

# Solar Products Manufacturing In Milwaukee

Summary of Project Findings

A Solar America Cities Project

July 2009



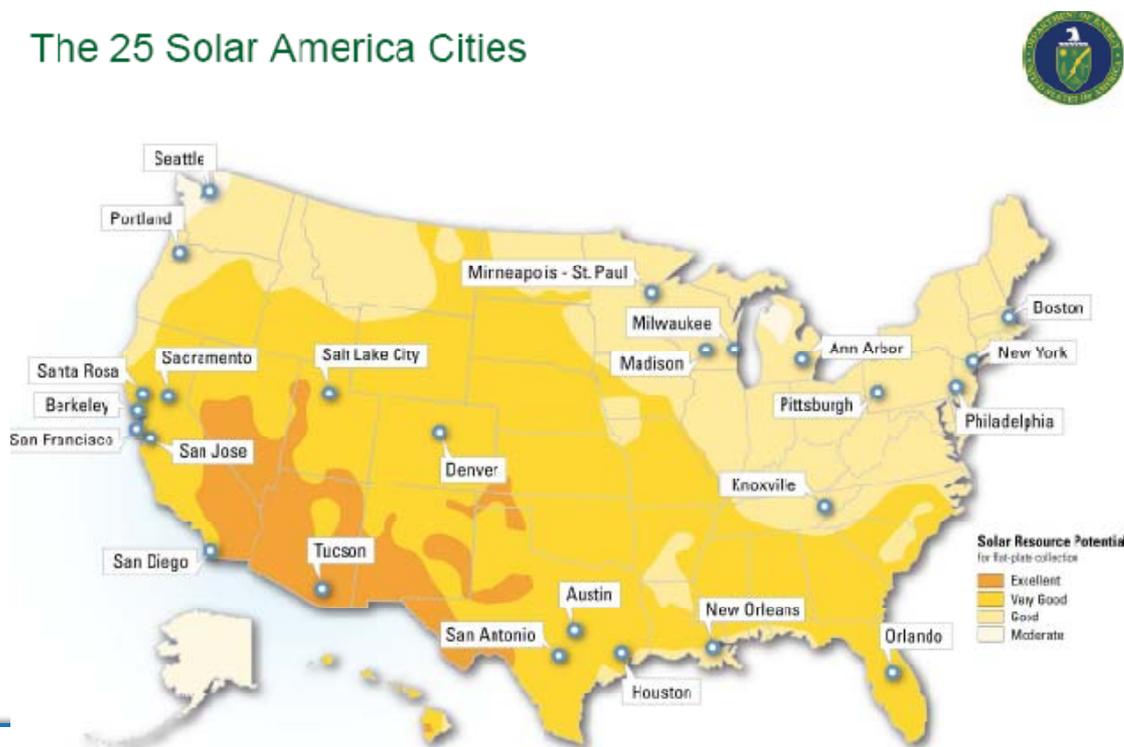
CH2MHILL

# Project Background

## Solar America Cities (SAC) Program

Through the U.S. Department of Energy's Solar America Cities (SAC) partnership, 25 major U.S. cities are working to accelerate the adoption of solar energy technologies for a cleaner, more secure energy future. The Solar America Cities program has engaged over 180 organizations, including municipal, county, and state agencies, solar companies, universities, utilities, and non-profit organizations.

## The 25 Solar America Cities



# Project Background & Goals

Using DOE Funding for Technical Assistance, the City of Milwaukee Contracted CH2M HILL to complete the following:

1. Review solar manufacturing, limited to PV and domestic Solar Hot Water products, and the critical elements of the supply chain relevant to their manufacture
2. Assess the City's ability and opportunity to attract and/or grow solar products manufacturing (*not including an assessment or discussion of installations or battery capabilities, technology, or opportunities*)
3. Provide recommendations on how the City could position itself to be successful in attracting or growing solar products manufacturing industries

