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Solar Ready Community Subcommittee members

Mark H. Clevey, Vice Chairperson, Energy Commission and Chairperson, Subcommittee.
John Mirsky, Community Volunteer and Subcommittee Vice Chairperson.
Wayne Appleyard, Chairperson, Energy Commission (Ex Officio).
Bonnie Bona, Contractor, Clean Energy Coalition.
Emily Drennen, Staff, Energy Office.
Nathan Geisler, Energy Analyst, Energy Office, Ex Officio.
Chuck Hookham, Energy Commission.
Kim Wolske, Member, Energy Commission.

Energy Commission *Solar Ready Community* Subcommittee Report

Prepared By:

Energy Commission, *Solar Ready Community* Subcommittee

Presented To:

Chip Smith, City Commission and City Council Liaison to the Energy Commission

Wayne Appleyard, Chairperson, Energy Commission

Nathan Geisler, Energy Analyst, Energy Office

April 12 2016

Executive Summary

In December 2012, with the passage (by the Ann Arbor City Council) of the Climate Action Plan (CAP), the City took on ambitious multi-strategy vision to reduce our community-wide greenhouse emissions (i.e., 8% by 2015 (a goal established by a previous Council resolution), 25% by 2025, and 90% by 2050, relative to year 2000 baseline carbon dioxide equivalent (CO2e) emissions levels). *In 2015, the City Council received reports that the city was behind in meeting its CAP goals.*

Solar Ready Community Subcommittee

Several of the CAP recommendations specifically addressed *increased solar installations* in the community as a way to reach the CAP goals. In response to the City not meeting its CAP goals, in January 2016 the Energy Commission formed a new *Solar Ready Community Subcommittee* to focus on finding effective ways to enhance the Energy Office's ability to *enable and expedite the effective*

implementation of solar-related initiatives sufficient to meet CAP goals. The Solar Ready Community Subcommittee initially pursued *three key questions of importance:*

1 Exactly how much solar energy (equivalent) does the Climate Action Plan actually call for?

Research concluded that a portion of the CAP's 2025 emissions reduction is expected to be achieved with solar photovoltaics (or equivalent) (i.e., *2.4 MW* installed each year, for the next ten years of new Solar PV equivalent in new energy capacity for a total of *24 MW* in new capacity in ten years).[1] To put this in perspective, 24 MW is equivalent to installing to the following every year for the next ten years:

- *Two installations equal to the 1.1 MW 4000 PV panel DTE Energy M-14 Installation;*
- *240 installations equal to the 10 kW Farmers Market Solar Array; OR .*
- *Two hundred installations equal to the 12 kW Michigan Theater system.*

While precise information does not exist, the Subcommittee estimates that the rate of solar implementation from now through 2025 needs to be at least 10x the current rate.

2 Does Ann Arbor have the *technical capacity* for 24 MWh of new solar installations?

The Subcommittee engaged a third party to conduct a Lidar[2]-based analysis of Ann Arbor (excluding University of Michigan property) and identified 78.5 MW of "technical"[3] solar rooftop potential and capacity in the community. The solar potential is, for the most part, spread-out evenly among all Wards.[4]

Questions regarding the t nameplate kW split exist between installations on City property, business property, private property and other property will need to be addressed as this effort moves forward. It is quite possible that the City and University will have to make the biggest/earliest investments in order to lead others. Towards this end, the Solar Ready Community Subcommittee expects to bring additional proposals forward in the future, with the framework of the newly adopted Solar Ready Community resolution.

3. Can a program be created that enables the installation of solar systems commensurate with the CAP and solar recommendations therein?

The Subcommittee conducted two studies to determine if a market-based approach to meeting the CAP's solar goals was sufficient. First, the Subcommittee and Energy Office surveyed the amount of solar activity in the City from 2001 to the present and projected the solar activity out to 2025. This linear "business as usual" case which would get us to only 31 solar permits being pulled in 2025. Adding a 2.8 multiplier (found through the Installer's Survey) would get us to approximately 88 solar permits pulled annually by 2025.

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[1] A2energy - http://www.a2gov.org/a2energy/Pages/default.aspx.
[2] **Lidar** is a surveying technology that measures distance by illuminating a target with a laser light.
[3] In this report, "technical potential and capacity" means that the site meets siting requirements but has not been financially evaluated for payback and viability for a solar installation.
[4] As part of this effort, the Subcommittee also worked with the Michigan Interfaith Power and Light, LLC, to identify *864 kW* of solar potential in Houses of Worship within the community that are candidates for solar installations. The Energy Office is currently working to complete an inventory of city-owned buildings and properties as potential sites for solar installations.

Second, the Subcommittee worked with the Energy Office to conduct a Solar Industry Survey of solar PV installers that serve the Ann Arbor market. The Subcommittee wanted to understand why private-sector solar businesses were not doing more business in Ann Arbor. The survey clearly showed that local installers estimate the current rate of solar PV installation implementation could be increased by *two and one-half times* if properly enabled with public policy and financial incentives, regulatory reform and public education.

While such an increase will help Ann Arbor reach its CAP solar goals, it is clear that a market-based approach alone will not be sufficient to meet the CAP solar goals – a more concerted public-private solar partnership will need to be put in place (i.e.(See Solar Ready Community).

Energy Commission Recommendations:

Specific *Solar Ready Community* proposals and action items will be presented to the Energy Office and, where necessary, the City Council in the future. In the meantime, the Energy Commission respectfully recommends two steps for immediate action by the City Council, both of which it sees as preconditions for future success:

- Adopt the proposed Energy Commission resolution, authorizing a commitment to making the City of Ann Arbor a *Solar Ready Community* (See Attached) and review the proposed enhancement to the Solar Ready Community Plan outlined in the Solar Subcommittee Report, "Solar Ready Community Report."

- Provide the Energy Office with the financial resources, contractor support and overall capacity needed to assume primary responsibility for implementing a Solar Ready Community plan that will meet the CAP solar goals.

Introduction

In December 2012, with the passage (by the Ann Arbor City Council) of the Climate Action Plan (CAP), the City took on ambitious multi-strategy vision to reduce our community-wide greenhouse emissions (i.e., 8% by 2015 (a goal established by a previous Council resolution), 25% by 2025, and 90% by 2050, relative to year 2000 baseline carbon dioxide equivalent (CO2e) emissions levels).

Several of the CAP recommendations specifically addressed *increased solar installations* in the community as a way to reach the CAP goals. Solar energy represents the least restrictive path towards localized renewable energy deployment in the City. This in turn enables reduced reliance on fossil fuels for energy supply to City residents and consumers, and reduced ensuing GHG emissions calculated from all CO2e sources.

In 2015, the City Council received reports that the city was behind in meeting its CAP goals.

Solar Ready Community Subcommittee

In response to the City not meeting its CAP goals, in late 2015, Wayne Appleyard, Chairperson of the Energy Commission, engaged the Energy Commission in a new Strategic Planning process designed to help the City pursue its solar-related CAP recommendations. Chairperson Appleyard was clear in his goals for the CAP aptly noting, *"We should be able to do it here!"* In response, Vice Chairperson Clevey

prepared and submitted a white paper on solar energy and the CAP, calling for a new and determined effort to increase solar installations commensurate with the CAP's overall goals.

Ann Arbor has been a leader in solar photovoltaic (PV) energy in our state for many years.[5] In January 2016 the Energy Commission formed a new *Solar Ready Community Subcommittee* (chaired by Mark Clevey (*See Attachment I)* to focus on finding effective ways to enhance the Energy Office's ability to *enable and expedite the effective implementation of solar-related initiatives* sufficient to meet CAP goals. The Subcommittee initially pursued *three key questions of importance:*

- **Exactly how much solar energy (equivalent) does the Climate Action Plan actually call for?**

  The Subcommittee found several solar-related goals in the CAP. While these goals were laudable, it was determined that neither the technical analyses nor the assumptions underlying the CAP goals were included in the CAP report and related specific actions for solar energy were not apparent. Within this context, the Subcommittee worked closely with the Energy Office and the Clean Energy Coalition to *determine the specific role solar energy should play in the CAP*.

  CEC's research concluded that a portion of the CAP's 2025 emissions reduction is expected to be achieved with solar photovoltaics (or equivalent) (i.e., *2.4 MW* installed each year, for the next ten years of new Solar PV equivalent in new energy capacity for a total of *24 MW* in new capacity in ten years).[6] *(See Attachment II).* To put this in perspective, 24 MW is equivalent to installing to the following every year for the next ten years:
  - *Two installations equal to the 1.1 MW 4000 PV panel DTE Energy M-14 Installation;*
  - *240 installations equal to the 10 kW Farmers Market Solar Array; OR .*
  - *Two hundred installations equal to the 12 kW Michigan Theater system.*

  While precise information does not exist, the Subcommittee estimates that the rate of solar implementation from now through 2025 needs to be at least 10x the current rate.

- **Does Ann Arbor have the *technical capacity* for 24 MWh of new solar installations?**

  The Subcommittee engaged a third party to conduct a Lidar[7]-based analysis of Ann Arbor (excluding University of Michigan property) and identified 78.5 MW of "technical"[8] solar rooftop potential and capacity in the community *(See Attachment III).* As the following table illustrates, the solar potential is, for the most part, spread-out evenly among all Wards (see table below).[9]

[5] The precursor to the Great Lakes Solar Energy Association – *Michigan Solar Energy Association* – was founded and housed in Ann Arbor and led the effort to enact Michigan's first Solar Tax Credit program. Since its creation in 1985, the City's Energy Office has secured and managed over $4.2 million in grants to promote energy conservation, efficiency, and renewables and helped make numerous facility and system upgrades with various funding tools. Ann Arbor pioneered LED streetlighting, was the first Property Assessed Clean Energy (PACE) program in Michigan (funding over half a million dollars of work to date in the community. As a tribute to Ann Arbor's solar leadership, the city was designated as a "Solar America City", by the U.S. Department of Energy, in recognition of the City's commitment to greater solar energy deployment.
[6] A2energy - http://www.a2gov.org/a2energy/Pages/default.aspx.
[7] **Lidar** is a surveying technology that measures distance by illuminating a target with a laser light.
[8] In this report, "technical potential and capacity" means that the site meets siting requirements but has not been financially evaluated for payback and viability for a solar installation.
[9] As part of this effort, the Subcommittee also worked with the Michigan Interfaith Power and Light, LLC, to identify *864 kW* of solar potential in Houses of Worship within the community that are candidates for solar installations. *(See Attachment IV).* The Energy Office is currently working to complete an inventory of city-owned buildings and properties as potential sites for solar installations.

Lidar-based Analysis of Ann Arbor's Addressable Solar Market

Ann Arbor's Total Potential Solar Annual Energy Production (AEP) in MWh:

Entity	AEP (MWh)*
City of Ann Arbor	97600 (97.1%)
University of Michigan	2930 (2.9%)
Total	100530 (100%)

97600 MWh is the output of 78.5 MW of Solar PV*

vs.

35.1 MW required per 2025 CAP

126.5 MW required per 2050 CAP

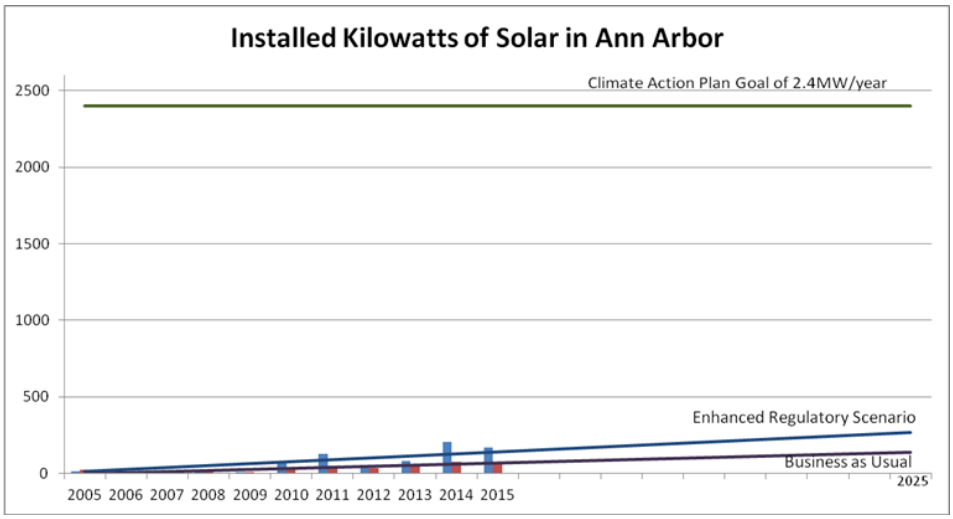
Ward (City only)	AEP (MWh)*	Site Class (City only)	AEP (MWh)*
1	17200 (17.6%)	Commercial	29720 (30.5%)
2	18270 (18.7%)	Industrial	870 (0.9%)
3	19090 (19.6%)	Public	3020 (3.1%)
4	23770 (24.3%)	Residential	53190 (54.5%)
5	19280 (19.8%)	Unspecified	10800 (11.1%)
Total	97600 (100%)	Total:	97600 (100%)

* In AA ~ 1244 kWh is generated by a 15% efficient 1 kW PV solar system

Ann Arbor Energy Commission, Solar Subcommittee – John Minsky March 14, 2015

- **Can a program be created that enables the installation of solar systems commensurate with the CAP and solar recommendations therein?**

  The Subcommittee conducted two studies to determine if a market-based approach to meeting the CAP's solar goals was sufficient. First, the Subcommittee and Energy Office surveyed the amount of solar activity in the City from 2001 to the present and projected the solar activity out to 2025. The following chart shows the linear" business as usual" and a 2.8 enhanced multiplier (found through the Installer's Survey) impacts out to 2025. It should be noted, however, that the City does not have control over most of the items in the enhanced scenario (like Michigan's renewable portfolio standard or a further extension of the ITC on a federal level), so we cannot assume all of this growth would happen.



