



# Land Use

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## **BOULDER COUNTY PLANNING COMMISSION**

**Monday, July 23, 2018, at 2:30 p.m.**

**Commissioners' Hearing Room, Third Floor  
Boulder County Courthouse, 1325 Pearl Street, Boulder, CO**

### **DISCUSSION ITEM ONLY**

#### **Docket DC-18-0002: Proposed Amendments to the Boulder County Land Use Code related to Solar Energy Systems**

*Staff:* Sinead O'Dwyer, Planner I, Land Use Department  
Nicole Wobus, Long Range Planning Manager, Land Use Department

### **AGENDA**

1. Staff presentation
2. Planning Commission discussion

### **INTRODUCTION**

On May 10, 2018, the Board of County Commissioners authorized Land Use staff to pursue text amendments to the Boulder County Land Use Code (the Code) specific to Solar Energy Systems and related provisions. Staff had identified a need for updating existing language and structure of the code, and increasing the opportunity for community solar gardens in the county. Staff proposes a reorganization of code language to clarify content and direct solar to rooftops and parking areas. Staff is preparing draft text amendments and is seeking Planning Commission (PC) feedback on a few key concepts under consideration. Staff is particularly interested in PC feedback on the concept of conditionally allowing Solar Energy Systems larger than 100 kW on Boulder County Comprehensive Plan (BCCP) designated Significant Agricultural Lands.

This document contains an overview of the changes to the Code under consideration and focus questions for the Planning Commission Study Session. For simplicity, this document refers to the changes under consideration as “proposed” changes. However, at this point these are only changes under consideration by staff, prepared for discussion at the study session. No specific text amendments are being proposed for approval at this study session. PC input at this study session will inform final preparation of proposed Code language.

### **ACTION REQUESTED**

No action is requested, discussion item only.

## CONTENTS

Section	Description
Section I	Objectives of Land Use Code Update
Section II	Background
Section III	Overview Of Code Changes Under Consideration
Section IV	Significant Agricultural Lands
Section V	Case Studies For Co-location Of Agriculture And Solar
Section VI	Focus Questions for Planning Commission Discussion
Section VII	Next Steps
Attachment A	Existing Solar-Related Land Use Code text

### I. OBJECTIVES OF LAND USE CODE UPDATE

The intent of the Code amendments is to facilitate solar energy installation in appropriate locations, while balancing the county's sustainability-related goals and policies with the scenic, agricultural, and environmental values of the Boulder County Comprehensive Plan. Land Use staff worked collaboratively with staff from the Parks and Open Space Department, Sustainability Office, and a consultant to identify potential locations for solar gardens in Boulder County. Through this work, staff identified a need to address the scarcity of sites meeting both technical needs and the current Code eligibility criteria for Solar Energy Systems greater than 100kW. Additionally, staff identified opportunities to improve the clarity and content of the Code.

Staff intends to update relevant content in Articles 4 (Zoning) and 18 (Definitions) of the Land Use Code, and will make other revisions necessary to integrate the changes into the Code as a whole. Some organizational changes and updates to the existing language are also needed to make the code easier to navigate and utilize.

#### Objectives

- Improve Code organization.
- Encourage solar development in appropriate locations.
- Encourage building-mounted and parking lot Solar Energy Systems.
- Increase the opportunity for Community Solar Gardens.
- Consider additional zone districts where ground mounted Solar Energy Systems greater than 500kW may be appropriate.
- Allow for review of projects on BCCP designated Significant Agricultural Lands, in a way that improves the soil health and/or pollinator habitat.
- Update language to be consistent with current industry standards and bring clarity to definitions.
- Revise solar energy system size categories based on acreage of land disturbed rather than the electrical output of the array.

## II. BACKGROUND

Staff conducted extensive research to inform the solar Land Use Code updates. Staff completed a literature review, reached out to industry professionals, conducted several interviews with local solar industry stakeholders, and researched example code language from other jurisdictions. Interviews were conducted with local installers, the National Renewable Energy laboratory, utility companies, renewable energy non-profits, and experts in soil health and agriculture. Findings from this research are reflected in the content presented in this report, and the proposed concepts for incorporating into Code revisions.

Solar energy has been identified as a viable and efficient renewable energy source for Boulder to meet sustainability goals and greenhouse gas reduction targets. Boulder County BOCC has set a goal for 50 percent of all energy consumed in the county to be renewable energy by 2030 and 100 percent by 2050. It has been estimated that 68 percent of all rooftops throughout public, private, commercial and incorporated areas of Boulder County are viable for solar. However, this does not take into account willingness of property owners, nor roof shading, and other factors which would likely bring the amount closer to 50 percent of all rooftops being viable for solar. Roof-mounted installations alone will not meet the county's sustainability goals of 100 percent renewable energy by 2050.

The impacts of installing ground mounted Solar Energy Systems are not as great as they once were, given current industry best practices. Instead of leveling entire parcels and disturbing large areas of land with heavy equipment, current solar energy system installation methods including pile driven anchors. This method of installation generally only requires foot traffic and a pick-up truck. The Solar Energy Systems are a significantly less intensive land use than other types of development which have continuous traffic, permanent soil compaction, and do not allow for continued use of the developed area. Sustainability goals, improved installation methods, and widespread demonstration of compatibility with various agricultural uses, as further described in later sections, prompted staff to explore additional areas that may be appropriate for Solar Energy Systems.

Even if all restrictions on Solar Energy Systems were removed from the Land Use Code, there are several factors that limit solar energy development. Those limiting factors include: the cost of land and land leases in Boulder County, regulation by utility companies and the Public Utilities Commission, and technical difficulties in balancing the complex energy network. Grid-connected solar energy system (i.e., those connected to the distribution system and larger than residential net metered systems) generally require Three-Phase power lines and a distribution substation within a mile. Additionally, the grid must be balanced for consumption and distribution, and an area must have the capacity to host new distribution of electricity. As an example, Xcel recently posted an [illustrative map of the hosting capacities](#) of their network. This hosting capacity map shows the technical limitations on solar energy development in the Xcel network, which covers a majority of Boulder County. In addition to this basic representation of hosting capacity, engineering studies are required to determine whether an installation can go in a certain location. These same hurdles would exist with all electric providers. Changes to this map may require new distribution substations, which require a 1041 State Interest review process.

