

Solar America Cities and the Minneapolis Saint Paul Solar Cities Program

As a result of the program's eventual cost competitiveness, the U.S. Department of Energy launched the Solar America Cities (SAC) program in 2007. SAC worked with 25 metropolitan areas across the nation to identify barriers to effective solar energy investments and to test methods of removing those barriers. In 2008, the



Minneapolis Saint Paul Solar Cities program was created to transform the market for solar energy in the core cities of our metropolitan area, advance market transformations throughout Minnesota. The Minneapolis Saint Paul Solar Cities program is a direct collaboration of the cities of Minneapolis and Saint Paul and the Minnesota Department of Commerce, Office of Energy Security. Other entities and organizations are program partners, contributing to and benefitting from program efforts.



Minneapolis and Saint Paul working in partnership with:

- Minnesota Department of Commerce
- Century College
- District Energy St. Paul
- SolarFlow
- Fresh Energy
- Green Institute
- International Brotherhood of Electrical Workers
- League of Minnesota Cities
- Minnesota Renewable Energy Society
- Minnesota Solar Energy Industry Association
- Neighborhood Energy Connection
- NRG Thermal
- Xcel Energy

Legislative Support and Direction

In 2009, the Minnesota Legislature passed Governor Pawlenty signed into law a historic series of solar energy market transformation initiatives. As part of those initiatives, the Solar Cities program was to annually report back to the Legislature on the progress of market transformation and solar industry development. This report summarizes the status of solar development in Minnesota, and identifies additional initiatives to be undertaken in Minnesota to cost effectively use its solar resource.

Solar Cities Legislative Report

The Solar Cities shall identify strategies to accelerate the rate of solar thermal and electric energy installations in all building types throughout the state. The report must address the following issues:

- 1) Identify legal, administrative, financial, operational barriers to increasing the installation of solar energy, and means to overcome them;
- (2) Identify financial and regulatory mechanisms that stimulate the development of solar energy;
- (3) Identify ways to link solar energy development with energy conservation, energy efficiency strategies and programs;
- (4) How efforts and initiatives taken by St. Paul and Minneapolis can be integrated with activities undertaken in other parts of the state; and
- (5) How projected trends in solar technology and the costs of solar generation can be integrated into the state's strategy to advance adoption of solar energy.

Summary Laws 2009, Chapter 110, Section

Trends in Solar Technologies and Costs

The United States is at the cusp of a significant growth period for most solar technologies. Markets experiencing the most rapid solar growth are where state policy has addressed financial, legal, and operational barriers. Solar technologies, including solar (photovoltaics, PV) and solar thermal, are a growing market with potential for explosive growth not only globally and nationwide, but also in Minnesota.

Working with its partners and other stakeholders, the Minneapolis Saint Paul Solar Cities program tracked and assembled information on the short-term and long-term trends in Minnesota and nationally. These trends clearly confirm the basis for the Solar Cities program which is to address short-term trends for solar energy, provided market barriers continue to be overcome so solar energy can become

J Solar Technology Trends Over the past four years, approximately 90% of solar electric installations have used crystalline silicon solar panels, the same technology that has been used for 30 years. Despite a number of new products and technologies on the market, the traditional crystalline silicon solar panel continues to dominate the market. Most solar thermal panels have similarly remained the same in appearance and size, with no great changes in technology sweeping the market. However, a number of important trends are likely to increase opportunities to install solar energy over the next years:



Crystalline silicon panels on a Saint Paul home.

