

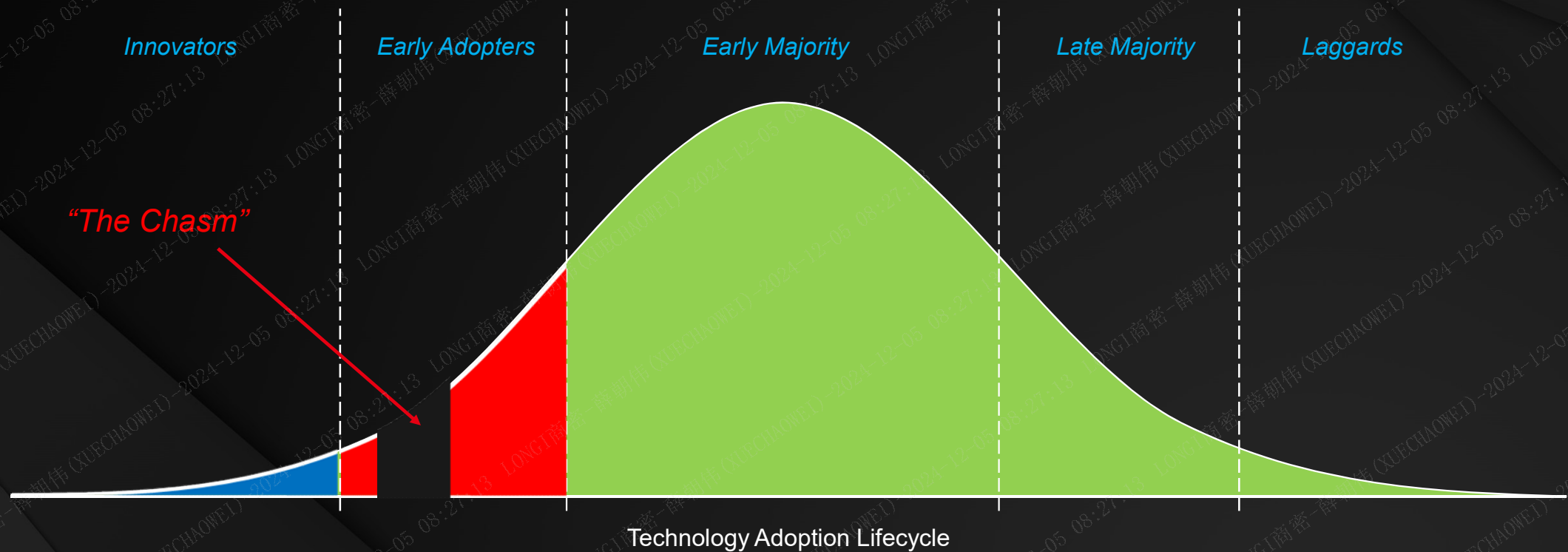


BC: Crossing the Chasm

***Chaowei Xue, LONGI
PV Magazine Roundtables Europe 2024***

The Chasm

1. https://en.wikipedia.org/wiki/Crossing_the_Chasm



- The Chasm: the market dynamics faced by innovative new products, with a particular focus on the "chasm" or adoption gap that lies between early and mainstream markets.¹

PV's Blueshift to Net Zero

- <https://netzeroclimate.org/what-is-net-zero-2/>
- <https://iopscience.iop.org/article/10.1088/0268-1242/8/1/001>

AI-BSF
 $\eta \leq 20\%$
\$0.5/w

2000

2016

2021

2025

2050-2060

Net zero emissions →

- Net zero² refers to a state in which the greenhouse gases going into the atmosphere are balanced by removal out of the atmosphere.
- AI-BSF (Aluminum Back Surface Field) technology, developed in 1970s³, became the most widely available Si PV technology by the early 2000s.