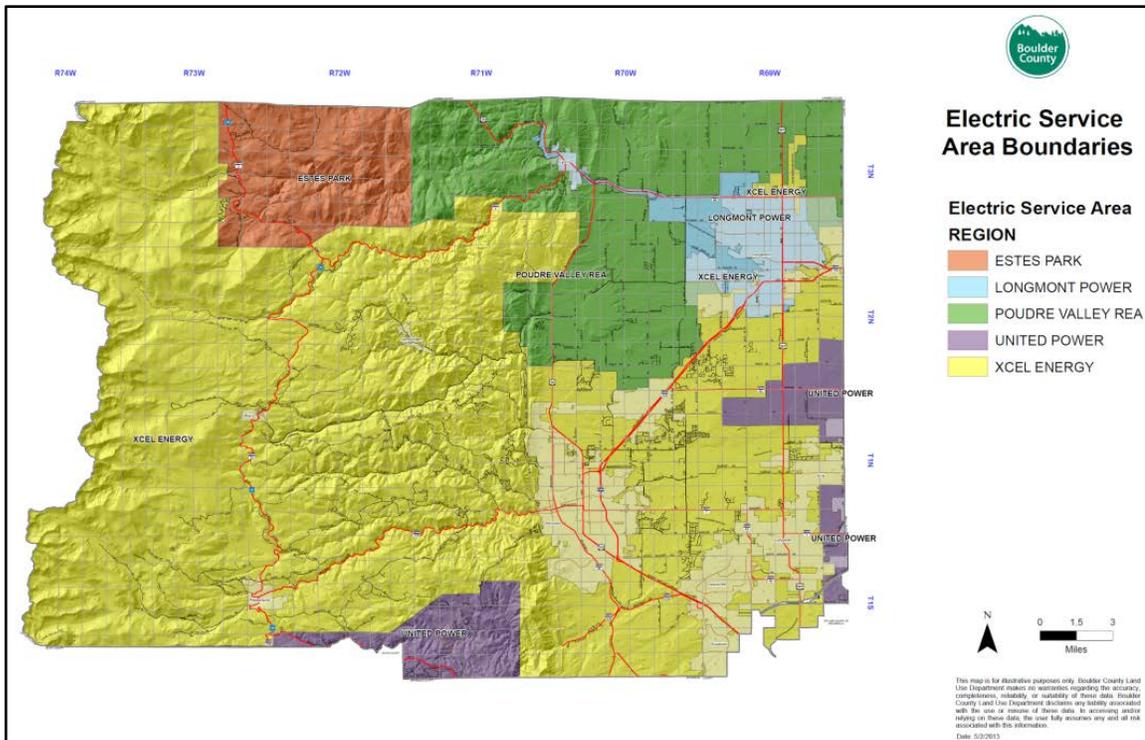


Figure 1. Boulder County Electric Service Area Boundaries

Recognizing that external constraints exist outside of the Code, staff has considered ways to decrease the barriers to community solar gardens created by the Land Use Code, while maintaining the environmental value and rural character of county lands. The proposed updates and Parks and Open Space policies maintain that no Solar Energy Systems are allowed as a principal use on Parks and Open Space fee land or land covered by county-held conservation easements. The County will continue to maintain that Solar Energy Systems over 100kW will not be permitted on BCCP designated Natural Landmark Natural Areas and Critical Wildlife Habitat.

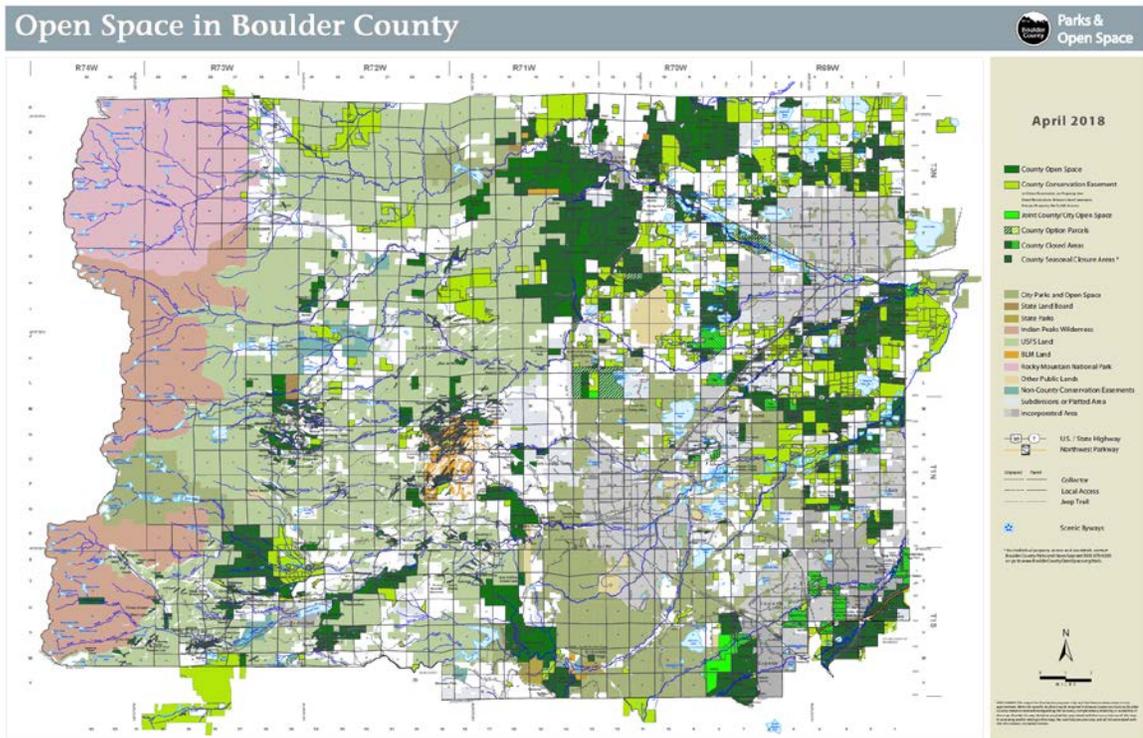


Figure 2. Map of Open Spaces in Boulder County. Green areas to remain protected from Solar Energy Development. A full view can be found here: <https://assets.bouldercounty.org/wp-content/uploads/2017/03/open-space-map.pdf>

The Code amendments under consideration would open up more zoning districts for Solar Energy Systems, and reduce the review process for Solar Energy Systems in zone districts deemed most appropriate for this use in order to prioritize development away from Significant Agricultural Land. This opens a very limited amount of land and includes portions of zoning districts which still contain Significant Agricultural Lands of national, state and local importance. The amendments under consideration would allow for installation of Solar Energy Systems on BCCP designated Agricultural Lands of Significance if a number of steps are taken to minimize impacts. These steps would include requiring a demonstrated agricultural use or pollinator habitat in conjunction with the solar installation.

### III. OVERVIEW OF CODE CHANGES UNDER CONSIDERATION

This section presents an overview of all changes under consideration. Section IV provides a more detailed discussion of changes under consideration related to installation of solar on BCCP designated Agricultural Lands of Significance.

#### Improve Code Organization

The proposed amendments will organize the code so that all primary use solar energy system uses are easily located, and building and ground mounted solar are clearly differentiated. Currently, the Solar Energy System uses are divided in separate sections of the code as 4-514.M Small Solar Energy System, 4-514.H Medium Solar Energy System, 4-514. F Large Solar Energy System, and 4-516.K Accessory Solar Energy System.

