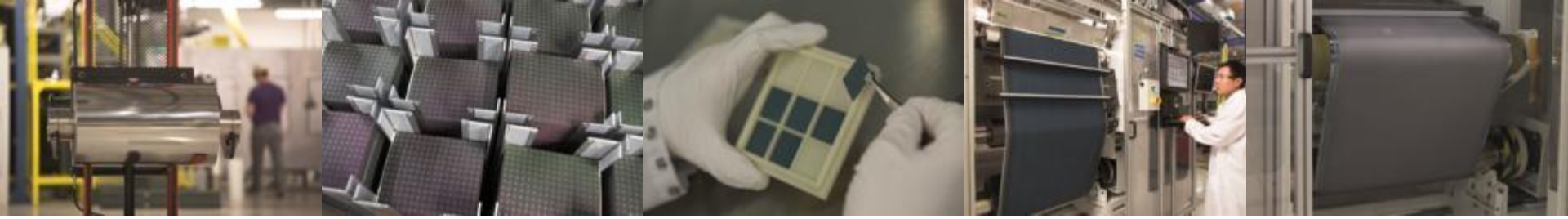

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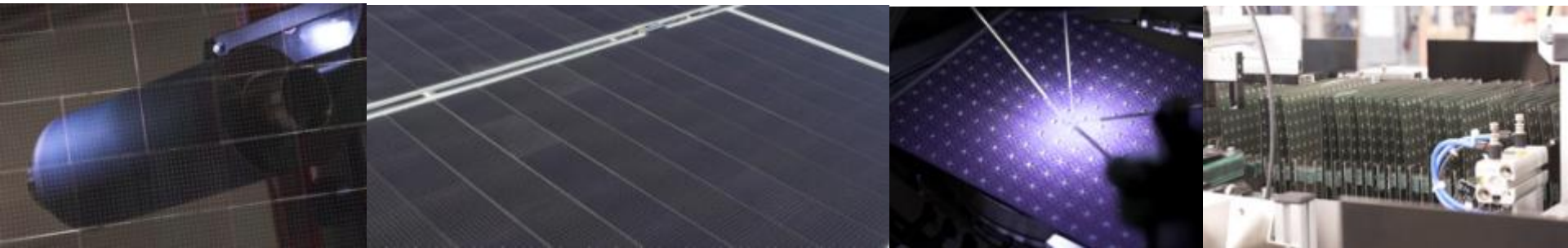
# Joint IEPR/Federal Stimulus Program (Ad Hoc) Committee Workshop
# Creating the Next Industrial Revolution

Brian Sager

Sacramento, CA

July 22,2010



# Nanosolar's Mission

- **To make solar power cost competitive with fossil fuels today by reinventing solar for superior cost & capital efficiency**
- **$500 million in funding, including $400 million in private equity and $97 million in Gov support**
  - **Department of Energy, Department of Defense, DARPA, Army, National Science Foundation, Department of Treasury, California Energy Commission (PIER)**

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# Our High-Speed Solar Cell and Panel Factories Can Be Built Cost Effectively Anywhere in the World