Second, the Subcommittee worked with the Energy Office to conduct a Solar Industry Survey of solar PV installers that serve the Ann Arbor market. The Subcommittee wanted to understand why private-sector solar businesses were not doing more business in Ann Arbor. The survey clearly showed that local installers estimate the current rate of solar PV installation implementation could be increased by *two and one-half times* if properly enabled with public policy and financial incentives, regulatory reform and public education.

While such an increase will help Ann Arbor reach its CAP solar goals, it is clear that a market-based approach alone will not be sufficient to meet the CAP solar goals – a more concerted public-private solar partnership will need to be put in place (See Solar Ready Community, below).

Questions regarding the t nameplate kW split exist between installations on City property, business property, private property and other property will need to be addressed as this effort moves forward. It is quite possible that the City and University will have to make the biggest/earliest investments in order to lead others. Towards this end, the Solar Ready Community Subcommittee expects to bring additional proposals forward in the future, with the framework of the newly adopted Solar Ready Community resolution.

Lastly, the Subcommittee researched current Energy Office programs and capabilities, the expected role of solar energy in the CAP, technical solar potential within the community, the viability of the Ann Arbor solar market and best-practices in other like communities. In spite of the huge challenges inherent in meeting the solar goals in the CAP (as outlined above), the Subcommittee believes that Ann Arbor has a solid foundation on which to build a *Solar Ready Community* program to enable increased solar installations, commensurate with the CAP.

Reaching the CAP's Solar Goals

The Solar Subcommittee identified several options for increased solar PV development in accordance with CAP goals:

- **Option 1 – Go-It-Alone**. The City of Ann Arbor can pursue public policies that enable 24 MW[10] of solar PV to be installed on residential, commercial, industrial and public buildings.

- **Option 2 – Utility Renewable Energy Program**. DTE Energy can install 24 MW of new solar dedicated specifically to service the Ann Arbor. However, currently DTE does not have mandates to do so as Public Act 295 which required a solar portion of the 10% renewable portfolio standard for electric utilities has now expired.

- **Option 3 – Utility – Industry Partnership**. The City of Ann Arbor can partner with DTE Energy to reach the 24 MW with through a combination of DTE-owned and private installations.

- **Electric Choice** – The City of Ann Arbor could explore the purchase of solar-energy produced energy third-party provider(s) to meet the CAP solar goals (assuming that Electric Choice subscription options become open beyond the current capped access). For example, the recently announced Nexterra 50 MW PV farm (to be built in Augusta Township).

[10] The City of Ann Arbor has not done an update of the community-wide GHG inventory. Therefore, the Solar Subcommittee is bound by an assumption that that 2015 solar installation goal was met in relation to the CAP goals for 2015 to 2025. The data behind these numbers is all the City's official GHG inventory data and needs to be updated in order to match the *International Council for Local Environmental Initiatives (*ICLEI) protocol. Assuming that the City Council accepts the Solar Report and authorizes the new Solar Initiative outlined in the Report, updated 2015 data may increase in the total needed to make up for any lost ground. The Energy Commission recommends that City Council allocate funds for an official update of the inventory that correlates with the CAP goals as it related to solar installations.

Solar Ready Community

The Subcommittee has researched current Energy Office programs and capabilities, the expected role of solar energy in the CAP, technical solar potential within the community, the viability of the Ann Arbor solar market and best-practices in other like communities. In spite of the huge challenges inherent in the CAP as outlined above, the Subcommittee believes that Ann Arbor has a solid foundation on which to build a *Solar Ready Community* program to enable increased solar installations, commensurate with the CAP. Towards that end, *the Energy* Commission recommends that the City Council adopt the proposed Energy Commission resolution, authorizing a commitment to making the City of Ann Arbor a *Solar Ready Community* (See Attached) and review the proposed enhancement to the Solar Ready Community Plan outlined in the Solar Subcommittee Report, "Solar Ready Community Report."

The Subcommittee notes that a *Solar Ready Community*[11] is one whose public polices, incentives and regulatory systems are supportive of the end goal of increased solar installations within a specific time frame. A *Solar Ready Community* includes programs and services elements designed to: improve outreach and marketing to property owners; make it easy for owners to assess the solar potential of their property; simplify the design and quotation process; reduce costs; increase options for and simplify financing; and streamline permitting and installation.

Under a grant from the Michigan Energy Office, the Clean Energy Coalition (CEC) completed a guidebook to assist local jurisdictions with becoming Solar Ready. This Guidebook provides detail on the following ten steps to become Solar Ready along with resources that can help make Solar Readiness easy and more consistent throughout the state. The following ten steps provide a pathway for Michigan local government to achieve Solar Readiness:

> **STEP 1:** BEGIN THE DISCUSSION - Introduce the concept of Solar Readiness to raise awareness and gather support for the project. Reaching out to neighboring jurisdictions and utility providers is important to consider during this step.
>
> **STEP 2:** ADOPT A RESOLUTION - The resolution adoption process introduces the conversation of solar at the leadership level, helping to both inform and ensure buy-in from local officials.
>
> **STEP 3:** ESTABLISH A GUIDING POLICY THAT SUPPORTS SOLAR - Planning document language that supports the advancement of solar will set the direction towards Solar Readiness and provide the basis for solar-related land use regulation.
>
> **STEP 4:** UPDATE CODE LANGUAGE - Solar language in your zoning codes will give clear guidance about how solar installations are to be integrated into the community.[12]

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[11] See Clean Energy Coalition, Solar Ready Community Guide (http://cec-mi.org/communities/programs/michigan-renewable-energy-tools/solar-ready-community/.

[12] ***Streamline Solar Zoning and Permitting Process –*** Research by the State of Michigan Energy Office and the U.S. Department of Energy's SunShot Program shows that the lack of dedicated solar zoning and permitting processes unnecessarily increases the installed-cost of solar energy systems for customers.[12] The Energy Commission recommends that the City Council adopt the Solar Ready Community Resolution (Passed as the February 8, 2016 Energy Commission meeting – *See Attachment VI*). As part of this effort, the City should endorse the U.S. Department of Energy's "Solar Roadmap" as part of the Solar Ready Development effort. Additionally, the City should continue with efforts to become certified as an Early Adopter Community through the DOE's SPARC Program. Closely associated with solar zoning and permitting is the issue of inspector knowledge about solar systems, along with the solar knowledge of other staff providing customer service. The Solar Subcommittee's Solar Survey found that "Inspector Knowledge" ranked *important to very important* as an issue important to solar installers (3+ points on a 5 point scale). This recommendation calls for the City Council to direct the Administration to arrange for ongoing solar PV training for all City Building Inspectors, Fire Department staff and other staff that interact with residents and businesses on solar issues.

STEP 5: CREATE AN EASY-TO-USE PERMITTING PROCESS - Common information and permit language will help residents, businesses, developers and installers have a clearer understanding of the local and regional expectations with regard to solar installation.

STEP 6: PROVIDE EASY ACCESS TO INFORMATION - Online and printed materials that detail how solar installation works in the community will help interested property owners and installers understand local expectations and better prepare for an installation process.

STEP 7: ESTABLISH SOLAR INSTALLATION TARGETS - Establishing solar installation targets will help continue the momentum and ensure that measures are taken to ensure solar readiness leadership in Michigan.

STEP 8: TRAIN STAFF - Increasing staff familiarity with solar technology and installation will help make the permitting process more efficient.

STEP 9: PURSUE SOLAR BUSINESS DEVELOPMENT OPPORTUNITIES - Working with development specialists on solar can leverage your Solar Ready Community's status to enhance economic reinvention.

STEP 10: GO THE EXTRA MILE- Going the extra mile is for communities that are really looking to be a solar leader by developing creative outreach efforts and encouraging

Solar Ready Community Initiatives

As it implements the *Solar Ready Community* plan, the Energy Commission recommends the Energy Office consider the following four *initiatives* to help enhance the Solar Ready Community program, towards the goal of meeting the CAP solar goals for 2024 - *Market Based Approach, Governmental Reform, Market Stimulation and Public-Private Partnership*.

Initiative 1 – Market-Based Approach

Renewable Energy Credit Resolution - The Michigan Tax Tribunal has held that a solar system is personal property, not real property, and therefore should be taxed as personal property. The effect of the property tax increase is to raise the installed cost of solar energy and subsequently dampen the market. The City of Ann Arbor can ameliorate this market barrier by leveraging Renewable Energy Credits (RECs) to enhance the solar market in the community. This recommendation calls for the City of Ann Arbor to purchase "RECs" associated with *previous solar installation* in the community as a way to offset property tax increases. It is expected that the Solar Ready Community program will include a REC purchasing option by third-parties to accomplish this property-tax offset in the future. A recommended resolution is expected to be proposed by the Energy Commission to the City Council in the future. *(See Attachment VII).*

Non Profit Solar Installations - In 2014, XSeed installed a solar PV system on the Michigan Theater in downtown Ann Arbor. Most importantly, unlike typical donations, the XSeed donations function as multiple donations – not a one-time donation – because they continue to produce financial value from energy that is produced by the solar array and used by the site host in place of purchased fossil fuels. The Solar Subcommittee recommends that the Clean Energy Coalition consider expanding the *XSeed Model* "to include new initiatives such as a matching program to leverage solar leases for non-profits.

Leveraged Purchasing – The Solar Subcommittee recommends that the Energy Office encourage and promote the solar initiatives available to everyone in the community such as Group Purchasing and community solar (with a fully supported a2energy web presence).

Initiative 2 – Governmental Reform

Become Part of H-GACBuy (http://hgacbuy.org/) **–** The City of Ann Arbor is eligible to join a procurement program ("HGACBuy") that will allow it to procure discounted solar PV panels for city-owned buildings (and possibly, private homes and businesses) with the benefits of bulk discounts and streamlined purchasing, as utilized by many municipalities in Michigan.[13] *(See Attachment VIII).*

Initiative 3 – Market Stimulation

Educate Citizens and Staff **-** The Solar Subcommittee Solar Survey found that consumer awareness and education continues to be an issue of importance to solar installers (4 points on a 5 point scale). This recommendation calls for the City Council to expand financial support for consultant support (currently CEC) so that they may expand work in this area including: (1) Educate City customer service staff; (2) Assist City staff in meeting the recommendations of the Solar Roadmap & Michigan Solar Ready Communities; (3) Engage and support local solar-related businesses; (4) Fully utilize the support services secured through their Solar group Purchase efforts; and, (5) Maintain two related websites: (a) *a2energy* (http://www.a2gov.org/a2energy/Pages/default.aspx); and, (b) The *City of Ann Arbor Solar Roadmap* (http://my.solarroadmap.com/ahj/city-of-ann-arbor/view).

Promotion – The Energy Office should initiate public relations-related programs designed specifically to promote Ann Arbor as a Solar Ready Community. We recommend that one of these efforts be targeted to the Faith Community. As part of its work, the Solar Subcommittee worked with the Michigan Interfaith Power and Light, LLC (MiIPL), to identify 864 Kw of solar potential in Houses of Worship within the community that are candidates for solar installations. MiIPL is very interested in collaborating with the City of Ann Arbor to convene, educate and assist this community with regard to the CAP and its solar goals.

Business Formation, Expansion, Retention and Attraction – The City Council should direct those responsible for Community/Economic Development in Ann Arbor to work closely with the current community climate and energy consultant Clean Energy Coalition to develop tools, programs and incentives and practices designed specifically to foster the formation, expansion, retention and attraction of solar-related business in the community. CEC should coordinate with Ann Arbor Spark, the Michigan Small Technology Business Development Center and others to include a dedicated solar-specialization to Ann Arbor Spark's entrepreneurship programs and enhanced solar-related technology transfer from local universities.

Initiative 4 - Public- Private Partnership

The proposed Public – Private Partnership option has four components:

[13] HGAC is a nationwide, government procurement service. As a unit of local government, HGACBuy strives to make the governmental procurement process more efficient by establishing competitively priced contracts for goods and services, and providing the customer service necessary to help its members achieve their procurement goals. All contracts available to participating members of HGACBuy have been awarded by virtue of a public competitive procurement process compliant with state statutes. All units of local government, including non-profits providing governmental services, are eligible to become participating members of HGACBuy. (See Attachment VIII, pp 40)

- **DTE Solar Siting** – Several sites have been evaluated and qualified by DTE Energy in Ann Arbor as potential sites for solar installations including the airport and landfill. The Energy Commission recommends that the City of Ann Arbor initiate high-level discussions with DTE Energy on City incentives and programs designed to encourage a partnership with DTE to install a combination of DTE-owned and privately owned solar systems for a total of 24 MW of new solar within the community.

- **City Water Utility as a Solar Utility** – While the City of Ann Arbor has taken no official action, there are recent examples in Michigan of municipally-owned utilities (e.g., Holland) being able to include water efficiency improvements on on-bill financing as among the suite of services they provide. The ability for water treatment utilities, similarly controlled locally, to do the same but for energy-related improvements and financing for users is a concept the Energy Commission recommends be explored in further detail[14]

- **Solar Aggregation or "Solarize" Campaign –** Through the work of the Solar Ready Community Subcommittee and the Energy Office, CEC is developing a solicitation to work with solar entities that have run "solarize" campaigns that organize a solar aggregated bulk buy for participants to help reduce costs and simplify the process for installing solar through a focused campaign.

- **Community Solar** - The Energy Commission recommends that the City of Ann Arbor continue to explore a partnership or pilot with DTE Energy for both wholly-owned and community owned Community Solar models as recommended in Council resolution R-13-283. To date, DTE does not have a pilot community solar program, in comparison with Consumers Energy's which launched in 2015. Towards that end, the Commission recommends the City Council should direct the Energy Office to fully explore and develop implementation plans for three options for Community Solar in Ann Arbor (See Attachment IX – Community Solar):
    - **Investor Model** – Ann Arbor citizens purchase "shares" in a solar array and receive financial benefits based on the power generated and sold to a non-utility third party(s).
    - **XSeed Model** - A non-profit organization using tax deductible donations, grants and other funds to finance a solar installations – and related programs and services – for non-profits in the community (including *houses of worship).*
    - **Utility Community Solar** – Rate payers purchase "shares" in a utility-owned solar array and receive financial benefits based on the financial value of the power to the utility.

