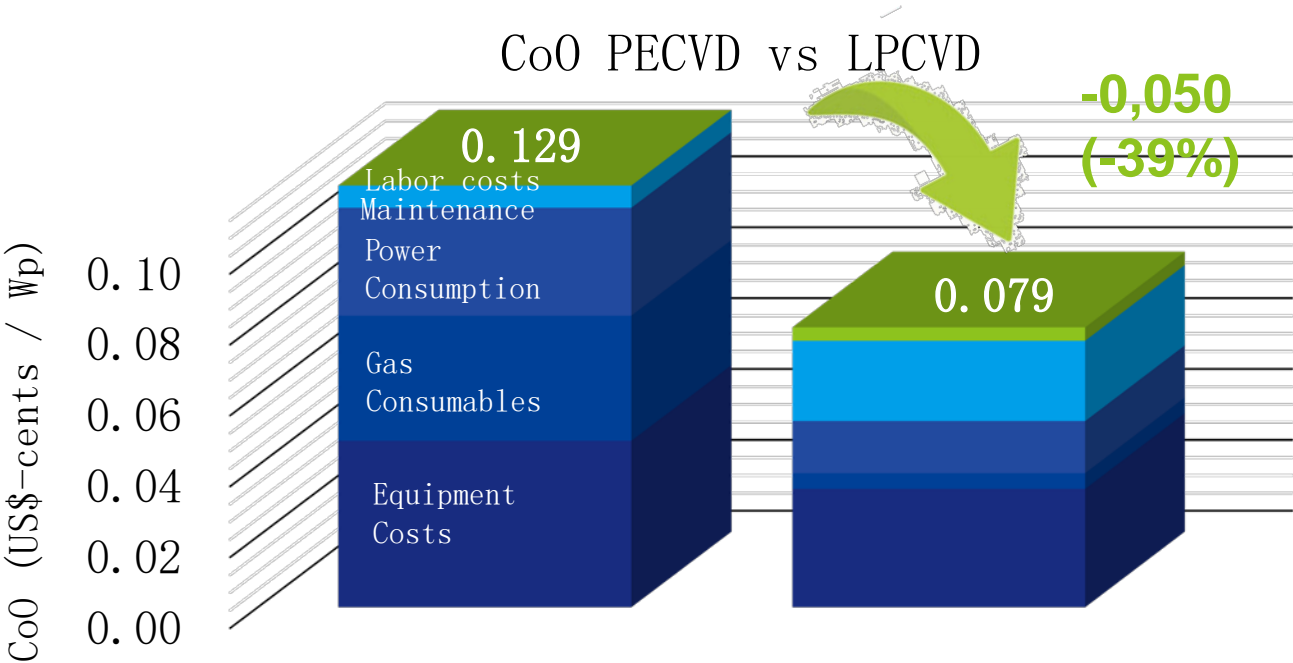
04

Quartz tube inside coating

- Pre-coating by nano crystallization technology
- Tube lifetime increase to over 6-9 months

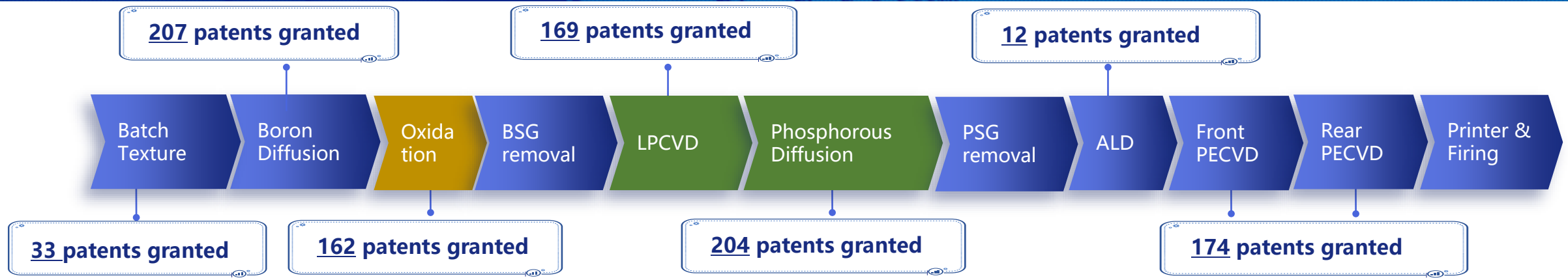


- **Laplace has improved the tool efficiency:**
For M10 wafers, besides double loading, GEN 4 Laplace tools have 2400 wafers/tube while GEN 5 has 2880 wafers/tube
- **Quartz tube inside coating:**
Pre-coating by nano crystallization technology increased tube lifetime to over 6-9 months



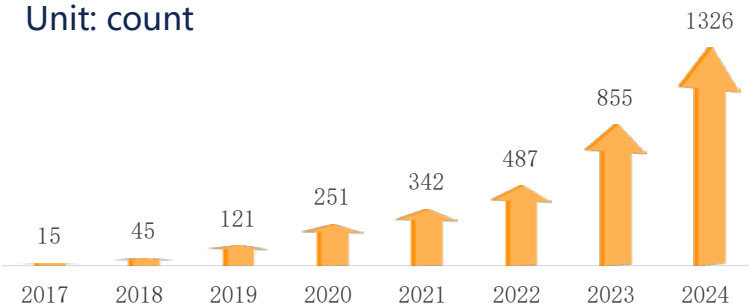
GEN5 tools (double loading) combined with increased tube lifetime have improved significantly the CoO of LPCVD with today a **~40% lower CoO than PECVD.**

LAPLACE Equipment Patent Portfolio



Accumulated Patent Applications

Unit: count



1,300+
Applied Patents

700+
Granted patents

- Laplace has a strong patent portfolio and is protecting its customers
- Laplace continuously analyses upcoming patents and lawsuits to ensure a seamless adaptation of upcoming technologies.