The results of these activities are presented in full in the written report



# Written Report Outline

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1. Solar Products Manufacturing Overview
  - Markets
  - Timing
  - System Components and Supply Chain
  - Manufacturing Processes
2. Milwaukee Solar Manufacturing Assessment
  - Milwaukee's Manufacturing Base
  - Solar Products Manufacturing Requirements
  - Comparison Matrix of Key Factors
3. Milwaukee Local Interviews and Contributors
  - Common Themes
4. Solar Manufacturing in Milwaukee: Conclusion, Opportunities, and Suggestions.
  - Milwaukee Analysis
  - Milwaukee Strengths and Challenges
  - Opportunities
5. Next Steps and Key Take-Aways

# Project Team

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## City of Milwaukee

Ann Beier – Director, Office of Environmental Sustainability

Andrea Luecke – Project Manager, Milwaukee Shines

## CH2M HILL

Nate Monosoff – Solar Manufacturing

Steve Petersen – Economic Development

Brent Brown – Local Coordination

Mark Mittag – Local Coordination

## Milwaukee Area Stakeholders

University Representatives

Small and Large Businesses

Local Power Utility

Economic Development

Renewable Energy and Energy Efficiency Groups

## DOE

Jason Coughlin – Tiger Team Lead

# Solar Product Manufacturing Overview:

## When and Where

- The solar products manufacturing industry is entering a long period of growth created by the following:
  - Stable energy demand growth
  - Increases in conventional energy costs (hydrocarbon)
  - Decreasing costs and increasing efficiencies of solar products and systems
  - Subsidies and incentives for end-use and manufacture
  - Carbon, climate change, other political forces, and Renewable Portfolio Standards and Goals
- Regional or local subsidies, still required to justify solar end-use in most of the U.S. will no longer be required in the best regions in 5-10 years.
  - Best end-use regions currently are those with highest price difference (conventional vs. solar). These are the shipping destinations for manufacturers

Figure 2. PV Solar Radiation kWh/m<sup>2</sup>/day from NREL

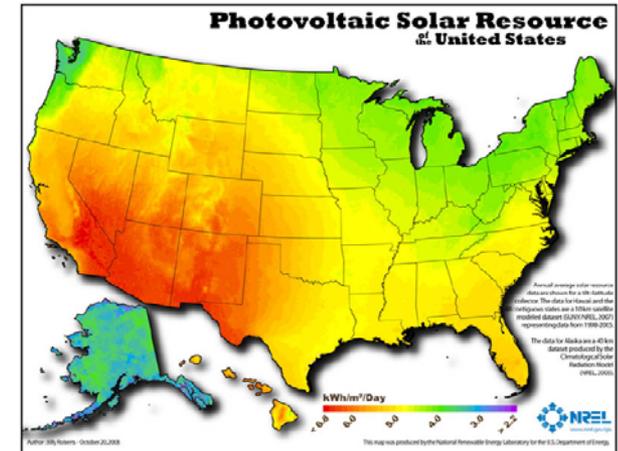
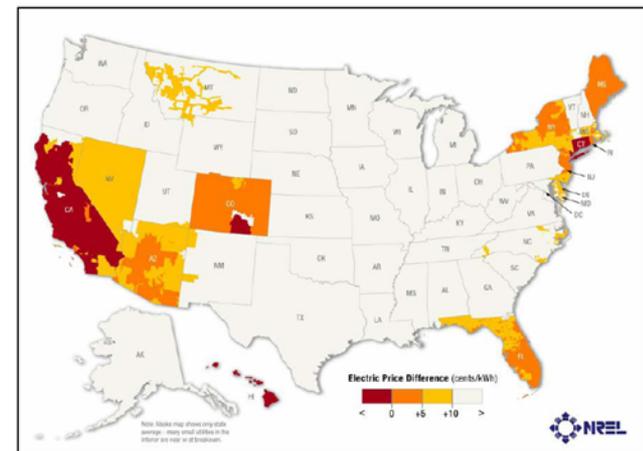