### EXISTING SOLAR REGULATIONS OVERVIEW

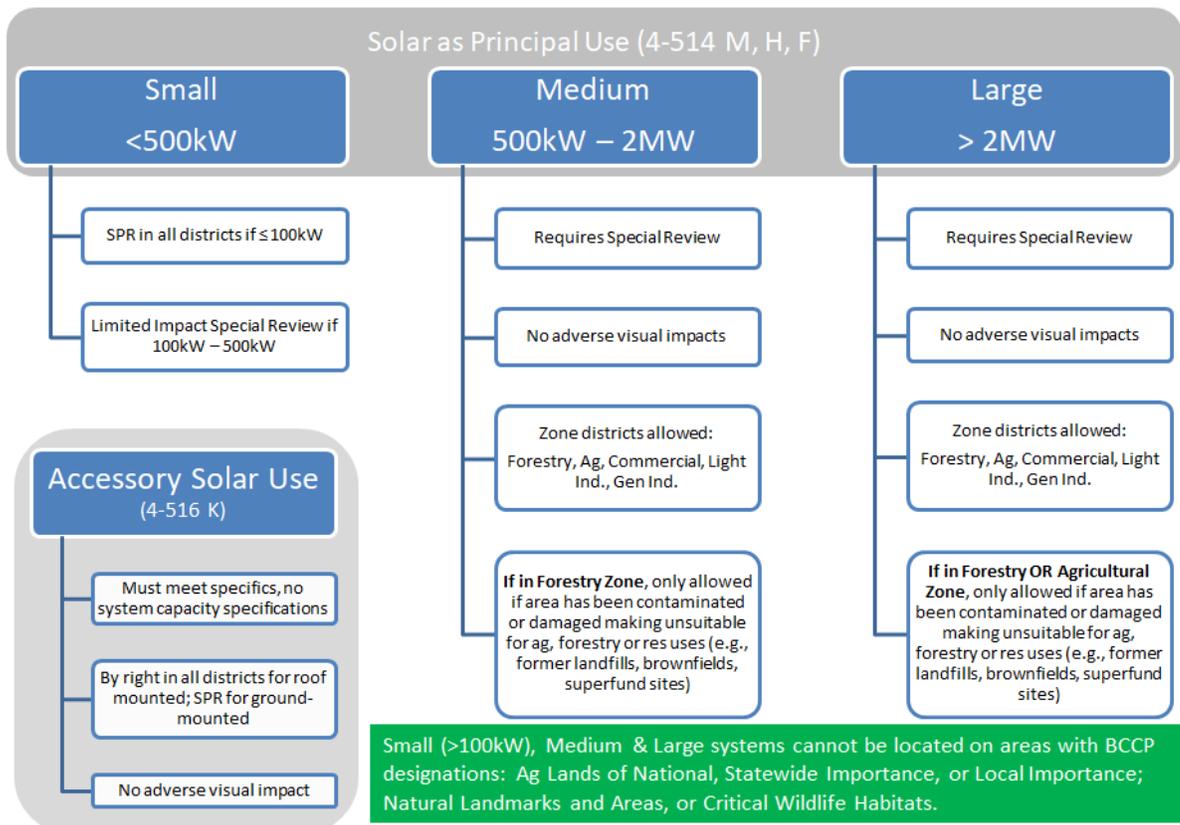


Figure 3. Overview of Existing Solar Uses in Land Use Code

The use section of the code is listed in alphabetical order, and thus these uses appear separately and do not clearly differentiate between building mounted solar, ground mounted solar, and solar parking canopies. There are some provisions related to roof-mounted systems under each of the above uses and buried in the sections of 4-100. The proposed changes will organize the uses into the following use categories: 4-514.K Solar Energy System- Building Mounted, 4-514.L Solar Energy System- Ground Mounted, 4-514.M Solar Energy Systems- Parking Canopy, 4-516.K Accessory Solar Energy System. All related provisions will be clearly listed under each use, instead of only in 4-100.

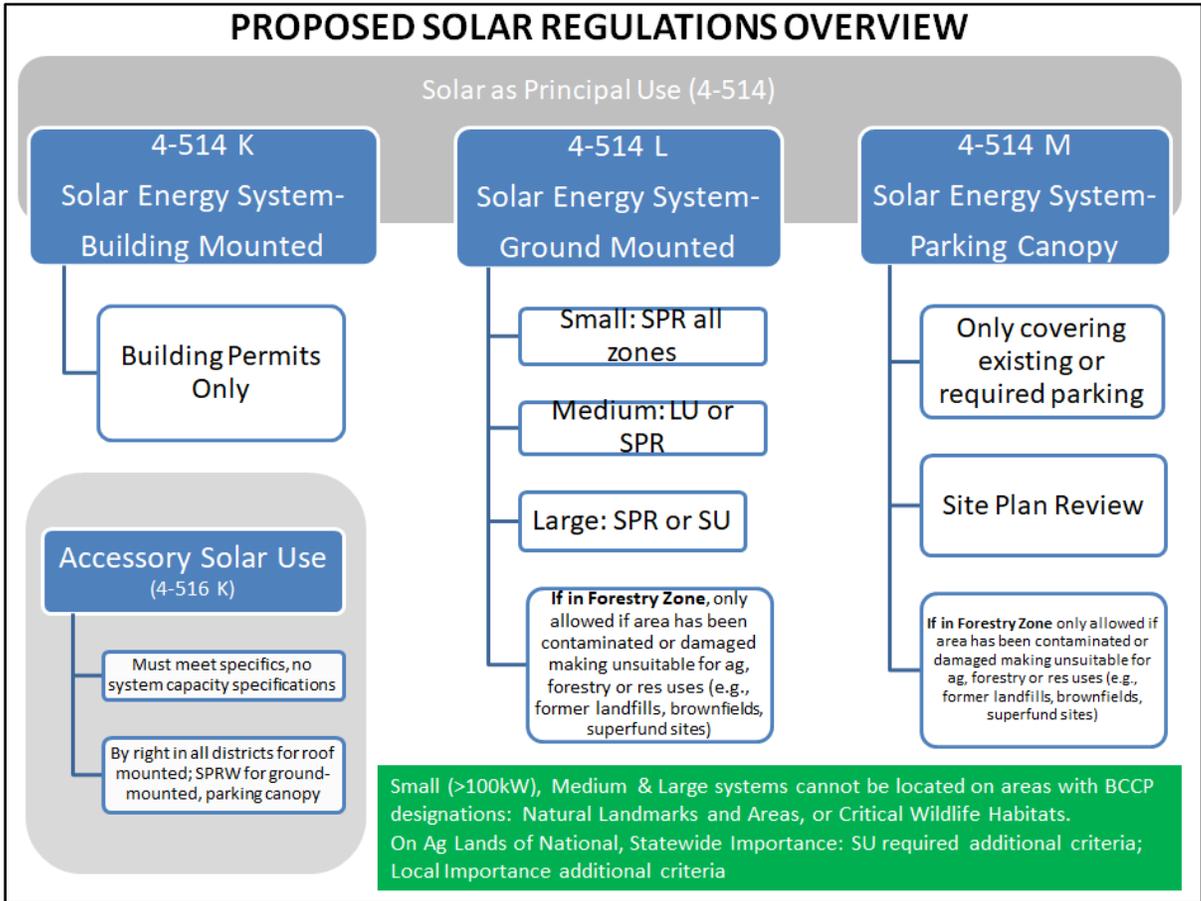


Figure 4. Summary of proposed Land Use Code changes under consideration.

The proposed organizational change will bring clarity to the differences of land use provisions for building, parking, canopy, and ground mounted Solar Energy Systems. A parking canopy use is proposed to properly address health, safety, land use impacts and special provisions for parking lot solar installations. Adding Code language specific to solar parking canopies is also intended to help facilitate this type of solar energy system that leverages already-developed land for solar production.