- § *Improving efficiency.* The efficiency of traditional solar panels is improving each year. = converted to electricity. New products on the market are now over 20% efficient. Products under development have achieved efficiencies over 30%. This trend will likely continue and will result in increasing productivity of capital and labor at the manufacturing end of the market.
- § *Building integrated products.* Thin film solar panels can be built into building materials, such as roofing shingles, windows and skylights, and awnings. Building integrated products will become more prevalent as new construction



Building integrated solar panels on a Minneapolis garage

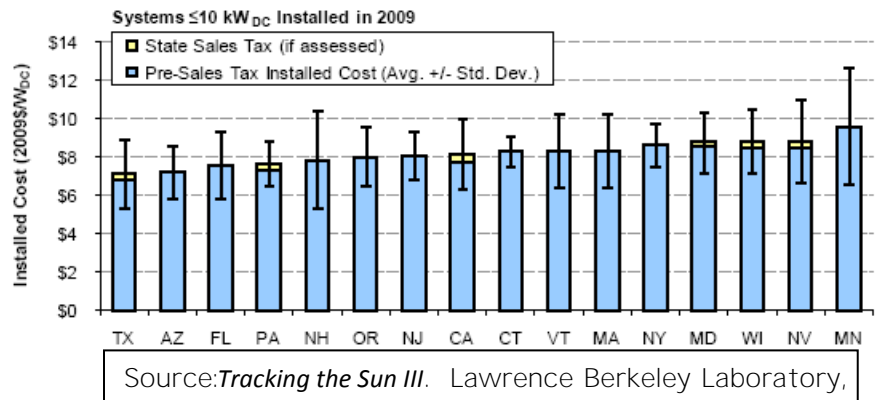
begins to routinely incorporate solar technology.

§ *Large-scale systems.* In Minnesota, almost all solar development has occurred at the residential or small commercial scale. States that have policies in place to encourage large-scale systems have realized both more solar investment than other states and greater price decreases for smaller systems. Technologies for deploying larger systems can drive down prices and improve competitiveness for the entire industry.

J Solar Cost Trends The high upfront cost of solar energy in Minnesota is a

trend is clearly downward. According to the U.S. Department of Energy, by 2015 solar PV is expected to reach grid parity for much of the U.S. As the Investment Tax Credit remains in place, electricity prices increase moderately and solar electric system pricing continues to decline.

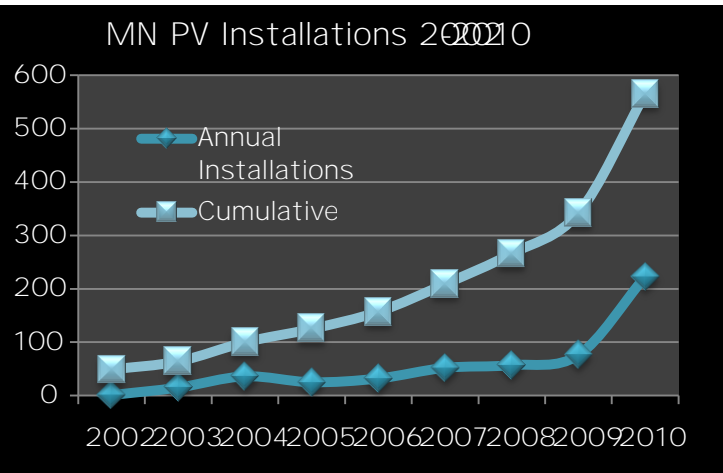
U The cost of solar energy systems is significantly higher than states with more mature solar energy markets, including California, New Jersey, and Texas. But places with lower solar costs (as much as 25% in 2009) do not have significantly better solar resources. In Minnesota, simply more mature markets. This bodes well for the future of solar energy investment in Minnesota. In Minnesota, solar PV prices declined approximately 20% from 2009 to 2011 following the national trend. The decline was largely due to the decrease in module pricing but also due to some increasing efficiencies in installation.



Integrating Solar Energy into State Strategy

The Minneapolis Saint Paul Solar Cities program and the Solar America Cities initiative examined how projected trends in solar technologies and costs of solar generation can be integrated into the state's strategy to advance adoption of solar energy. In 2009, several significant state policy efforts to test the market readiness for solar energy were promoted by solar energy stakeholders and the Solar Cities program, including the revival of the State solar energy rebate for residential and small commercial systems and the launching of a new expanded utility incentive program. These efforts led Minnesota to reach a milestone of 3.6 megawatts total of solar photovoltaic (PV) capacity in 2010. The Minnesota Solar Electric Rebate Program supported 211 solar PV installations in Minnesota in 2010, with more projects currently in progress. The \$2.7 million dollars committed to solar electric and thermal

projects have leveraged over \$10 million in additional private sector investment in solar technology. Private sector response to incentive-based programs demonstrates a latent demand for solar technologies and interest in the private sector to invest in solar technology.