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PV's Blueshift to Net Zero

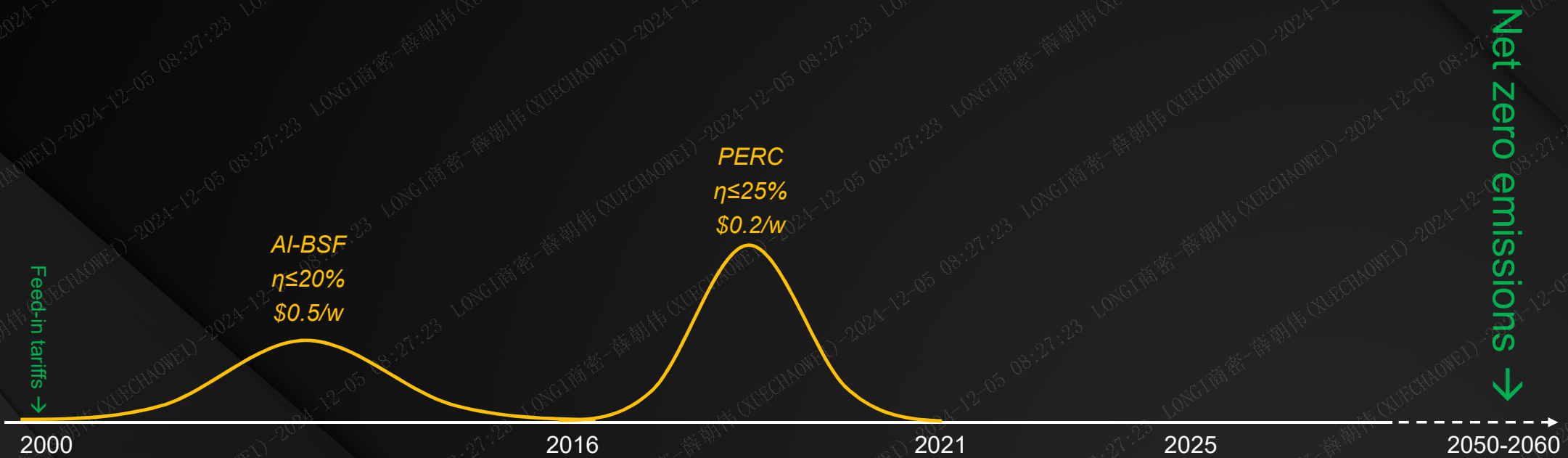
4. <https://clean-coalition.org/feed-in-tariffs/lessons-from-germany/>



- FITs (Feed-in tariffs)⁴, as a policy mechanism, was designed to accelerate investment in solar PV technologies by offering long-term contracts to PV electricity producers.

PV's Blueshift to Net Zero

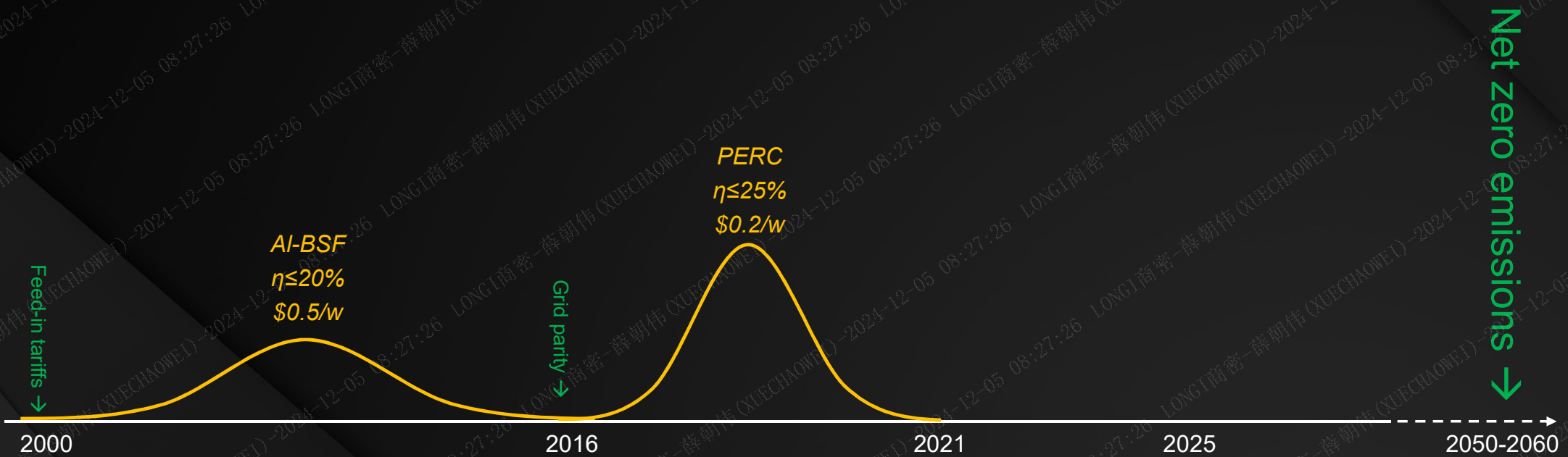
5. <https://bovietsolar.com/technology/perc-cell-technology>



- PERC (Passivated Emitter and Rear Contact)⁵ solar panels, delivering 6%-12% more energy at a relatively low cost, rapidly gained dominance in the market.

