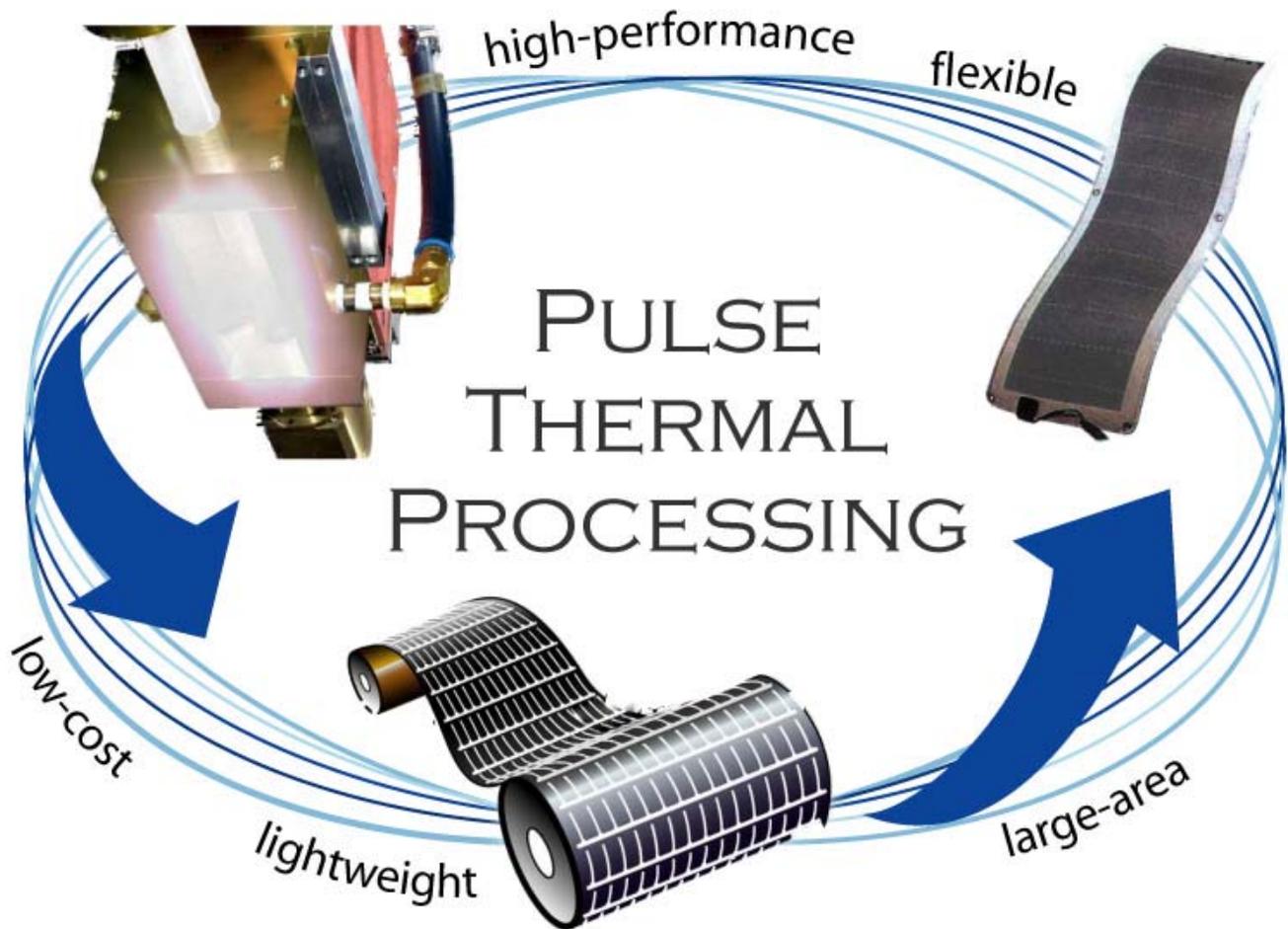


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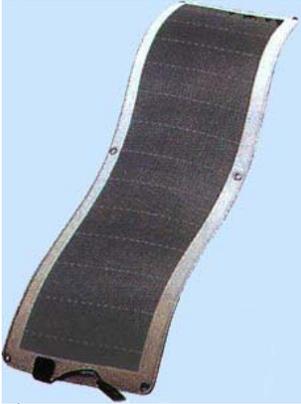
Oak Ridge National Laboratory
Materials Science & Technology Division

**ORNL has an Enabling Technology for Manufacturing
High Performance, Low-cost, Flexible Photovoltaics**



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Flexible solar cell module

Solara Energy, Inc.