Next Steps

Specific *Solar Ready Community* proposals and action items will be presented to the Energy Office and, where necessary, the City Council in the future. In the meantime, the Energy Commission respectfully recommends two steps for immediate action by the City Council, both of which it sees as preconditions for future success:

- Adopt the proposed Energy Commission resolution, authorizing a commitment to making the City of Ann Arbor a *Solar Ready Community* (See Attached) and review the proposed enhancement to the Solar Ready Community Plan outlined in the Solar Subcommittee Report, "Solar Ready Community Report."
- Provide the Energy Office with the financial resources, contractor support and overall capacity needed to assume primary responsibility for implementing a Solar Ready Community plan that will meet the CAP solar goals.

[14] See: Michigan Utility Residential Clean Energy Program Act (HB 5397): (b) "Energy efficiency improvement" means equipment, devices, 7 or materials intended to decrease energy consumption, including, but not limited to, all of the following: …(x) Measures to reduce the usage of water or increase the efficiency of water usage.

Attachment I

City of Ann Arbor, Energy Council
Solar Ready Community, Subcommittee Operating Guide

Mark H. Clevey, Chairperson

<u>Revision</u>: February 12 2016

"We should be able to do it here!" – Wayne Appleyard,
Chairperson, Ann Arbor Energy Council

"If not here, where? If not now, when?" – Bonnie Bona, Clean Energy Coalition

"The Solar Subcommittee is focused exclusively on finding ways to *enable and expedite the effective implementation of solar-related initiatives* sufficient to meeting the solar-related goals of the Ann Arbor Climate Action Plan (CAP). There is no time left for inessentials." – Mark H. Clevey, Chairperson, Solar Subcommittee.

<u>Introduction</u>

In December 2012, the Ann Arbor City Council passed the *Climate Action Plan (CAP)*, an ambitious multi-strategy vision to reduce our community-wide emissions 8% by 2015, 25% by 2025, and 90% by 2050, relative to year 2000 baseline carbon emissions levels. 20% of the Climate Action Plan's 2025 electrical savings goal is slated to be met with solar photovoltaics (or equivalent) (i.e., 2.4 MWh of new capacity be installed each year, for the next ten years - 2.4 MWh in new capacity per year of new Solar PV equivalent in new energy capacity for a total of 24 MWh in 10 years).

The Energy Council is operated as an advisory committee to the City of Ann Arbor, City Council. The Solar Subcommittee operates under the direction of the Energy Council. The Subcommittee will prepare and deliver Subcommittee report(s), findings and recommendation to the Energy Council in support of the Climate Action Plan.

<u>Energy Council, Solar Subcommittee Purpose Statement</u>

The Solar Subcommittee is focused exclusively on finding effective ways to *enable and expedite the effective implementation of solar-related initiatives* sufficient to meeting the solar-related goals of the Ann Arbor Climate Action Plan (CAP). The subcommittee is keenly aware, and fully appreciates, the work done by others in the past to build a firm foundation on which the solar subcommittee work is proceeding. The subcommittee seeks to honor these individuals and their work with our success.

Towards that goal, the Subcommittee's efforts will focus primarily on ways the City of Ann Arbor can effectively *enhance and enable* Clean Energy Coalitions's *a2energy Community Solar* program model (a multi-pronged approach to bring rooftops together with funding sources and making participation in solar available to everyone in the community, all towards the goal of generating 2.4 MW per year of new Solar PV equivalent in new energy capacity for a total of 24 MWh in new capacity in 10 years).[15]

Subcommittee Membership

Membership to the Solar Subcommittee is on a voluntary basis (with the exception of the Chairperson) and but must be approved by the Committee Chairperson. Members can be drawn from the Energy Council, other City Councils, City Staff, solar-related support contractors, business and non-profit community, faith community, education community, and appropriate community members. Committee members are expected to work with Committee leadership and staff to generate the Committee purpose statement, goals and objectives and to develop and implement a related work plan.

C current members include the following:

Mark H. Clevey, Solar Subcommittee Chairperson
John Mirsky, Community Volunteer and Subcommittee Vice Chairperson
Wayne Appleyard, Chairperson, Energy Commission
Bonnie Bona, Contractor, Clean Energy Coalition
Emily Drennen, Staff, Energy Office
Nathan Geisler, Energy Analyst, Energy Office
Chuck Hookham, Energy Commission
Kim Wolse, Member, Energy Commission
Chip Smith (City Council representative to the Energy Commission and Solar Subcommittee)

Subcommittee Meetings and Schedule

The Solar Subcommittee shall meet regularly to plan, conduct and review its work outputs. The Solar Subcommittee should also be included in the review of all solar-related support contractor reports to the Energy Office.

Subcommittee Roles and Responsibilities

Committee Leadership and Term

Generally the Chairperson will be the person who functions as the champion for the Solar Subcommittee. A Vice Chairperson may be appointed by the Chairperson and will serve at his/her discretion. On February 1 2016 John Mirsky, Community Volunteer, was appointed as the subcommittee Vice Chairperson. The Chairperson will serve in such capacity until they choose to resign, are unable to fulfill the functions and responsibilities, are removed at the discretion of the Energy Council Chairperson, or when the Subcommittee purpose is ended.

Role of Energy Office Staff

The City of Ann Arbor, Energy Office, Director and/or his/her designee will serve as technical support for the Subcommittee. Such support *may* include the following:

[15] A2energy - http://www.a2gov.org/a2energy/Pages/default.aspx.

- Serve as a knowledgeable technical specialist in the area focus area of the Subcommittee. Provide technical support to the Subcommittee in the form of information on current policy, organizational history, Subcommittee-related opportunities and threats, organizational collaborations, and organizational needs and issues.
- Staff may be called upon to do research or work on a Subcommittee project. In these instances, the Director must approve such work.
- Directly involve Subcommittee members - *as appropriate* - when communicating and/or promoting solar-related Energy Office policy positions and/or interests to policy makers, collaborators and the Energy Office community of interest.
- As appropriate, integrate the interests of the Solar Subcommittee into solar-related contracts and utilize as an Advisory Committee Group on solar-related contracts with area support contractors.

Attachment II

How Much Solar Energy Is Needed to Meet the Climate Action Plan Goals

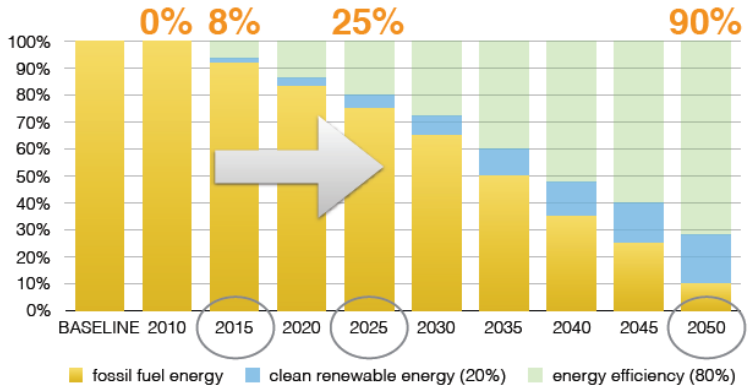
According to Nathan Geisler, City of Ann Arbor Energy Office, the following is a heavily caveated past estimate of total PV potential throughout the City with 25% usable roof area assumed (doesn't account for shade impacts):

MinPV (kW)	MaxPV (kW)	MinPV (kWh)	MaxPV (kWh)
94,390	188,780	124,113,522	248,227,044

In the fall of 2015, the Clean Energy Coalition, in response to a query from Mark Clevey, researched the underlying assumptions behind the Climate Action Plan to determine the solar energy component of the CAP. The following is the findings from this CEC assessment. *Please note*: the Solar Subcommittee has reviewed and endorsed the methodology and findings of this CEC work:

A2 Climate Action Plan goals

20% of reduction from renewables



greenhouse gas emissions reduction

---

annual target 2016-2015

20% of electricity reduction from renewables

1.7% annual reduction

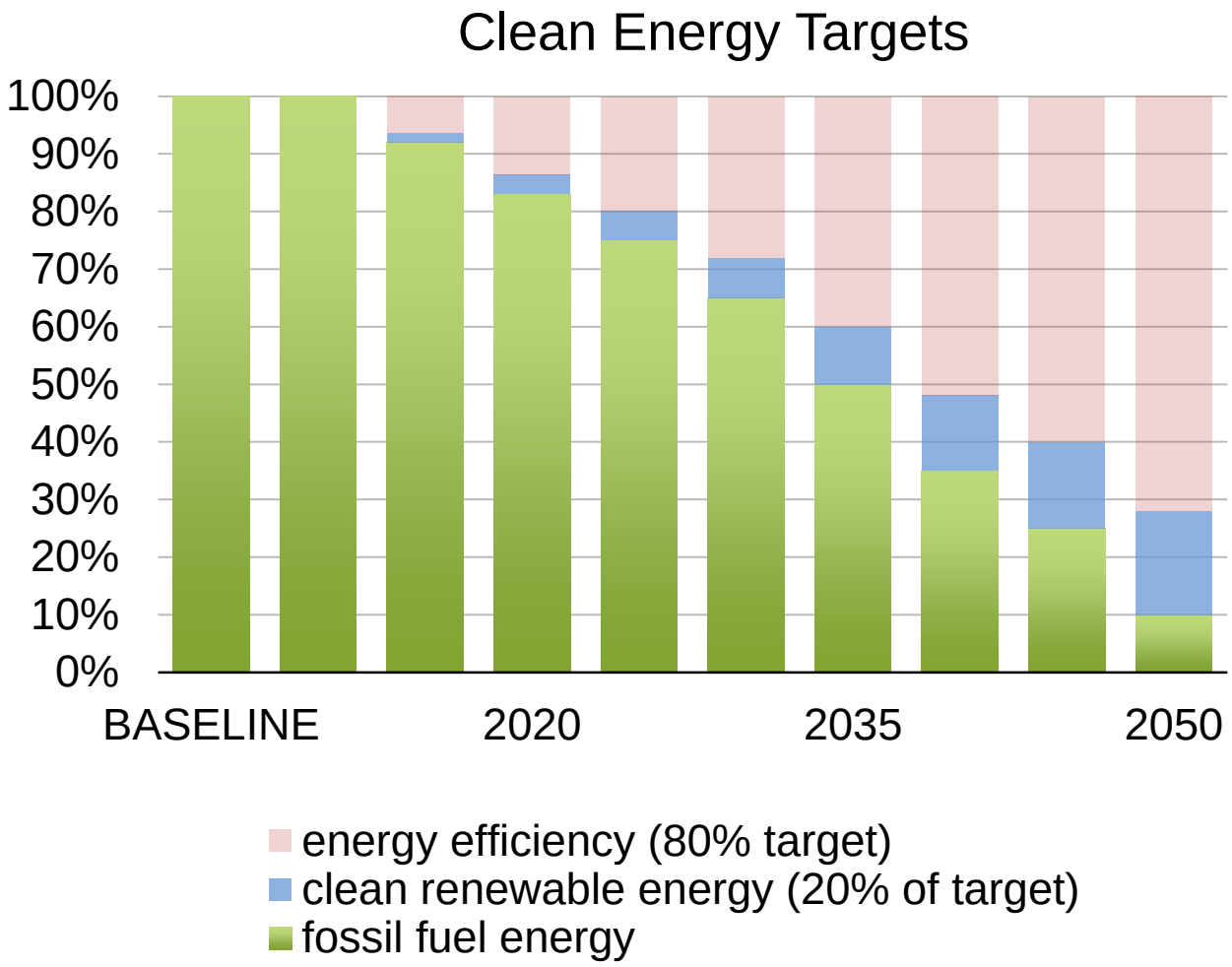
2,972,967 kWh annual renewable offset

$325,686 annual electric savings

2.4 MW

annual solar PV equivalent

$4,779,690 annual solar investment required


Clean Energy Targets
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
BASELINE
2020
2035
2050
energy efficiency (80% target)
clean renewable energy (20% of target)
fossil fuel energy

Clean Energy Targets

	BASELINE	2010	2015	2020	2025	2030	2035	2040	2045	2050
fossil fuel energy	**100%**	100%	**92%**	83%	**75%**	65%	50%	35%	25%	**10%**
clean renewable energy (20% of target)		0%	**2%**	3%	**5%**	7%	10%	13%	15%	**18%**
energy efficiency (80% target)		0%	6%	14%	20%	28%	40%	52%	60%	72%
carbon reduction targets			**8%**		**25%**					**90%**
Annual reduction					**2%**					
Total electric GHG emissions, excluding UM (million metric tons CO2e) for residential, commercial & industrial		0.66	**0.61**		**0.49**					**0.066**
Reduced GHG emissions (million metric tons CO2e)		0	**0.05268648**		**0.16464525**					**0.5927229**
Reduced GHG emissions from renewable offset (million metric tons CO2e)	20%		**0.0105**		**0.0329**					**0.1185**
Renewable kWh offset needed (X 1000 X 1000000) (eGRID factor = 1660.41 lbs CO2e/MWh divided by 2205 lbs/tonne)	0.753	**874,609,562**	**13,993,753**		**43,730,478**					**157,429,721**
Annual Renewable kWh offset needed										
Solar kW equivalent needed (1kW=1244kWh)	1244	**703,062**	**11,249**		**35,153**					**126,551**
Annual MW offset needed (per year)	10				**2,390**					**3,656**
Annual cost	$2000				**$4,780,824**					
Annual Electricity Savings	$0.14				**($334,658)**					

Attachment III

Ann Arbor Lidar Analysis of Solar Potential

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Fast Facts

- The U.S. Department of Energy (DOE) SunShot Initiative Incubator program provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private sector investment.
- As part of the Incubator 8 program, Geostellar is producing an interactive solar profile that models the financial benefits of solar energy unique to each individual home. Geostellar and the National Renewable Energy Laboratory (NREL) conducted a blind study to determine the validity of the system size and energy production estimates within the solar profile.
- When compared with actual measurements from completed installations, NREL determined that Geostellar successfully predicted the viability of the site and the performance of the system based on system size, tilt, orientation, and solar access.