PV's Blueshift to Net Zero

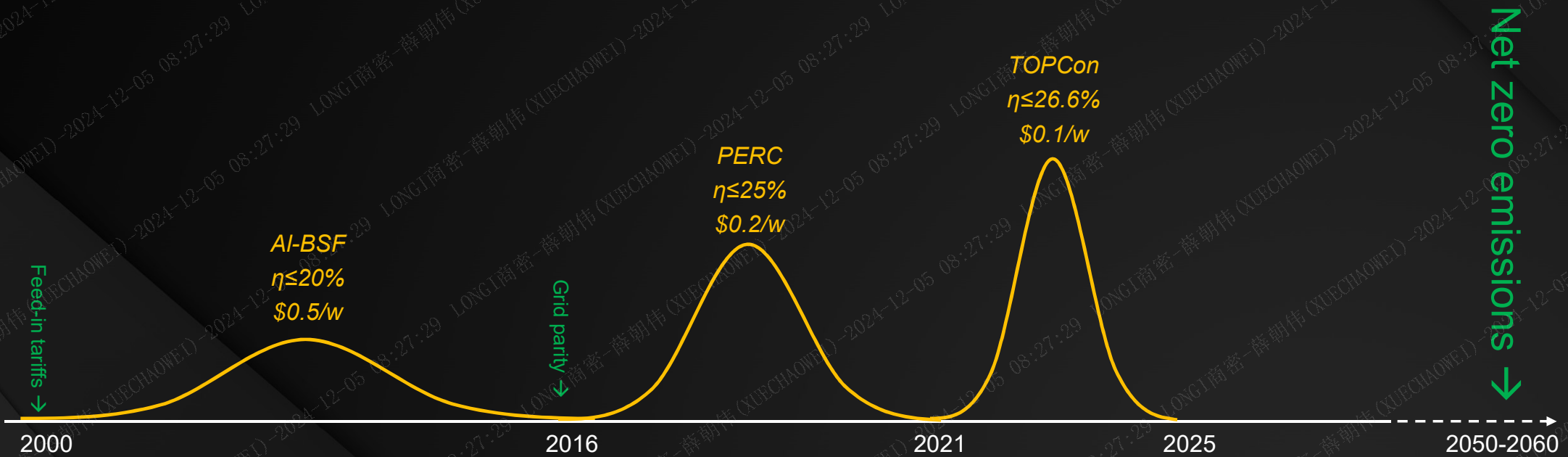
6. https://en.wikipedia.org/wiki/Growth_of_photovoltaics#cite_note-deutsche-2015-chasm-7



- Grid parity, where the cost of solar power becomes equal to or lower than traditional energy sources, began to be achieved in most countries⁶.

PV's Blueshift to Net Zero

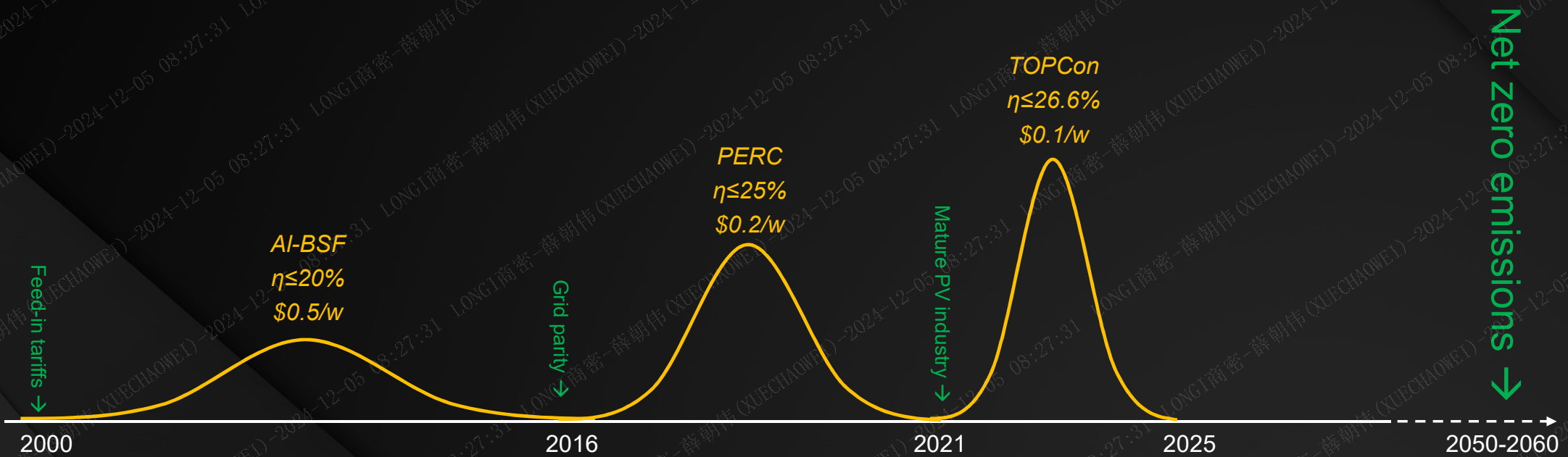
7. <https://www.ise.fraunhofer.de/en/research-projects/topcon.html>



- TOPCon (Tunnel Oxide Passivated Contact)⁷ swiftly overtook PERC in the market due to its superior performance, delivering higher efficiency and enhanced energy output while remaining scalable and cost-effective.