The Photovoltaic Industry

- Growing 30% to 40% per year
- Annual revenues of over \$500 million in United States
- In 2003 the industry generated \$4.7 Billion in revenues worldwide
- \$15 Billion dollar industry worldwide by 2020
- 150,000 American high-tech jobs by 2020 (similar to current glass industry in size)
- US PV world market share dropped from 40% in 1997 to 14% in 2003

US Photovoltaic Industry has Outlined the Required Research and Development Goals

- Improve collection efficiencies
- Reduce cost
- Develop advanced PV production equipment
- Improve throughput of products in manufacturing processes
- Integrate R&D activities
- Create manufacturing partnerships
- Support for basic materials research

Reference: Solar Power Today and Solar Electric Power – The U.S. Photovoltaic Industry Roadmap

Industry recognizes the potential in ORNL's enabling technology

“ORNL's Pulse Thermal Processing would be an important step in further research and ultimately commercialization of advanced material processing which could have profound impacts in lowering the manufacturing costs of solar photovoltaics.”

– former SEIA* Executive Director Scott Sklar, and current President of The Stella Group in Washington, D.C.



Flexible module
United Solar Ovonic Corp.

*Solar Energy Industries Association (SEIA) the national trade group representing solar energy manufacturers, component suppliers and distributors which represents over 700 companies and 20,000 employees in the US solar industry

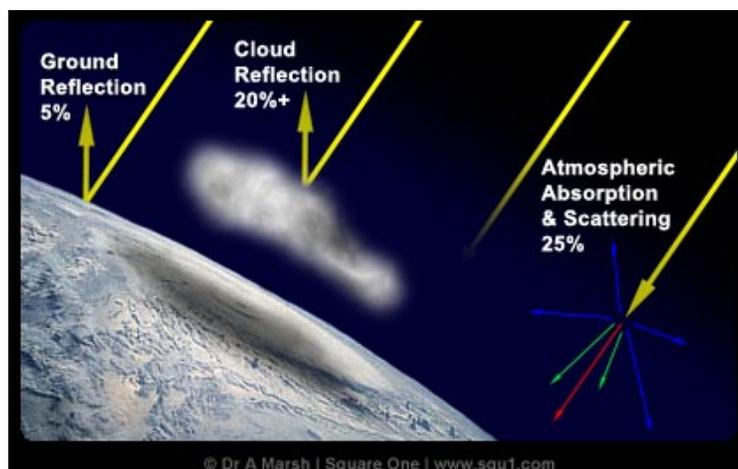
US Congressman calls for aggressive advancements in photovoltaic technology

"The acceleration of renewable energy technologies and the increase in support for solar must be key ingredients to the Congress's plan for energy independence...Solar is an energy source that holds tremendous potential for today's demand. As co-chairman of the Renewable Energy and Energy Efficiency Caucus, and as point man for energy issues on the House Policy Committee, I plan to aggressively pursue a sharper focus on energy efficiency and energy conservation in the 109th Congress."

- Congressman Zach Wamp at a Capital Hill briefing, January 26, 2005, by the Solar Energy Industries Association (SEIA)

The Time is Right for a Major Thrust in Photovoltaics

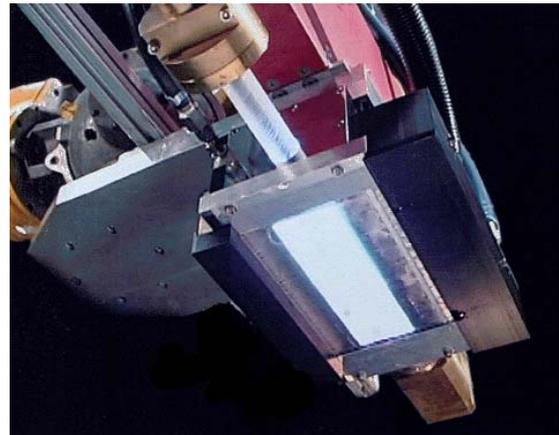
- Richard Smalley, a 1996 Nobel Prize Laureate in chemistry, is calling on the United States to mount a multibillion-dollar campaign to fund research into alternative energy...energy is the single most important problem facing humanity today—not just the U.S., but worldwide (December 2004)
- Smalley has outlined photovoltaics as the primary technology for future energy needs
- ORNL is presently building relationships with US based Universities and Industries linked to photovoltaics in an effort to exploit ORNL's enabling technology



- 165,000 Terawatts of sunlight hit the earth every day
- United States primary yearly power consumption is 3.3 Terawatts
- Sun provides an enormous amount of free energy

ORNL's Enabling Technology

- Unique high density plasma arc processing technology for rapid thermal annealing of thin-film LEDs and PV thin-film and nano-particle materials
- Potential to significantly increase PV collection efficiency and LED electrical properties
- Increase production rate and reduce production cost
- High density plasma arc technology offers large area processing and the greatest heating rates available
 - Large area processing enables increased production rate, or throughput
 - Reduces residual stresses
 - Obtain more uniform microstructures, thus properties
 - High heating rates allow processing on polymer substrates



High density plasma arc light source

ORNL's has a Long History of Transferring Technology to Industry

Top R&D 100 Award Winners

