

Appendix E

Resources and Resilience

This appendix provides supporting content for Resilience, Natural Resources, and Special Resource Protection.

INTRODUCTION

This appendix provides supporting content for Resilience, Natural Resources, and Special Resource Protection.

AGGREGATE RESOURCES

Aggregate resources are not available within the City of Minneapolis.

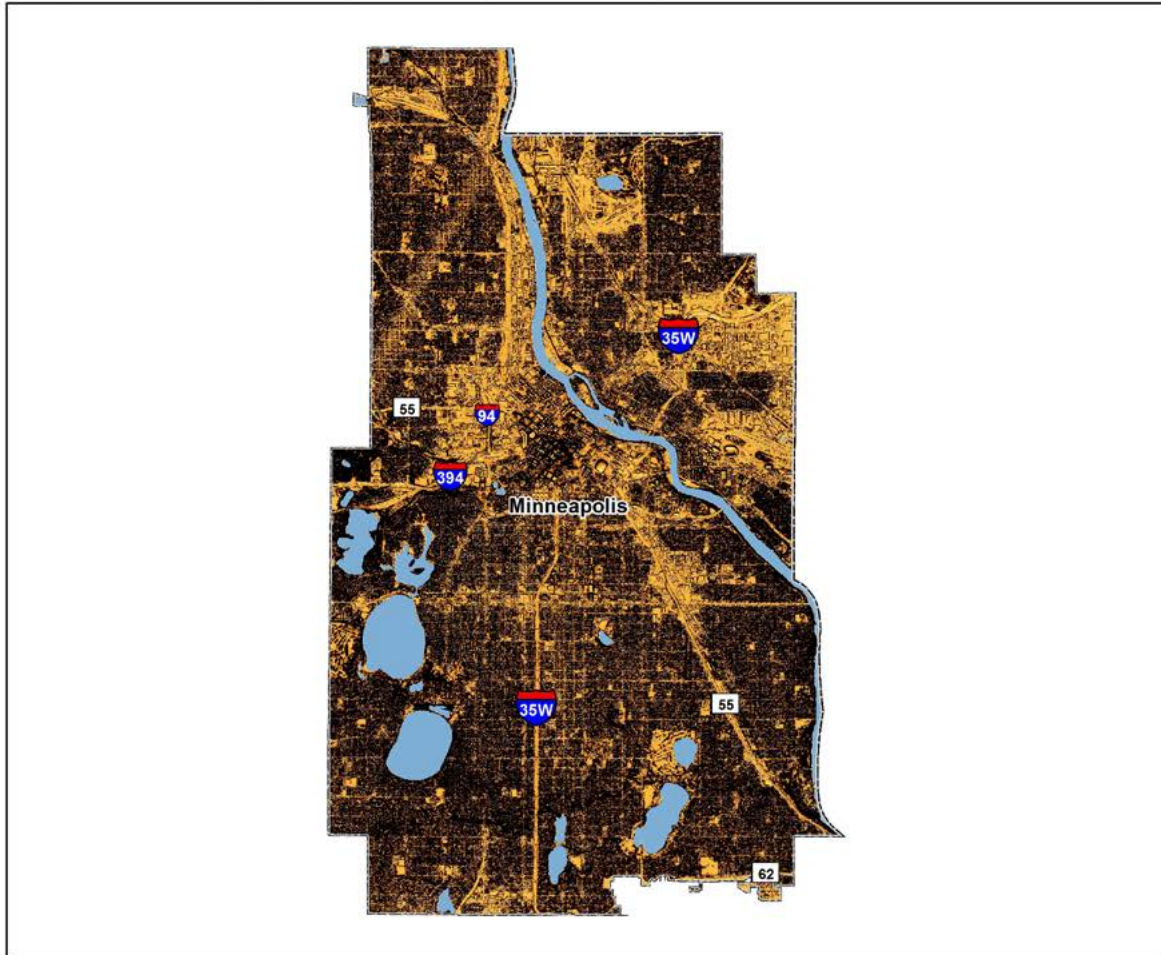
SOLAR RESOURCE DEVELOPMENT

The gross solar potential and gross solar rooftop potential are expressed in megawatt hours per year (Mwh/yr), and are based on the solar map for Minneapolis. These calculations estimate the total potential resource before removing areas unsuitable for solar development or factors related to solar energy efficiency.