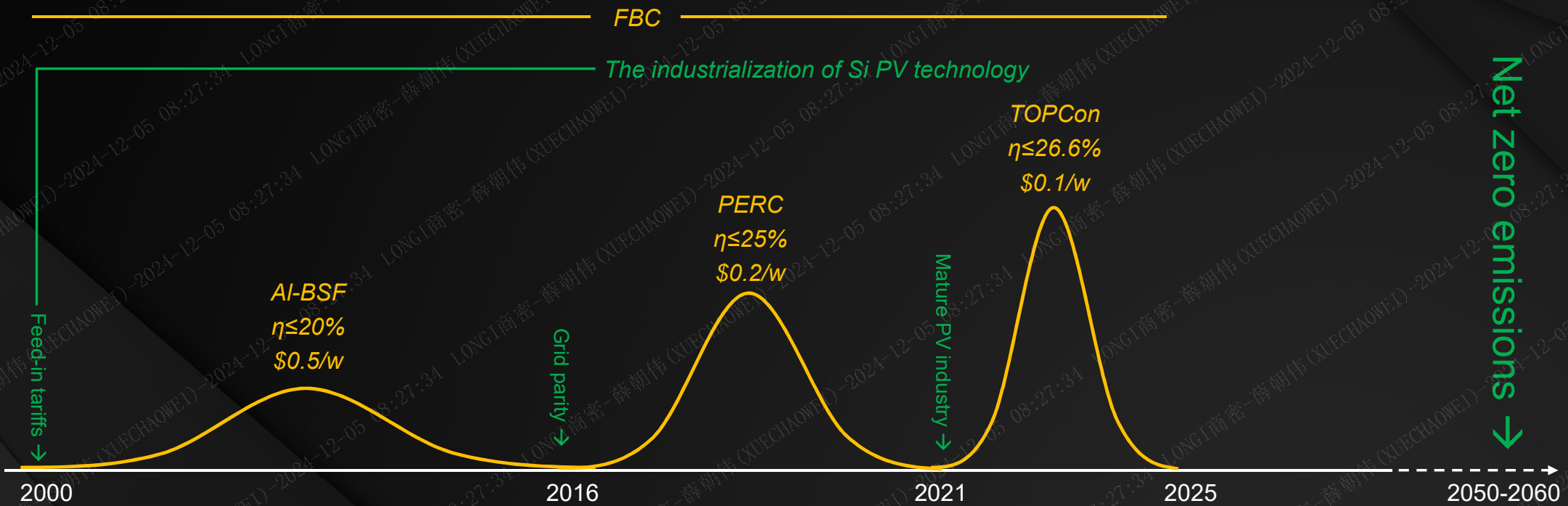
PV's Blueshift to Net Zero

8. <https://www.iea.org/reports/solar-pv-global-supply-chains/executive-summary>



- The rapid advancement of TOPCon technology can be attributed to the maturity of the PV industry⁸, which provided a robust foundation for its development and adoption.

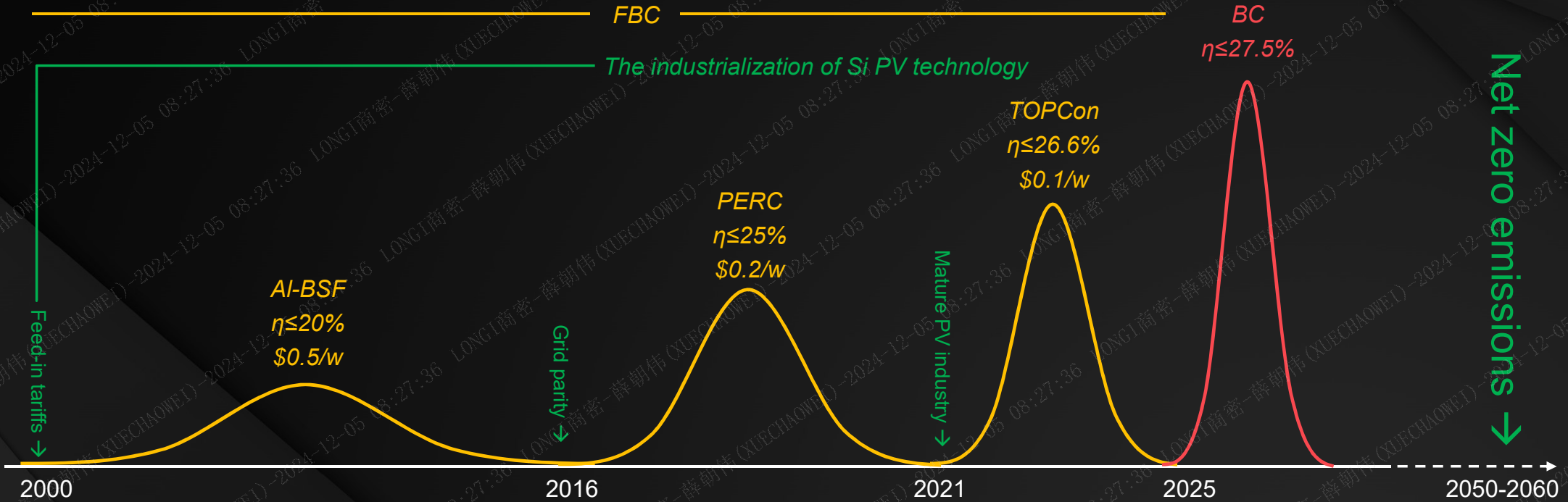
PV's Blueshift to Net Zero



- Si PV technology, specifically the Front and Back Contact (FBC) structure, has now completed industrialization.

