

**Commercial Solar Collection Facilities on
Agricultural Land in Baltimore County:
Recommendations to the Baltimore County Council
From CEQ**



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EXECUTIVE SUMMARY

Baltimore County Councilman Wade Kach asked the Baltimore County Commission on Environmental Quality (CEQ) to analyze and comment on Bill 89-16: Commercial Solar Facilities. In addition, the Councilman asked questions and expressed concerns about how the County's rural areas will incorporate commercial solar collection facilities without losing their traditional character.

In response, the CEQ has written this report to address his questions and concerns, and the potential ecological impacts of commercial solar facilities on farms in Baltimore County. The report briefly defines and describes commercial solar collection facilities, lists key questions that the County should consider, suggests additions to the bill (i.e., in the permitting and review processes, siting, construction, operation and maintenance, and decommissioning of commercial solar collection facilities), and recommends actions that will ensure that environmental and other impacts are considered as commercial solar collection facilities are reviewed and developed in Baltimore County.

1.0 Introduction

Provision for new solar electrical generation capability helps local and state governments meet the need to replace carbon-based energy sources with renewable energy, while reducing energy costs and providing benefits to the local economy. Power generated by solar panels is clean and does not emit harmful substances into the environment (e.g., CO₂, NO_x, lead, particles, etc.). Solar panels generate power during the day when electrical demand is higher. Solar power generation is distributed and decentralized (i.e., produced closer to where the electricity is consumed), reducing the need for large transmission systems. However, these environmental and economic benefits should not conflict with measures to protect land, air, water, and biodiversity, and should not lead to increased clearing of forest, or loss of wetland or productive agricultural land. Therefore, the measures suggested in this report and the language proposed for the bill are intended to promote the use of agricultural land that is already less productive and whose conversion to solar photovoltaic electrical generation does not threaten habitat, water quality, or sensitive ecosystems.

Mandates from the State

Under existing legislation, Maryland utilities will be required to generate 20% of electricity annually from non-hydro renewables, including 2% from photovoltaic by 2022. In 2016 so far, Maryland has secured 13.4% of its electricity from non-hydro renewable energy, including 0.7% from solar photovoltaic.

2.0 Definitions and Descriptions

2.1 Commercial Solar Collection Facilities

Commercial, grid-tied, ground-mounted photovoltaic electrical generation systems are commonly called solar farms. The difference between a solar farm and roof-top solar is that the commercial solar farms are connected directly to the electrical grid like a traditional power generation plant. A rooftop solar installation is designed to provide power to the building that it is installed on. Ground-mounted solar panels can also provide power for on-site farms or business use, without being tied to the electrical grid. The commercial solar collection facilities addressed in Bill 89-16 are grid-tied.

The utility measures the power produced and pays the system owner for the power. In the case of the proposed bill in Baltimore County, the solar collection system owner leases the land from the farmer or landowner. The approximate amount of the lease is \$1000/acre annually. Current technology allows for about 2 megawatts on a 15-acre flat site. This will produce enough electricity to provide power to 150 to 200 "typical" homes in Maryland.

The simplest description of a commercial solar farm is:

1. Solar panels collect the energy from the sun and convert it to DC (direct current) electricity.



(Installation of typical ground-mounted solar panels in Middletown, Maryland)

- The leading edge of the panels is 2–3 feet off the ground; this height varies with terrain. The panel size varies by manufacturer and panel capacity. The dimensions of the panels in the picture above is 77”x39”. The maximum height of the panels from the ground above is approximately 7 feet; this height varies with terrain.
2. An inverter changes the DC electricity to AC (alternating current) electricity. There are usually multiple inverters at a solar collection facility.
 3. A transformer increases the voltage to the grid voltage.



(Typical inverter)



(Typical transformer)

2.2 Regulating Agencies

Electrical generation is a highly-regulated industry. Any commercial solar collection facility in Baltimore County will be regulated accordingly. The Federal Energy Regulatory Commission (FERC) is responsible for the interstate sale and transmission of electricity and natural gas on a national level. PJM Interconnection (PJM) is a regional transmission authority that is authorized by FERC to manage the production and distribution of electricity in the PJM area. The Public Service Commission of Maryland is responsible for approving electrical generation and transmission lines in Maryland. The local utility also has oversight of solar installations.

2.3 Agriculture in Baltimore County

Agricultural products grown in Baltimore County generated over \$76M in revenue in 2012 (the last year data are available). This represents the activity of 640 farms covering 70,419 acres. However, from 2007 to 2012, the number of farms declined 15% and the acres in farmland decreased by 10%. In addition, during that period, the average farm size increased by 6% and average government payments to farms increased 66% (Appendix A for US Department of Agriculture data). The goal is to maintain productive agriculture activities in Maryland, and installation of commercial solar can facilitate that goal. This leads to the following questions about managing these solar facilities for win-win outcomes.