Geostellar: Remote Solar Energy Assessments Personalized

Geostellar has produced an online tool that generates a unique solar profile for homeowners to learn about the financial benefits to installing rooftop solar panels on their homes. The *Geostellar website* incorporates the physical building characteristics of the home, including shading, slope, and orientation of the roof, and applies electricity costs and incentives to determine the best solar energy production options at the best price. Homeowners can type in their address to see a personalized report of the total energy production available through solar technology and identify the best financing option for their specific needs.

POWER FOR YOUR HOME: ENERGY BENEFITS (ESTIMATED)

Energy Use

Your home uses 905 kWh of electricity in an average month

Energy Offset with Solar

23 solar panels will provide 5.42 kW of solar capacity.
This will offset 62% of your electricity use with clean solar energy.

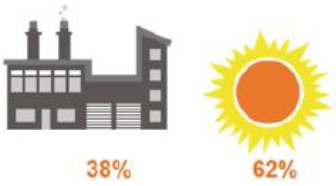


Figure 1. Geostellar power report for a residential home

In 2013, DOE selected Geostellar as a SunShot Incubator award from the U.S. Department of Energy (DOE). This award provides technical assistance to startup companies working in the solar energy sector. In addition, DOE provided the National Renewable Energy Laboratory (NREL) with funding to assist Geostellar with an independent validation of its online estimated energy production values against actual installed rooftop photovoltaic systems.

Platform Validation

The validation conducted by NREL concluded that more than three-quarters of Geostellar's potential size estimates were at least as large as the actual installed systems, indicating a correct assessment of roof availability. Geostellar can be set to estimate the largest possible system for a given roof, and consequently, finding that actual systems are equal-to or smaller-than that maximum validates the sizing methodology. In addition, those estimates are within 10% of actual PV Watts results.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Accuracy of Estimated System Size and Performance

The Geostellar energy production results were directly compared against existing residential homes in New Jersey. Of the 83 buildings in the original validation dataset, 15 were excluded either because they are commercial buildings or because the installer noted that trees would need to be cut so that the installation could be completed. NREL compared the remaining 68 homes to Geostellar outputs based on system size and 25-year energy production.

The system size component of the validation model compared the size of an actual installed system in kilowatts (kW) to the estimated size reported by Geostellar. Of the 68 homes used in the validation, Geostellar estimated a potential system of at least the installed system size in 76% of the homes (Table 1). This level of agreement indicates a reasonable assessment of the available roof area for successful solar installation.

Table 1. Distribution of Geostellar Size Estimates

Percent of Geostellar estimates compared to actual installed systems	Number of homes
>100	52 (76%)
75–100	7 (10%)
50–75	4 (6%)
25–50	4 (6%)
0–25	1 (1%)

The Geostellar results were also validated by comparing their calculated 25-year energy production values against calculated 25-year energy production values using known installation data. For this comparison, 45 homes in the New Jersey sample were used according to solar availability measurement data. Using the same performance derate losses, first-year soiling loss, and annual degradation values as Geostellar's default model assumptions, NREL compared the PV Watts 25-year energy production values for the actual installed systems to the Geostellar predictions. To estimate the 25-year energy production, NREL used the same assumptions for system losses as Geostellar but substituted in known-values for system size, tilt, orientation, and solar access. These variables were calculated using on-site Solar Pathnder measurements. The results are provided in Table 2.

Table 2. Distribution of Geostellar 25-Year Production Value Estimates

Percent of Geostellar estimates compared to PVWatts values	Number of homes
>110	7 (15%)
101–110	7 (15%)
90–100	24 (53%)
80–89	7 (15%)
N/A	31

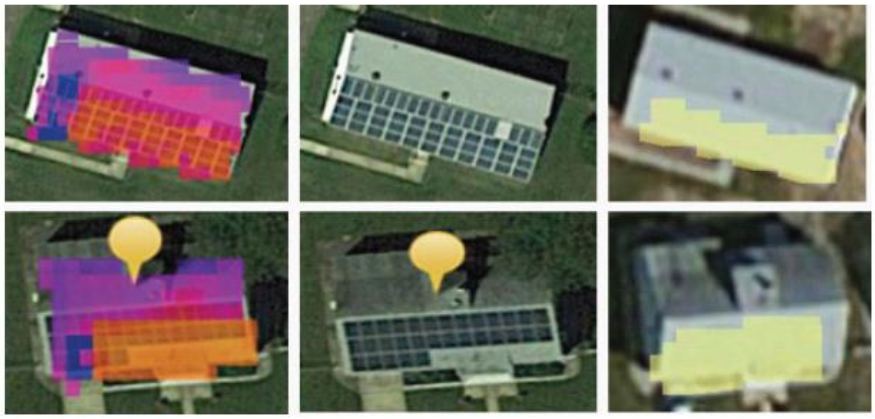


Figure 2. Comparison of Geostellar remote assessment (left), installed system (middle), and NREL Lidar (right)

Front page photo credits (left to right): Susan Bilo, NREL 21401; Dennis Schroeder, NREL 22184; Susan Bilo, NREL 21402

NREL

National Renewable Energy Laboratory
15013 Denver West Parkway, Golden, CO 80401
303-275-3000 • www.nrel.gov

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NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

NREL/FS-7A40-63615 • October 2015

Addressable Solar Market in Ann Arbor MI

A brief analysis was conducted to determine an approximate value for the total addressable solar market in Ann Arbor MI. For this analysis the solar sites in Geostellar's data store were hashed against the geographic shape files that were provided to us.

For the analysis a summation of the expected annual output of the solar sites was performed. There are, however, a few caveats

- This calculation is for the addressable solar market – it does not account for any particular site's usage. In other words, solar systems of the maximal allowed size were sited. Thus, for any particular site the output represents a maximum
- We normally apply a heuristic to our reduced data to account for the fact that LIDAR cannot pick up things like small obstructions, stand-pipes, setbacks, etc. We developed the scaling heuristic with residential data, and it usually matches reality well. However, the data set included in this analysis includes commercial and industrial site too, which are probably being scaled more than would be necessary for those kinds of site. Thus the numbers in this report should be considered a **conservative estimate**. The addressable market in the commercial and industrial spaces (especially the industrial) is probably higher than reported here.

Various charts and visualization are presented below. In terms of summary, though, it is estimated that the total addressable market is approximately 100 GWh/year:

Ward	Annual Power (MWh)
1	17843.63
2	20045.62
3	19206.85
4	24131.11
5	19301.26
Total	100528.47

The Sites

The following graphic displays the sites that were included in the analysis:

Lidar-based Analysis of Ann Arbor's Addressable Solar Market

- The Solar Subcommittee requested Geostellar, a solar PV provider with patented Lidar-based analytical capabilities, to analyze Ann Arbor's total PV solar potential.
- Lidar is a surveying technology that measures distance by illuminating a target with a laser light. It is often used as a technology to make high-resolution maps.
- Geostellar programmatically places solar panels on rooftops or tracts of land in a 3D virtual world and simulates solar production over a typical meteorological year based on shading, slope and orientation.
- NREL has evaluated Geostellar assessments and stated they are accurate.
- A typical solar potential map is at left. The solar potential of each roof can be quantified.

Ann Arbor Energy Commission, Solar Subcommittee – John Mosky March 14, 2015

Lidar-based Analysis of Ann Arbor's Addressable Solar Market

Ann Arbor's Total Potential Solar Annual Energy Production (AEP) in MWh:

Entity	AEP (MWh)*
City of Ann Arbor	97600 (97.1%)
University of Michigan	2930 (2.9%)
Total	100530 (100%)

97600 MWh is the output of 78.5 MW of Solar PV*

vs.

35.1 MW required per 2025 CAP

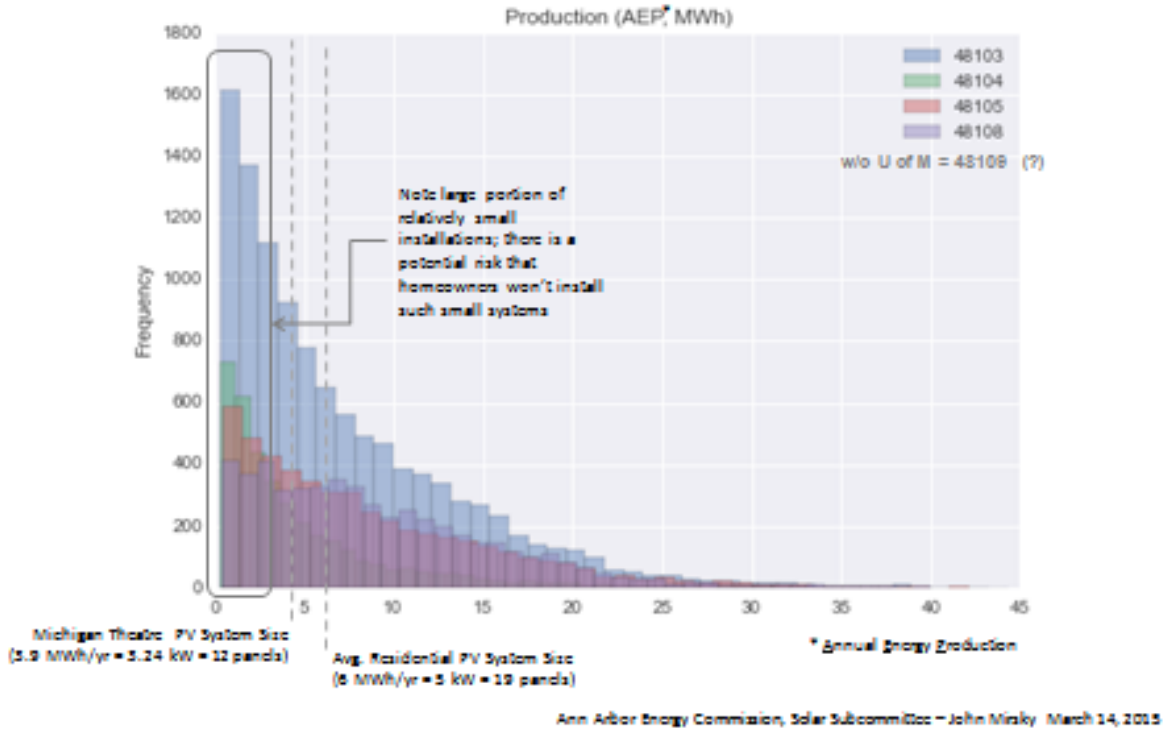
126.5 MW required per 2050 CAP

Ward (City only)	AEP (MWh)*	Site Class (City only)	AEP (MWh)*
1	17200 (17.6%)	Commercial	29720 (30.5%)
2	18270 (18.7%)	Industrial	870 (0.9%)
3	19090 (19.6%)	Public	3020 (3.1%)
4	23770 (24.3%)	Residential	53190 (54.5%)
5	19280 (19.8%)	Unspecified	10800 (11.1%)
Total	97600 (100%)	Total:	97600 (100%)

* In AA ~ 1244 kWh is generated by a 15% efficient 1 kW PV solar system

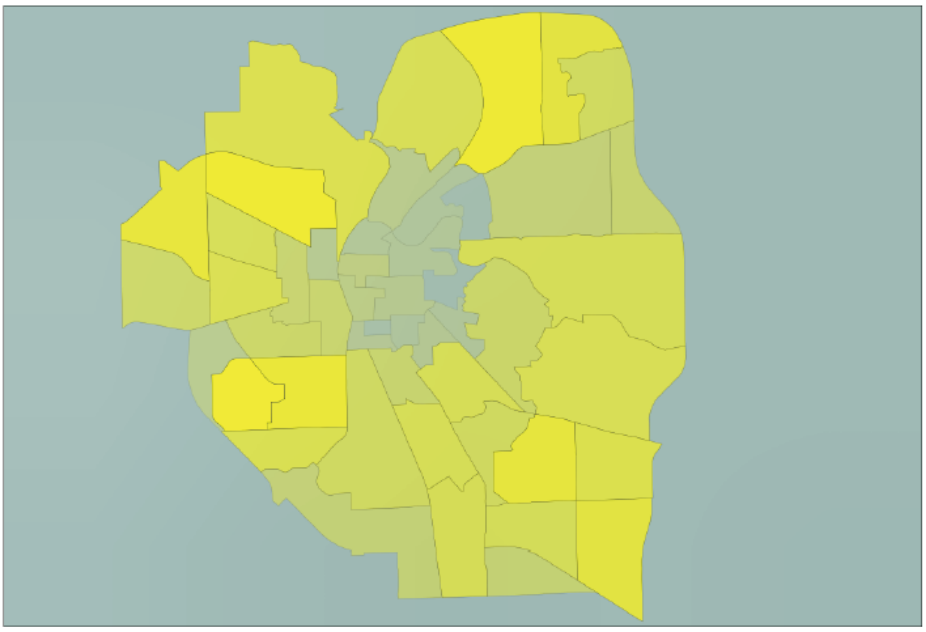
Ann Arbor Energy Commission, Solar Subcommittee – John Mosky March 14, 2015