Private and public investment in solar technologies helps create a Minnesota solar industry and jobs. A report completed in October 2010 by Solar Foundation states that Minnesota is

expected to have 1,193 solar jobs including R&D, manufacturing, and installation. Solar jobs are defined by authors as workers who spend at least 50% of their time supporting solar activities. Nationally, the number of workers employed in solar is expected to grow by 26% in 2011.

sectors. Manufacturing and wholesale trade are increased with access to those states with the most mature solar markets.

Recommendations for Integrating Solar Energy

Minnesota has taken steps to begin to integrate solar energy into energy planning and policy. The initial integration attempts have identified policy and planning barriers that have yet to be fully addressed. Better integration of solar energy into Minnesota's energy planning, and fully integrating our solar resource into our energy portfolio will serve multiple purposes.

to ensure Minnesota's energy independence. At the State policy level, the following initiatives should be considered in order to remove barriers, leverage private sector investment, and capture the multiple benefits of solar energy.

- J *Improve tie between solar energy and energy efficiency.* Solar energy and energy efficiency share a number of characteristics, far more than any other energy source in the energy portfolio. As a result, linked solar energy and energy efficiency programs have the potential to add significant value to each other.
- J *Coordinate local regulation of solar energy.* Local governments are responsible for most land use and development regulations. Local governments currently have little or no direction on how to integrate solar energy development standards and land use controls. Similarly, they have no direction from the State on how local application of these standards provide a framework to ensure a consistent development of solar energy installations that allows for local control while reducing uncertainty faced by the solar industry.
- J *Balance property interests within Common Interest Communities.* Common interest communities frequently create barriers to homeowners who want to use their solar resource. State policy should encourage consistent sign and use standards that

policy could provide framework to protect the interests of property owners who want to take advantage of solar resources, and the interests of property owners.

- J *Fully value solar energy within rate structures and resource plans.* Current utility rate structures and resource planning tools were developed for traditional energy fuels. Integrating wind energy into rate structures and plans required substantial study and modeling. No such effort has been completed for solar energy, resulting in undervaluing of the solar resource within wholesale transactions and resource planning processes. Legislative policy could direct action by the Public Utilities Commission or Department of Commerce to initiate dockets or studies to ensure full value for solar energy in wholesale or net metering transactions.
- J *Re-create the State-wide incentive.* Solar energy costs are rapidly decreasing, consistent with the long-term forecasts by U.S. DOE national labs. Minnesota needs to proceed with market transformation efforts to capture the cost efficiencies and to accelerate movement toward a more mature solar market that other states have reached. The Minnesota Solar Electric Rebate Program demonstrated that incentive programs can reduce the front-cost barriers and leverage significant private investment in solar energy. Finding a stable source for funding incentive programs is difficult in the current fiscal situation, but opportunities do exist for creating incentives that will leverage future private investment.
- J *Make buildings solar ready for construction.* A primary barrier to retrofitting existing buildings with solar systems is that the buildings were not designed for solar systems. New buildings can be constructed, at very little additional cost, to easily accommodate solar additions in the near future. Policy or program concepts include ensuring that State-funded buildings are solar ready, programmatic promotion of solar ready construction guidelines to the private sector, rebate programs to offset the additional costs of making buildings solar ready, and utility-based programs to incentivize solar ready construction.
- J *Create policies and programs to encourage large-scale solar installations.* Removing policy and regulatory barriers to investment in large scale solar systems (systems with capacity measures in the hundreds of KW to multiple MWs) will significantly accelerate adoption. Policies and programs that were not developed with large scale solar projects in mind (systems with capacity measures in the hundreds of KW to multiple MWs) were not developed with large scale solar projects in mind. The result is that Minnesota has very few large scale projects and very little market pull to attract investment. State policies adopted by other states changes include reworking the net metering rules, improving interconnection standards for large solar installations, instituting a solar-ready program, or creating standards for a back tariff based on solar energy costs.