3.0 Key Questions about Commercial Solar Collection Facilities in Baltimore County

1. How can Baltimore County protect and conserve the biodiversity and natural systems of the County while supporting development of solar power as a cleaner, safer alternative to traditional fossil fuels and nuclear energy?
2. How can the County minimize the loss or degradation of forests in the County as they encourage the development of solar power sources?
3. How can the County conserve its agricultural land base while establishing commercial solar collection facilities? How much agricultural land in the County should be converted to commercial solar collection facilities?
4. How can the County protect the existing character of rural areas while supporting the development of commercial solar collection facilities?
5. What are the best places to locate commercial solar collection facilities in the County? How can the County direct the development of commercial solar collection facilities toward those places?
6. How can the County support farmers and farm economic viability?

4.0 Recommendations for addition to Bill 89-16

Following a review of the proposed bill and comparing with approaches taken in other jurisdictions, the CEQ offers recommendations in the main phases of development of commercial solar facilities including: permitting, siting, construction, operation and maintenance, and decommissioning, presented in that order below.

4.1 Permitting and Review of Commercial Solar Facilities

Add to Bill 89-16:

1. The development of a solar facility that is directly grid-tied shall be considered ‘commercial.’
2. The development of a commercial solar facility that is directly grid-tied shall be considered a ‘special exception’ to the zoning law/code, triggering the special exception review process.
3. The development of a directly grid-tied commercial solar facility that is on agricultural land shall be considered a ‘building,’ thereby triggering the building permit review process.
4. The special exceptions and the building permit review processes shall consider the potential negative impacts on the following during construction, operation, maintenance, upgrading, and decommissioning of the commercial solar collection facility: **soil, ground water and surface water, biodiversity of wildlife, plants, and forests.**
5. Applications and reviews of applications for commercial solar collection facilities shall include a review of the soil conservation plan of the potential solar facility site.
6. Applications and reviews of applications for commercial solar collection facilities shall include a summary of anticipated ecological benefits and impacts.
7. Farm owners whose primary acreage participates in the Baltimore County Agricultural Land Preservation Program shall receive special consideration for Commercial Solar Collection facilities on smaller, less productive lots that do not qualify for this program.

4.2 Siting of Commercial Solar Collection Facilities

Add to Bill 89-16:

1. The commercial solar facilities shall be well-located, avoiding: prime agricultural land (with consideration of soil conservation plan (Appendix B), soil classification, and slope). The commercial solar collection facilities shall not be located in agricultural land that meets the criteria of productivity and location of the MD Agricultural Land Preservation Program. (Appendix C – Guidelines for Maryland Agricultural Land Preservation Program, pp. 2–3). The commercial solar collection facilities shall not be located in larger acreage parcels bordering land in preservation programs.
2. The commercial solar facilities shall be well-located, minimizing impacts on wildlife habitat and corridors.
3. The land on which a commercial solar facility is proposed shall not be in wetlands, wetland buffers, flood plains, forest buffers, Critical Areas, Conservation Reserve Program areas, Rural Legacy lands (Appendix H), and other environmentally sensitive or protected areas (i.e., forest; stream buffers; habitats of rare/threatened/endangered plants and wildlife).
4. The commercial solar collection facility shall be sited with enough setback from existing forest so that no trees are cut for shading or other reasons.
5. The land on which a commercial solar facility is proposed shall not be in dedicated open space or within view of County scenic roads.
6. The land on which a commercial solar facility is proposed shall not be over septic systems, sewer lines, or wells.
7. The commercial solar collection facilities shall be well-located, with access to transmission lines.

4.3 Construction of Commercial Solar Collection Facilities

Add to Bill 89-16:

1. Construction of the solar facility shall minimize the clearing of ground cover vegetation, and the grading and compaction of soil.
2. Construction of the solar facility shall minimize the clearing of trees.
3. Construction of the solar facility shall minimize sediment, runoff, and contamination by chemicals from the construction process. The owners/operators shall implement an erosion and sediment control plan.
4. The fencing around the solar facility shall: 1. provide adequate security; 2. be visually buffered by plantings of native plants; and 3. be raised off the ground by ~4–6 inches to provide passage for small animals.

