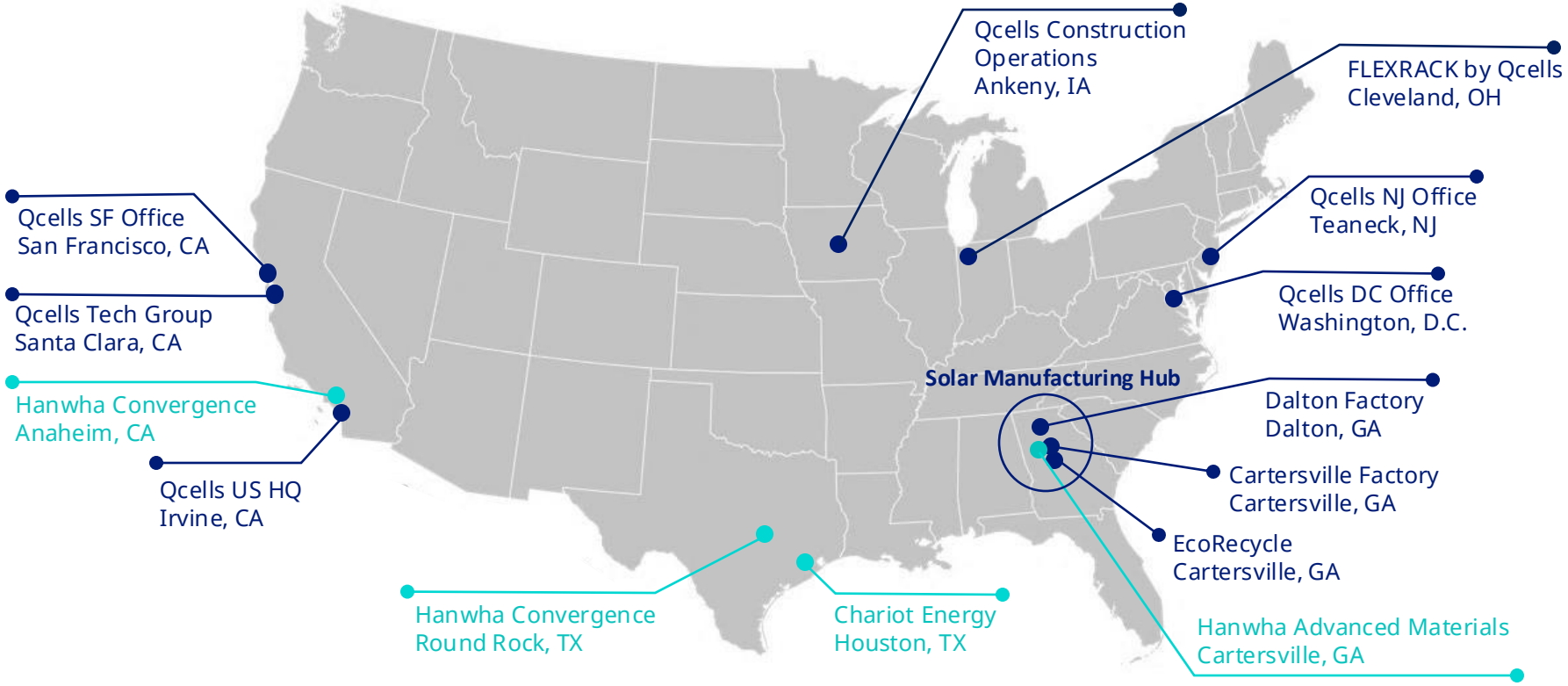
U.S. PV Manufacturing

Facing today's challenges while building for the future