The Solar Cities and program partners created a number of initiatives that addressed governmental and market barriers to solar energy, studied viability of solar energy applications, tested new financing alternatives, and prepared workers and entrepreneurs for a growing solar industry. The details of these efforts are provided below, consistent with Minnesota Laws 2009, Chapter 110, Article 35.

Engaging Stakeholders to Identify Barriers and Solutions

Much of the success of the Minneapolis Saint Paul Solar Cities program is due to collaborative work with program partners and engaging a wide range of stakeholders in the process of identifying barriers and solutions. The Solar Cities worked with a wide range of stakeholders to identify and remove legal, administrative, financial, and operational barriers to solar energy investment. These barriers were found to exist at several levels including within state policies and a range of local governmental policies and regulation, and in market failures in the private sector. In order to create a coherent response to barriers, the Solar Cities program convened several stakeholder workgroups to define barriers, assess risks associated with removing barriers, and to engage stakeholders in crafting solutions that had acceptance across a wide range of interests.

J State Policy Workgroup The Solar Cities State Policy workgroup identified legal, financial, and operational barriers to developing U.S. and specific measures to overcome the barriers. Barriers include regulatory issues around net metering, interconnection policies and practices particularly for large solar installations, lack of incentives commensurate with other preferred energy alternatives, and integration of solar energy in resource planning and policy.

The State Policy Workgroup identified a set of principles to guide market transformation efforts in policy, programs, and communications. These principles guided the work of the Minneapolis Saint Paul Solar Cities program and the work of program partners, and set the stage for legislative action on solar energy market transformation.

Solar Cities State Policy Workgroup Principles	
1.	Develop effective market transformation at the stage for market penetration of solar.
2.	Take legislative action necessary to leverage funding and maximize solar deployment to learn what will be needed to broaden solar adoption.
3.	Identify mechanisms, both technological and intrinsic, to incorporate solar.
4.	Integrate solar appropriately in anticipation of eventual cost parity rather than simply cost isolated solar projects.
5.	Link solar energy to energy efficiency, solar to efficient buildings.
6.	Stimulate solar development in residential markets into commercial and larger solar opportunities as well.
7.	Position Saint Paul, Minneapolis and the State of Minnesota to coordinate and immediately utilize any available Federal funding.
8.	Anticipate market forces and leverage existing mechanisms to deepen solar penetration at cost parity.
9.	Collaborate with all state and local governments to find the best position for cities and states to start solar energy.

J Local Policy Workgroup The Solar Cities program also created a Local Policy workgroup to identify local barriers and potential solutions to those barriers

(below) in building permit processes, development regulations, and communication. The Local Policy workgroup identified needs for training of solar installers and local permit officials, for education and outreach to local governments

financing options for solar energy projects and governmental cooperation on local regulation.

- J Communications Workgroup A Communications workgroup was formed to address informational barriers to the development of solar energy. Many people still have



the applicability of solar technology in Minnesota buildings, and the cost of solar energy relative to retail electricity. The workgroup identified a number of messages that need to be routinely communicated in order to allow informed decision making by consumers, businesses, and policymakers. Part of the communications strategy was to create the **Solar Works! In Minnesota** campaign.

The Solar Cities stakeholder workgroups were instrumental in identifying next steps to removing barriers to solar energy development and interesting initiatives in State policy, local policy and regulation, and public understanding of solar potential. The specific initiatives undertaken by the Solar Cities program are described below.