City	Gross Potential (Mwh/yr)	Rooftop Potential (Mwh/yr)	Gross Generation Potential (Mwh/yr)*	Rooftop Generation Potential (Mwh/yr)*
Minneapolis	67,672,348	13,956,006	6,767,234	1,395,600

** In general, a conservative assumption for panel generation is to use 10% efficiency for conversion of total insolation into electric generation. These solar resource calculations provide an approximation of each community's solar resource. This baseline information can provide the opportunity for a more extensive, community-specific analysis of solar development potential for both solar gardens and rooftop or accessory use installations. For most communities, the rooftop generation potential is equivalent to between 30% and 60% of the community's total electric energy consumption. The rooftop generation potential does not consider ownership, financial barriers, or building-specific structural limitations.*

Gross Solar Potential City of Minneapolis, Hennepin County



12/22/2016



Gross Solar Potential (Watt-hours per Year)

High : 1277453
Low : 900001

- Solar Potential under 900,000 watt-hours per year
- County Boundaries
- City and Township Boundaries
- Wetlands and Open Water Features

Source: University of Minnesota U-Spatial Statewide Solar Raster.

FIGURE 1: CITY OF MINNEAPOLIS MINNESOTA SOLAR SUITABILITY ANALYSIS MAP

SOURCE: UNIVERSITY OF MINNESOTA

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



**Minneapolis - Saint Paul
Solar in the Cities Initiative**



Minneapolis and Saint Paul are pleased to be recognized as Solar America Cities. Through the U.S. Department of Energy's Solar America Cities partnership, 26 major U.S. cities are working to accelerate the adoption of solar energy technologies for a cleaner, more secure energy future. The Minneapolis Saint Paul *Solar in the Cities* Initiative has an aggressive goal of increasing solar capacity 500% in the Twin Cities during the two years covered by the grant period.

Five priority areas:

- City and state policies
- Financing mechanisms
- Integrating solar in city infrastructure
- Building public awareness
- Training and education

The Solar America Cities grant allows Minneapolis and Saint Paul to dedicate resources to identify strategies that will result in solar friendly policies, practices, and regulations. The grant includes technical expertise from the National Renewable Energy Lab in the areas of policy, technology, research, financing, and education.

Solar in the Cities Initiative includes partnerships with:

- | | |
|---|------------------------------------|
| Minnesota Department of Commerce | District Energy St. Paul |
| Xcel Energy | Minnesota Renewable Energy Society |
| League of Minnesota Cities | Center for Energy and Environment |
| Fresh Energy | SolarFlow Energy |
| International Brotherhood of Electrical Workers | Neighborhood Energy Connection |

Accomplishments to Date:

- Secured \$1 million American Recovery and Reinvestment Act Solar Market Transformation Grant which leverages and additional \$1.2 million from District Energy St. Paul.
- Secured \$2.8 million in additional Federal Stimulus funds plus approximately \$1 million in rebates and matching funds for solar installations along the Energy Innovation Corridor between downtown Saint Paul and downtown Minneapolis.
- Coordinated multi-stakeholder working group that resulted in passage of strong solar legislation in 2009 and advancing 2010 legislative initiatives.
- Installed two solar charging systems for plug-in hybrid cars that is part of HourCar, a local non-profit's car sharing program in order to showcase emerging opportunities.
- Commissioned Net Metering "White" Paper providing an overview national trends and best management opportunities for Minnesota.
- Sponsored solar trainings for regulators, local government officials and solar instructors.
- Creating a solar resource mapping process to proactively identify where solar energy opportunities can be incorporated into new development and redevelopment, such as along the Energy Innovation Corridor.
- Developed a real-time solar evaluation model to more accurately predict the value of solar energy for end-users and utilities.

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FIGURE 2: MINNEAPOLIS - SAINT PAUL SOLAR IN CITIES INITIATIVE

SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations

Before approval and issuance of permit(s) for solar thermal/photovoltaic energy installations, applicant shall submit the following minimum information. Required drawings shall be scaled and dimensioned, readable, and legible. Additional information may be requested for the building permit.