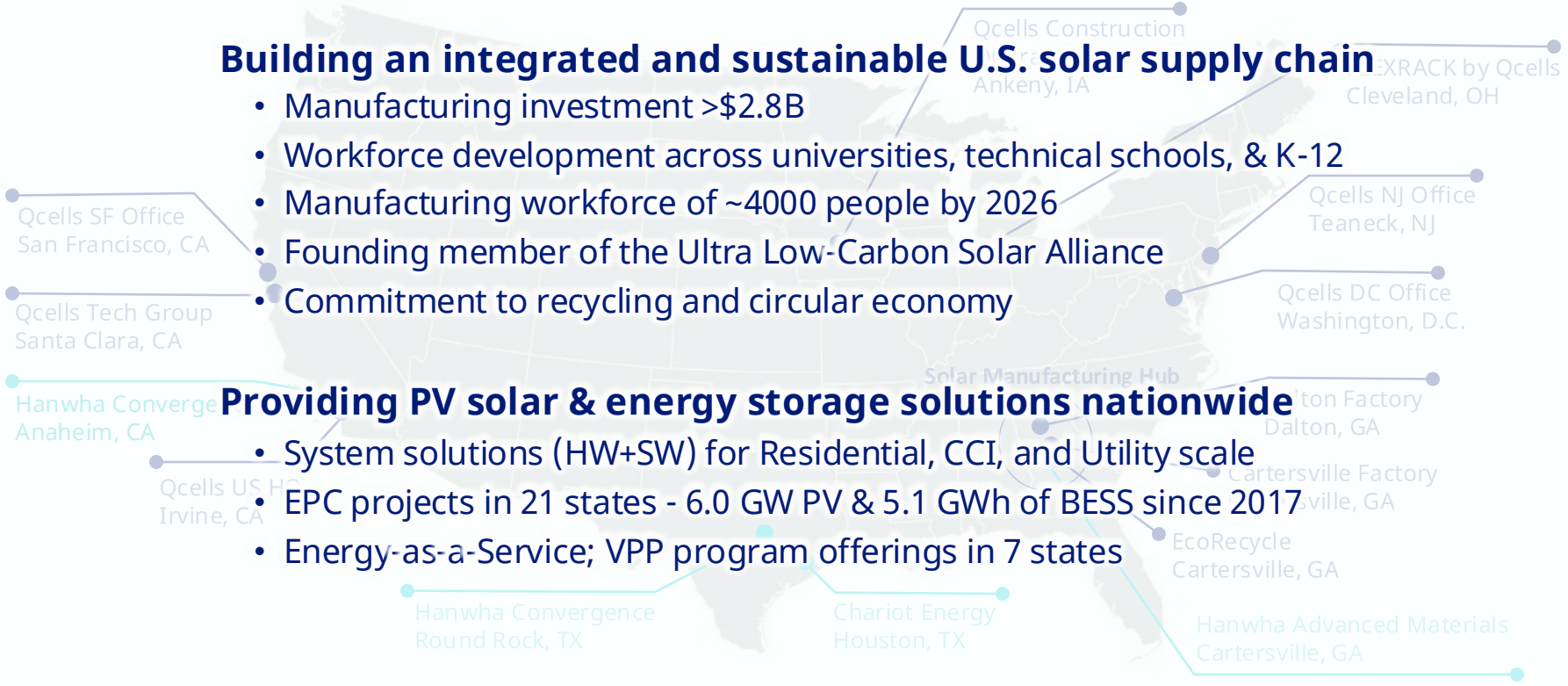
Danielle Merfeld, Global Chief Technology Officer, Qcells