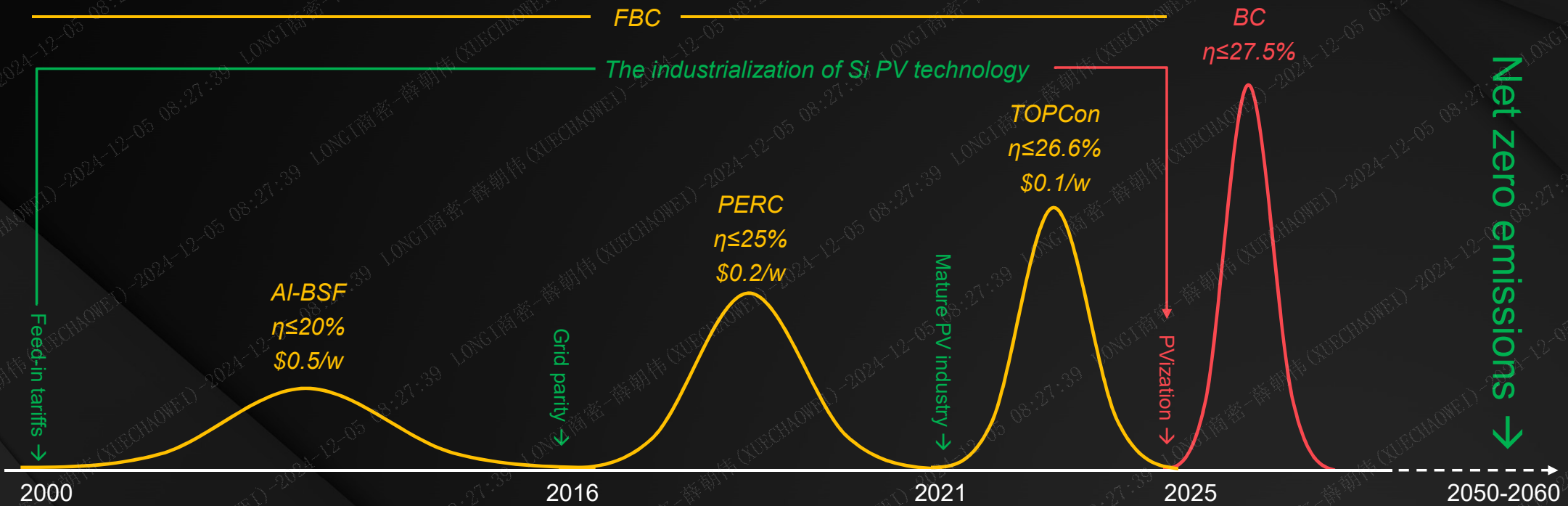
PV's Blueshift to Net Zero

9. <https://taiyangnews.info/business/longis-h1-2024-solar-module-shipments-totaled-3134-gw>



- BC (Back Contact) technology, offering higher efficiency and many other advantages, is rapidly surging⁹, driven by the mature PV industry.