Figure 4. PV and Conventional Electric Price Difference in the U.S. from NREL



# Solar Product Manufacturing Overview:

## When and Where

- Best manufacturing regions are driven by other factors than the best End-Use regions
  - Low vs. High Power Cost
  - Available Materials
  - Ready Sites and Buildings
  - Economical Labor
  - Access to Research and Development
  - Manufacturing Specific Incentives

Figure 2. PV Solar Radiation kWh/m<sup>2</sup>/day from NREL

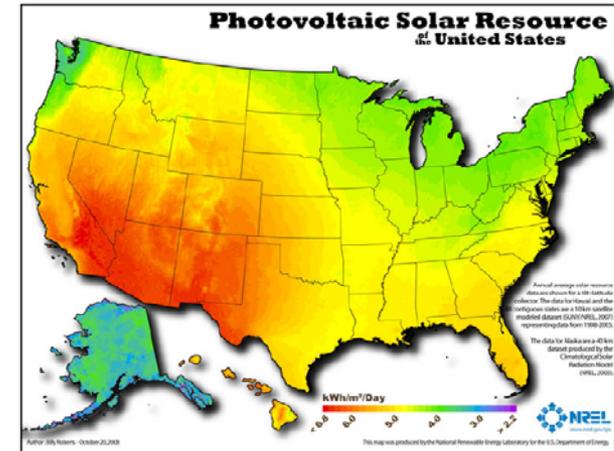
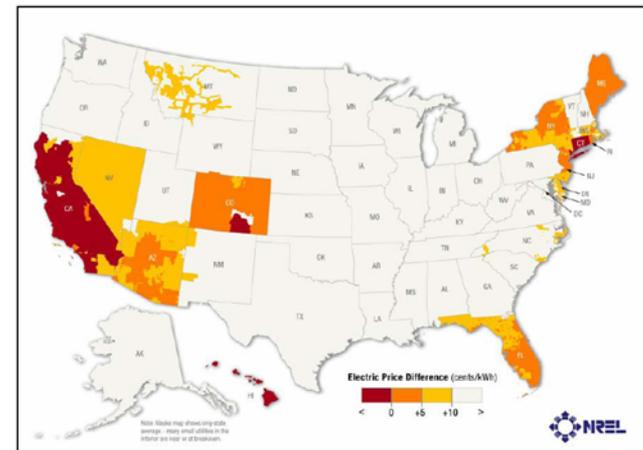


Figure 4. PV and Conventional Electric Price Difference in the U.S. from NREL



# Solar PV Product Systems and Supply Chain

- Solar PV Product Manufacturing has many steps and involves many components, some of them requiring high tech processes and advanced materials
- Lower complexity PV system components fit well with Milwaukee's existing manufacturing expertise
  - Mounting Systems, Tracking, Power Electronics...
- High tech PV processes and materials are also possible in Milwaukee, but more investment would be needed to develop these capabilities and workforce
- Existing manufacturing capability and facilities could be leveraged, and there is opportunity to develop new facilities