We Do Not Need to Manufacture in Asia to Be Competitive

**San Jose, California, Global Headquarters & Solar Cell Production Factory, 200,000 sq ft**

**Luckenwalde, Germany, Panel Assembly Factory, 500,000 sq ft**

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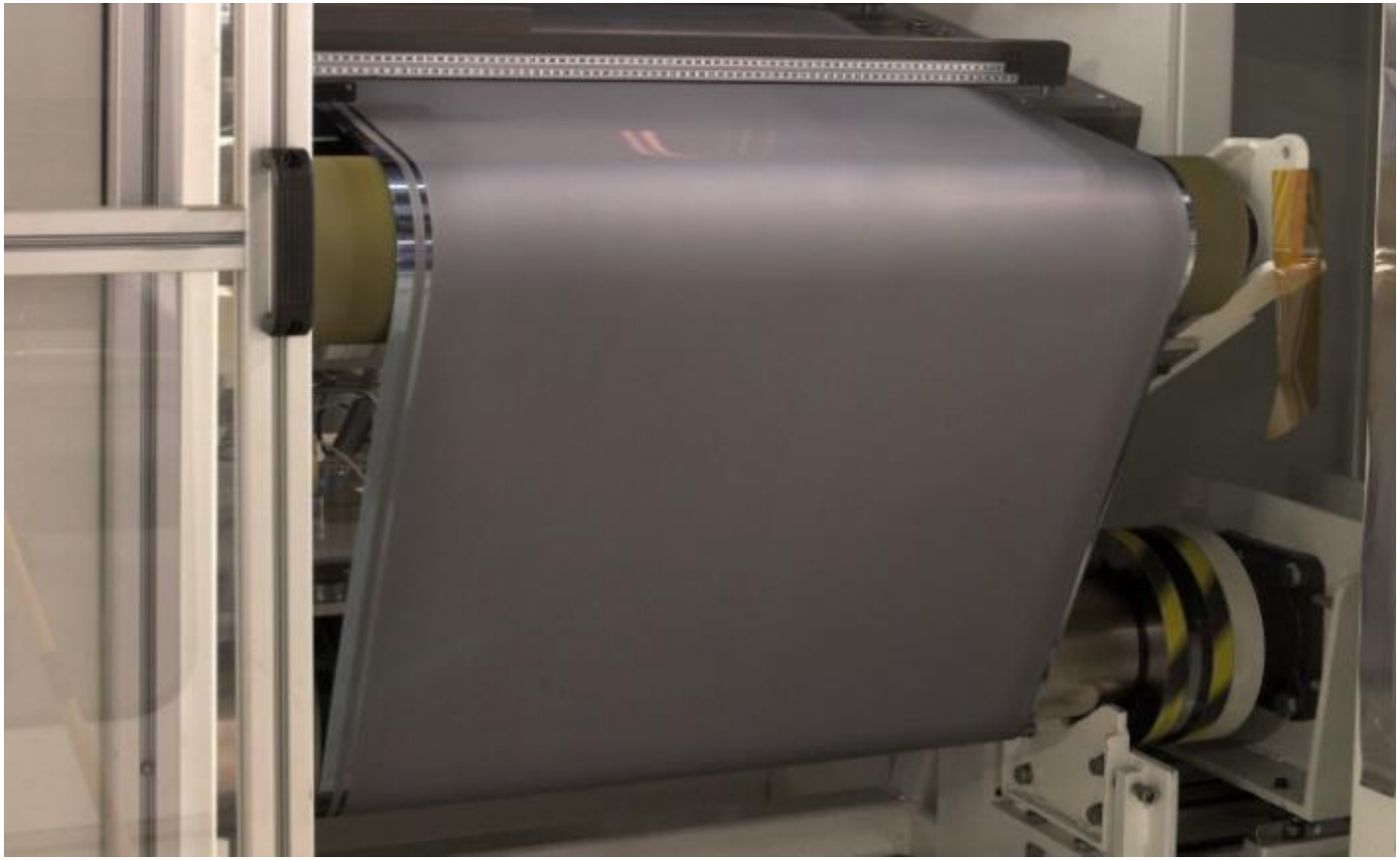
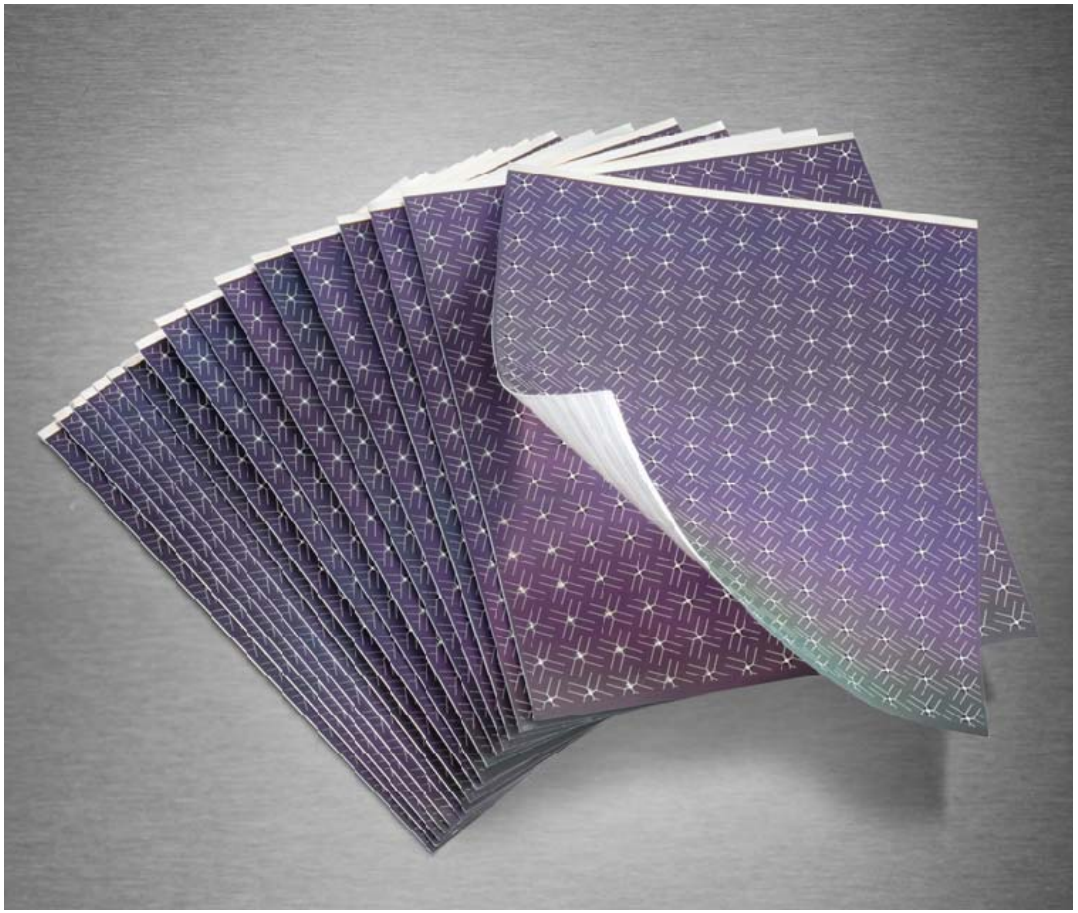
# We Print Nanotechnology-enabled Ink on Rolls of Very Inexpensive Aluminum Foil