Financial and Regulatory Mechanisms

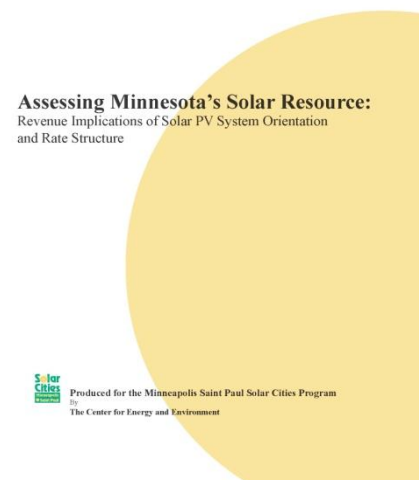
The Solar Cities program worked with NREL and Solar Cities partners to identify energy resources

- J Net Metering The Solar Cities program worked with NREL to review standards, created in 1981, to evaluate whether the current program meets original and new legislative goals. The final report, **Net Metering Policy Development in Minnesota: Overview of Trends in Nationwide Policy Development and Implications of Increasing the Eligible System Size Cap**, was published by NREL in October of 2009. The report concluded that

the current design of net metering rules create significant market barriers to the development of U



- J Solar Value Analysis The Solar Cities program worked with Sandia National Laboratory to adapt existing modeling tools for assessing the market value of solar energy in Minnesota. The model was used to assess the value of multiple configurations of a commercial scale solar system under a variety of market scenarios, including demand and supply rate structures and coincidence of Minnesota's solar production to wholesale electric market conditions. The study concluded that existing rate structures undervalue solar produced electricity.



- J Property Assessed Clean Energy (PACE). The decentralized nature of solar production means that local governments are in an excellent position to affect and to oversee solar energy market development. PACE programs offer a unique way to engage local governments in the promotion and financing of both renewable energy systems and energy efficiency. The Solar Cities program convened its State Policy workgroup of stakeholders to work with legislators on enabling legislation for local PACE programs. The enabling legislation passed easily with bipartisan support. Recent developments at the federal level have limited immediate implementation of PACE programs for residential buildings. But Solar Cities program partners are working to create commercial PACE initiatives to overcome some of the financial barriers to developing U

J Communicating Financing Alternatives One barrier to solar energy development is the lack of experience in Minnesota with financing tools more commonly used in states with more developed solar markets. The Solar Cities program conducted several workshops attended by over 150 local government officials and staff, planners and advocates, and state agency staff on financing options for small and large installations. These workshops identified the best practices for using various financing techniques such as purchase power agreements (PPAs) and bonding opportunities such as Clean Renewable Energy Bonds, as well as limitations and opportunities of traditional financing for different types of solar projects.

J Solar Leasing Pilot Program Minneapolis and Saint Paul participated in an innovative program to lease solar systems to residential and small commercial building owners. This innovative residential/small commercial solar lease program offered by SolarFlow installed solar systems throughout the metropolitan area. The pilot program was funded by the



0 Auto Body in Minneapolis (Photo credited to SolarFlow)

Renewable Development Fund. SolarFlow installed over half a million dollars of solar systems in Minneapolis and Saint Paul for which building owners pay a monthly lease fee; the systems are owned and maintained by SolarFlow.

The Solar Cities program engaged stakeholders, including Department of Commerce Energy Security staff, utilities, labor, local governments, and the solar industry at all phases of the discussion regarding regulatory and financial barriers. Convening of all interested parties helped limit objections and focused potential solutions to minimize risk and conflict.

Linking Solar Resource Development and Energy Efficiency.

Minnesota has a long history of encouraging efficient use of energy and integrating demand side (efficiency) resources into a market based energy portfolio. Solar energy has the decentralized nature and small scale energy efficiency, but is also long infrastructure similar to other types of energy generation (coal, gas, nuclear). The Solar Cities program identified methods of linking energy efficiency and solar energy investment to better capture the synergies between these different types of energy resource

