



Carroll County Environmental Advisory Council (EAC)

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SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS FINDINGS AND RECOMMENDATION TO BOARD OF COUNTY COMMISSIONERS

Background

In October 2015, Commissioner Dennis Frazier requested that staff review the maximum size requirements for solar energy conversion facilities in the residential zoning districts and provide a recommendation if warranted. His concern was that the size was not sufficient enough to contribute significantly to the homeowners' power needs. The County Administrator then directed the project to the Environmental Advisory Council (EAC) to be added to the EAC's 2016 Work Plan.



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The EAC members reviewed the proposed project at the January 21, 2016, annual joint meeting between the Board and the EAC. Commissioner Rothschild requested that the EAC, in preparing a recommendation, consider several factors that he indicated had been of importance to the Planning Commission during the drafting, review, and adoption process for the original requirements in 2013. These factors included:

1. *Aesthetics*. The Planning Commission felt that the ground-mounted systems looked like a billboard in the yard.
2. *Setbacks*. Ground-mounted solar systems should be closer to the house that is installing them than to the neighbor's house.
3. *Solar Access*. Whose rights prevail if a neighbor blocks the sun?

Currently, §158.153 Solar Energy Conversion Facilities, of the Carroll County Code of Public Local Laws, permits a maximum surface area of 120 square feet in all residential districts for ground-mounted systems. Ground-mounted systems are subject to the same five-foot setback requirements in the side and rear yard as other accessory uses, with a maximum height of 10 feet above grade. The maximum surface area for roof-mounted systems is limited to the size of the roof. Wall-mounted systems are not addressed. Additional safety and building code

restrictions apply, which may impact size as well, particularly for roof-mounted systems. The request to revisit the size requirements primarily concerns ground-mounted systems, as roof-mounted systems are not subject to the 120-square-foot maximum.

Options for Solar Surface Area Requirements in Residential Districts

Jurisdictions across Maryland and across the country take varying approaches to prescribing the maximum surface area permitted for solar facilities in residential districts. Solar facilities in residential districts can be ground-mounted (or “freestanding”), roof-mounted, or building/wall-mounted. Wall-mounted systems are less common, but some jurisdictions allow solar facilities to be mounted on the sides of buildings. Carroll County’s zoning code currently does not specifically permit wall-mounted systems. Some jurisdictions address roof-mounted and wall-mounted systems as one under the heading of “attached” systems.

Setting the maximum allowable surface area is most commonly considered within the context of the impacts on aesthetics, impervious area, and safety. Generally, the maximum, or minimum, area or disturbance zone of the system is measured in acres, square feet, percentage of lot coverage, or percentage of the primary structure’s footprint, depending on the type and location of the system. Other bulk requirements or standards within the zoning code may contribute to the maximum size limit as well, such as setbacks and height limitations.

The following are basic descriptions of the most common options used by other jurisdictions.

Maximum Based on Roof Area: The maximum size of a roof-mounted system may also be based on a percentage of the size of the roof area. Some jurisdictions base the calculation on the entire roof area; others base the calculation only on the south-facing roof surface. Carroll County currently uses this approach for roof-mounted systems, with the roof area including the entire roof of the principal residence as well as any accessory buildings.

Fixed Maximum: The maximum square footage of surface area remains the same regardless of lot size, zoning district, or building area or regardless whether the system is ground-mounted or roof-mounted. Carroll County currently uses this approach for ground-mounted systems, with 120 square feet as the maximum surface area in residential districts, including the Conservation Zoning District.

Maximum Based on Footprint of Principal Building: The maximum allowable size of the system is a percentage of the footprint of the principal building on the property. With this option, often the maximum is set as a percentage of the footprint or a fixed amount, whichever is greater. This approach is most often applied to freestanding or ground-mounted systems.

No Maximum: Many jurisdictions either do not address surface area size at all for roof-mounted (“attached”) systems, or specifically include text to indicate there is no surface area

EAC SCOPE: SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS

APRIL 2016

size limitation. Some jurisdictions also omit maximums for ground-mounted systems as well, leaving setbacks, height requirements, and other bulk requirements to restrict size of the system.

Maximum Based on Lot Size: A percentage of the lot area serves as the basis for prescribing the maximum surface area in some jurisdictions. Generally, this is applied to ground-mounted systems, rather than roof-mounted. Other jurisdictions prohibit the surface area from exceeding the maximum lot coverage standard of the applicable zoning district.

Hybrid: Many jurisdictions apply different requirements to ground-mounted systems than roof-mounted systems, using some combination of the above options. Most often a surface size limit is set on ground-mounted systems, but the roof-mounted systems are limited only by setbacks.