Lidar-based Analysis of Ann Arbor's Addressable Solar Market



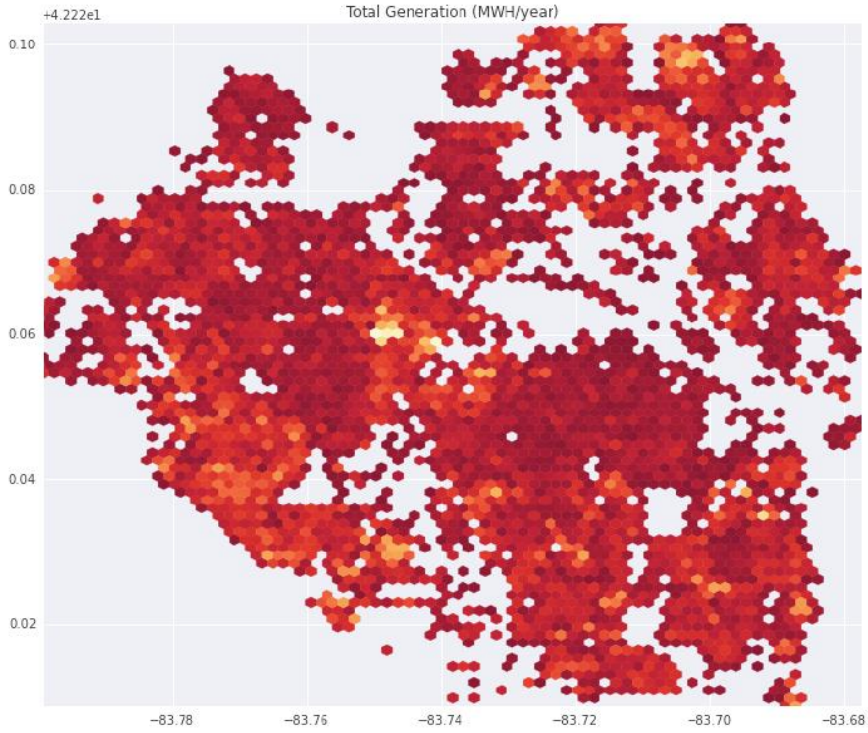
Ann Arbor Solar Potential by Ward

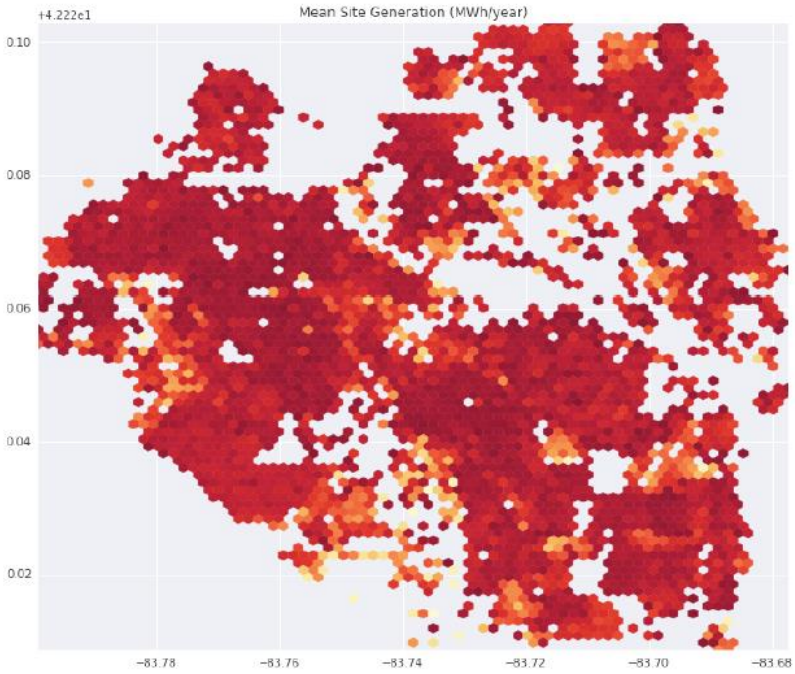
More pictorially, the following figure shows the relative numbers of sites in each ward and precinct, with lighter shades denoting higher numbers:



Production

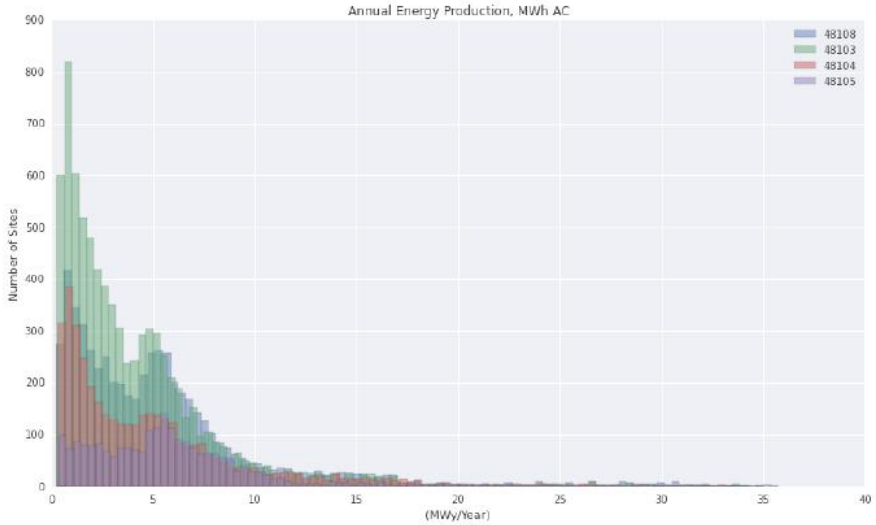
Two heat-maps were produced to provide insight into the spread and location of solar generation potential in the city: one displaying overall production, one displaying average production. Often these calculations are inverse of one another, with overall production being higher in more densely constructed areas and mean production being highest in the less-densely constructed neighborhoods. This was in fact observed to an extent:





(Note that these are not GIS-projections, so there is some distortion in the point location.)

The distribution of production was also examined by zip code for the site that fell within the ward limits:



Tabular Data

Production was partitioned on Ward, Precinct, and class

Ward	Annual Power (MWh)
1	17843.63
2	20045.62
3	19206.85
4	24131.11
5	19301.26
Total	100528.47

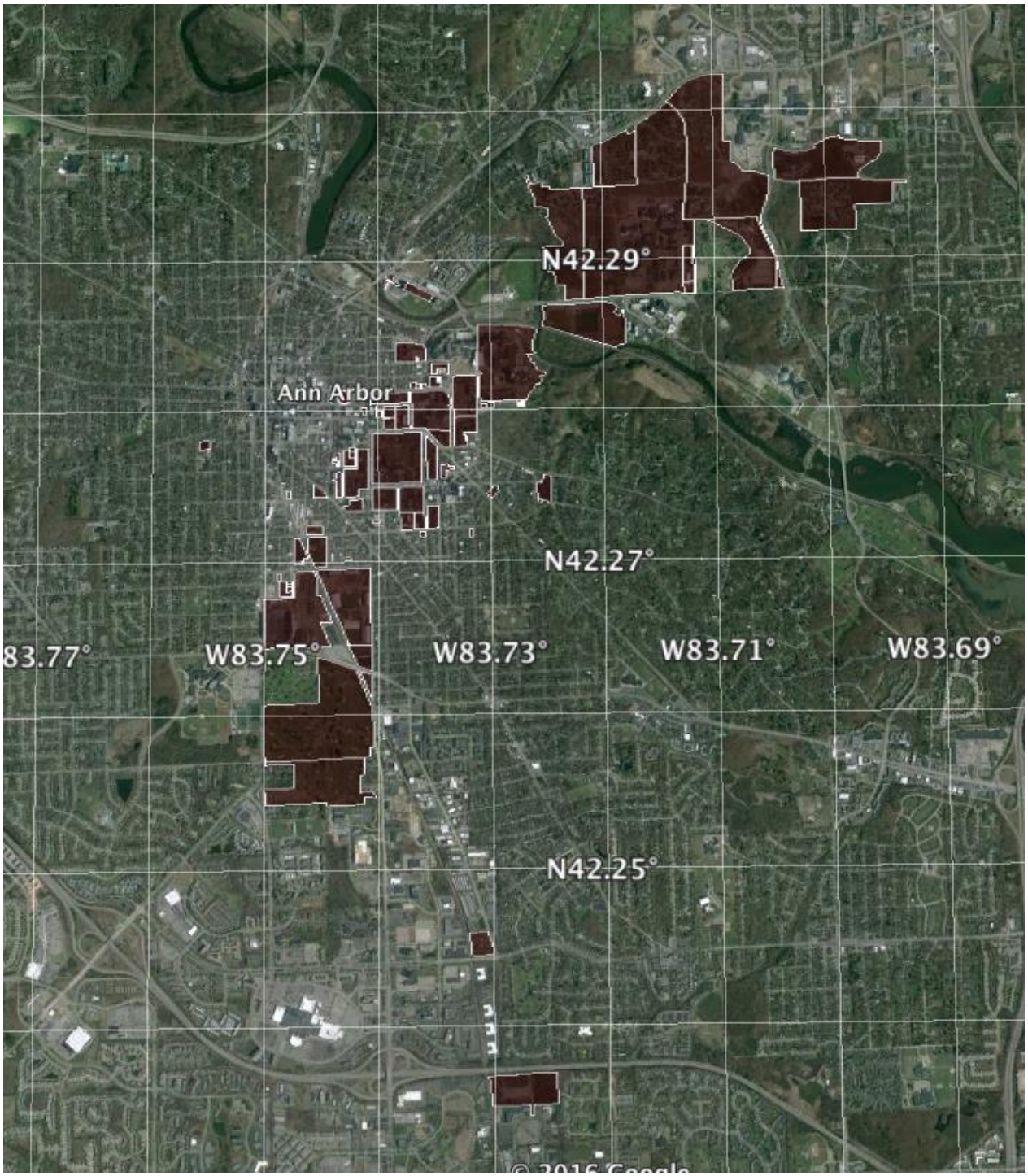
Ward	Precinct	Annual Power (MWh)
1	1	1569.523599
	2	1810.639157
	3	772.8609891
	4	782.2048276
	5	819.2570906
	6	1370.026982
	7	267.9294244
	8	2708.563348
	9	5015.579545
	10	2727.041583
2	1	2071.962295
	2	195.6639721
	3	676.4909738
	4	1550.702121
	5	3233.139435
	6	2495.898698
	7	3469.19608
	8	2125.510143
	9	4227.06054
3	1	808.8444325
	2	901.6112993
	3	1374.473258
	4	2550.520125
	5	2079.659552
	6	2353.687049
	7	2744.678966
	8	3031.178235
	9	3362.196454
4	1	321.2592794
	2	819.7897113
	3	1082.538255

	4	3044.372578
	5	2854.028347
	6	2662.816119
	7	3698.521398
	8	3902.600258
	9	2913.803828
	10	2831.3769
5	1	1639.948162
	2	1085.354541
	3	609.9487877
	4	853.6887774
	5	2305.235927
	6	1719.036624
	7	2030.529235
	8	1903.478413
	9	1548.644612
	10	3053.794141
	11	2551.602371

Site Class	Annual Power (MWh)
Commercial	32652.37
Industrial	867.86
Public	3020.08
Residential	53187.79
Unspecified	10707.43
"V"	92.93
Total:	100528.47

(Note that CoreLogic defined some of these sites as "V". There were only a handful of such sites, and a visual inspection was performed. The majority of these sites appear to be residential.)

Breakout of University of Michigan Property



Attachment IV

Houses of Worship in Ann Arbor – Solar Potential

ADDRESS	CITY	ZIP	SOLAR POTENTIAL
900 John A. Woods Dr.	AA	48105	9.01
3823 N. Dixboro	AA	48105	8.48
4844 Jackson Rd	AA	48103	9.01
2898 Packard	AA	48108	8.75
2455 Washtenaw	AA	48104	8.22
915 E. Washington	AA	48109	
2455 Washtenaw	AA	48103	
2118 Ann Arbor-Saline Rd.	AA	48103	9.54
5550 Morgan	YPSI	48197	8.48
2150 S. Wagner	AA	48103	
1750 Dhu Varren	AA	48105	11.13
7950 Warren	AA	48105	16.22
2580 Packard	AA	48104	8.75
517 E. Washington	AA	48104	9.01
3150 Glazier Way	AA	48105	9.54
218 Chapin	AA	48103	7.42
5055 Platt	AA	48108	8.48
929 Barton	AA	48105	8.48
850 Red Oak	AA	48103	8.75
3630 Platt	AA	48103	9.01
825 N. Maple	AA	48103	3.45
1300 S. Maple	AA	48103	8.75
4220 Packard	AA	48108	8.75
No fixed address	AA		
1129 Oak Valley	AA	48108	8.22
614 Miner	AA	48103	3.18
1320 Baldwin Ave.	AA	48104	5.04
7101 W. Liberty	AA	48103	1.06
1214 Packard	AA	48104	1.86
4000 Ave Maria	AA	48105	18.03
5671 Whitmore Lake	AA	48105	9.54
2250 E. Stadium	AA	48104	8.48
331 Thompson	AA	48104	9.54
530 Elizabeth	AA	48104	8.75
230 Collingwood St Suite 240	AA	48103	
3208 Ravenwood St	AA	48103	4.24