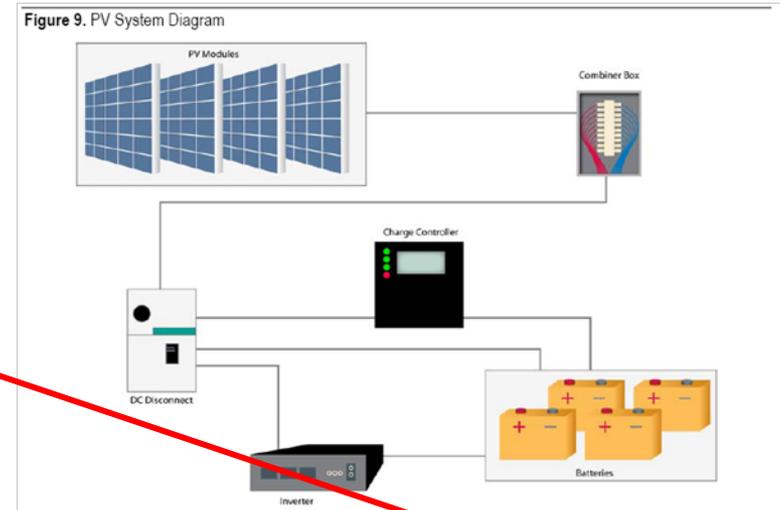


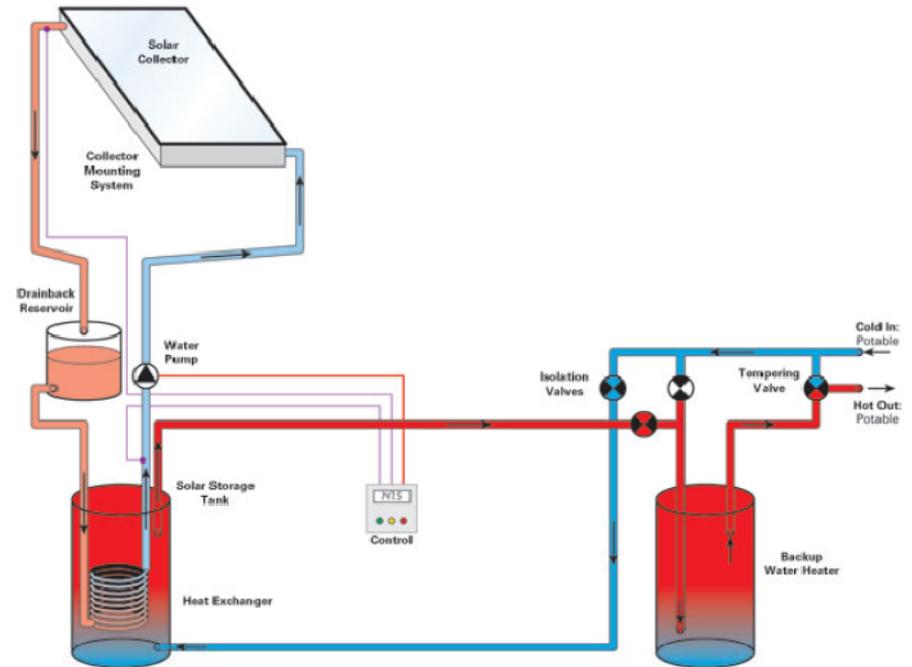
Figure 8. Solar PV Manufacturing Supply Chain



# Solar Hot Water Systems and Supply Chain

- Solar Hot Water Product Manufacturing has many steps and involves many components
- The majority of Solar Hot Water system components match well with Milwaukee's expertise in manufacturing
  - Collectors, Controllers, Tanks, Heat Exchangers, Valves, etc.
- Only minor changes would be required for existing area companies to produce these products using existing facilities and capabilities.
  - Structural Metals, Tanks, Valves, Controls, etc.
- New facility development is also a good opportunity

Figure 13. Typical Drain-Back Solar Hot Water System Diagram from [www.energygridsolutions.com](http://www.energygridsolutions.com)



# Milwaukee Solar Manufacturing Assessment – Key Criteria

- Analyzed 8 Key Factors Solar Companies Use to Select New Manufacturing Locations:
  - Solar Manufacturing Initiatives – An indicator of local support
  - Base of Tech Businesses – Companies familiar with technology manufacturing and experience dealing with technical industries
  - Solar Products R&D – Access to technology important for ongoing improvement
  - Electricity Availability and Costs – Economical power with room to grow
  - Proximity to Markets – Reach into points of sale
  - Sites – Available and ready land and buildings
  - Workforce – Economical and technically experienced labor
  - Incentives for Manufacturing – Funding to bridge gaps to unsubsidized market acceptance

Other factors beyond these key criteria were considered and are discussed in the report

# Milwaukee Solar Manufacturing Assessment – Evaluation Themes

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- Milwaukee has a history of traditional manufacturing expertise
- The manufacturing needs of the solar products industry are slightly different than traditional manufacturing, but have overlapping characteristics
- Our evaluation of Milwaukee reveals gaps and areas of improvement opportunities to compete for solar manufacturing industries