**Rapid processing using low cost equipment and the lowest cost metal substrate**

# Our Flexible Foil Cells Are Built in San Jose, CA

- Rolls of printed foil processed and thin film layers added to complete electrical structure
- Foil cut into individual, rectangular cells
- Flexibility to tune cells' power output for Utility, Commercial and Residential solar markets



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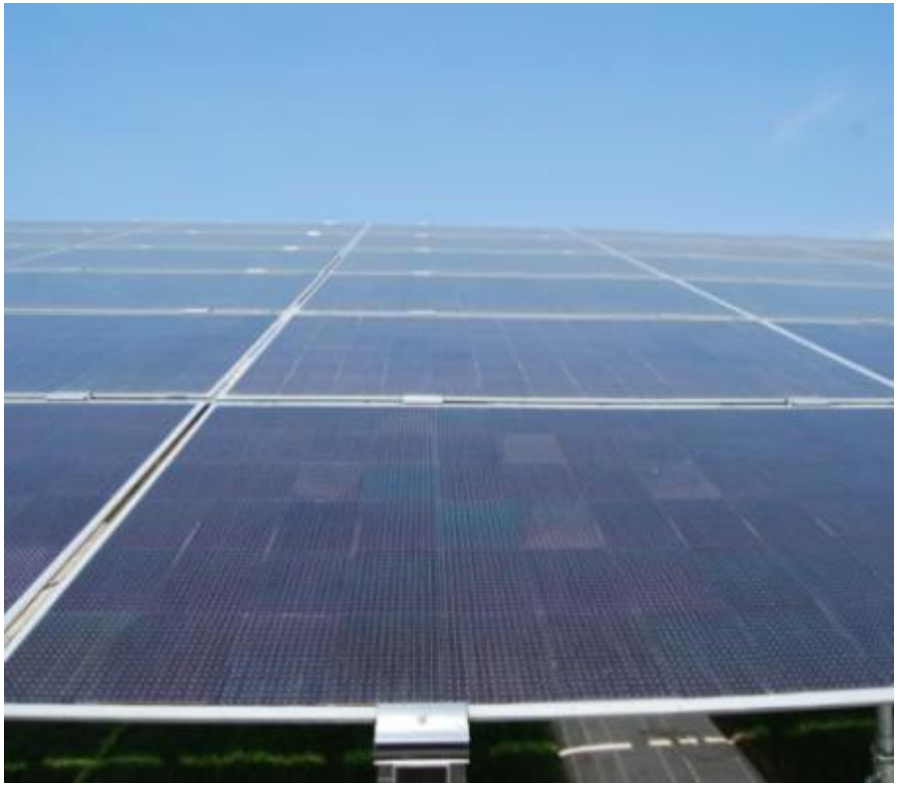
# We then Assemble these Cells into Utility-scale Panels