**Size Categories for Ground Mounted Systems**

	Small	Medium	Large
<b>Current Code (Electrical Capacity)</b>	0-500kW	500kW- 2MW	>2MW
<b>Proposed Code (Disturbance Area)</b>	0 – 2.5 acres	2.5 acres – 10 acres	> 10 acres

Figure 5. Current and proposed ground-mounted solar energy system size categories.

The proposed size categories of ground-mounted Solar Energy Systems are based on land coverage rather than electrical output. As technological development increases the efficiency of solar panels, the land consumed by an installation of a given electrical capacity will decrease. The proposed size categories were developed by converting the current system size categories provided in the Land Use Code to an equivalent approximate land area affected. Those land area approximations are calculated based on the 2013 NREL report, “Land-Use Requirements for Solar Power Plants in the United States.”<sup>1</sup>

**Allow for Medium and Large Solar in More Zoning Districts**

The proposed code amendments under consideration would allow for the review of Medium and Large ground-mounted solar installations in more zoning districts: Transition (T), Business (B), unplatted Rural Residential (RR), and unplatted Estate Residential. No changes would be proposed for Multi-Family (MF), Suburban Residential (SR), Mobile Home (MH) and Mountain Institutional (MI). Currently, the Code severely limits the zoning districts for Medium and Large ground mounted Solar Energy Systems. Medium and Large Solar Energy Systems are only allowed in Light Industrial (LI), General Industrial (GI), Commercial (C), Agricultural (A), and Forestry (F). Additional restrictions regarding the Forestry and Agricultural zoning districts are addressed in the next subsection.

Consistent with the intent of this code update to allow more opportunity for community solar gardens, staff identified zoning districts which are appropriate for medium and large Solar Energy Systems, and not currently available for this use. Figure 6 displays the zoning districts and descriptions from Article 4-100 of the Code, for the subject zoning districts which staff identified as more appropriate for Solar Energy Systems. The zoning districts were created in a way that each zoning district carries similar sizes and characteristics.

<b>Zone District</b>	<i>Purpose as Described in Article 4-100</i>
<b>Agricultural (A)</b>	<i>Rural areas where conservation of agricultural resources is of major value, and where residential development compatible with agricultural uses is allowed</i>
<b>Rural Residential (RR)</b>	<i>Residential areas developed at a density and character compatible with agricultural uses.</i>
<b>Estate Residential (ER)</b>	<i>Low density urban residential areas.</i>
<b>Transitional (T)</b>	<i>Areas containing both a variety of residential uses and a limited number of business uses which are compatible with residential development.</i>
<b>Business District (B)</b>	<i>Areas for the development of restricted retail and business uses which have minimal exterior impact on surrounding properties.</i>
<b>Commercial District (C)</b>	<i>Areas for the development of commercial, business, retail, and/or service uses.</i>
<b>Light Industrial (LI)</b>	<i>Area for the development of research, light industrial, warehouse, and/or distribution centers.</i>

**Figure 6. Zoning district purposes as described in Article 4-100 of the Land Use Code.**

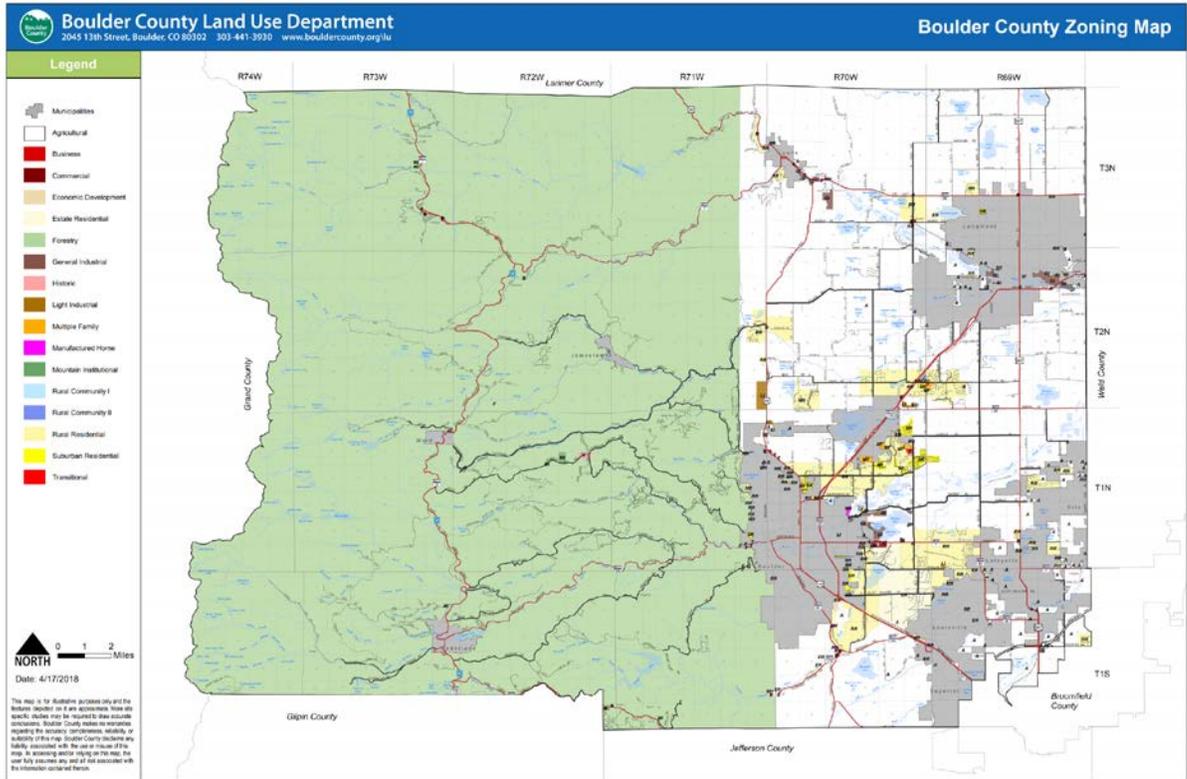
Transitional and Business zone districts are treated similar to LI, GI, C in other uses of the Code, are generally seen in more developed areas, and are likely to have the hosting capacity and services required for grid-tied Solar Energy Systems. Transitional and Business zoning districts allow for large

<sup>1</sup> NREL (2013) Land-Use Requirements for Solar Power Plants in the United States. Ong et. al.

marijuana grows and other industrial uses, which have a higher structural development intensity and more lasting impacts than Solar Energy Systems. Staff’s proposed amendments under consideration would allow for review of Medium and Large Solar Energy in the Transitional and Business zoning districts, as staff believes this is consistent with the treatment of other uses in the Code, and that these areas are appropriate for this use.

The un-subdivided lands in the Rural Residential and Estate Residential Zoning district tend to have larger parcel sizes, and are treated similarly to the Agricultural Zoning district in regards to allowed uses, with the exception of some Intensive Agricultural and Agribusiness uses such as feedlots. These zoning districts have also been identified to generally coincide with the potential for solar development on Xcel’s Hosting Capacity Map.

Multi-family, Mobile-home parks, and Suburban Residential were not included in this chart or proposed for allowance of Medium and Large Solar Energy Systems, because those zoning districts are composed of small, dense lots, and are important for maintaining available housing stock. These housing areas are also the places where rooftop solar can be the most challenging. No changes are proposed in these zoning districts.