4.4 Operation and Maintenance of Commercial Solar Collection Facilities

Add to Bill 89-16:

1. The owners/operators shall maintain cover vegetation (i.e., grass; crops; low-lying native plants) under and around the solar panels to minimize soil erosion.
2. The owners/operators shall use grazing animals or monitor and mow vegetation to decrease the introduction and spread of invasive species, and to protect any rare or protected species.
3. In order to minimize impacts on wildlife habitat and corridors and to maintain connectivity between wildlife habitats, the owners/operators shall: time the mowing of plants on the site to avoid breeding and migration times of amphibians, birds, reptiles, and mammals; and minimize soil and vegetation disturbance during operation and maintenance activities.
4. The operation and maintenance of the commercial solar collection facility shall minimize sediment, runoff, and contamination by chemicals, including herbicides, pesticides, and other hazardous chemicals. The owners/operators shall regularly monitor and inspect any chemical containment areas around transformers to minimize contamination.
5. If technology changes so that replacement or upgrade of the panels or equipment becomes necessary, these changes shall be subject to review by the Baltimore County Department of Protection and Sustainability.

4.5 Decommissioning of the Commercial Solar Collection Facility

Add to Bill 89-16:

1. Once the facility reaches the end of its lifespan, the commercial solar collection facility land shall be returned to conditions suitable for agricultural use following the decommissioning.
2. The decommissioning of commercial solar collection facilities shall minimize soil and vegetation disturbance during decommissioning activities.
3. The solar panels and fencing materials shall be reused or recycled as appropriate after the decommissioning of the commercial solar collection facility.
4. The owners of the commercial solar collection facility shall post a bond to ensure return of the land to conditions suitable for agricultural use, as well as solar panel recycling.

4.6 Other additions to Bill 89-16:

1. In recognition of the concern about the amount of agricultural land converted to commercial solar collection facilities in the County, as well as the anticipated evolution of the solar power industry, Baltimore County shall reconsider this bill in five years. The Department of Planning and the Department of the Environmental Protection and Sustainability shall conduct the review and make recommendations to the County Council.

5.0 Additional Recommendations for Baltimore County

The CEQ recommends that Baltimore County:

1. Develop an energy policy for the County that sets goals and strategies for developing renewable energy sources. Involve relevant County Departments (i.e., Department of Environmental Protection and Sustainability and the Department of Planning) and the public. Consider policy developed by other government entities. (See Bibliography of this document.) For example, “large-scale solar PV arrays should...ideally be guided toward previously developed or contaminated land; industrial land and its margins; and adjacent major transport corridors...Land classified as the best and most versatile agricultural land should be avoided.” (www.southsomerset.gov.uk/media/406143/ssdc_pv_guidance_2011.pdf)
2. Conduct a County-wide evaluation of land to determine ideal suitability for development as Commercial Solar Collection facilities (i.e., including proximity to transmission lines, solar radiation analysis, productivity of agricultural land, potential environmental impacts; avoiding excluded lands as described in this document).
3. Develop guidelines and goals for how much agricultural land should ultimately be converted to commercial solar collection facilities (i.e., acreage or percent) in the County.

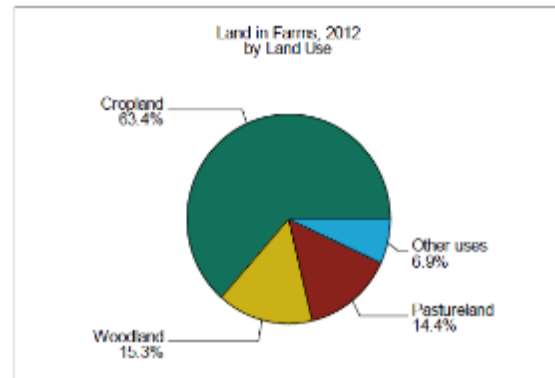
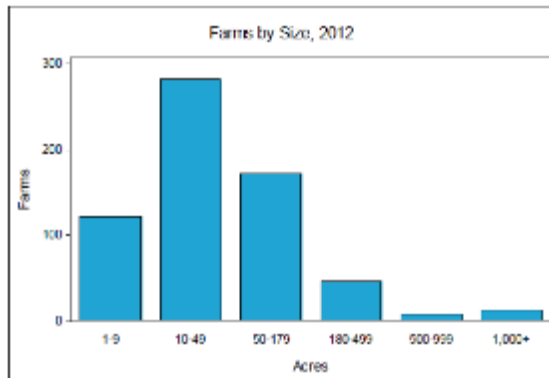
We encourage the Baltimore County Council to:

1. Seek the guidance from the Department of Environmental Protection and Sustainability and the Department of Planning when developing future bills that include environmental impacts and planning and zoning issues.
2. Continue to use the CEQ as a resource when it faces issues with environmental impacts, early in the process when possible.