- 84 cells welded together to form one solar panel
- Cells sandwiched between two tempered glass plates
- Glass plate edges sealed to protect against weather

Specifically designed from the start to make Nanosolar utility-scale solar power plants competitive with fossil fuels

# Nanosolar Power Plants Are Built in Municipal Areas

## Connection to Distribution Voltage Lowers Delivery Costs



**Nanosolar power plants can be constructed on landfills, brown fields and green fields, as well as on flat rooftops**

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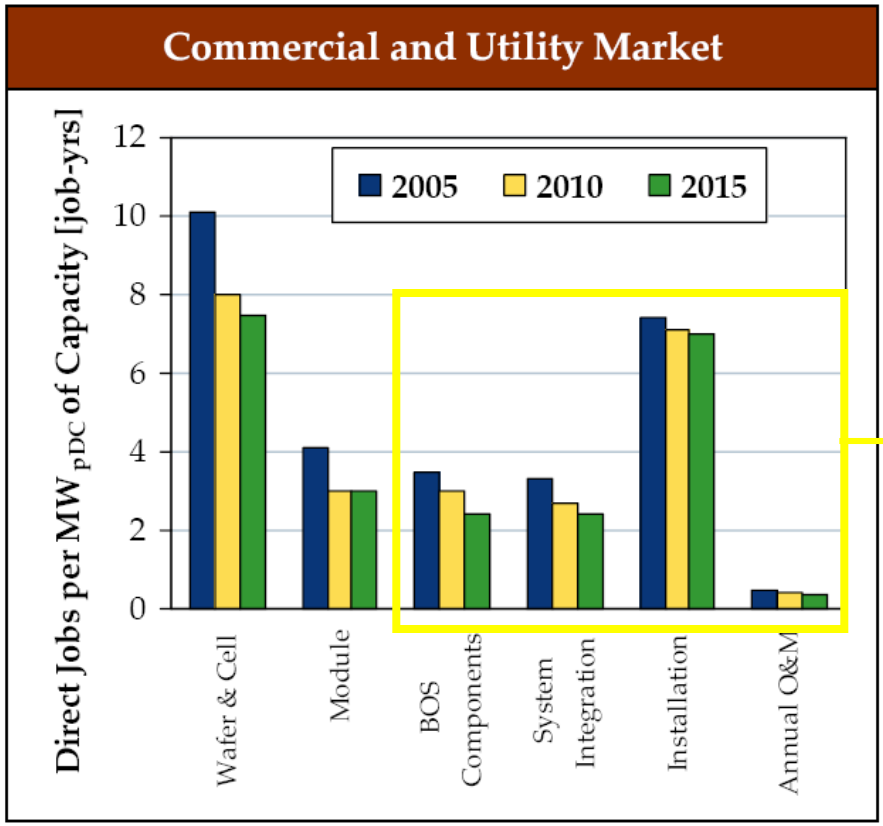
# Nanosolar CA Factory Expansion Will Create Thousands of Skilled Solar Jobs Each Year




*Source: Navigant Consulting ,Economic Impacts of Extending Federal Solar Tax Credits, September 15, 2008, Final Report Prepared for the Solar Energy Research and Education Foundation*

<u>For every 100 MW of production:</u>

- **1,000** downstream jobs in system integration, installation, and O&M
- Immediate job creation for 2010 factory expansion

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# These Jobs Represent Skilled Roles in Both Manufacturing and Installation