PV CellTech USA| October 7, 2025

Qcells Commitment to the Future of U.S. Energy



Qcells Commitment to the Future of U.S. Energy



Building an integrated and sustainable U.S. solar supply chain

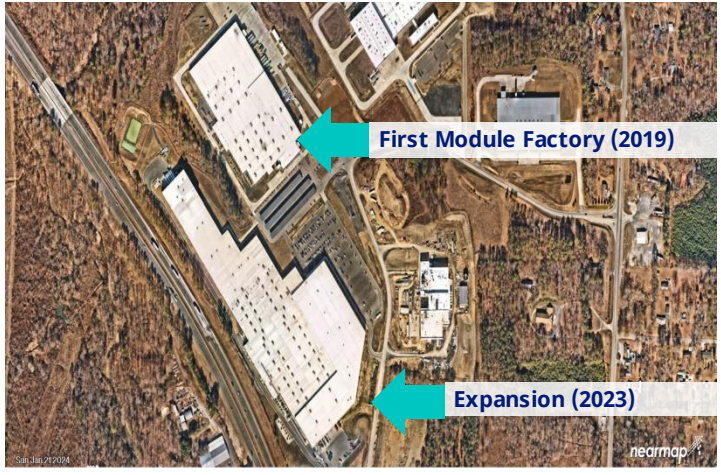
- Manufacturing investment >$2.8B
- Workforce development across universities, technical schools, & K-12
- Manufacturing workforce of ~4000 people by 2026
- Founding member of the Ultra Low-Carbon Solar Alliance
- Commitment to recycling and circular economy

Providing PV solar & energy storage solutions nationwide

- System solutions (HW+SW) for Residential, CCI, and Utility scale
- EPC projects in 21 states - 6.0 GW PV & 5.1 GWh of BESS since 2017
- Energy-as-a-Service; VPP program offerings in 7 states

Dalton, GA Manufacturing Facility

- Tariffs due to Section 201 (Jan 2018) created conditions for manufacturing investment
- Started operations in 2019 with capacity of 1.7 GW
- Expanded in 2023 to 5.1 GW of PV modules



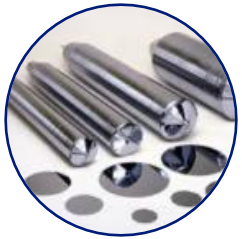
Cartersville, GA Manufacturing Facility

- Construction started in 2023
- Loan guarantee from DoE secured in 2024
- 3.3 GW of ingots, wafers, cells and modules when completed
- Meets domestic content requirements under the Inflation Reduction Act
- Enables customers to maximize clean energy tax credits

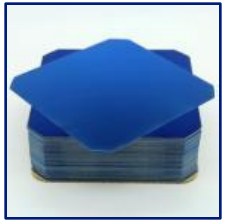
Reaping the Benefits of Integrated Manufacturing

Smart design and **seamless integration**, along with **cutting-edge automation** and **inventory controls**, orchestrate a smooth flow of materials throughout the manufacturing process.

Ingot Pulling



Wafer Cutting



Cell Fabrication

Encapsulant & Backsheet
from Hanwha Advanced Materials

Hanwha Momentum is providing **ingot pullers, wafer saws, and wafer and cell processing equipment**

- Layout of the factory is designed to enhance production efficiency
- Automation is crucial for maintaining quality and productivity, generating terabytes of data
- Significant opportunity for adoption of AI-assisted controls to improve overall performance

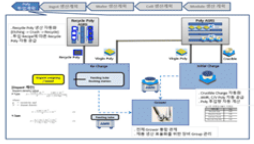
Smart Factory to Drive Manufacturing Competitiveness

Intelligent (Digital Transformation)

Connected Factory (IWCM)

Automated (Digitalization)