## Revise Provision for Forestry and Agricultural Zones

Staff is considering revising the additional provisions for Medium and Large Solar Energy Systems in the Forestry zoning district and Large Solar Energy Systems in the Agricultural zoning district (See Figure 7). Currently, Medium installations are only allowed in the Forestry zoning districts on landfills, superfund sites, brownfields and the like. The same provisions apply to Large systems in the Forestry and Agricultural zoning district. Staff has considered revising the language to be more inclusive of intensely developed lands that do not qualify as brownfields or superfund sites. Additionally, staff has explored removing the provision from Agricultural zoning district, as the most productive agricultural lands are protected by the provisions for BCCP designated Significant Agricultural Lands.

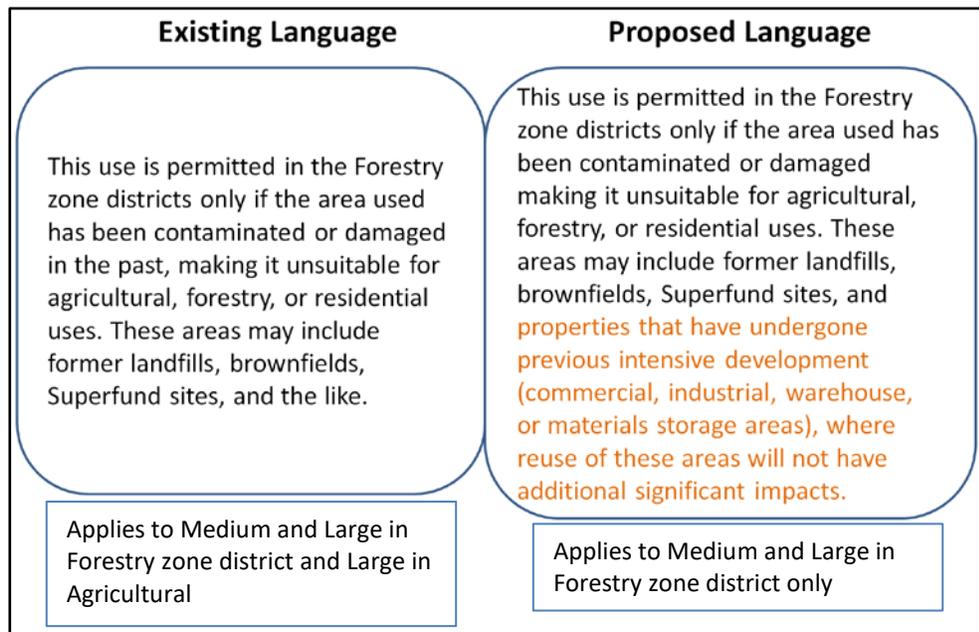


Figure 7. Existing and Proposed Language under consideration for Medium and Large ground-mounted Solar Energy Systems in the Forestry zoning district and Large Solar Energy Systems in the Agricultural zone district

## Facilitate Solar in Appropriate Locations

In addition to opening up more appropriate zoning districts to Solar Energy Systems of all sizes, the proposed text amendment includes reducing the intensity of review in those areas considered most appropriate for Solar Energy Systems. The intent of these changes is to prioritize solar development in the most compatible areas, and allow limited development of Medium ground mounted Solar Energy Systems on Significant Agricultural Lands, where rigorous conditions are met.

All ground-mounted Solar Energy Systems will still require a land use review. The intensity of review in the proposed text amendment is proportional to the projected land impacts of the solar energy system.<sup>2</sup> By reducing some of the review requirements from Special Use review to a less rigorous review, it effectively reduces soft costs and time associated with the review, but maintains the ability for public comment and potential hearing before the Board of County Commissioners as

<sup>2</sup> For reference, the following is an overview of the review processes for solar energy systems as a principal use. Site Plan Review (SPR): six week Administrative Review, with potential for call-up for BOCC hearing Limited Impact Special Review (LU): about 2-4 month process, BOCC hearing Special Review (SU): most intensive, PC and BOCC hearing.

needed. Notably, all land use processes involve notification of neighbors and acceptance of public comments.

<b>Current Code</b>					
<b>Zoning District</b>	<b>Accessory</b>	<b>Small</b>		<b>Medium 500kW-2MW</b>	<b>Large &gt;2MW</b>
		<b>&lt;100kW</b>	<b>100-500kW</b>		
MF, MH, MI, SR, H	SPRW	SPR	LU#	Not allowed	Not allowed
ER, RR	SPRW	SPR	LU#	Not allowed	Not allowed
F	SPRW	SPR	LU*	SU*	SU*
A	SPRW	SPR	LU#	SU#	SU#*
LI, GI, C	SPRW	SPR	LU#	SU#	SU#
T, B	SPRW	SPR	LU#	Not allowed	Not allowed

\*Only if the areas used has been contaminated or damaged in the past making it unsuitable for agricultural, forestry, or residential uses. These areas may include former landfills, brownfields, Superfund sites, and the like.  
 #This use is not allowed on Agricultural Lands of Importance as designated by the Comprehensive Plan.

Figure 8. Table overview of current Code review processes required for ground mounted Solar Energy Systems sizes by zoning districts

<b>Proposed Code</b>					
<b>Zoning District</b>	<b>Accessory</b>	<b>Small</b>		<b>Medium 2.5-10 acres</b>	<b>Large 10+ acres</b>
		<b>&lt;0.5 acres</b>	<b>0.5-2.5 acres</b>		
MF, MH, MI, SR, H	SPRW	SPR	SPR#	Not allowed	Not allowed
ER, RR	SPRW	SPR	SPR#	LU#	SU#
F	SPRW	SPR	SPR*	SU*	SU*
A	SPRW	SPR	SPR#	LU#	SU#
LI, GI, C	SPRW	SPR	SPR#	SPR#	SPR#
T, B	SPRW	SPR	SPR#	SPR#	SPR#

\*Only if the areas used has been contaminated or damaged in the past making it unsuitable for agricultural, forestry, or residential uses. These areas may include portions of properties that have been intensely developed, former landfills, brownfields, Superfund sites, and the like.  
 # On Significant Agricultural Lands, as designated by the Comprehensive Plan, this use is subject to additional criteria. This use requires Special Review on Lands of Statewide or National Importance.

Figure 9. Overview of proposed changes to the review processes required for ground mounted Solar Energy Systems by zoning district. Changes are denoted in red.

Figure 8 displays the current intensity of review required for various sizes of ground mounted Solar Energy Systems in each zoning district. Figure 9 denotes the proposed text amendment changes in red. The proposed text amendments for small ground mounted Solar Energy Systems, 0.5-2.5 acres, would reduce the review to a Site Plan Review in all zoning districts instead of a Limited Impact Special Use Review (LU). The proposed amendments is to reduce the review for Solar Energy Systems of any size in LI, GI, C to Site Plan Review, instead of LU for Medium or SU for Large, as

required in the current code. Transitional and Business is proposed as a Site Plan Review process, the same intensity of review as LI, GI, C.