APPENDICES

Appendix A – Baltimore County Farm Statistics

	2012	2007	% change
Number of Farms	640	751	- 15
Land in Farms	70,419 acres	78,282 acres	- 10
Average Size of Farm	110 acres	104 acres	+ 6
Market Value of Products Sold	\$76,306,000	\$68,423,000	+ 12
Crop Sales \$67,632,000 (89 percent)			
Livestock Sales \$8,675,000 (11 percent)			
Average Per Farm	\$119,229	\$91,109	+ 31
Government Payments	\$840,000	\$541,000	+ 55
Average Per Farm Receiving Payments	\$7,182	\$4,325	+ 66





US Department of Agriculture
 National Agricultural Statistics Service
 www.agcensus.usda.gov

www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Maryland/cp24005.pdf

Appendix B – Baltimore County Soil Conservation Plan

www.bcsed.org/conservation-plans

Soil Conservation Plans typically include the following:

- A. An aerial photograph, map or diagram of the farm;
- B. An inventory of natural resources on the property;
- C. A soil map showing the type and location of soils on the farm
- D. A list of management decisions, agreed upon Best Management Practices (BMPs) and an implementation schedule.
- E. An operation and maintenance plan for installed BMPs
- F. Additional information on soil loss, seeding, tillage and fertilization may also be included.

Best Management Practices on Agricultural Lands - www.bcsed.org/ag-publications

This guide features 26 conservation practices - best management practices (BMPs) that farmers can use to maintain farm production, control soil erosion, manage nutrients and safeguard water quality.

Appendix C – Guidelines for Maryland Agricultural Land Preservation Program – Eligibility Requirements

mda.maryland.gov/malpf/Documents/fact01Eligibility.pdf

Appendix D – Rural Legacy – Description and Maps

dnr2.maryland.gov/land/Pages/RuralLegacy/home.aspx

BIBLIOGRAPHY AND OTHER RESOURCES

Baltimore County Examples

2017 Baltimore County Land Preservation Accomplishments Map

<file:///C:/Users/Owner/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/I20X1R0W/2017%20Baltimore%20County%20Land%20Preservation%20Accomplishments.pdf>

A Citizen's Guide to Baltimore County Planning and Zoning

savefallsroad.org/wp-content/uploads/2012/05/citizensguide.pdf

Baltimore County Zoning Code for Agricultural District

ecode360.com/12101075

Maryland Examples

Forest Conservation Plans

dnr.maryland.gov/forests/Pages/programapps/newfca.aspx

Energy in MD

msa.maryland.gov/msa/mdmanual/01glance/html/energy.html

MD Energy Commission

energy.maryland.gov/Pages/Info/renewable/solar.aspx

Political context of solar in Maryland

thinkprogress.org/job-losses-expected-as-maryland-governor-stuns-solar-industry-with-clean-energy-veto-ad32c03e2a39#.w2lf469tn

Overview of solar installations in Maryland (from the solar collection industry organization):

www.seia.org/state-solar-policy/maryland

Current overview of Solar Farms in Maryland; “Site Concerns Grow As Plans for Solar Farms Continue to Take Root: Temporary Moratoriums in Watershed Set to Develop Rules for Size, Landscapes” by Rona Kobell in *Bay Journal*, November 2016.

www.bayjournal.com/article/site_concerns_grow_as_plans_for_solar_farms_continue_to_take_root

Forest Conservation Plans

dnr.maryland.gov/forests/Pages/programapps/newfca.aspx

Overview of Eastern Shore Solar Farm and a good overview of the issue in Maryland

www.baltimoresun.com/news/maryland/bs-md-renewable-energy-conflict-20161015-story.html

Howard County, MD

An act amending the Howard County Zoning Regulations as generally relating to Commercial Solar Facilities. cc.howardcountymd.gov/LinkClick.aspx?fileticket=elatVtaDBAM%3D&portalid=0

Howard County Solar Collection Facility Bill



Howard County -
Solar Power.pdf

Howard County energy initiatives

www.baltimoresun.com/news/maryland/howard/ellicott-city/ph-ho-cf-political-notebook-1217-20151217-story.html

Howard County zoning regulation amendment request

cc.howardcountymd.gov/LinkClick.aspx?fileticket=XJbwp1kumqk%3D&portalid=0

Council's approval

cc.howardcountymd.gov/LinkClick.aspx?fileticket=xALE7ocJ_Ho%3D&portalid=0

Anne Arundel County: Bill 68-13 – Zoning – Solar Energy Systems

www.aacounty.org/departments/county-council/legislation/bills-and-resolutions/an-ordinance-concerning-zoning---solar-energy-systems