## Manufacturing Jobs

- Manufacturing
  - Factory worker
  - Technician (including semiconductor technician)
  - Material handler
  - Factory supervisor
  - Manufacturing engineer
  - Manufacturing manager
  - Quality assurance engineer/technician
  - Chemical/Process engineer
- Design
  - Material scientist
  - Electrical engineer
- Administrative and support
  - Purchasing agent
  - Director
  - Health and safety officer
  - Accountant
  - Administrative assistant
  - Information technology professional

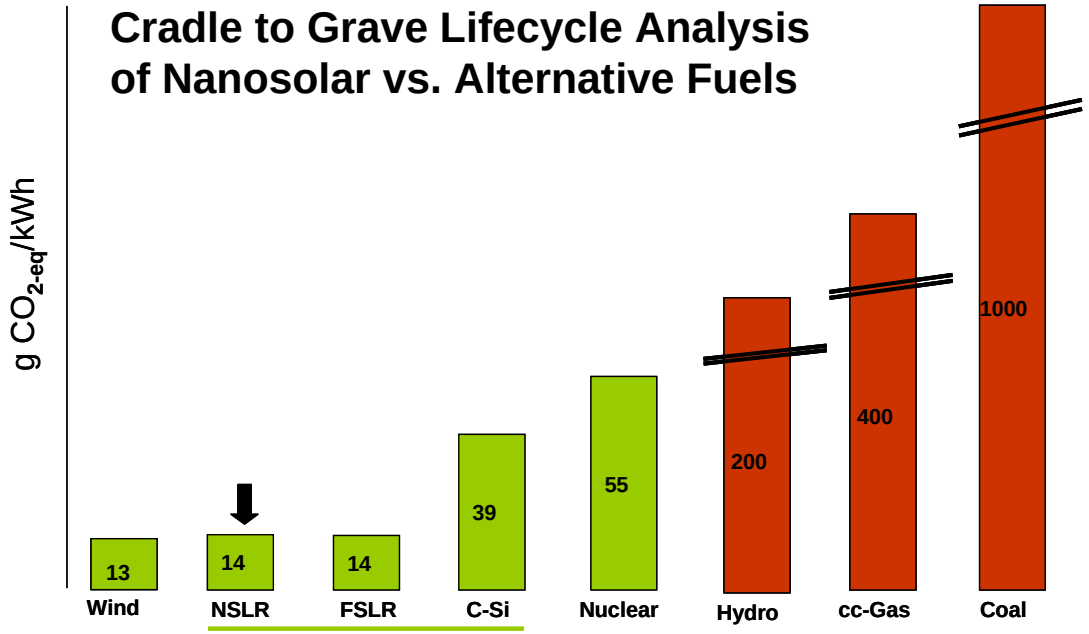
## Installation Jobs

- Installation
  - Electrician
  - Roofing contractor
  - General contractor
  - Shift supervisor
  - Foreman
  - Heavy construction (for utility scale projects)
- Design
  - Mechanical engineer
  - Electrical engineer
  - Civil engineer
- Administrative and support
  - Health and safety officer
  - Accountant
  - Administrative assistant
  - Information technology professional

Source: Navigant Consulting, July 2008 and Navigant Consulting's Module Manufacturing Cost Model, June, 2008

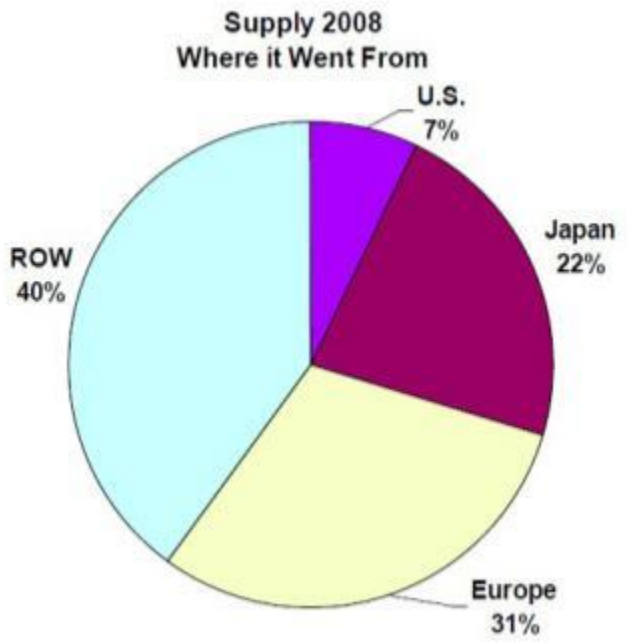
# Nanosolar Panels' Ultra-Low Carbon Footprint