Additional Conditions:

Additional restrictions can be placed on systems that have the effect of restricting size. Most jurisdictions apply several or all of these restrictions.

- **Setbacks:** The limiting setbacks on roof-mounted systems are often prohibited from extending beyond the edge of the roof, or must be no closer than one foot from the edge of the roof. For ground-mounted systems, setbacks from property lines or buildings may also limit the size of the system.
- **Safety:** Many jurisdictions require demonstration or certification that the roof can safely support the weight of the solar system. The system may be restricted to a smaller area than the surface area of the roof if the roof cannot support the weight of a system that covers the entire roof. Carroll County currently addresses these requirements through the building and electrical codes.
- **Screening:** Ground-mounted systems may be required to be screened. This may apply only to certain types of adjoining uses, or it may apply to any adjoining use. Space used for screening may reduce the space available, and, therefore, the size, of a ground-mounted system.
- **Height Limit:** Many jurisdictions apply height limits to roof-mounted systems. Often these systems are required to be flush with the roof if the roof is sloped. However, many jurisdictions apply different requirements to flat roofs. Most jurisdictions apply height-limits to ground-mounted systems, particularly to ensure they do not exceed the maximum height limit of the residential zoning district. Carroll County currently limits the height of ground-mounted systems to ten feet above grade and roof-mounted systems to 10 feet above the highest point of the principal structure.

Findings

The request to revisit the size requirements primarily concerns ground-mounted systems, as roof-mounted systems are not subject to the 120-square-foot maximum. However, the EAC took a holistic approach in reviewing size needs and requirements.

The EAC members researched, reviewed, and discussed the various approaches used by other Maryland counties. Requirements could not be found for several Maryland counties. To ensure a wider range of options were reviewed, options for approaching surface area requirements for solar facilities in residential areas in other parts of the country were reviewed as well. Several Maryland counties were contacted directly by phone to inquire about the effectiveness of those counties' requirements, if there had been any feedback from the community, and if there were any planned revisions.

The EAC agreed at the start that addressing the issue of aesthetics was a primary concern, which took precedence over the amount of electricity generated or needed by the homeowner. However, some balance was needed to address aesthetics while still providing additional energy generation. Consensus also was reached that the requirements should not be overly complicated. The requirements should be easy for a property owner to understand and easy to administer and enforce, particularly without having to add staff.

The importance of generating enough electricity to power the house as a consideration was discussed. However, the surface area of the systems is not a reliable indication of the capacity of the systems to meet this expectation. There are too many variables, such as system technology, size of house, size of household, other potential energy sources to the home (such as natural gas, propane, geothermal) that also provide power, and occupant habits and conservation measures. In addition, the house would need a storage system, which would be an additional cost, to be able to use the generated electricity 24 hours a day, as the sun is not out 24 hours a day. Although evaluating possible increased surface area maximums for solar systems in residential districts, the EAC did not determine to actually base the maximum solar surface area on amount of electricity needed.

The following described the EAC's discussion and conclusions regarding the possible options for approaches to setting the maximum, as well as other associated provisions.

Maximum Based on Roof Area: Carroll County currently uses this approach for roof-mounted systems, with the roof area including the entire roof of the principal residence as well as any accessory buildings. Using the entire roof area provides the homeowner with the opportunity to generate a greater amount of electricity for the needs of the household without as much visual impact to the property and neighbors as a ground-mounted system. In most cases, only the portion of the roof that faces south will actually be used. As the concerns over the

EAC SCOPE: SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS

APRIL 2016

aesthetic impact primarily apply to ground-mounted systems, the EAC did not feel the approach or size requirements needed to be changed for roof-mounted systems.

Fixed Maximum: Carroll County currently uses this approach for ground-mounted systems, with 120 square feet as the maximum surface area in residential districts, including the Conservation Zoning District. The EAC members did not feel that the size should be the same for all properties. Since visual impact was a primary concern, they felt the visual impact may be different for different-sized properties.

Maximum Based on Footprint of Principal Building: The building footprint can be the same for a 1,000-square-foot house as it is for a 2,000- or 3,000-square-foot house if there are multiple stories. That same house could be located on a ¼-acre lot or a 1-acre lot. The size of the house does not necessarily influence the visual impact of ground-mounted systems. Rather, it is the size of the yard that has a greater influence on the proximity of neighbors and visual impact.

No Maximum: Since aesthetics is a priority, the EAC believed that a maximum was needed to address aesthetic impacts to neighbors and adjacent properties.