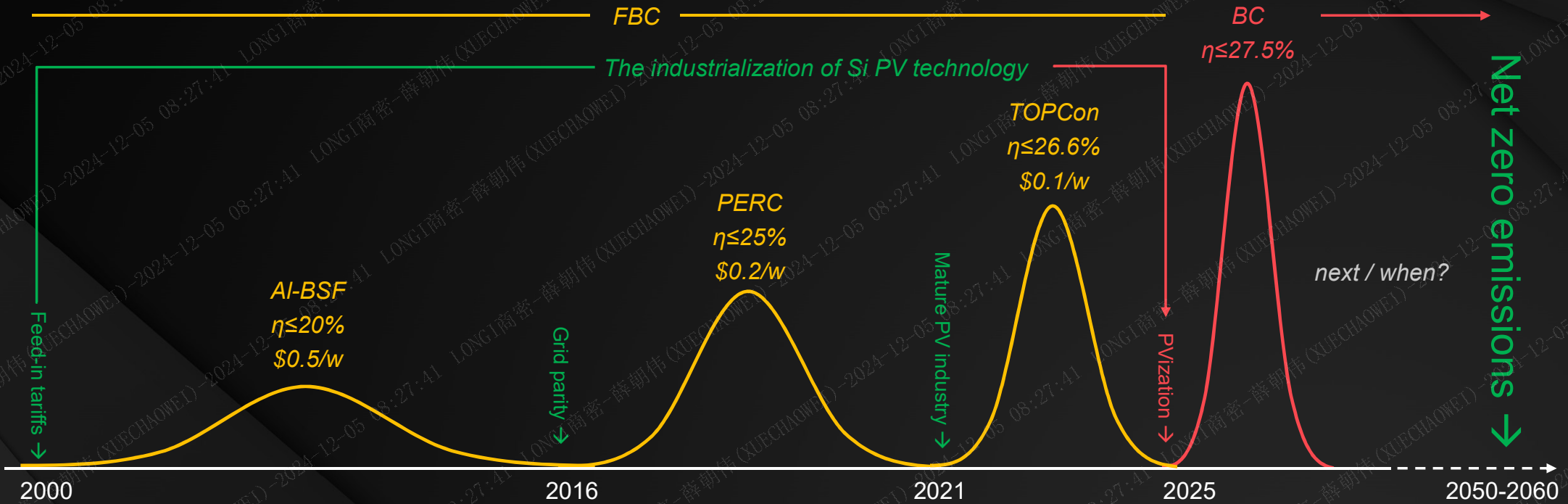
PV's Blueshift to Net Zero



- PVization (photovoltaicization) refers to the process of integrating photovoltaic technology into various industries and systems, enabling cleaner and more sustainable energy solutions.
- Net zero needs PVization.

PV's Blueshift to Net Zero

10. <https://www.pv-tech.org/technical-papers/evolution-of-silicon-photovoltaics-toward-a-back-contact-future/>

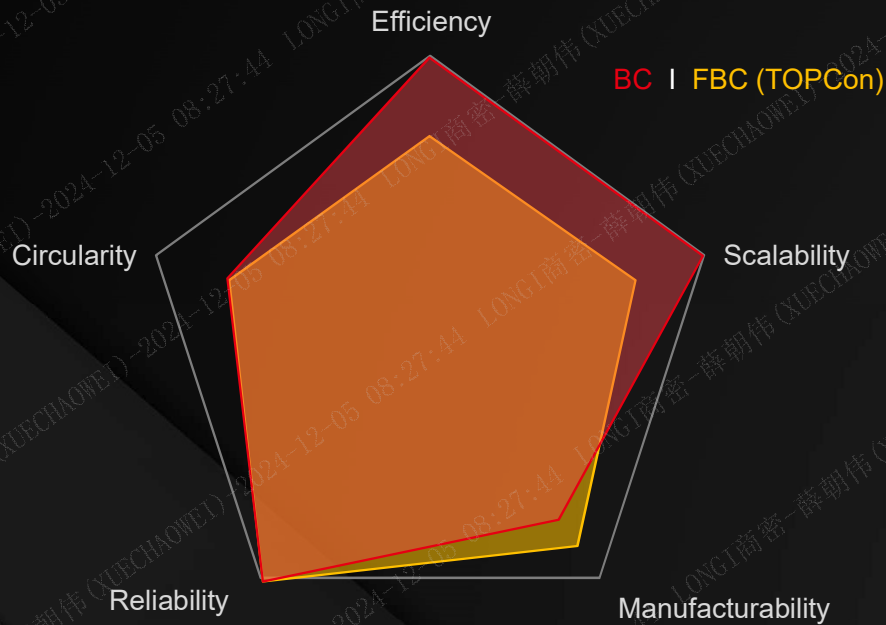


- BC could be the ultimate Si PV solution¹⁰.

1. Efficiency: over 27% (29.4% theoretical limit);
2. Aesthetics: front-shading free;
3. Product: tunnel-diode enabled hot-spot management

BC: Crossing the Chasm

- Sustainable PV technology: the ESMRC model

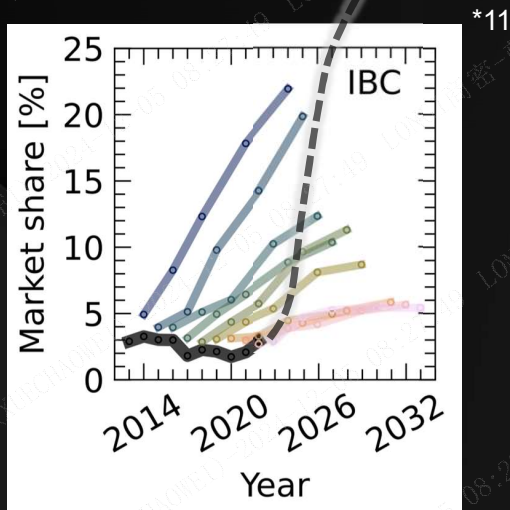


- **Technology:** Enhanced efficiency and scalability
- **Product:** Improved aesthetics and advanced hot-spot management
- **Solution:** Greater adaptability for diverse application scenarios
- **Challenges:** Complex manufacturing processes and higher costs