In addition to the building permit, an electrical permit will be required. Electrical permits are issued by the State of Minnesota, Department of Labor and Industry's Electrical Division. For more information, call (651) 284-5026 or go to http://www.dli.mn.gov/CCLD/etrakit_electrical.asp. Further permitting may be required.

Building integrated solar installations, where the solar collector replaces or substitutes for an architectural or structural component of a building, such as a roof, shingle, or awning, do not require completion of this checklist separately from the permit application for the building, structure, or building modification.

Please provide the following information:

GENERAL INFORMATION

1. A fully completed building permit application, providing the following information:
 - Project address
 - Owner's name, address, phone number
 - Plan preparer's name, address, phone number
 - Description of proposed work, including both solar equipment installation and all associated construction
2. Contractor's name and license: _____
3. Name of installation company: _____
4. System information
 - a. For electric (photovoltaic) systems:
 - System's kW rating (DC): _____
 - System designation: (circle one) inter-tie stand alone
 - Does the system include battery backup or an uninterrupted power supply (UPS)?
 - (circle one) Yes No
 - If Yes, give the number, size and location of the batteries: _____
 - b. Minnesota Rules (1325.1100 Solar Energy, Supb. 5a. Certification) states that solar collectors sold, offered for sale, or installed in the state must bear a Solar Rating and Certification Corporation (SRCC) certification seal evidencing the manufacturer's compliance with the design, reliability, durability, safety, operation, servicing, installation, and manual criteria contained in the Operation Guidelines and Standards in the Minnesota State Building Code (Documents OG-100, OG-300-95, and Standard OG-100-86) and must provide every prospective buyer with a copy of the certification award issued by the SRCC (<https://www.revisor.mn.gov/rules/?id=1325.1100>). The SRCC is part of the International Code Council (ICC). For more information about their certification programs or directory of certified products, visit <http://www.solar-rating.org/about/purpose.html>.
Is the system SRCC certified? The inspector will look for this seal onsite.
(circle one) Yes No

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FIGURE 3: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 1

SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations

ROOFTOP SOLAR INSTALLATIONS

1. Roof type: (circle one) Flat roof (nominal pitch) Sloped; identify pitch: _____
2. Existing roofing type (shingles, tile, metal, ballasted, membrane, etc.): _____
3. Number of roofing layers that will be under panels (no more than 2 layers of roof shingles are allowed): _____
4. Age and condition of roofing material: _____
Has the homeowner been made aware of the lifespans of the existing roof and a new solar installation?
(circle one) Yes No
5. Is the equipment to be **flush-mounted** to the roof (such that the collector surface is parallel to the roof)?
(circle one) Yes No
If Yes,
 - a. Does the roof structure use 2x4 or larger rafters, spaced no wider than 24 inches on center?
(circle one) Yes No
 If No, (i.e. if **non-flush-mounted**)
 - a. Is the finished pitch of the collector at or less than a 12/12 pitch?
(circle one) Yes No
 - b. Is the collector or racking system fastened to the roof within one foot of the roof peak?
(circle one) Yes No
 - c. Is the collector or racking system fastened to each rafter passing under the collector? (circle one)
Yes No
 - d. And, is the horizontal span (roof span dimension) of the rafter less than 7.75 feet for 2X4 rafters or 11.5 feet for 2X6 rafters?
(circle one) Yes No
6. Roof decking and structural supports should all be in good condition without visible roof sag/deflection. Is the roof structure in good condition, having no visible sag, cracking or splintering of rafters, or other potential structural defects? (circle one) Yes No
 - Provide photos showing the condition of the roof structure (rafters in the attic space), if accessible.
- or -
 - Provide exterior photos, showing a side view of the roof, if accessible.
7. If the answer is "No" for any parts to questions 5 through 6 above, provide a study or statement regarding the proposed solar installation and all proposed structural modifications as required and approved (stamped) by a Minnesota licensed/certified structural engineer.
 - Provide construction plans denoting the roof structure and any modifications to the structure if required, as well as the method of installation of solar collector on the subject property.
- or -
 - Provide a letter from the engineer, specifically addressing the subject property, explaining its roof structure, any required modifications, as well as method of installation of the solar collector on subject property.

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FIGURE 4: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 2

SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations

Required Drawings and Plans: (See next three pages for examples.)