Maximum Based on Lot Size: The EAC felt that ground-mounted systems on smaller lots have the potential to create more significant visual impacts to neighboring properties than those on larger lots. Therefore, the EAC determined the size of the property should have a bearing on the maximum panel surface area of ground-mounted systems. Several ranges of lot sizes were created for the purpose of applying differing panel surface area maximums. These ranges were loosely based on the minimum lot size associated with the requirements of Carroll County's residential zoning districts. The EAC did not choose to base the maximum surface area on the zoning itself, as not all lots conform to minimum lot size of the zoning district in which they reside; lots are permitted to be larger than the minimum lot size. The 120 square feet currently allowed was deemed appropriate for the smallest size range. The maximum size of each range, which correlated somewhat with the progression of the minimum lot size of the residential zoning districts and roughly doubled each time, progressively doubled as well. Therefore, if a maximum of 120 square feet is permitted on lots ½ acre in size or less, then a maximum of 240 square feet would be permitted in lots greater than ½ acre and up to 1 acre in size, a maximum of 480 square feet would be permitted in lots greater than 1 acre and up to 3 acres in size, and a maximum of half the size of the roof, or roofs of structures, situated on the subject property, would be permitted in lots greater than 3 acres. (The recommended size ranges and associated maximum surface areas are shown in the Recommendations section of this report). Properties over 3 acres would be treated differently. These properties tend to be larger and the visual impact on adjacent properties should be less than smaller lots. The size range of these properties can vary more widely as well. Rather than again doubling the maximum size as was done as the smaller residential properties progressed in size range, however, for properties over 3 acres, the maximum surface area of ground-mounted solar panels would be half the size

EAC SCOPE: SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS

APRIL 2016

of the roof(s). The portion that is ground-mounted would be limited to half the size of the aggregate roof areas.

Hybrid: The approach for the ground- and roof-mounted systems together can be considered a hybrid approach, as the maximum surface area of roof-mounted systems would be addressed and determined differently than ground-mounted systems. Under the EAC's recommendation, a homeowner could install part of the system on the ground and part on the roof, as long as the total square footage does not exceed the aggregate square footage of the roof areas on the property and the portion on the ground does not exceed the maximum prescribed for ground-mounted systems.

Additional Requirements:

The EAC considered additional requirements beyond the maximum surface area of the solar panels as these factors may also affect the aesthetics and the maximum size that can be achieved. Most jurisdictions apply several or all of these restrictions.

- **Setbacks:** For ground-mounted systems, setbacks from property lines or buildings may also limit the size of the system. Carroll County currently requires a minimum setback of 5 feet from the rear and side lot lines and prohibits ground-mounted solar systems in the front yard. The EAC did not propose to change this. However, they recommended no variance to the setbacks be allowed and clarified that no portion of the system would be allowed in the setback.
- **Safety:** Carroll County's Code already contains requirements related to the safety of the system, many of which are included in the building and electrical codes rather than Chapter 158. The EAC did not propose changes.
- **Screening:** Ground-mounted systems may be required to be screened. However, the EAC chose not to require screening, as this could impact the solar access as well.
- **Height Limit:** The maximum height for ground-mounted systems in Carroll County currently is 10 feet from grade, or 10 feet from the highest point of the principal structure if roof-mounted. The EAC felt this was appropriate and did not propose to make a change to either.
- **Appearance:** Carroll County currently places additional requirements on appearance in residential zones, as follows. The EAC proposed only to add clarification to the glare criteria. The additional criterion is meant to prevent glare from becoming a nuisance or hazard, rather than trying to enforce action to correct it after the fact.
 1. Color must remain as it was originally provided by the manufacturer, or match the exterior of the principal structure.
 2. No signs other than the manufacturer's, or installer's identification, appropriate warning signs; and not more than two manufacturers' signs may be on the system.
 3. Glare must be mitigated away from an adjoining property or adjacent road, **which shall be certified by the solar installer prior to installation** ~~when it creates a nuisance or hazard.~~
 4. The system cannot unreasonably interfere with the view of, or from, a site of significant public interest (scenic road, historic resources, etc.).

EAC SCOPE: SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS
APRIL 2016

5. Ground-mounted systems may not be affixed to a block wall or a fence.” [§158.153(B)(5)(b)]
- **Solar Access:** The EAC found that some jurisdictions, including Washington County, include a “buyer beware” provision that places the responsibility to address this issue directly with the property owner. The provision does not require a solar easement but indicates that the property owner acts at their own risk if they do not negotiate with a neighbor and secure an easement. The EAC has proposed language to include such a provision.

Other:

Some jurisdictions allow wall-mounted systems. Carroll County is not well-situated for taking advantage of wall-mounted systems. Generally, to be efficient and most effective, these systems need to be used in more northern latitudes where the sun angle is less. Given this, and in the interest of keeping the interpretation and administration/enforcement of the requirements simple, the EAC proposed to remove any ambiguity and explicitly prohibit wall-mounted systems.

