



# Unleashing the Power of Silicon

## Dow Corning Solar Solutions

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SNEC 2009 – Shanghai

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# Today's Topics

- Dow Corning Overview
- Our Commitment to Sustainability
- Dow Corning in China
- Our Focus on Solar
- Energy Needs in China
- Silicones in Solar Applications

# Dow Corning Corporation

*A Leader in Si-based Chemistry*

- Founded in 1943 to develop, manufacture and market Si-based material solutions
- Fully integrated from feedstock to Dow Corning Solar Si-based material
- Over \$5 billion (USD) in sales in 2008
- 10,000 employees worldwide
- Approximately 4-5% of sales invested in R&D

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# Our Commitment to Sustainability

- Supported through business strategies, processes, products and solutions
- Sustainable solutions can secure a competitive advantage as well as preserve precious natural resources and energy
- Ecologically sound materials and solutions are fundamental to our success.
- Improving quality of life now and for future generations



# Our Commitment to China

- Entered China market in 1973, began manufacturing in 1997
- Facilities
  - Headquarters in Shanghai; 7 regional offices
  - Manufacturing facilities in Zhangjiagang and Songjiang
  - Application Center and Technical Information Center
- Invested > US \$670 million in China to provide proven solutions to local customers



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# Silicones Applications Support Virtually Every Industry in China

- Automotive
- Beauty & Personal Care
- Chemical Manufacturing
- Compound Semiconductor
- Construction
- Electronics
- Food & Beverage
- Healthcare
- Household & Cleaning
- Imaging
- Paints and Inks
- Power and Utility
- Pressure Sensitive
- Rubber Fabrication
- Solar
- Textile, Leather & Nonwovens



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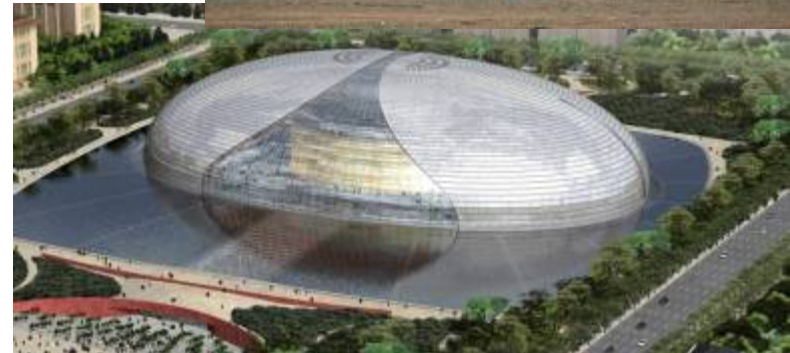
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# Support to Advance China's Infrastructure

- Local infrastructure development
  - Qingzang Railway
  - National Center for Performing Arts
  - Grand National Theatre
  - Hangzhou Bay Bridge



# Support to China's Solar Industry

- Invested solar market development in China
  - Working closely with Chinese solar manufacturers
  - Developing new cost/ownership reduction technology
  - Participant in the China Greentech Initiative Program
  - Active with key public renewable energy bodies (e.g., China Energy Association)

# China Solar Energy Industry

- China plays a critical role in the global PV industry
  - China is producing more than 50% of the PV modules globally
  - China is becoming a leader in solar thermal applications globally
- China aims to increase proportion of renewable energy consumption as part of its commitment to take action against global climate change
  - 15% by 2020 (vs. 7.5% now)
- Government offers favorable policies to support solar applications

# Solar Challenges

- Fundamental challenge: Cost/kWh to be grid parity
  - High efficiency technology approach through process innovation along the mainstream c-Si PV entire value chain
    - Active and diversified PV technology innovations under way
      - Thin Film, CSP, CPV, Nano PV, Dye PV, ... unlimited
  - Operational excellence approach: reduce capital/Wp
    - High throughput/yield through automation, process innovation.
    - Less capital investment (e.g. space & equipment) through process optimization and innovation
    - Labor efficiency – reduce labor, better management
  - Raw material cost reduction approach
    - Less raw material/Wp consumption – thinner wafer, lower kerf loss, etc.
    - Enlarge material supply to ease the high material price pressure
    - Replacement of less cost material
  - Longer durability approach: Enhance the durability of solar panels



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# Dow Corning Solar Solutions

- Active 9 years, now a corporate priority
- Goal: help the industry compete with conventional energy sources and become a sustainable energy option globally
- Offer advanced silicon solutions through the entire solar chain
- Perfect fit between Si and Solar applications
- Majority shareholder of Hemlock Semiconductor



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# Dow Corning Solar Solutions

- Mission is to become *the* material house for the Solar Industry
- Approach: by bringing cost-effective Si-based solutions to enable accelerated penetration of solar energy into the global energy market



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# The Power of a Material House...