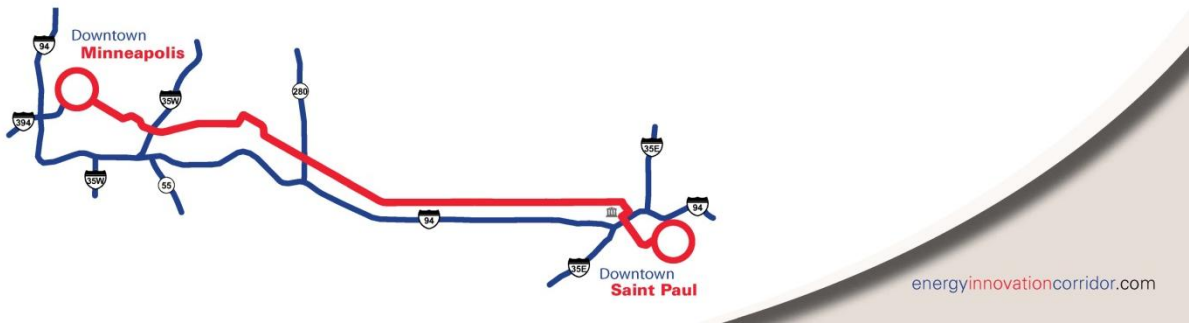
Solar Cities Legislative Workgroup
Principle 5 Link solar energy to energy efficiency by adding solar to efficient buildings.

J Linking Efficiency to Solar Energy Incentives The Solar Cities Program has worked to advance the opportunities for investment in energy efficiency along with solar energy. The cities and program partners worked to ensure that state incentive programs for solar were coupled with energy efficiency assessments. Solar Cities partners also identified opportunities to link energy efficiency programs and utility solar rebates.

J Solar in the Energy Innovation Corridor Saint Paul, Minneapolis, Xcel Energy, and many additional project partners have designated the Central Corridor light rail line as an opportunity for aggressive transformation in sustainable development and energy use. The focus of the Energy Innovation Corridor (EIC) is to ensure that existing buildings, new development, transportation systems and energy infrastructure are transformed by the substantial transit investment to substantially more energy efficient. The legislature allocated \$3.1 billion for Minneapolis and Saint Paul to use the EIC as a showcase for how solar energy systems could be integrated into the urban fabric

Energy Innovation Corridor Goals

- J Achieve 50% higher levels of energy efficiency savings than mandated by Minnesota goals (enough for 7,100 homes)
- J Achieve 9.5 GWh of renewable energy supplied or generated (enough for 1,000 homes)
- J Support the deployment of electric vehicles
- J Reduce carbon emissions (95 million pounds annually)
- J Create local jobs
- J Showcase and advance the use of sustainable building design and practices
- J Create a regional smart energy technology demonstration project



The two cities worked with NREL and Solar Cities partners to identify a variety of public building types in the EIC and design solar systems for those applications. The cities conducted analyses on roofed commercial style buildings, older buildings with historic elements and facades, recreational buildings with large parking lots, parking ramps, and unique structures such as the Xcel Energy Center. The results of the analyses demonstrated clear opportunities where none were believed to exist, and significant limitations on sites previously believed to be unsuitable. The installation process is ongoing through 2011 and will result in approximately 20 new solar electric and solar thermal installations along this eleven mile corridor.

Initiatives undertaken by Saint Paul and Minneapolis.

Saint Paul and Minneapolis successfully completed a number of initiatives that provide a path for others to replicate and improve upon. The initiatives included measures to remove local barriers for solar investment, providing leadership on large innovative solar projects and engaging diverse interests to create policy and programmatic changes.

- J Large Scale Demonstrations Minneapolis and Saint Paul both created a large solar demonstration projects. These two very different projects both demonstrate the capacity of M landscape and energy infrastructure.

Minneapolis Convention Center

Project. The City of Minneapolis partnered with Best Power Int. and received a grant from the Xcel Renewable Development Fund to purchase a 600kW solar electric system on the roof of the Minneapolis Convention Center. The system covers almost five acres of roof space and is currently the largest solar electric installation in the upper Midwest. The installation demonstrates the viability of large scale third party



owned purchased power agreements as a means of creatively financing projects, of using existing building solar asset, and collaborative public/private opportunities.