Synchronized Production Plan



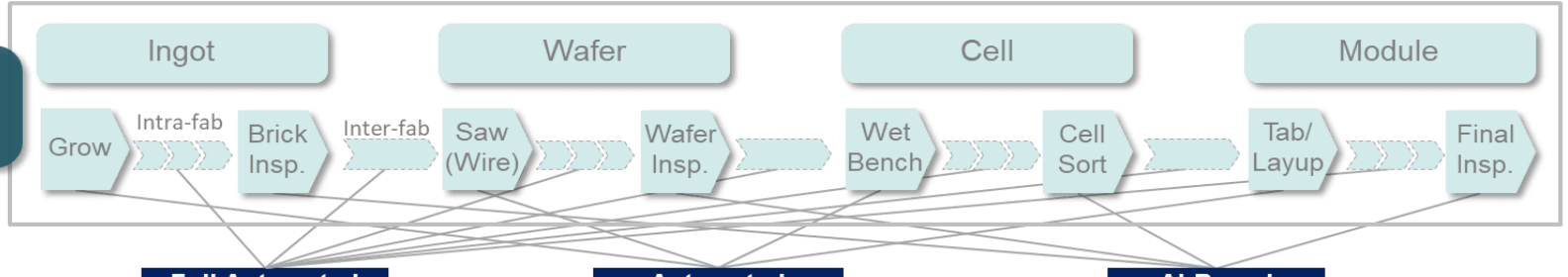
* IWCM Synchronized Product Plan
* Detail Work Instruction (Mix Ratio, etc)

Centralized Monitoring & Control

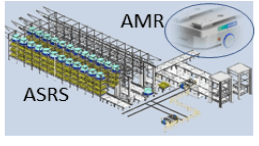
* Real-Time Monitoring/Alert
* Remote Control

Advanced Analysis

* AI/ML Based
* Full Value Chain Traceability
* Prediction/ Optimization



Full Automated Logistics

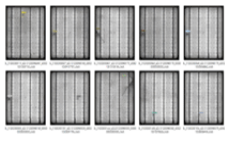


* 100+ AMR (Global First)
* 7 ASRS
* Intra/Inter fab Auto Logistics

Automated Process Control

* Automated by Robot
* System based operation (MES/RMS/SPC)

AI-Based Inspection



* 1.2M Cells/Operation/Day
* 99.9%(△) Accuracy

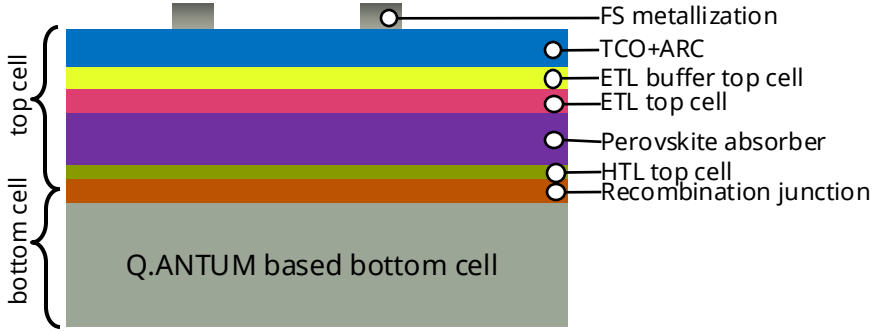
Overcoming Challenges in U.S. PV Supply Chain Development

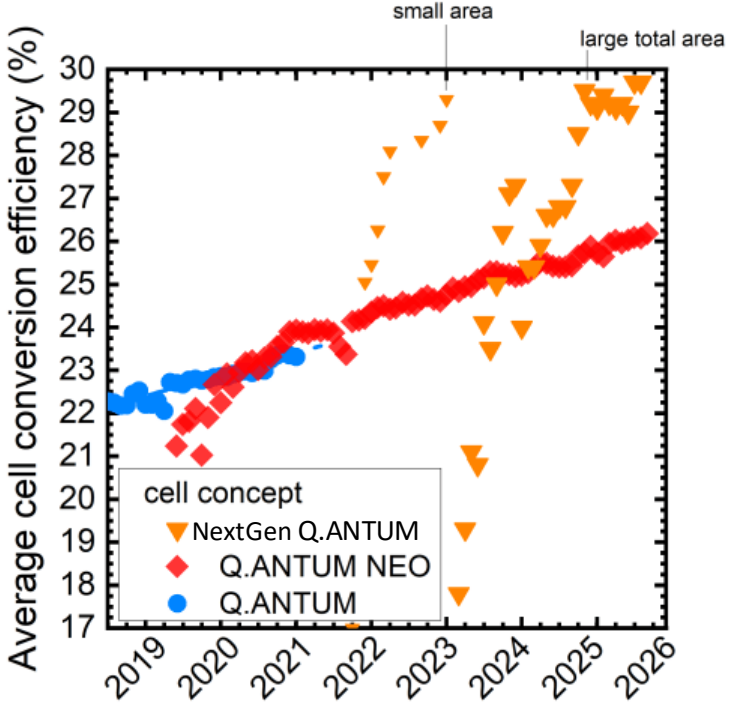
Pillars to Support U.S. Solar Manufacturing