4597 Warren Rd	AA	48105	9.01
4515 Warren Rd	AA	48105	
1289 Jewett Ave	AA	48104	9.01
1293 N. Zeeb	AA	48103	8.75
no fixed location			
1833 Washtenaw	AA	48104	9.01
306 E Liberty St	AA	48104	2.39
3840 Varsity	AA	48104	
530 W. Stadium	AA	48104	9.01
2780 Packard	AA	48108	9.01
520 W. Jefferson	AA	48103	2.92
608 E. William	AA	48104	9.81
929 Barton	AA	48105	
1900 Manchester	AA	48104	9.28
2065 South Wagner Road	AA	48103	
721 E. Huron, Suite 2	AA	48104	
3257 Lohr	AA	48104	9.54
306 N. Division	AA	48104	
1679 Broadway	AA	48105	
306 N. Division	AA	48104	18.02
2309 Packard	AA	48104	9.01
4090 Geddes Rd.	AA	48105	9.01
3109 Scio Church	AA	48103	8.75
4760 Packard	AA	48108	8.48
530 S. State	AA	48109	
410 S. Maple	AA	48103	8.75
1829 W. Stadium, Suite 100	AA	48103	
1900 Manchester	AA	48104	
2309 Packard	AA	48104	
200 Huronview Blvd.	AA	48103	
4205 Washtenaw	AA	48108	
1001 E. Huron / 928 E Ann St	AA	48104	
925 E. Ann	AA	48104	1.06
704 Airport Blvd.	AA	48104	
3301 Creek	AA	48108	0.8
4800 E. Huron River	AA	48105	
4600 Scio Church	AA	48103	8.75
4599 Carpenter	Ypsi	48197	
921 Church	AA	48104	8.48
3200 Boardwalk Dr.	AA	48108	
3205 Boardwalk St	AA	48108	
2000 Champagne	AA	48108	
2000 Champagne	AA	48108	9.01

2211 N. Maple	AA	48103	9.01
2211 N. Maple	AA	48103	
2000 Champagne	AA	48103	
715 Hill	AA	48104	
2935 Birch Hollow	AA	48108	8.48
2000 Washtenaw	AA	48104	9.28
715 Hill	AA	48104	5.83
2935 Birch Hollow	AA	48108	
2309 Packard	AA	48104	
1429 Hill	AA	48104	9.01
3545 Packard	AA	48108	6.89
2600 Nixon	AA	48105	9.01
2685 Packard	AA	48105	9.28
801 S. Forest	AA	48104	9.81
8260 Jackson	AA	48104	8.48
1360 Pauline	AA	48103	9.54
7474 Scio Church	AA	48103	9.81
4205 Washtenaw	AA	48108	8.48
420 W. Liberty	AA	48103	9.54
10001 W. Ellsworth	AA	48103	9.01
1400 W. Stadium	AA	48103	9.54
1511 Washtenaw	AA	48104	9.28
1501 W. Liberty	AA	48103	8.75
3773 Geddes Road	AA	48105	9.01
495 Earhart Rd	AA	48105	8.48
2566 Arrowwood	AA	48105	
2340 Oak Valley	AA	48103	8.75
2727 Fernwood	AA	48104	
1951 Newport	AA	48103	7.95
5221 Church	AA	48105	9.01
120 S. State	AA	48104	10.07
1001 Green Road	AA	48105	5.04
1526 Franklin	AA	48103	6.36
120 S. State	AA	48104	
900 S. Seventh	AA	48103	9.28
1415 Miller Ave	AA	48103	8.75
1385 Green	AA	48105	8.48
2301 Plymouth	AA	48105	8.75
3393 Plymouth	AA	48105	
6075 Jackson	AA	48103	
2500 S. Main	AA	48103	8.22
3257 Lohr	AA	48108	
2775 Bedford	AA	48104	8.75

416 W. Huron,	AA	48103		
1541 Washtenaw	AA	48104		9.54
4100 Carpenter	Ypsi	48197		
2275 Platt	AA	48104		8.48
1829 West Stadium, Suite 100	AA	48103		
3350 Textile	Ypsi	48197		
2727 Fernwood	AA	48104		9.01
929 Barton	AA	48105		
5171 Jackson	AA	48103		8.22
1432 Washtenaw	AA	48104		9.28
2065 S. Wagner	AA	48103		8.22
2141 Brockman	AA	48104		8.48
1679 Broadway	AA	48104		10.6
1432 Washtenaw	AA	48104		
1500 Scio Church	AA	48104		8.75
1420 Hill	AA	48104		0.8
1717 Broadway	AA	48105		9.28
2500 S. Main	AA	48103		
1236 Washtenaw Ct.	AA	48104		9.01
2803 Boardwalk	AA	48108		8.22
100 Arbana	AA	48103		9.28
2796 Packard	AA	48108		9.01
1320 Baldwin Ave	AA	48104		
4001 Ann Arbor-Saline	AA	48103		8.22
423 S. Fourth Ave.	AA	48104		9.81
2145 Independence	AA	48104		9.01
			SUM	864.18

Attachment V

Solar Survey of Solar Installers

Mark H. Clevey, Vice Chairperson
City of Ann Arbor, Energy Commission and,
Chairperson, Solar Subcommittee
email: mclevey123gmail.com

March 8 2016

Michigan-based Solar Installers/Contractors Servicing the Ann Arbor Market

Dear Solar Installer/Contractor Servicing the Ann Arbor Market:

I wish to sincerely thank you for responding to our Energy Commission, Solar Subcommittee's *Solar Survey.* Your input is proving to be instrumental in helping our Energy Commission craft recommendation for programs and strategies to further *enable the solar market* in our community.

As you may know, Ann Arbor has been a leader in solar energy in our state for many years. The precursor to the Great Lakes Solar Energy Association – *Michigan Solar Energy Association* – was founded and housed in Ann Arbor and led the effort to enact Michigan's first Solar Tax Credit program. Moreover, we are pleased to note that Ann Arbor has openly and steadfastly supported the survey's two top issues – "Federal Solar Tax Credits" and "Extension of State Renewable Portfolio Standard". Within this context, I want to draw your attention to two key websites that pertain to our solar work: *A2Energy* (http://www.a2gov.org/a2energy/Pages/default.aspx); and, the *City of Ann Arbor Solar Roadmap* (http://my.solarroadmap.com/ahj/city-of-ann-arbor/view).

As I indicated in my initial survey letter, the City of Ann Arbor also has an aggressive Climate Action Plan (CAP) with stretch goals for solar energy. Our CAP calls for roughly 24 MW of *new* renewable energy (solar PV equivalent) in the next 10 years (at a rate of 2.4 MW installed each year starting in 2016). A recent LIDAR-based analysis conducted by our Solar Subcommittee found over a 100 MW of "technical" solar potential in the community.

I've attached a copy of the solar survey results for your review. As you will note, the survey clearly showed that the solar market in Ann Arbor could expand by *two and one-half times* if properly enabled with public policy and financial incentives, regulatory reform and public education. Essentially, if we mined 1/4 - 1/3 of the technical solar potential we'd meet our CAP's 24 MW solar goals. Thus, we sincerely hope that you will continue to work with us to, in the words of one survey respondent, make Ann Arbor the *"poster child for solar in the Midwest."* Indeed, we not only want, but *need* your business goal - to sell more solar in Ann Arbor - *to succeed!*

We are now drafting plans for a series of initiatives to identify and qualify solar sites, expand financing and incentive options, reform our solar permitting process, educate consumers and aggressively promote Ann Arbor as a Solar Ready Community. Towards that end, we will be inviting solar installers who *chose to complete* the survey to a briefing with the Energy Commission (in the spring) to present our plans and seek your input. Again, I sincerely thank you for your time, thoughtful input and, most importantly, *solar entrepreneurship.*

Respectfully yours,

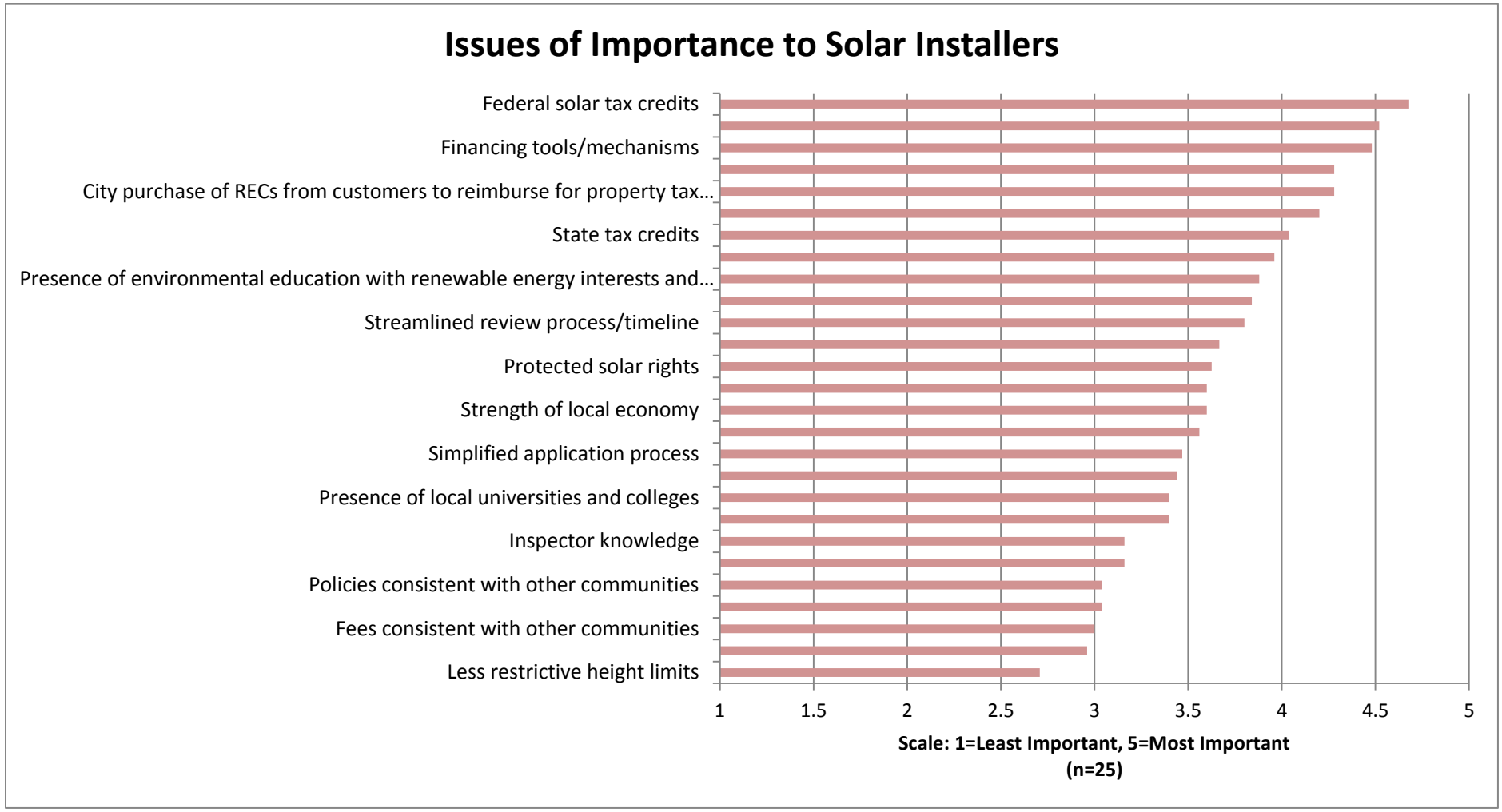
Mark H. Clevey, Vice Chairperson, Energy Commission and Chairperson, Solar Subcommittee

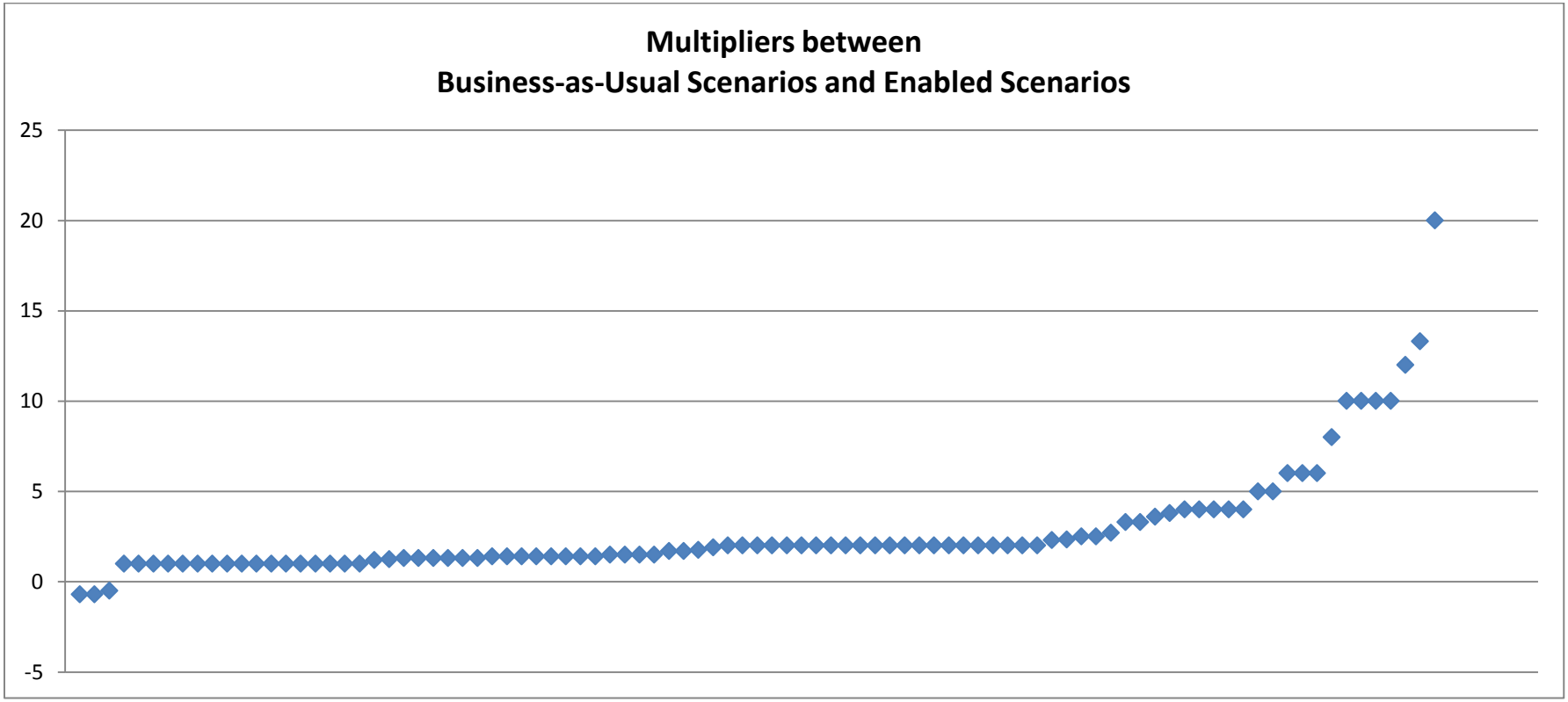
Attachments

A Survey of Local Solar Installers

Conducted by the
Solar Subcommittee of the
Ann Arbor Energy Commission

March 8, 2016


Issues of Importance to Solar Installers
Federal solar tax credits
Financing tools/mechanisms
City purchase of RECs from customers to reimburse for property tax…
State tax credits
Presence of environmental education with renewable energy interests and…
Streamlined review process/timeline
Protected solar rights
Strength of local economy
Simplified application process
Presence of local universities and colleges
Inspector knowledge
Policies consistent with other communities
Fees consistent with other communities
Less restrictive height limits
1
1.5
2
2.5
3
3.5
4
4.5
5
Scale: 1=Least Important, 5=Most Important
(n=25)



The average multiplier is 2.8. In other words, installers assumed that they would do approximately 2.8 times the number and/or size of solar projects in the City of Ann Arbor should the City deal with regulatory, financing, and support barriers.