BC: Crossing the Chasm

11. Historical market projections and the future of silicon solar cells, December 2023 Joule 7(12)

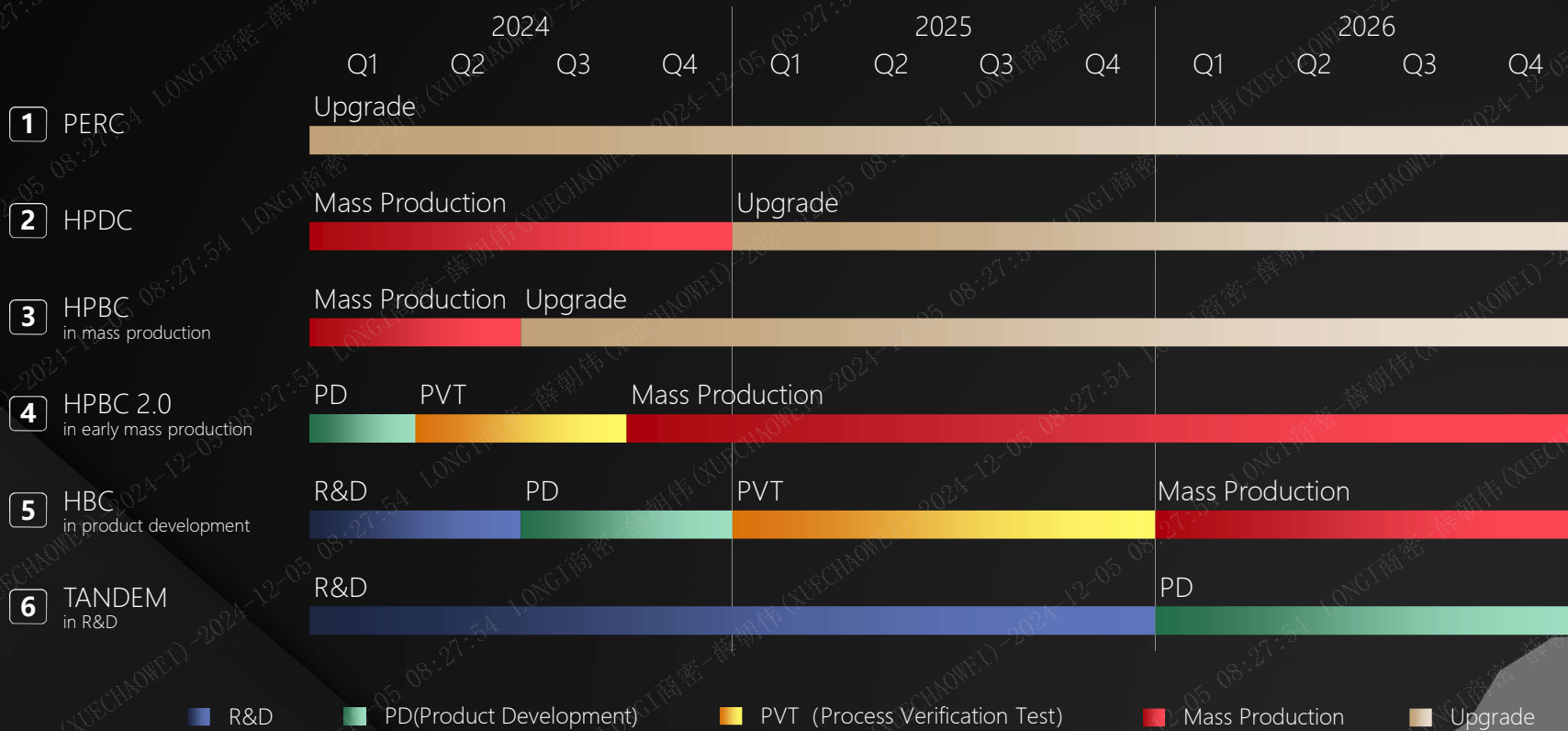
- Challenge and opportunity
 - Patterning: further integration of lasers into advanced Si PV manufacturing
 - Metallization: base metals to replace Ag



Timing is everything.....