Frederick County

www.fredericknewspost.com/news/environment/ban-fails-to-stop-proposal-for-county-s-largest-solar/article_de92ab13-4954-5fd2-9c4c-eeff8bd296b1.html

Frederick County's temporary hold (January 2016):

www.frederickcountymd.gov/DocumentCenter/View/287652

U.S. Examples

Solar PEIS prepared by the USDOE and USDOJ to assess **environmental impacts** associated with the development and implementation of utility-scale **solar energy development** in six western states (Arizona, California, Colorado, New Mexico, Nevada, and Utah). **Brief, general overview of environmental impacts** (solareis.anl.gov/guide/environment/); **Environmental Impact Statement** (solareis.anl.gov/eis/what/index.cfm); **Solar Energy Development Environmental Considerations** (solareis.anl.gov/guide/environment/)

Environmental impacts from the installation and operation of large-scale solar power plants -

National Photovoltaic Environmental Research Center, Brookhaven National Laboratory – 2011

www.bnl.gov/pv/files/pdf/229_rser_wildlife_2011.pdf

West Tennessee Solar Farm Project – U.S. DOE

www.netl.doe.gov/File%20Library/Library/Environmental%20Assessments/EA-1706.pdf

Brookhaven National Lab – Environmental Assessment for BP Solar Array Project

www.bnl.gov/community/docs/pdf/final%20final%20ea%20-%20bp%20solar%20project.pdf

Final Environmental Assessment – Strata Solar Farm Project McNairy County, TN - Nov 2013

152.87.4.98/environment/reports/strata/Strata_Solar_FEA_Ch1-2.pdf

Environmental Assessment - Marshall Properties Solar Farm – Union County, GA

www.tva.gov/file_source/TVA/Site%20Content/Environment/Environmental%20Stewardship/Environmental%20Reviews/Marshall%20Properties%20Solar%20Farm/Blairsville_Solar_Farm_EA.pdf

Brief overview of environmental impacts of Solar Collection Facilities

en.reset.org/blog/potential-environmental-impacts-and-obstacles-solar-energy

Global Examples**Union of Concerned Scientists statement**

www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-solar-power.html#.WA4cTYWcHVI

UK Guardian – overview of solar ‘parks’

www.theguardian.com/sustainable-business/solar-power-parks-impact-environment-soil-plants-climate

Biodiversity/Wildlife Concerns with Solar Farms

www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/National-Solar-Centre---Biodiversity-Guidance-for-Solar-Developments--2014-.pdf “Activities likely to result in disturbance or removal of habitat should be avoided during key periods...breeding seasons.”

Siting solar collection facilities on agricultural lands

www.southsomerset.gov.uk/media/406143/ssdc_pv_guidance_2011.pdf

General resources from the UK - www.bre.co.uk/nsc/page.jsp?id=3435 (UK – The British are decades ahead of US and have many resources to help us.)

UK Planning guidance for the development of large scale ground mounted solar PV systems
www.bre.co.uk/filelibrary/pdf/other_pdfs/KN5524_Planning_Guidance_reduced.pdf

A guide to environmental assessment and regulation for renewable energy projects - This is the process in the UK for someone wanting to build a solar farm.

www.jbaconsulting.com/sites/default/files/Environmental%20Guide%20for%20Renewables_final.pdf

Environmental Impact Assessment - Solaire Direct: Drennan Photovoltaic (PV) Solar Park (South Africa) - www.erm.com/en/public-information-sites/Solaire-Direct-Drennan/

Informal guidance for the development of large-scale Solar PV Arrays in South Somerset (UK)
www.southsomerset.gov.uk/media/406143/ssdc_pv_guidance_2011.pdf

Environmental Assessment Report - Proposed Solar Power Station Near Moree, NSW (Australia)
www.moreesolarfarm.com.au/pdf/Appendix%2011%20-%20Risk%20Analysis.pdf

Baseline water quality assessment for a proposed solar farm in Cornwall (UK) - www.bsg-ecology.com/project/baseline-water-quality-assessment-for-a-proposed-solar-farm-in-cornwall/

Very short report about a proposed solar farm

www.aecol.co.uk/Pages/52/printable/Solar---EcIA-Puriton-Solar-Farm.html

Planning process for Solar Farm Development in one UK shire (County):

www.renfrewshire.gov.uk/media/1499/Solar-Farm-Developments-in-Renfrewshire/pdf/Solar_Farm_Developments_in_Renfrewshire.pdf

What one Ecological Consulting company offers as services to someone proposing a solar farm
www.wildfrontier-ecology.co.uk/development-services/solar-arrays/