Attachment VI

City of Ann Arbor

DRAFT **Renewable Energy Credit (REC) Resolution**

WHEREAS, in December 2012, the Ann Arbor City Council passed the *Climate Action Plan (CAP)*, an ambitious multi-strategy vision to reduce our community-wide emissions 8% by 2015, 25% by 2025, and 90% by 2050, relative to year 2000 baseline emissions levels;

Whereas 20% of the Climate Action Plan's 2025 electrical savings goal is slated to be met with solar photovoltaics (or equivalent) (i.e., 2.4 MW installed each year, for the next ten years);

Whereas, the City of Ann Arbor increases the owner of an installed solar photovoltaic system's real estate property taxes equivalent to approximately 20 percent of the value of the electricity generated by the solar array;

Whereas, the Michigan Tax Tribunal has held that a solar system is personal property, not real property, and therefore can be taxed as personal property;

Whereas, the effect of the property tax increase is to raise the installed cost of solar energy and to subsequently dampen the market;

Whereas, a Renewable Energy Credit (REC) represents the property rights to the environmental, qualities of renewable electricity generation which can be sold separately from the underlying physical electricity associated with a renewable-based generation source;

Whereas the sale of REC's by the purchaser of a solar system can ameliorate the property-tax increase market barrier for solar PV in Ann Arbor;

Resolved, the City of Ann Arbor Energy Commission requests the City Council to instruct the City Administrator to explore the purchase Renewable Energy Credits (REC's) from citizens who have installed solar PV system and to work with the Clean Energy Coalition to secure the purchase of REC's from future solar installations in the City as a way to offset the increased property tax for solar purchasers.

Attachment VII

Become a Solar-Ready Community!

A Guide for Michigan Local Governments

Executive Summary

Known for innovation and home to several solar industry leaders, Michigan has the foundation to become a front-runner in solar energy. Local governments are key to Michigan's success in this effort and can help create and encouraging climate for residents and business owners to install solar by becoming Solar Ready. Solar Readiness means:

- Proactively addressing solar in policies in procedures
- Supporting the local and statewide solar industry
- Responding to the needs of local citizens
- Helping developers, homeowners, and businesses through a cost-effective solar installation process

Clean Energy Coalition completed a guidebook to assist local jurisdictions with becoming Solar Ready. This Guidebook provides detail on the following ten steps to become Solar Ready along with resources that can help make Solar Readiness easy and more consistent throughout the state. The following ten steps provide a pathway for Michigan local government to achieve Solar Readiness.

STEP 1: BEGIN THE DISCUSSION - Introduce the concept of Solar Readiness to raise awareness and gather support for the project. Reaching out to neighboring jurisdictions and utility providers is important to consider during this step.
STEP 2: ADOPT A RESOLUTION - The resolution adoption process introduces the conversation of solar at the leadership level, helping to both inform and ensure buy-in from local officials.
STEP 3: ESTABLISH A GUIDING POLICY THAT SUPPORTS SOLAR - Planning document language that supports the advancement of solar will set the direction towards Solar Readiness and provide the basis for solar-related land use regulation.
STEP 4: UPDATE CODE LANGUAGE - Solar language in your zoning codes will give clear guidance about how solar installations are to be integrated into the community.
STEP 5: CREATE AN EASY-TO-USE PERMITTING PROCESS - Common information and permit language will help residents, businesses, developers and installers have a clearer understanding of the local and regional expectations with regard to solar installation.
STEP 6: PROVIDE EASY ACCESS TO INFORMATION - Online and printed materials that detail how solar installation works in the community will help interested property owners and installers understand local expectations and better prepare for an installation process.
STEP 7: ESTABLISH SOLAR INSTALLATION TARGETS - Establishing solar installation targets will help continue the momentum and ensure that measures are taken to ensure solar readiness leadership in Michigan.
STEP 8: TRAIN STAFF - Increasing staff familiarity with solar technology and installation will help make the permitting process more efficient.
STEP 9: PURSUE SOLAR BUSINESS DEVELOPMENT OPPORTUNITIES - Working with development specialists on solar can leverage your Solar Ready Community's status to enhance economic reinvention.
STEP 10: GO THE EXTRA MILE- Going the extra mile is for communities that are really looking to be a solar leader by developing creative outreach efforts and encouraging programs.

http://cec-mi.org/wp-content/uploads/2013/09/Guide-Book_Solar_FINAL_web.pdf

RESOLUTION AUTHORIZING A COMMITMENT TO MAKING THE CITY OF ANN ARBOR A *SOLAR READY* COMMUNITY

WHEREAS in December 2012, the Ann Arbor City Council passed the *Climate Action Plan (CAP)*, an ambitious multi-strategy vision to reduce our community-wide emissions 8% by 2015, 25% by 2025, and 90% by 2050, relative to year 2000 baseline emissions levels.

Whereas 20% of the Climate Action Plan's 2025 electrical savings goal is slated to be met with solar photovoltaics (or equivalent) (i.e., 2.4 MW installed each year, for the next ten years);

Whereas the U.S. Department of Energy, SunShot and Rooftop Solar Challenge programs and other National Renewable Energy Laboratory (NREL) studies have found that lack of solar-specific zoning and related building permitting within a community can actually dampen the local solar market by increasing the installed cost for solar systems for consumers[16];

Whereas the City of Ann Arbor has hosted numerous SunShot-related educational programs in an effort to increase solar awareness and interest in the community;

Whereas the Michigan Energy Office has funded the Clean Energy Coalition (CEC) to build upon the SunShot Initiative and to develop a Solar Ready Community Guide for Michigan, complete with model and streamlined zoning and permitting guidelines (see: Solar Ready Community, Executive Summary, Attachment I);

Whereas the Solar Ready Community Guide project was successfully piloted in Mid-Michigan (Saginaw, Bay City and Midland) and subsequently successfully adopted by several other communities in the state;

Whereas the Ann Arbor Energy Commission created a Solar Subcommittee in 2016 whose primary goal is to research and recommend ways the City can effectively enable increased solar installations in the community, commensurate with the goals of the Climate Action Plan;

Whereas the Solar Subcommittee finds that the Solar Ready designation would provide the necessary platform to enable the solar energy components of the Ann Arbor Climate Action Plan;

Resolved, The City of Ann Arbor Energy Commission recommends that the City of Ann Arbor support efforts to make the City a Solar Ready Community and recommends that the City Council direct all effected city departments and agencies to adopt the Clean Energy Coalition's Solar Ready Community guidelines towards the goal of securing the designation of Solar Ready Community for the city.

[16] http://energy.gov/eere/sunshot/rooftop-solar-challenge - The DOE SunShot program estimates that soft or "plug-in" costs of solar account for as much as 64% of the total cost of a new solar system. The DOE Rooftop Solar Challenge aims to reduce the cost of rooftop solar energy systems through improved permitting, financing, zoning, net metering, and interconnection processes for residential and small commercial photovoltaic (PV) installations. Launched in February 2012 the aggregated efforts of Rooftop Solar Challenge I teams *cut permitting time by 40% and reduced permitting costs.* The Michigan Energy Office, Solar Ready Community program with Clean Energy Coalition found similar results in Michigan. A more recent NREL study (http://www.nrel.gov/docs/fy15osti/64746.pdf page 16, Figure 4) found that permitting costs could be reduced by 3.5% of the installed cost with streamlined zoning and permitting programs.

Attachment VIII

H-GACBuy (http://hgacbuy.org/)

The City of Ann Arbor is eligible to join a procurement program ("HGACBuy") that will allow it to procure solar PV panels ("SolarWorld" PV – the same PV Panels installed on the Michigan Theater by McNaughton – McKay, an Ann Arbor-based solar contractor[17]) for city-owned buildings (and, possibly, citizens buildings via CEC) *without an RFP* (resulting is significant savings) and receiving the *benefits of bulk discounts.*

H-GAC is a nationwide, government procurement service. As a unit of local government, HGACBuy strives to make the governmental procurement process more efficient by establishing competitively priced contracts for goods and services, and providing the customer service necessary to help its members achieve their procurement goals.

All contracts available to participating members of HGACBuy have been awarded by virtue of a public competitive procurement process compliant with state statutes. All units of local government, including non-profits providing governmental services, are eligible to become participating members of HGACBuy.

Types of HGACBuy Participating End Users

The following are the types of legal entities eligible for participation in HGACBuy:

- Municipalities, Cities, Counties and State Agencies
- Councils of Government
- Schools, School Districts, Colleges, Universities
- Hospitals and Hospital Districts
- Emergency Medical Services and Services Districts
- Volunteer Fire Departments and Rural Fire Prevention Districts
- Special Law Enforcement Jurisdictions
- Judicial Courts & Districts
- Emergency Communications Districts
- Utility Districts (MUDs, WCIDs, Irrigation, etc.)
- Special Districts
- Authorities (Airport, Port, River, Water, Toll Road, etc.)
- State Agencies
- Not-for-Profit Corporations [501(c)(3)] providing government functions and services.
  (Special requirements apply: See Program Info/Executing an Interlocal Contract with HGACBuy)

Michigan HGACBuy End Users

The following is a list of current Michigan HGACBuy End Users:

[17] SolarWorld is an approved vendor under HGACBuy, a 35-year-old cooperative-purchasing program. HGACBuy selects highly technical products that require detailed technical specifications and procurement through a competitive process and provides a pre-negotiated contract for its 8,000 members across 47 states. HGACBuy makes it easier and faster for state, county and municipal governments to go solar.SolarWorld is listed on the U.S. government's roster ofpreapproved solar suppliers. Now Federal entities can access SolarWorld solar systems and services and take advantage of the prenegotiated terms and pricing contracted through the General Services Administration (GSA). Access SolarWorld contract information on gsaadvantage.gov in the GSA Schedules List: Contract Number: GS-21F-131AA

Michigan HGACBuy End Users

Arenac County Road Commission (MI)	Standish
Berkley School District (MI)	Oak Park
Berlin Charter Township (MI)	Newport
Big Bay de Noc School District (MI)	Cooks
Birmingham Public Schools (MI)	Birmingham
Brain Injury Association of Michigan (MI)	Brighton
Branch County (MI)	Coldwater
Bridgman Public Schools (MI)	Bridgman
Briley Township (MI)	Atlanta
Brockway Township (MI)	Yale
Cadillac/Wexford Transit Authority (MI)	Cadillac
Cannon Township (MI)	Rockford
Capital Region Aurport Authority (MI)	Lansing
Cedar Springs Public Schools (MI)	Cedar Springs
Charlevoix Township (MI)	Charlevoix
Charter Township of Plymouth (MI)	Plymouth
Charter Township of Washington (MI)	Washington
City of Benton Harbor (MI)	Benton Harbor
City of Birmingham (MI)	Birmingham
City of Dearborn (MI)	Dearborn
City of Escanaba (MI)	Escanaba
City of Ferndale (MI)	Ferndale
City of Flat Rock (MI)	Flat Rock
City of Fraser (MI)	Fraser
City of Huntington Woods (MI)	Huntington Woods
City of Kalamazoo (MI)	Kalamazoo
City of Lansing (MI)	Lansing
City of Lathrup Village (MI)	Lathrup Village
City of Madison Heights (MI)	Madison Heights
City of Mason (MI)	Mason
City of Muskegon (MI)	Muskegon
City of Novi (MI)	Novi
City of Portage (MI)	Portage
City of River Rouge (MI)	River Rouge
City of Roseville (MI)	Roseville
City of Saginaw (MI)	Saginaw
City of St. Clair Shores (MI)	St. Clair Shores
City of Sterling Heights (MI)	Sterling Heights
City of Taylor (MI)	Taylor
City of Troy (MI)	Troy
City of Wyoming (MI)	Wyoming
County of Ottawa (MI)	West Olive
Dearborn Public Schools (MI)	Dearborn
Delhi Charter Township (MI)	Holt
Escanaba Township (MI)	Gladstone
Franklin-Bingham Fire Department, Inc. (MI)	Franklin
Freedom Farm Bible Church (MI)	Pittsford
Freeland Community School District (MI)	Freeland
Gibraltar School District (MI)	Woodhaven
Grand Ledge Public Schools (MI)	Grand Ledge

Grant Township School District #2 (MI)	Copper Harbor
Harbor Hospice (MI)	Muskegon
Hospice of Michigan (MI)	Detroit
Jackson County Intermediate School District (MI)	Jackson
Jenison Public Schools (MI)	Jenison
Jewish Community Center of Metropolitan Detroit (MI)	West Bloomfield
Kalamazoo County Road Commission (KCRC) (MI)	Klamazoo
Lakeshore Public Schools (MI)	Stevensville
Lansing Housing Commission (MI)	Lansing
Manistee County Transportation, Inc. (MI)	Manistee
Merritt Township (MI)	Munger
Northville Public Schools (MI)	Northville
Novi Community School District (MI)	Novi
Operation Get Down, Inc. (MI)	Detroit
Otsego Public Schools (MI)	Otsego
Oxford Community Schools (MI)	Oxford
Parchment School District (MI)	Parchment
Resolution Services Center of Central Michigan (MI)	Lansing
Saginaw County Road Commission (MI)	Saginaw
Sanilac County (MI)	Sandusky
School District of the City of Harper Woods (MI)	Harper Woods
The Charter Township of Commerce (MI)	Commerce
Township of Delta (MI)	Lansing
Township of Portage, Charter (MI)	Houghton
Township of Redford (MI)	Redford
Village of Romeo (MI)	Romeo
Washtenaw County(MI)	Ann Arbor
Wayne County Airport Authority (MI)	Detroit
Wayne-Westland Community Schools (MI)	Westland
West Ottawa Public Schools (MI)	Holland

How HGACBuy Works

Most States in the United States have either Interlocal Cooperation or Joint Powers authority to allow local governments in those states to join and participate in programs like HGACBuy. Click on Authorizing Statutes on the HGACBuy web site to see what cooperative purchasing statutes exist in each state to allow for participation in HGACBuy.