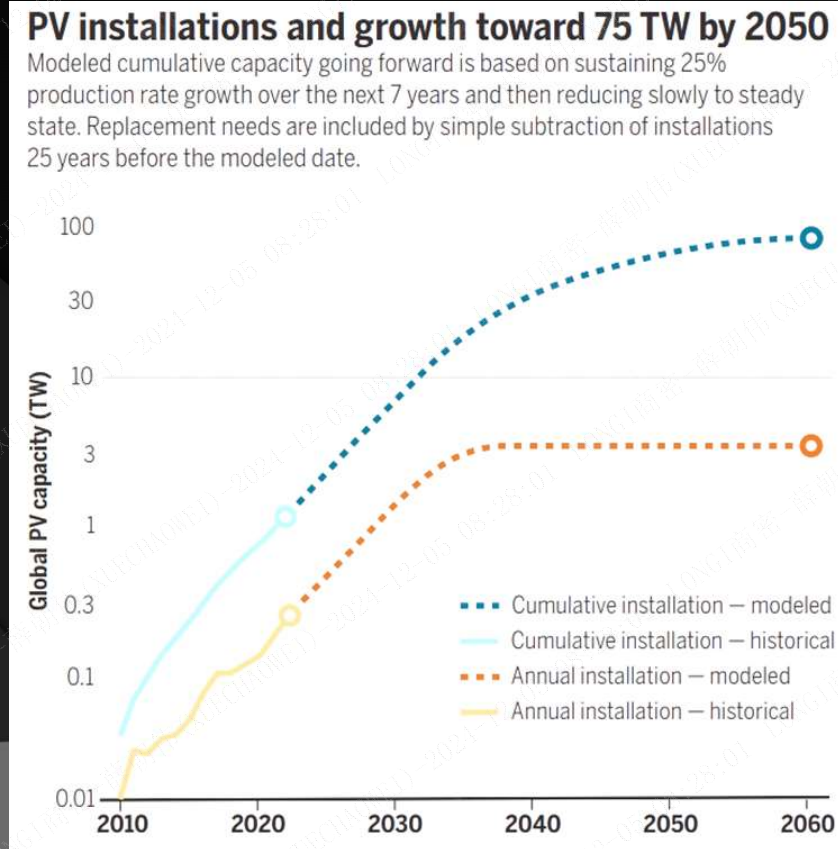
BC: Crossing the Chasm

BC Platform



BC: Crossing the Chasm

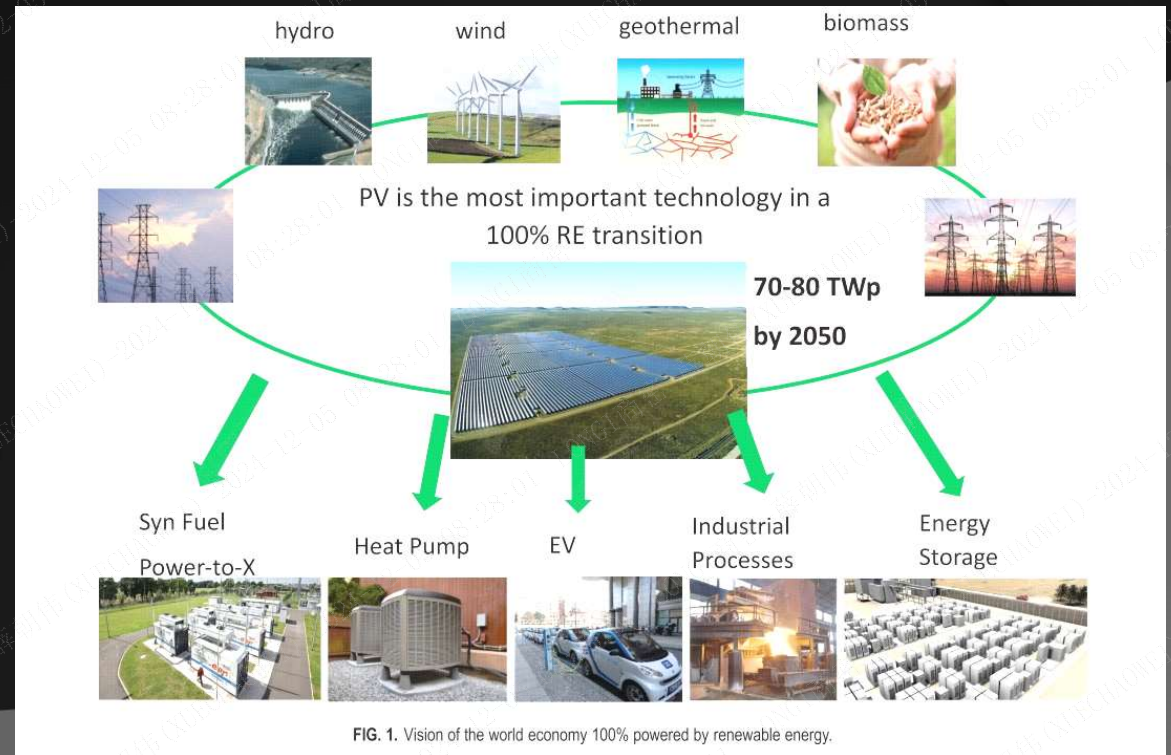
- Pvization towards 100% RE transition



*12

12. <https://www.science.org/doi/10.1126/science.adf6957>

13. <https://pubs.aip.org/aip/jrse/article-abstract/12/5/053505/1060520/Future-challenges-for-photovoltaic-manufacturing?redirectedFrom=fulltext>



*13

FIG. 1. Vision of the world economy 100% powered by renewable energy.

Light boats have already passed through countless mountains.

轻舟已过万重山



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