The proposed amendments reduce the intensity of review for medium ground-mounted Solar Energy Systems, from an SU to LU and retains that an SU is required for large systems in A and F zoning districts. The same intensity of review, LU for Medium and SU for Large, shall be required in ER and RR on un-subdivided lands.

## SIGNIFICANT AGRICULTURAL LANDS

The current Code strictly prohibits Solar Energy Systems over 100kW (0.5 acres) on all Significant Agricultural Lands as designated by the BCCP. A majority of the Plains is designated Significant Agricultural Lands; these lands are categorized as either Land of National, Statewide, or Local Importance. Research and pilot projects have demonstrated that solar can be compatible with agricultural uses. This section explores code amendments under consideration, case studies, and example codes from other jurisdictions.

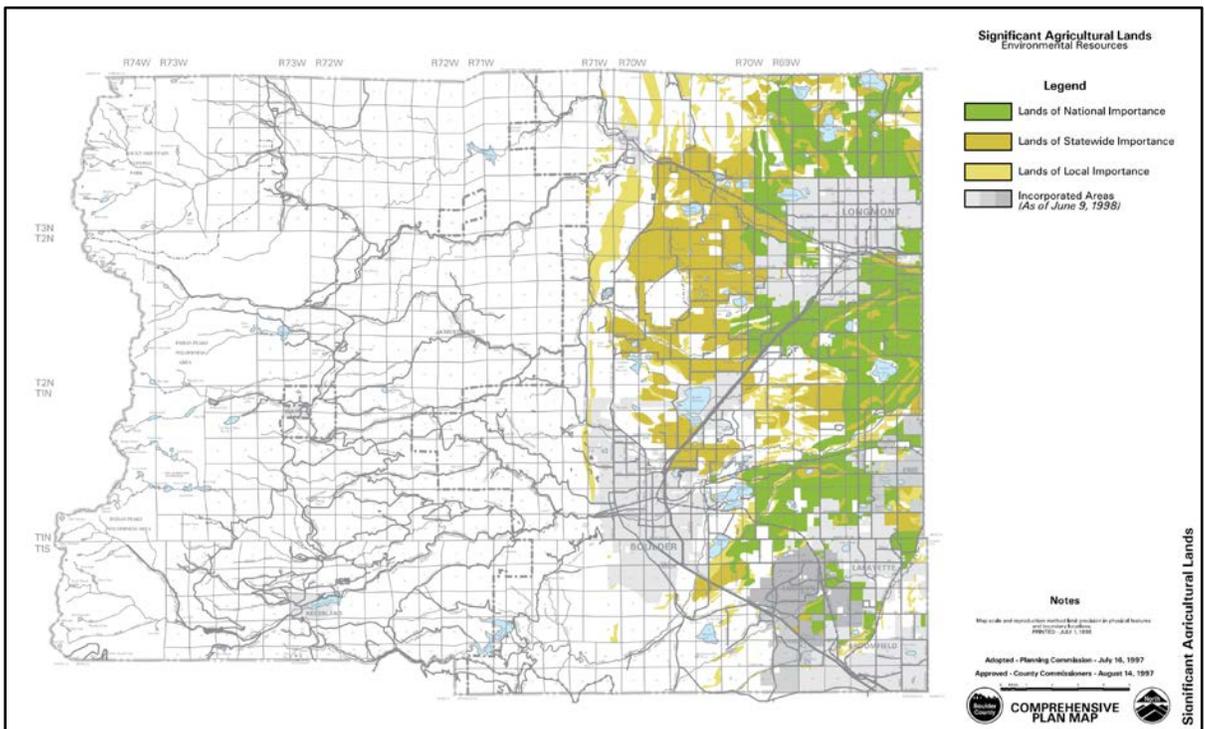


Figure 10. Boulder County Comprehensive Plan Significant Agricultural Lands

## Proposed Code Amendments

Requirements	Lands of Local Importance	Lands of State or National Importance
Review Process	Same as applicable Zoning District	Special Use (SU) Review
Application Materials	Management Plan with narrative for agricultural use or pollinator habitat under and/or around the solar arrays	Development Report required for Special Review Suggested specific components include: <ul style="list-style-type: none"> <li>• Installation Plan</li> <li>• Management Plan with narrative for proposed agricultural use under and/or around solar arrays</li> <li>• Weed Control Plan</li> <li>• Decommissioning Plan</li> </ul>
Size Cap for Area of Disturbance	None	5 acres of disturbance for parcels up to 70 acres 10 acres of disturbance for parcels more than 70 acres <i>Note: Five acres is the minimum possible area for a 1MW solar system, which staff understands to be the minimal size that is financially viable for a solar garden-scale project.</i>

**Figure 11. Proposed code for Solar Energy Systems greater than 0.5 acres (100kw) on Significant Agricultural Lands. Systems less than 0.5 acres have no additional provisions in the current and proposed codes.**

Staff proposes considering amendments that would allow for Solar Energy Systems over 0.5 acres (about 100kw) in conjunction with an agricultural use on Agricultural Lands of Local, State, and National Importance. The intent of this change is to open up more area to be available for community solar gardens, and to promote agricultural activity to improve soil health and pollinator habitat. The proposed text amendments would not place a cap on the size of Solar Energy Systems on Agricultural Lands of Local Importance. Solar Energy Systems on Agricultural Lands of State and National Importance would be subject to a size limit, and would require a Special Use Review.

Staff suggests requiring the application materials for the Special Use Review on lands of State and National Importance include a Development Report that contains an installation plan, management plan, and decommissioning plan. The management plan will demonstrate the proposed agricultural use under and/or around the solar installation. The intent of the Development Report is to ensure adequate mitigation measures that will retain soil health, pollinator habitat and agricultural uses in the vicinity of the Solar Energy Systems.

As an additional mitigation measure, staff suggests placing a cap on the area of disturbance of Solar Energy Systems on agricultural lands of State and National Importance:

*Solar Energy Systems must not disturb more than 5 acres of land on parcel smaller than 70 acres. Up to ten acres of land disturbance may be permitted for Solar Energy Systems located on parcels 70 acres in size or larger. Solar Energy Systems may be limited to a smaller area of disturbance as determined necessary by the Director or Board of County Commissioners, in order to comply with the other provisions of the Code.*

Staff explored other options, including a percentage cap instead of acreage, and a county wide limit. The acreage cap is presented for consideration rather than percentage cap for a few reasons. First, a wide variety of parcel sizes exist within the county and staff did not want to limit installations on

smaller parcels, which may be appropriate locations for Solar Energy Systems. Likewise some very large parcels could allow for utility scale arrays which may not be appropriate on a given parcel. The formulaic nature of a percentage based cap is also not a favored method for addressing land use decisions in general.

The size cap of five acres is presented for consideration because it corresponds with the approximate disturbance area of the smallest solar garden-scale system staff understands could be financially viable to construct under the best case scenario. Some industry professionals indicated that at least 2 MW, or about 10 acres is required for financial viability. Arriving at the appropriate size cap is a challenge, as staff seeks to allow for solar projects on agricultural land to be spaced appropriately to allow for co-location of agricultural and solar uses. However, the intent is to keep the disturbance area to the minimum amount needed for a financially viable project. Staff recognizes that 5 acres may be too limiting on parcels that may want to further space panels to adequately accommodate agricultural uses.