Recommendations

Based on its research, discussion, and findings, the EAC offers the following recommendations related to the maximum surface area of solar panels in the R (Residential) and C (Conservation) Districts. The proposed change is shown in the right-hand column, with new or added text being shown in brown.

	Current Requirement	Proposed Change										
Maximum Surface Area of Solar Panels: Roof-Mounted	The physical size of the system shall be limited to the size of the roof, when roof mounted.	The physical size of the system shall be limited to the size of the roof, or roofs of structures, situated on the subject property, when roof mounted. [Note: This includes accessory structures.]										
Maximum Surface Area of Solar Panels: Ground-Mounted	The physical size of the system shall... no larger than 120 square feet when ground mounted.	Ground-mounted systems shall be no larger than the square footage of the solar panel surface area allowed based on the size of the lot as shown below.										
		<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 50%;">Lot Size</th> <th style="width: 50%;">Solar Panel Surface Area Maximum Square Footage for Ground-Mounted Systems</th> </tr> </thead> <tbody> <tr> <td>Less than or equal to ½ acre</td> <td>120 square feet</td> </tr> <tr> <td>More than ½ acre to 1 acre</td> <td>240 square feet</td> </tr> <tr> <td>More than 1 acre to 3 acres</td> <td>480 square feet</td> </tr> <tr> <td>More than 3 acres</td> <td>½ the size of the footprint of all structures, situated on the subject property <i>(revised per text clarification 8/4)</i></td> </tr> </tbody> </table>	Lot Size	Solar Panel Surface Area Maximum Square Footage for Ground-Mounted Systems	Less than or equal to ½ acre	120 square feet	More than ½ acre to 1 acre	240 square feet	More than 1 acre to 3 acres	480 square feet	More than 3 acres	½ the size of the footprint of all structures, situated on the subject property <i>(revised per text clarification 8/4)</i>
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EAC SCOPE: SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS
APRIL 2016

	Current Requirement	Proposed Change
Maximum Surface Area of Solar Panels: <i>Wall-Mounted</i>	Not mentioned.	Wall-mounted systems are not permitted.
Maximum Surface Area of Solar Panels: <i>Aggregate</i>	Not mentioned.	In the event that a combination of roof-mounted and ground-mounted systems is utilized, the total area cannot exceed the aggregate square footage of the roof areas on the property on which the system is installed on lots that are 3 acres or less in size. On lots more than 3 acres, the total area cannot exceed 1½ times the aggregate square footage of the roof areas on the property on which the system is installed.
Setbacks	Ground mounted facilities shall satisfy the minimum side and rear yard setback requirements for the district in which the use is situated. No such facility shall be located within a front yard in any district.	Ground mounted facilities shall satisfy the minimum side and rear yard setback requirements for the district in which the use is situated. No portion of such facility shall be located within a front yard in any district.
Variance	Not mentioned.	No variance or waiver to the size or setback requirements of the ground-mounted system is allowed.
Height	No portion of the system shall extend more than ten feet from the highest portion of the principal structure to which it is attached. The total height of the building, including all portions of the solar facility, shall comply with the height regulations as set forth in the bulk requirements for the individual district in which the use is proposed. Ground mounted systems may not exceed a total height often feet above existing grade.	No change.
Solar Access	Not mentioned.	A property owner who has installed or intends to install a solar energy conversion facility shall be responsible for negotiating with adjacent property owners for any necessary solar easement and shall record the easement with the Clerk of the Court. A property owner who fails to secure an easement for the receipt of solar energy acts at their own peril.

EAC SCOPE: SOLAR SURFACE AREA REQUIREMENTS IN RESIDENTIAL DISTRICTS
APRIL 2016

	Current Requirement	Proposed Change
Glare	Glare must be mitigated away from an adjoining property or adjacent road when it creates a nuisance or hazard.	Glare must be mitigated away from an adjoining property or adjacent road when it creates a nuisance or hazard , which shall be certified by the solar installer prior to installation.

Process/Next Steps

The EAC approved this report at the April 20, 2016, meeting and directed staff to transmit the report to the Board. Staff will draft Code revisions to reflect these recommendations and provide the draft to the Board with the report. The EAC will present the report to the Board. The Board may give direction regarding desired revisions or additional issues to address at that time. The EAC then will shepherd the process to move the amendment through to public hearing at the approval of the Board, as follows.

1. Transmit findings and recommendations report to Board with text of proposed Code amendment
2. Present findings and recommendations report to Board in open session
3. Present proposed Code amendment to Planning Commission
4. Request approval from Board to proceed to public hearing