Sand



Quartz/Charcoal



Solar-grade Polycrystalline



Module



Cell



Wafer



Ingot



Junction Box



Installation

from sand to sun™

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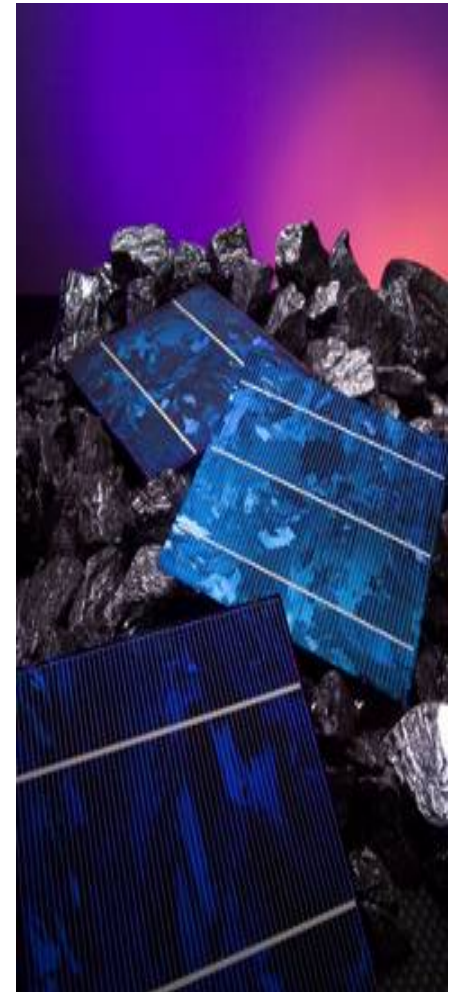
# Dow Corning Solar Strategy

*‘Material House’ means reliable supply  
of a complete silicon feedstock range*

- Supporting Hemlock Semiconductor’s investments to expand polysilicon production
  - Recent announcement nearly doubling capacity – up to additional 34,000 MT
- Continued investment in UMG
- Investing in a new monosilane production facility
  - Plan to start supply in 2011

# Continued Investments in Solar Solutions

- 2006** First commercially viable metallurgical feedstock produced using large-scale manufacturing processes
- 2007** US \$1 billion investment in Hemlock Semiconductor
- 2008** US \$3 billion investment in Hemlock Semiconductor to expand polycrystalline production
- 2008** New manufacturing process lowers cost per watt of solar power
- 2008** New potting agents introduced
- 2008** Solar Solutions Applications Center opened in US
- 2008** Investment in facility to produce monosilane gas for thin films
- 2009** New Korea Solar Solutions Application Center announced



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# Silicones in Solar Applications

- Why Silicones in Solar Modules?
- Material Advancements

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# Why Silicones in Solar Modules?