Photo credit: Meet Minneapolis

District Energy St. Paul Solar Thermal Project. The Solar Cities program worked with District Energy St. Paul to acquire a million dollar Solar Cities Special Projects grant to leverage over a million dollars of match from District Energy to create a unique solar thermal installation in downtown Saint Paul, also the largest in the upper Midwest. The project demonstrates opportunities to integrate solar thermal systems as either supply side inputs to the district energy system or as demand side investment for district energy customers or buildings. The integration can serve multiple goals such as:



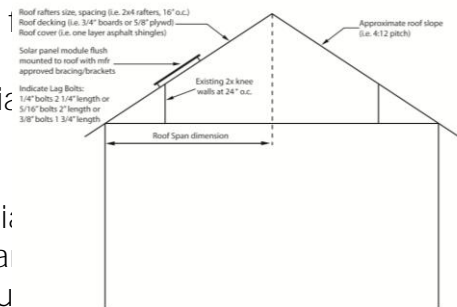
Photo credit: District Energy St. Paul

- < fuel supply diversity,
- < reducing carbon footprint and meeting climate protection goals,
- < positioning the district energy system to capture future solar investment opportunities,
- < cost effectively pre-heating water on either supply or demand side of the system

The technology will also work

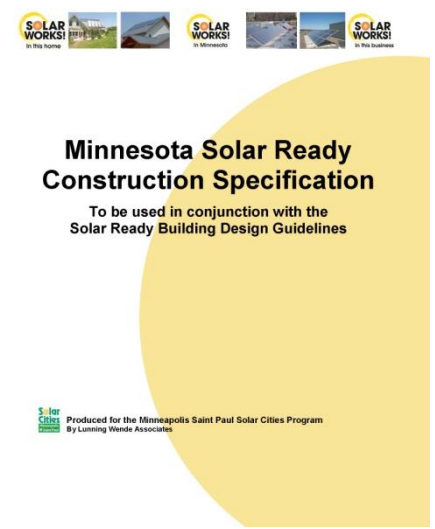
Buildings with common ownership and ability to link energy systems are also innovative application of solar thermal energy, in hospitals, industrial parks, business and academic campuses.

J Collaborating on Local Permitting Processes and Standards
 Minneapolis and Saint Paul collaborated with local and state building officials, solar installers, and national organizations to create a solar permitting guidance document to use in both cities to ensure consistent permitting requirements for solar electric systems. Solar installers have a clear set of requirements to demonstrate compliance with building and electric codes, and obtain a permit with a single visit for reroofing systems. The guidance document allows for residential solar installations meeting certain performance and design standards to avoid having a structural study or engineer stamp



Example of Cross-Section drawing for Solar Panels

J Solar in Development Regulations
 As solar systems have become more common, local development regulations are sometimes found to present substantial barriers to retrofitting existing buildings. Moreover, homeowners and businesses installing solar systems are concerned about how the long-term viability of their investments could be affected by new buildings or changes in land use adjacent properties changing their solar access. Minneapolis and Saint Paul engaged in dialogue with installers and manufacturers so that development regulations should be changed to both allow solar investment and protect community character and property values. The Solar Cities program worked with other cities across the state to assess options for zoning and development modifications to address solar energy. Minneapolis adopted a solar energy ordinance that defined how solar systems fit within zoning and land use regulations. Saint Paul has evaluated their zoning issues and will move ahead with zoning modifications in 2011.



J Encouraging Solar Ready Buildings Many of the barriers to solar energy installations are associated with structural or design elements of existing buildings. Such barriers can be avoided easily and at little cost for new buildings if the design takes into consideration at the design phase. The Solar Cities program completed a Minneapolis/Saint Paul specific guidance document and model specification for solar ready buildings, based on the NREL Solar Ready Planning Guide.

J Removing Structural and Design Uncertainty The Solar Cities program started a new effort focused at streamlining the permitting process for solar thermal retrofits on existing buildings. Using Solar America Cities assistance, Solar Cities will assess the structure of ten residential buildings installing solar thermal installations, and then run a series of scenarios based on these real life examples to provide permit officials and installers a common base of knowledge for when structural modifications are needed and solutions that satisfy structural retrofit requirements