1. **Promoting Fair Competition:** Trade policy and enforcement should be designed to even the playing field for domestic manufacturers coupled with active enforcement of our existing trade laws.
2. **Well-Implemented Incentives:** Encourage investment and innovation within the U.S. solar industry by championing accessible incentives for solar manufacturers to stimulate growth and R&D.
3. **Coordinated State-Level Support:** Enhance local solar manufacturing capabilities through targeted state initiatives; establish workforce development programs in partnership with educational institutions; and promote local supply chains and infrastructure investments for solar manufacturing and deployment.

Future Product Roadmap

Tandem Solar Cell



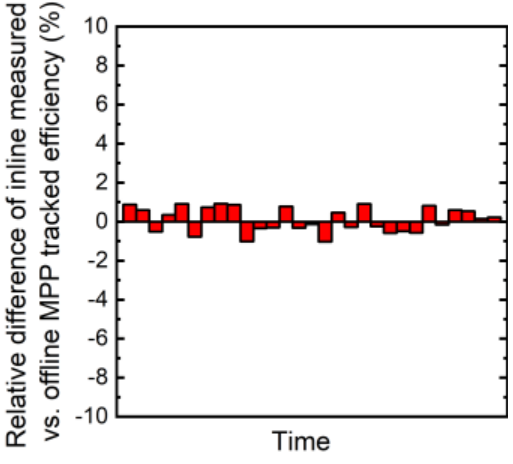


2-Terminal Perovskite-on-Silicon to overcome practical limit of silicon solar cells

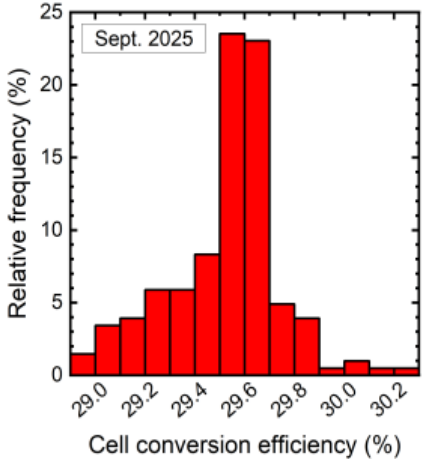
Qcells' next gen Q.ANTUM technology based on tandem has efficiency headroom > 30%

Addressing Key Conditions for Tandem PV Success

High-Efficiency, High-Throughput Cell-Line

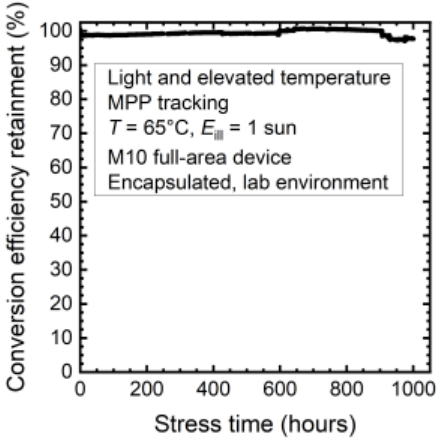


Accurate, high throughput IV test



High efficiency on full area with high reproducibility

Reliable and Bankable Module



All critical IEC tests passed

Beyond IEC: Light & Temp stress

Thank you!

www.qcells.com