# Milwaukee Solar Manufacturing Assessment – Comparison Matrix

Figure 19. Milwaukee Comparison Matrix for Selected Variables

MILWAUKEE COMPARISON MATRIX				
CRITERIA	Milwaukee	State A	State B	State C
Solar Manufacturing Initiatives	Red	Green	Green	Green
Base of Tech Businesses	Yellow	Green	Green	Green
Solar Products R&D	Red	Yellow	Yellow	Yellow
Electricity Availability & Costs	Green	Green	Green	Green
Proximity to Markets	Yellow	Yellow	Green	Green
Sites - Land and Facilities	Red	Green	Green	Green
Workforce	Yellow	Green	Green	Green
Incentives for Manufacturing	Yellow	Green	Green	Yellow
		Good	Fair	Poor

- Some states are currently better positioned to compete for solar manufacturing capability in these key areas, but by investing to bridge the gaps, Milwaukee can compete

# Summary of Findings – Milwaukee's Strengths

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- Existing manufacturing and engineering base
- Skilled manufacturing workforce
- Applied technology focus in area Universities
- Abundant and high quality water and water technology
- Competitive electricity rates
- Good transportation and distribution networks
- Public and private support and enthusiasm for solar products and manufacturing jobs
- Existing solar products companies
- Supportive and committed power utility

# Summary of Findings – Milwaukee Challenges

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- More focus and investment in a solar initiative and visible commitment to attracting new investment and growing existing companies
- More focus and investment on the City's visibility in the solar manufacturing industry
- More focus and investment to create, promote, and certify available sites and buildings to meet the requirements of the industry
- More focus and investment in developing a more complete and more significant manufacturing incentive program

# Summary of Findings – Best Opportunities

- The City of Milwaukee has existing companies working in solar products. These companies provide good potential for expansion
- Milwaukee has strength and expertise in metals manufacturing that can be leveraged into supply chain components such as:
  - Manufacturing of fittings and valves for solar hot water systems
  - Forming and assembly of frames for both PV and SHW
  - Manufacturing of mounting systems for both PV and SHW
  - Manufacturing of tracking systems for PV
  - Manufacturing of tanks for SHW systems for specialty and high performance applications
- Milwaukee's strength and experience in electronics can be leveraged into:
  - Controllers for SHW systems
  - Inverter and charge controllers for PV systems
- Although the City is not ideally suited for integrated large scale PV panel manufacturing, smaller scale PV assembly is feasible, and could be a highly visible commitment to the solar industry.

# Next Steps

- **Commit to the Solar Products Industry with Solid Public Action**
  - **Commit Resources and Outreach and Marketing Program**
    - Contract key program manager and industry champion
    - Organize a working group of stakeholders
    - Coordinate public and private interests
    - Analyze situation and prioritize opportunities and actions
  - **Improve the Milwaukee Product**
    - Invest to bridge gaps
      - Specifically in local Solar Manufacturing Initiatives, Sites and Buildings, and Incentives
    - Develop an informational kit
  - **Develop Showcase Projects to Create Public Enthusiasm and Educate**
    - Create highly visible solar product projects
      - Small PV assembly or solar hot water collector manufacturing operation
      - Local commercial, industrial, or small utility scale installation
  - **Market to Solar Product Companies**
    - Local and Foreign, PV and Solar Hot Water

# Looking Forward – Key Take Aways

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- Milwaukee faces challenges in growing solar products manufacturing, however, these challenges are manageable
- The solar products manufacturing industry is about to enter a long growth phase and Milwaukee has a window of opportunity to begin planning and positioning activities
- Milwaukee will need to invest substantial time and effort, recruit the right people, and commit the necessary funding to compete with other regions and cities also seeking to develop solar product manufacturing capabilities

# CH2M HILL Contacts

## Local Contacts

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**CH2MHILL**