8. Building cross section detail (see example) with complete notation of method of fastening equipment to the roof of the subject property, including the following details:
- Identification of rafter size, spacing, and span dimension
 - Approximation of roof slope
 - Identification of style, diameter, length of embedment of bolts (i.e. 5/16th lags with minimum 3" embedment into framing, blocking, or bracing.)

Is the system to be mounted according to panel and rack manufacturer's instructions?

(circle one) Yes No

If No, explain and attach explanation if more space is need.

9. Elevation of structure illustrating the appearance of the proposed solar installation (see example) indicating the finished height of the system above roof surface.
10. Site plan indicating the buildings and features of the property (see example). The site plan shall show the following:
- Property line locations
 - Location of all structures
 - Setback from property lines
 - Location of solar panel installations
 - Solar panel setback dimension from the peak and all edges of the roof. (To avoid turbulence and uplift, the suggested set back from edges/ridges is 2" per 1" lift from roof surface. E.g., for an array which is mounted 4" off the roof surface, there would be an 8" setback.)
 - Main service location
 - Solar easement across adjoining properties (if applicable)

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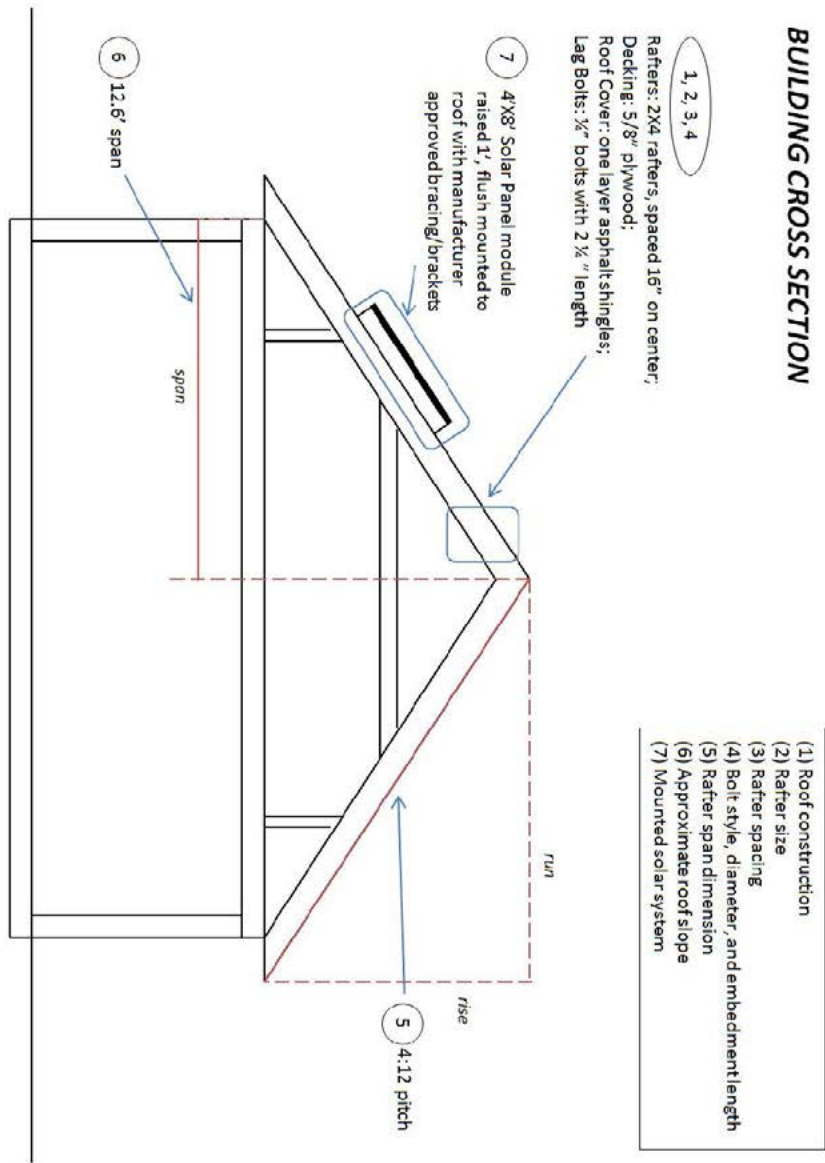
FIGURE 5: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 3

SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations



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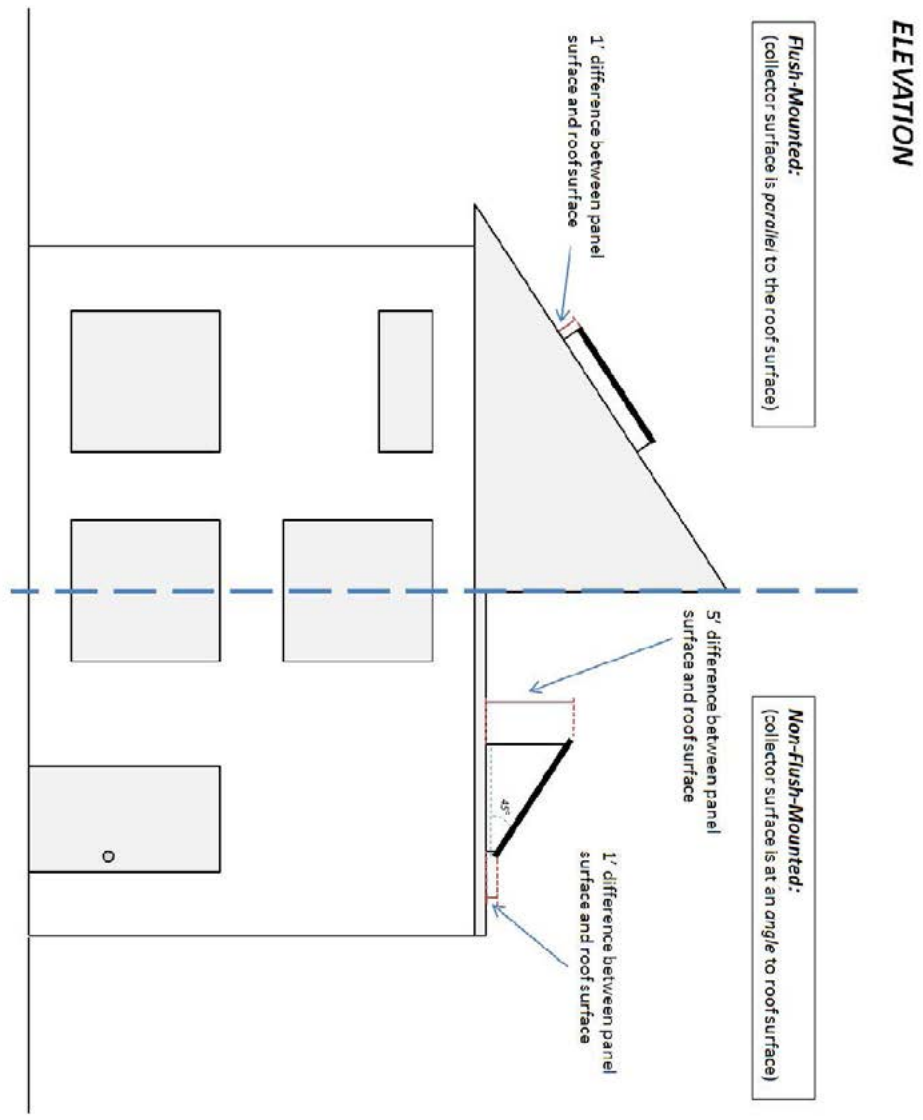
FIGURE 6: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 4

SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations



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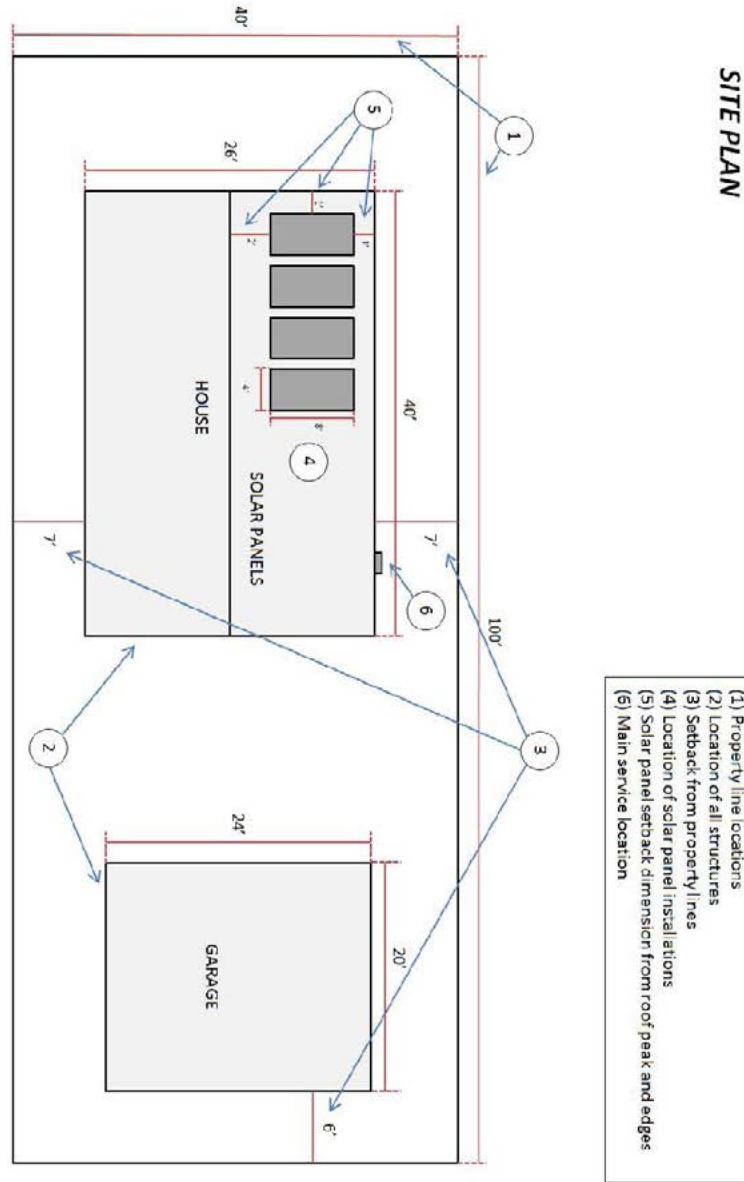
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FIGURE 7: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 5
SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations



- (1) Property line locations
- (2) Location of all structures
- (3) Setback from property lines
- (4) Location of solar panel installations
- (5) Solar panel setback dimension from roof peak and edges
- (6) Main service location

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FIGURE 8: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 6

SOURCE: CITY OF MINNEAPOLIS

SUPPLEMENTAL INFORMATION SOLAR RESOURCE DEVELOPMENT



Permit Applicant Checklist for Residential Solar Energy Installations

GROUND SOLAR INSTALLATIONS

For **ground-mounted solar energy systems**, the installation must meet property line setback standards for solar accessory structures, as identified in the Minneapolis Zoning Code: Title 20, Chapter 535 – Regulations of General Applicability, Article XII – Solar Energy Systems, 535.820-870 (www.municode.com/library/mn/minneapolis/codes/code_of_ordinances).

Required Drawings and Plans: (See previous examples.)

1. Elevation of structure illustrating the appearance of the proposed solar installation (see example) indicating the finished height of the system above ground.
2. Site plan indicating the buildings and features of the property (see example). The site plan shall show the following:
 - Property line locations
 - Location of all structures
 - Setback from property lines
 - Location of panel installations
 - Main service location
3. Property lines and setbacks are required to be verified.
 - Provide a completed survey.
 - or -
 - Denote *property pins* on site plan, as located by homeowner or contractor.

HERITAGE PRESERVATION

Exterior work, including installation of solar systems, within city designation heritage preservation sites and districts is subject to additional review and approval by administrative staff or the Heritage Preservation Commission prior to the issuance of city permits. For a city map showing individual sites and district boundaries go to the city website (www.ci.minneapolis.mn.us/hpc/landmarks/). You may also search a specific address by using "property look-up" at www.ci.minneapolis.mn.us/propertyinfo/.

1. Is the installation address within a heritage preservation district, or on a landmark property or building?
(circle one) Yes No

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FIGURE 9: RESIDENTIAL SOLAR ENERGY INSTALLATIONS PERMIT PAGE 7

SOURCE: CITY OF MINNEAPOLIS