In 1971, the Texas Legislature passed the Interlocal Cooperation Act [Texas Government Code, Title 7, Chapter 791] to promote activities among local governments across Texas. Any local government or non-profit providing government services may contract or agree with one or more local governments under the terms of this Act to conduct purchasing and other administrative functions. The following excerpt from the Act states that... "The Interlocal Cooperation Act's purpose is to improve the efficiency and effectiveness of local governments by authorizing the fullest possible range of inter-governmental contracting authority at the local level including contracts between all political subdivisions of the state and agencies of the state.

HGAC Partnership At Work

The three-way partnership between *HGACBuy, Program End Users, and Contractors* is a very important relationship that provides vital links to ensure effective cooperative results. Clear, concise communication is

essential to making the partnership effective and successful. The contact path includes all three parties: HGACBuy, End User, and Contractor.

H-GAC's Role: HGACBuy's role is to conduct product research and surveys, write technical specifications, conduct pre-bid conferences, open bids, and evaluate responses. After contracts are awarded by the H-GAC Board, HGACBuy certifies contract validity, and administers contracts.

The End User's Role: End Users are expected to consult with Contractors' representatives for the purpose of determining the exact requirements needed to serve constituents. End Users work with Contractor's representatives to detail and complete all documentation required when submitting purchase orders.

The Contractor's Role: HGACBuy relies upon its Contractors to quickly respond to End User inquiries that provide detailed product information and pricing, including priced options for specific products. Contractors' representatives work closely with each End User to meet specific constituent needs.

Legal Authority

Governmental entities join HGACBuy by execution of an Interlocal Contract (ILC) which can be found on the HGACBuy website under Program Info. By executing the ILC, the End User represents and warrants to H-GAC that (1) it is eligible to contract with H-GAC under the Act because it is one of the following: a qualifying non-profit corporation, county, municipality, special district, or other political subdivision of the State of Texas, or another state, and (2) it possesses adequate legal authority to enter into this Contract.

Scope of H-GAC's Professional Services

When participating in HGACBuy, members make their purchase orders out to, and directly pay, the HGACBuy contractor. However, H-GAC does act as the designated purchasing agent on behalf of participating End Users by performing specific services including, but not limited to:

- Conducting research and surveys
- Developing specifications for each product/service
- Soliciting vendor participation
- Issuing specifications documents
- Conducting pre-bid/pre-proposal conferences
- Opening bid/proposal responses
- Evaluating responses
- Issuing Vendor Contracts awarded by the H-GAC Board of Directors
- Certifying contract validity
- Contracts Administration

HGAC Board of Directors Awards All Contracts

The Board of Directors composed of 35 elected officials awards all H-GAC cooperative purchasing contracts. As a political subdivision of the State of Texas, Board agenda are publicly posted in advance of public meetings. Board meetings are customarily held on the third Tuesday of each month in H-GAC Conference Room A, Second floor, 3555 Timmons Lane, Houston. The Houston-Galveston Area Council is one of Texas' 24 regional councils of governments.

Steps To Placing Purchase Orders Through HGACBuy

1. Execute the "Interlocal Contract" (ILC) found on the HGACBuy website under Program Info, and return to H-GAC. H-GAC will sign two copies and return one to the End User for their records. The ILC may be faxed to 713-993-4548 for expedited processing.

2. Obtain specific product details from the HGACBuy website, www.HGACBuy.org . Then, contact the contractor's nearest representative for additional assistance and a definitive price quotation.

Contractor information can be found at the bottom of each contracts web page under Products Available.

3. Prepare and submit your purchase order directly to the relevant HGACBuy contractor, after completing consultation with the contractor's representative. A copy of the order along with a copy of the contractor's written quotation shall be faxed or mailed to HGACBuy at FAX: 713-993-4548. Orders should include specific details regarding the purchase (i.e., name of the End User's contact person, shipping/delivery instructions, and installation details, if any). HGACBuy contractors will then invoice End User for all purchases, and End User will pay the contractor directly following delivery and acceptance.

H-GAC Web Site

Information on products under contract through HGACBuy can be accessed through the web site. The web site contains the following:

- Product categories with base bid prices
- Contractors' representatives with telephone numbers
- H-GAC staff telephone numbers and e-mail addresses
- Listing of Specifications Conferences
- Listing of Bid opening dates for each product category

Contacting HGACBuy

3555 Timmons Ln, Suite 120
Houston, TX 77027

Phone: 800-926-0234
Fax: 713-993-4548
Web: www.HGACBuy.org

Individual staff phone numbers and emails may be found on the HGACBuy website under Program Staff.

Attachment IX

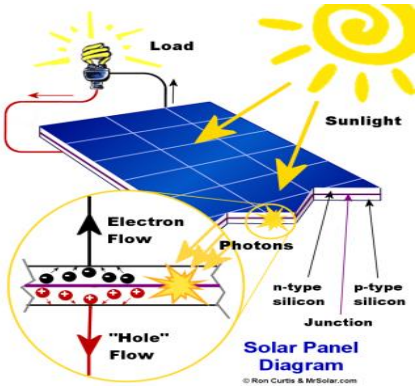
Community Solar

Solar Energy 101

Converting the sun's energy into electricity is *not* a new concept. A French scientist discovered the photovoltaic effect in 1839, and in 1953, American physicists developed the first silicon solar cell capable of powering everyday electronics. Modern PV cells are used in a wide variety of applications, from charging a calculator battery, to PV systems, which contain many interconnected solar cells that provide power to homes or businesses or, in a large array, to the grid. Most solar systems installed today are either roof-mounted or ground-mounted, depending on the location and size of the installation.

Thomas Edison famously noted that, "I'd put my money on the sun and solar power." Today, solar is a rapidly growing global market. Solar energy is a proven technology that harnesses energy from the sun to create electricity. "Photovoltaics" (PV), a Greek term that means "light volt," has some important features:

- Solar (PV) *arrays* are made up of *panels* that contain many PV *cells.* Each PV *cell* converts sunlight into electricity.
- The electricity from the array is fed into an inverter that converts it from DC to AC power so it is compatible with standard U.S. electrical systems.
- AC electricity is used to power the building's appliances and other energy needs.



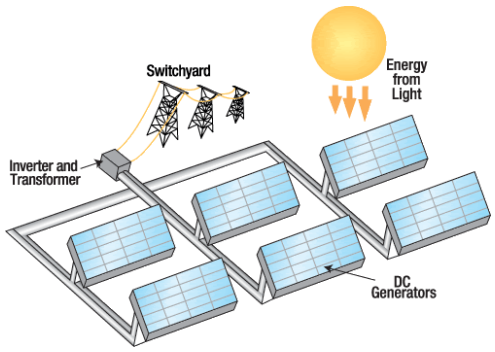
- Any excess electricity is sent back to the utility grid through a meter.

Germany, the world's leader in solar energy generation, receives about as much sunlight as the state of Alaska, yet Germany has 80 times more solar power feeding the grid than the U.S. Closer to home, New Jersey is a great example of a state that is not especially sunny, but has one of the fastest growing solar markets in the nation

Community Solar

Distributed Generation (DG) refers to energy production through a series of smaller, distributed power production systems (e.g., hydroelectric facilities, solar systems, wind farms, etc.) versus a few large and highly-concentrated power plants (e.g., nuclear, oil, natural gas-powered plants). DG systems are typically less expensive to build and maintain, more flexible and resilient, less polluting and less vulnerable to terrorism. "Community Solar" is a Distributed Generation (DG) system powered by solar photovoltaics (PV).

Community Solar systems are somewhat unique among DG systems. Community solar, also called "shared solar," is defined by the U. S Department of Energy, National Renewable Energy Laboratory (NREL), as, "a solar-electric system that provides power and/or financial benefit to multiple community members." *Community Solar, by definition, means that individual solar panels in a large array are either owned by investors or – in the case of the proposed NGO CS Model – donated via a tax deductible charitable donation to the organization hosting the solar array*. Under a Community Solar program the actual generation of solar electricity does not occur at the customer's home or business site. Instead, the customer subscribes to - or contributes funding to underwrite a portion of - a *shared solar energy facility*



(much like a resident may invest in a community garden) located elsewhere in the community (e.g., on Libraries, Museums, Cultural buildings and *educational institutions*) and the power generated results in each subscriber receiving their portion of the financial benefit based on their investment (i.e., how many panels they own in a shared array).

Community Solar Financing Options

The various forms of Community Solar are summarized below:

1. **Solar Lease Model** – Under a Solar Lease model, the Solar Leasing Company pays for and owns a solar system that is installed on a property owned by a Third-Party. The third party uses the solar power generated from the solar system and pays the Solar Leasing Company rent equivalent to the value of the generated power. The Solar Leasing Company takes all associated Solar Tax Credits and related tax benefits.

2. **Municipal Utility CS Model** – Municipal Utilities are locally-owned utilities. Unlike large shareholder-owned utilities such as DTE and/or Consumers Energy, Municipal Utilities have increased flexibility to collaborate with their local ratepayers on innovative energy programs (e.g., Community Solar). In April 2013, the Traverse City Light and Power (TCL&P) became the first Municipal Utility in the state to approve a new "Community Solar Garden" project for local ratepayers. The TCL&P CSG partnership with Cherryland Cooperative allows customers to lease part of a larger PV array[18]. The Lansing Board of Water and Light, Municipal Utility, launched a Community Solar program for LBWL ratepayers in 2015.

3. **NGO CS Model** – Several Non-Governmental Organization (NGO) Community Solar projects have also been undertaken in the state. In Ann Arbor, XSeed solicits tax-deductible contributions which are then used to finance solar PV installations located on community assets. In 2014, XSeed installed a solar PV system on the Michigan Theater in downtown Ann Arbor. Another example is the Sierra Club of Michigan which has collaborated with McNaughton-McKay Energy Systems to provide discounted solar systems to their members. Other examples include faith-based colleges and universities seeking to use an alumni-based Community Solar model to finance onsite solar systems. HoWs can—on their own or in conjunction with a group of HoWs—launch fundraising programs on their own to raise funds for solar installations on their property.

[18] Please see: http://www.tclp.org/Mutual/CommunitySolar/EnergySmart.

Clean Energy Coalition's *Xseed Model* can be used to finance the Community Solar Arrays in the city. XSeed uses funds from community donations and grants, Proceeds from financial incentives and donations are recycled back into an "energy bank" to fund ongoing renewable energy installations throughout Ann Arbor. An NGO CS Model Community Solar Program would solicit donations from donors who would become members of the "Community" (Community Solar) by purchasing a portion of a solar panel, a solar panel or multiple solar panels in solar arrays located on campus. The energy produced from the solar array(s) will be used to replace energy that is purchased from fossil-fuel powered utility plants. Most importantly, unlike typical donations, the Community Solar project donations will function as multiple donations – not a one-time donation – because they will produce financial value from energy that is produced by the solar array and used by the university in place of purchased fossil fuels.

Most importantly the XSeed Model can be highly leveraged for Third Party Leasing and Utility-Owned systems for non-profits. Typically, non-profits have difficulty demonstrating their long-term financial viability for solar leasing projects. The XSeed Model would overcome this barrier by using XSeed Funds as if it were "buying down the interest rate" of a related loan. In this instance, however, the XSeed funds would fund a default insurance policy for the Third-Party Solar Leasing company.

4. **Michigan's Property Assessed Clean Energy (PACE) Model** – Lean & Green Michigan is a statewide PACE program run by Levin Energy Partners, which now encompasses nine counties and three cities representing 44% of Michigan's population. PACE allows property owners to finance solar PV systems through a property tax special assessment with the local government. Community Solar projects can utilize PACE to enhance project financing. HoWs, even though they do not pay property taxes, can nonetheless use PACE financing. At present, Lean & Green Michigan handles only large, commercial projects ($250,000 and up for buildings with energy expenses of $100,000+ per year). (See Lean & Green Michigan for more details.) The City of Ann Arbor also runs a non-profit PACE program, administered by the Clean Energy Coalition.

5. **Investor-Owned Utility CS Model** – Investor owned utilities are undertaking a modified form of Community Solar by placing utility-owned solar systems in communities. These systems operate under the Public Act 295 Renewable Energy Portfolio System. Both DTE Energy and Consumers Energy are also exploring new CS programs where their ratepayers can participate as investors.