Laplace proprietary **TOPCon process flow**, and **LPCVD with ex-situ doping** technology allows customers to manufacture and sell TOPCon products to the USA and Europe



Why TOPCon+ and BC Technologies are taking over TOPCon

TOPCon

TOPCon⁺

Eff. up to 27.62 % [1]

Similar requirements

- Stable, uniform, thermal SiOx
- Lasers gain importance

XBC

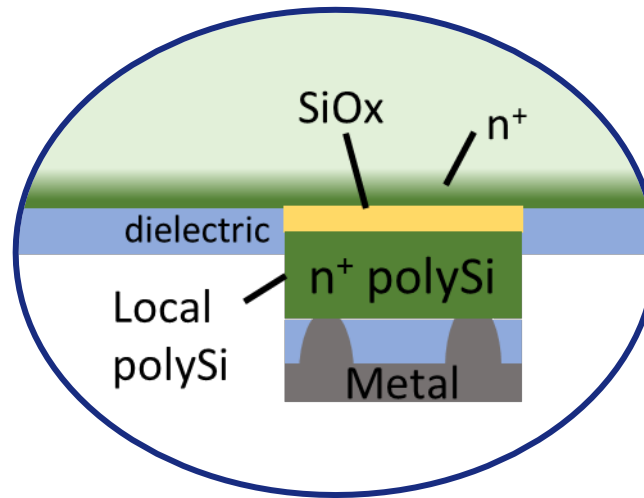
Eff. up to 27.99 % [1]

	TOPCon ⁺	TOPCon	Back Contact
Bifaciality:	85 %	80 %	70 %
Manufacturing Complexity weighted score	7 (moderate)	6 (moderate)	10 (hard)
Required manpower:	103 %	100 %	120%

Why LAPLACE has a leading role for TOPCon⁺ and XBC Technology

Most important demand for all TOPCon plus and XBC cells:
Stable, reproducible, uniform, thermal SiOx layer

——> Implementation to TOPCon plus and XBC requires the use of **LPCVD for the deposition of both the tunnel SiOx and polysilicon layers**



For localized polySi, either as polySi fingers or XBC design, lasers are the most cost-efficient way for patterning

Laplace developed advanced laser technology for all critical steps in TOPCon plus and XBC manufacturing

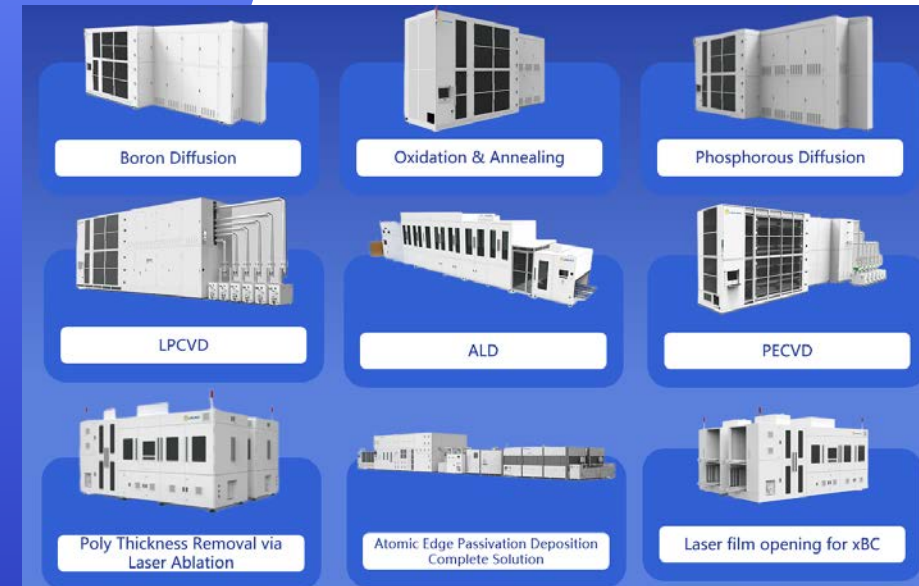
Our Turnkey technology is **fully compatible** for the polySi implementation in TOPCon⁺ and XBC cells, with equipment already delivered and operating successfully.

Laplace is driving the next generation of intelligent PV manufacturing through AI-powered factory integration

=> Allows better product and lower skilled manpower

- ❑ AI Factory Integration : Unified platform connecting all production equipment, sensors, and data streams.
- ❑ Smart Process Control : Real-time monitoring and adaptive optimization of each process step Wet processes, diffusion, passivation, metallization, and testing.
- ❑ Predictive Maintenance : Machine learning models anticipate equipment anomalies, reducing unplanned downtime.
- ❑ Yield & Energy Optimization : Continuous data analysis improves conversion efficiency while lowering energy and material consumption.

LAPLACE PRODUCTS AND SOLUTIONS



Experience:

Pioneers of TOPCon for mass production with
> **500 GW** equipment delivered

Double-loading for LPCVD

→ Highest throughput in the market: 40% lower CoO compared to PECVD deposition tools

Proprietary coated quartz tube

→ Double and potentially triple the lifetime of quartz tubes



Leading equipment for TOPCon+ and XBC:

- Laplace toolset is fully compatible for TOPCon+ and XBC integration.
- Strong support for our customers to achieve their goals in successfully achieve mass production
- **New equipment:**
New laser tools for TOPCon+ and BC, facilitating the process flow with local openings