### Context for BCCP Designated Significant Agricultural Lands

The Boulder County Comprehensive Plan designates Significant Agricultural Lands based on a variety of criteria including water availability, soil type, and productivity. Agricultural Lands of National Importance are U.S. Department of Agriculture Prime Farm Lands based on criteria in Federal Public Law 95-87, including soil moisture, water availability and irrigation, mean soil temperature, salinity, permeability, erodibility, drainage, and slopes less than six percent. Agricultural Lands of State Importance were designated by the Colorado Division of Agriculture, Department of Natural Resources, and Soil Conservation Board following criteria similar to the Federal criteria, but these areas generally have less water availability or productivity. Agricultural Lands of Local Importance were designated by the local Soil Conservation Services and Boulder County Extension offices, and generally consist of grazing lands with limited water supply.

	Types	Distinguishing Factors and Crops Generally Grown Here	Source of Identification
<b>National</b>	Prime Farmland-based on criteria in Federal Public Law 95-87	Best physical and chemical characteristics: <ul style="list-style-type: none"> <li>• Soil moisture</li> <li>• water availability/irrigation</li> <li>• mean soil temperature</li> <li>• salinity</li> <li>• permeability</li> <li>• erodibility</li> <li>• drainage/deeper water table</li> <li>• slope less than 6%</li> </ul>	USDA
<b>Statewide</b>	Irrigated Lands (inadequate water) High Potential Dry Cropland	Hay meadows, Dryland wheat, grain sorghum, forage sorghum, corn, fruit and vegetable growing and seed cultivation	CO Division of Agriculture, Dept of Natural Resources and CO Soil Conservation Board
<b>Local</b>	Irrigated Crop Land Dry Crop Land Rangeland	<ul style="list-style-type: none"> <li>▪ Soil type- includes class III which is very limited</li> <li>▪ Existing land Use—using aerial photography and Land Use records</li> <li>▪ Carrying Capacity – based on soil type and moisture</li> <li>▪ Grasses, grass-like plants, forbs and shrubs, valuable for grazing</li> </ul>	Longmont office of SCS and Boulder County Extension Office

Figure 12. Boulder County Comprehensive Plan Significant Agricultural Lands Classifications

The BCCP designated Significant Agricultural Lands cover the majority of the unincorporated plains, across a variety of zoning districts. The current Land Use Code does not allow Solar Energy Systems over 100kW (approximately 0.5 acres) on any designated Agricultural Lands of importance. Since the inception of these regulations, large portions of Significant Agricultural Lands have been permanently preserved by Parks and Open Space, and it has been demonstrated that Solar Energy Systems can be a beneficial secondary use on Agricultural Lands. Many Significant Agricultural Lands are not currently in production for agricultural uses. Swimming pools, large homes, riding arenas, and other more intensive uses, are a use by right on these same lands that cannot be developed for the less intensive use of Solar Energy Systems. The proposed amendments aim to achieve BCCP Agricultural Element goals of grazing land preservation and soil conservation, by requiring agricultural management and soil health improvement plans. The agricultural management and soil health improvement plans are required as mitigation measures for any potential impacts of the proposed solar energy development.

#### IV. CASE STUDIES FOR CO-LOCATION OF AGRICULTURE AND SOLAR



Pilot research projects and some local governments have demonstrated that Solar Energy Systems can be a strategic planning tool to protect and increase productivity of agricultural lands. Pilot projects by NREL, UMass Amherst, and many others have demonstrated the successful co-location of various agricultural uses, including vegetable gardens, grazing, and crop production on the same plot of land as covered by Solar Energy Systems.<sup>4, 5</sup> Solar Energy Systems have been shown to increase the productivity of the land because they provide necessary shading, lower ambient air temperature, increase moisture retention for crops, and allow for grazing.<sup>6,7</sup> In light of recent progress in the co-location of agriculture and solar, many guides for solar and agriculture co-location have become available.<sup>8</sup> Throughout the literature it is recommended that adequate spacing and elevation of panels is needed to accommodate agricultural uses. Recommended spacing is generally the industry standard of 4 feet between the panels. Recommended elevation of the panels depends on the proposed use, and ranges from 2 feet to 8 feet.<sup>9</sup> Vermont and Minnesota have regulations that require pollinator habitat with utility scale solar facilities on their prime agricultural lands, and Maryland will soon follow

<sup>3</sup> Picture sources from left to right: Global Urban Commons <https://goo.gl/images/H6wdqN>; Lightsource <https://goo.gl/images/YprpVi>; US News <https://goo.gl/images/TyC2zf>

<sup>4</sup> NREL (2013) Overview of Opportunities for Co-Location of Solar Energy Technologies and Vegetation

<sup>5</sup> NCSEA (2017) North Carolina Solar and Agriculture. Aldina et. al.

<sup>6</sup> NREL(2011) Potential for Photovoltaic Solar Installation in Non-Irrigated Corners of Center Pivot Irrigation Fields in the State of Colorado. Billy Roberts

<sup>7</sup> NCSU (2017) Balancing Agricultural Productivity with Ground-Based Solar Photovoltaic (PV) Development

<sup>8</sup> UVM (2017) Guide to Farming Friendly Solar.

<sup>9</sup> BRE (2014) Agricultural Good Practice Guidance for Solar Farms. Ed J Scurlock

suit.<sup>10</sup> Native pollinator habitat is a simple and cost-effective way to improve soil conditions on-site, and provide a great benefit to the natural environment and surrounding agricultural lands.

### Example Codes

Balancing sustainable energy development and preserving agricultural lands is not a challenge unique to Boulder County. Jurisdictions throughout the country have implemented creative solutions to responsibly developing Solar Energy Systems on agricultural lands. The following figures provide a summary of example codes from various sources. Figure 13 provides examples of size limits for solar on agricultural lands. Not included in the table are numerous jurisdictions which have no specific size limitation for solar on agricultural lands, although size compatibility may be monitored through the relevant review processes in those jurisdictions.

Example Codes	Size Cap for Solar on Agricultural Lands
<b>Weld County</b>	By Special Review for Small Projects <20 acres and Medium Projects >20 acres No system greater than 30 MW in Agricultural zone
<b>Santa Barbara County</b>	Permanent preservation of off-site agricultural land at a ratio of 1 acre preserved land to 1 acre of solar
<b>California County Planning Director's Association</b>	<i>State Conservation Easement:</i> 15% of parcel up to 5 acres, up to 10 acres if non-prime <i>Prime or State Unprotected:</i> 30% of parcel, up to 7 acres through administrative process, up to 10 acres through Minor Review, 20+ acres requires conditional review <i>Grazing Land:</i> 30% up to 10 acres by administrative review, greater than 10 acres by minor review
<b>Maui County</b>	Up to 15 acres and no more than 35% of the lot, except land with soil class D or E
<b>UMass Agricultural Solar Tariff Guidelines</b>	Maximum AC rated capacity shall be 2MW
<b>Casco Maine</b>	More than 40% of system on Prime Ag Land requires Special Use Review
<b>New Jersey State Agriculture Development Committee</b>	No more than 10 acres, 1:5 solar to agricultural operations land ratio; No more than 2 MW

Figure 13. Example Codes from other land use authorities for solar energy system size caps on agricultural lands

Figure 14 describes additional provisions in some example codes, which are utilized to mitigate impacts of Solar Energy Systems on agricultural lands. Staff has considered these strategies as

<sup>10</sup> [Minnesota DNR \(2018\) Prairie Establishment & Maintenance Technical Guidance for Solar Projects](#)

potential application requirements and conditions of approval of a Special Use for any Solar Energy Systems greater than 0.5 acres on Agricultural Lands of State Importance and National Importance.