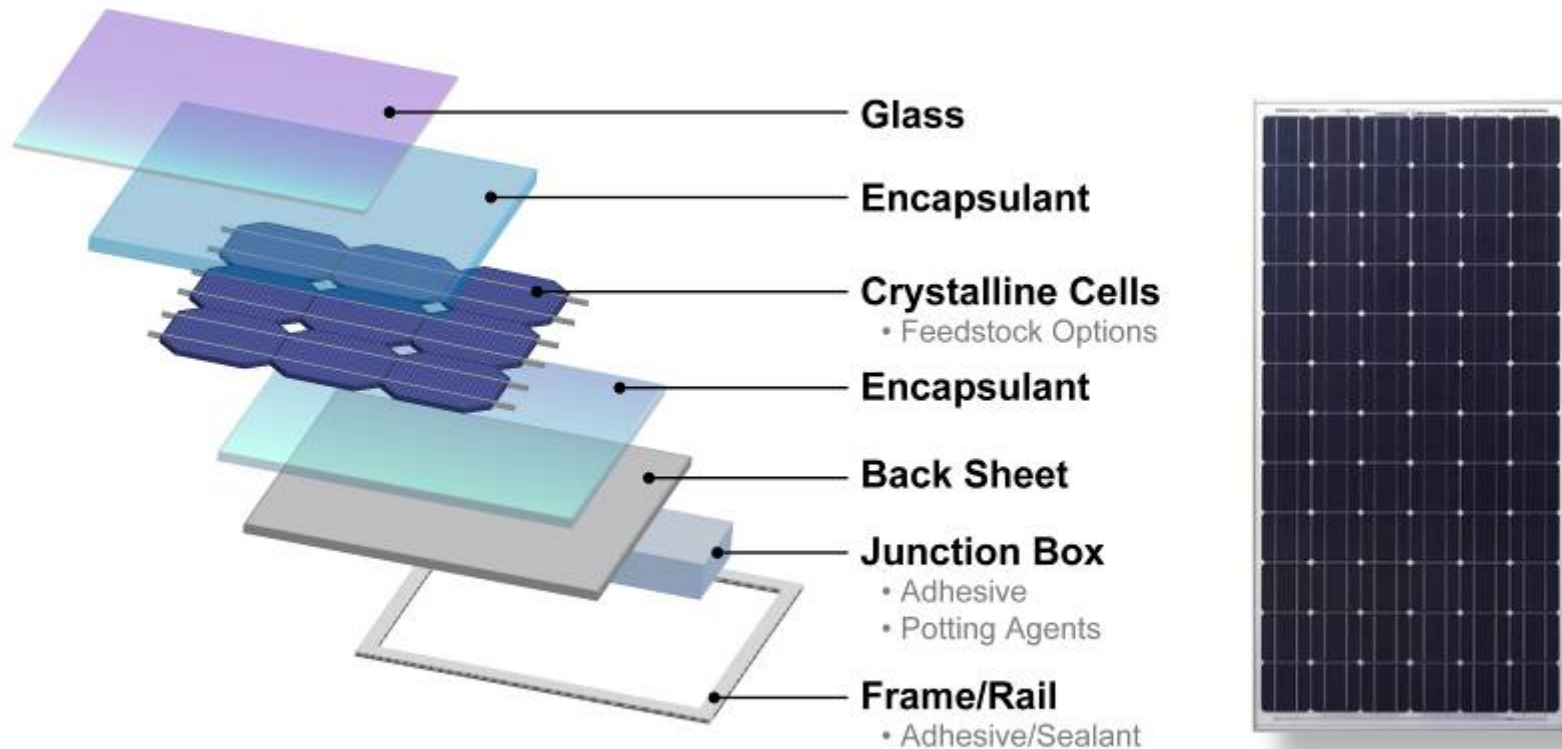
*Where conditions are extreme, silicone has the upper hand*

- Proven performance in construction, electronics industries
- Property advantages
  - Durability to UV exposure
  - Wide temperature range
  - Corrosion resistant
  - Ultra transparent
  - Excellent electrical insulation
- Supply chain advantages
  - Global availability
  - Ease of delivery
  - Not leveraged on petrochemicals
  - Flexible chemistry/mass production



Time Warner Building, New York

# Anatomy of a Solar Panel



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# Raw Material Importance

*Selection critical to long term success of the solar industry*

- Supply guarantee
  - Solar industry is a large, growing, materials consumer
- Manufacturing cost
  - Raw material cost is > 50% total module cost
  - Integration of materials & manufacturing processes
- End-user cost & revenue
  - Impact on module efficiency
  - Impact on module durability } = Cost per kWh!

# Silicone Material Advances

- *Dow Corning*<sup>®</sup> PV-6100 Series Encapsulants
  - Very fast cure
  - Small manufacturing floor plan
  - Target 1 module/min
  - Low capital
  - Continuous processing
  - Lower energy use
  - New installation/retrofit options



# Silicone Material Advances

- *Dow Corning*<sup>®</sup> PV-8101 Sealant
  - One-part, easy-to-apply PV frame sealant and junction box adhesives
  - Made in China exclusively for the China solar market
  - Provides reliable adhesion to typical PV substrates and reliable weathering performance



# Silicone Material Advances

- *Dow Corning*<sup>®</sup> brand PV Junction Box Potting Agents
  - Long-lasting protection against environmental ingress
  - Excellent electrical insulation of components



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# Material Roadmap

- Next-generation encapsulants
- Sealants and pottants
- Anti-reflective coatings
- Conductive materials



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# Thank You

## *Questions? Comments?*

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