Nanosolar is 3x lower than conventional solar panels, 50x lower than a combined-cycle gas plant and over 50x lower than a coal-fired plant




**Sources:**
Life Cycle Analysis of Nanosolar CIGS PV system, Fthenakis, V.M., H.C. Kim H.C. and R. van Haaren, Center for Life Cycle Analysis (CLCA) at Columbia University; V.M., Kim H.C. and E. Alsema. 2008. *Emissions from Photovoltaic Life Cycles, Environmental Science and Technology.* **42** (6): 2168–2174; Fthenakis V.M. and E. Alsema. 2006. *Photovoltaics Energy Payback Times, Greenhouse Gas Emissions and External Costs: 2004-early 2005 Status, Progress in Photovoltaics: Research and Applications* **14**:275-280; Energy Pay-back Time and CO2 Emissions of PV Systems.Alselma, E.A. 2000. *Progress in Photovoltaics: Research and Applications* **8**: 17-25; Life cycle assessment of photovoltaic systems: results of Swiss studies on energy chains. Dones, R. and R. Frischknecht. 1998. *Progress Photovoltaic Research Applications* **6**: 117-125; Nuclear Information and Resource Service; International Rivers Network; Energy Information Administration, U.S. Department of Energy.

# Nanosolar Can Help America Regain its Leadership & Competitiveness in Solar Manufacturing




Photovoltaic Manufacturer Shipments, Capacity and Competitive Analysis, 2008/2009. Navigant Consulting, April 2009.

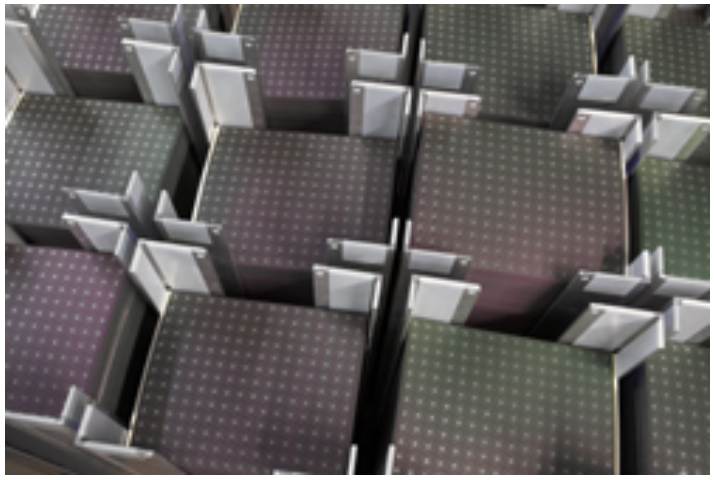
- Of the Top 10 global solar panel manufacturers, nine are non-U.S. based companies
- The one U.S. based supplier manufactures 80%+ of its solar modules outside of the U.S.
- Achieving energy security requires regaining our leadership in solar manufacturing
- Nanosolar will manufacture 100% of its solar cells in the U.S.

# Nanosolar Can Manufacture Gigawatts in the U.S. with the Support of the State and Federal Government

Nanotechnology + Printing =

- Rapid Scalability
- Industry-leading Cost and Capital Efficiency
- Significant Market Creation

*Capability to scale to GWs of production very quickly with the support of the State and Federal Government*



# State Programs that can Support the Growth of Solar Electricity and Green Jobs in California

***Supply*** ⟷ ***Demand***

- Fair and transparent SB71 implementation
- CA Cost-Share of Federal-backed Product Warranty Insurance
- CA Cost-Share of Federal Loan Guarantee for Renewable Energy Manufacturing

- Electricity Feed-in Tariffs
- Support for Renewable Portfolio Standards
- Support optimizing BLM Rental Pricing in CA

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