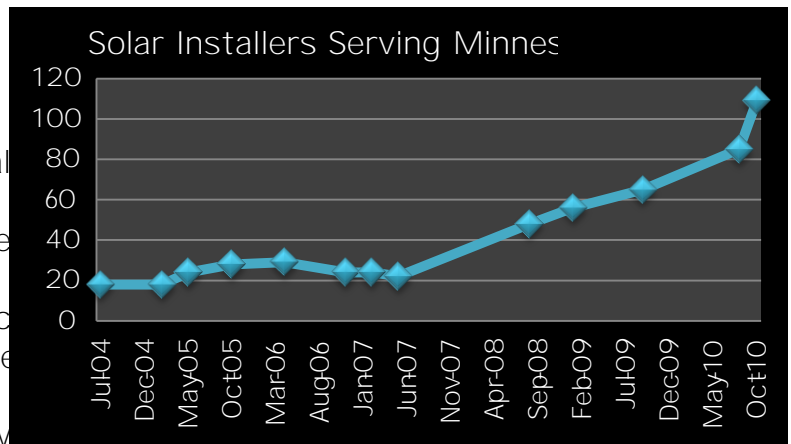
J Neighborhood and Community Programs Partnering with the Minnesota Renewable Energy Society (MRES), the Solar Cities program is promoting solar energy targeted to Saint Paul and Minneapolis neighborhoods. The program uses a bulk equipment rate from two manufacturers of solar thermal equipment, a subsidized solar assessment, and a rebate from the State of



Minnesota to offer an attractive upfront price to neighborhood residents. Neighborhood organizations assist in putting on workshops and publicizing the program to residents.

J Business Development and Training In 2004, the Office of Energy Security listed 20 businesses on its list of

in 2010, 102 Minnesota solar installation businesses were listed. These companies typically employ four to ten employees. Most do not provide exclusive solar PV or thermal services, but offer solar services in conjunction with other contracting services. Solar installation companies typically work in partnership with



electricians, general contractors, and engineers through subcontracts. The solar industry thus offers both opportunities for new businesses and opportunities for existing businesses to diversify.

Training. The Solar Cities program worked with program partners to build the capacity of existing contractors and new businesses through training and certification in solar installations. Solar Cities and NREL helped build local capacity for training licensed electricians and others seeking certification. IBEW, St. Paul College and Century College expanded training and certification courses. St. Paul College built a new solar training lab. Minnesota increased the number of individuals certified



potential bottleneck in ramping up the educational infrastructure for job creation.

Planning

hoto credit: C

Business expansion. Minnesota has the opportunity to expand an already diverse manufacturing supply chain that includes solar thermal collectors, PV modules, inverters, deposition and annealing equipment among other things. Minneapolis Saint Paul Solar America Cities sponsored a Minnesota Department of Employment and Economic Development hosted the first of a number of solar supply chain round December 2010.

Links to Resources

[U.S. Department of Energy Solar America](#) (General info home page)

[Minneapolis Saint Paul Solar America](#) (MSP specific page)

[Net Metering Policy Development and Distributed Solar Generation in Minnesota: Overview of Trends Nationwide Policy Development and Implications of Increasing the Eligible System Size Cap](#)

[Energy Innovation Corridor](#)

District Energy St. Paul [Solar thermal installation](#) the largest solar thermal installation in the Upper Midwest.

[Solar*Rewards](#) for Xcel

<http://www.ci.minneapolis.mn.us/sustainability/solar> for the Minneapolis Convention Center solar installations, the largest PV system in Minnesota

<http://www.ci.minneapolis.mn.us/sustainability/solar> Minneapolis guidance document for obtaining building permits for PV systems (Permit Applicant Checklist for Retail Solar Electric System)

Solar Energy Ordinance (Minneapolis) [solar energy ordinance](#)

[Make Mine Solar H20](#) Minnesota Renewable Energy Society Solar Thermal Bulk Buy Program

[Hiring a Renewable Energy Contractor](#) list of solar contractors

Solar Cities Partners:

[U.S. Department of Energy](#)

[City of Minneapolis](#)

[City of Saint Paul](#)

[Neighborhood Energy Connection](#)

[Minnesota Renewable Energy Society](#)

[NRG Energy Center Minneapolis](#)

[Xcel Energy](#)

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[The Center for Energy and Environment](#)

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[Century College](#)