Example Codes	Additional Provisions for Agricultural Lands		
	Installation Plan	Soils Analysis/ Ag Use Required	Reporting and Decommissioning
<b>Illinois Solar Toolkit for Local Governments</b>	Top soils shall not be removed, unless part of remediation effort	Must comply with Site assessment or soil identification standards. Planting of perennial vegetation, mix of grasses and wildflowers. No insecticides.	Decommissioning plan required. May require bond, escrow or letter of credit to ensure proper decommissioning
<b>Santa Barbara County</b>	Pest and weed management plan		Continued weed control reports. Decommissioning Plan and financial assurance of reclamation
<b>Massachusetts Agricultural Solar Tariff Guidelines</b>	Height max 8 feet for fixed, 10 feet for tracking, shading no more than 50% of baseline conditions; spacing required is minimum of four feet	Optimize a balance between the generation of electricity and the agricultural productive capacity of the soils beneath. Solar will not interfere with the continued use of the land beneath the canopy for agricultural purposes.	Annually report productivity in pounds of crops, herd size, potential changes
<b>California Land Conservation Board</b>		Soil survey and site assessment required with BMPs for continued Ag production	
<b>New Jersey State Agriculture Right to Farm</b>	Non-permanent mounting methods preferred, concrete and asphalt prohibited except for mounting components	Land under panels must be used for Agricultural use.  Conservation plan to be approved by soil conservation district.	

Figure 14. Example codes from other land use authorities on additional provisions for agricultural lands

## **V. FOCUS QUESTIONS FOR PLANNING COMMISSION DISCUSSION**

- 1. Should Solar Energy Systems be allowed on Significant Agricultural Lands including Lands of National, Statewide, and Local Importance?**
  - A. Should Solar Energy Systems be allowed on Agricultural Land of Local Importance without additional review beyond zoning district?**
  - B. Should Solar Energy Systems be allowed through Special Use Review for State and National Importance, given the proposed conditions?**
  - C. If yes to B, should the size (area of disturbance) be limited to a maximum of 5 acres, 6 acres, 8 acres, 10 acres, other?**
  
- 2. Should the language or additional provisions for limiting solar development Forestry and Agricultural zoning district be revised?**
  - A. Should we remove the restrictions on Agricultural zoned property for 10+ acre (2MW+) arrays, given the proposed criteria for Significant Agricultural Lands?**
  
- 3. Is it appropriate to open up more zoning districts (T, B and RR, ER on unsubdivided lands) to solar development over 2.5 acres (500kW)?**
  - A. Transitional and Business?**
  - B. Un-subdivided Lands in RR and ER?**

## **VI. NEXT STEPS**

Staff will finalize proposed amendments based on outcomes from the Planning Commission study session, as well as the referral process that has yet to be completed. Staff anticipates presenting complete draft amendments to Planning Commission at the August Planning Commission meeting, with a request for Planning Commission approval and recommendation to the Board of County Commissioners. Subsequently, staff will present the proposed text amendments and Planning Commission recommendations to the Board of County Commissioners for decision in late August or early September.

# Attachment A: Existing Solar-Related Land Use Code Text

## Article 4:

### **4-101 Forestry, 4-102 Agricultural, 4-110 Commercial, 4-111 Light Industrial, 4-112 General Industrial**

#### **(F) Additional Provisions**

5. Small Wind-Powered Energy Collectors Systems, and Small Solar Energy Collectors Systems or Solar Gardens, Medium Solar Energy Systems or Solar Gardens, and Large Solar Energy Systems can be approved on parcels with existing principal uses without Special Review approval, however, these uses shall be reviewed using the process and standards described in the Utility and Public Service Uses classification in this Code.

### **4-103 Rural Residential, 4-104 Estate Residential, 4-105 Suburban Residential, 4-106 Multi-family, 4-107 Manufactured Home Park, 4-108 Transitional, 4-109 Business, and 4-117 Mountain Institutional**

#### **(F) Additional Provisions**

5. Small Wind-Powered Energy Collectors Systems, and Small Solar Energy Collectors Systems or Solar Gardens can be approved on parcels with existing principal uses without Special Review approval, however, these uses shall be reviewed using the process and standards described in the Utility and Public Service Uses classification in this Code.

## **4-514 Utility and Public Service Uses**

### **F . Large Solar Energy System**

1. Definition: A system composed of a solar energy collector which may include an energy storage facility, and components for the transmission and distribution of transformed energy, and which may be used for one or more users .
2. Districts Permitted: By Special Review in GI, LI, C, A, F if the system has a rated capacity greater than 2 MW but does not meet the Land Use Code definition of Power Plant
3. Parking Requirements: To be determined through the review
4. Loading Requirements: None
5. Additional Provisions:
  - a. This use is required to be located on a building lot or an outlot platted for this purpose.
  - b. Ground-mounted solar energy collectors may not be located within utility easements or ditch easements unless authorized in writing by the easement holder.
  - c. This use shall not have a significant adverse visual impact on the natural features or neighborhood character of the surrounding area and shall be located to minimize glare on adjacent properties and roadways.
  - d. This use is permitted in the Agricultural or Forestry zone districts will be permitted only if the area used has been contaminated or damaged making it unsuitable for agricultural, forestry, or residential uses. These areas may include former landfills, brownfields, Superfund sites, and the like.

# Attachment A: Existing Solar-Related Land Use Code Text

- e. This use cannot be located on areas with the following Boulder County Comprehensive Plan designations: Agricultural Lands of National Importance, Agricultural Lands of Statewide Importance, Agricultural Lands of Local Importance, Natural Landmarks and Areas, or Critical Wildlife Habitats.
- f. Roof-mounted systems proposed as a principal use may be mounted on any legal structure, subject to review through the building permit process. Roof-mounted systems shall be mounted as flush as possible to the roof. In order to achieve proper solar orientation, panels may exceed the roofline by up to five feet or the maximum height of the zone district by up to five feet (whichever is more restrictive) .
- g. Applications shall be reviewed with special consideration given to lands identified as Open Corridor, Roadside in the Boulder County Comprehensive Plan.

## **H . Medium Solar Energy System or Solar Garden**

- 1 . Definition: A system composed of a solar energy collector which may include an energy storage facility, and components for the transmission and distribution of transformed energy, and which may be used for one or more users.
- 2 . Districts Permitted: By Special Review in GI, LI, C, A, F if the rated capacity of the system will be at least 500 kW but not more than 2 MW
- 3 . Parking Requirements: To be determined through the review
- 4 . Loading Requirements: None
- 5 . Additional Provisions:
  - a. This use is required to be located on a building lot or an outlot platted for this purpose.
  - b. Ground-mounted solar energy collectors may not be located within utility easements or ditch easements unless authorized in writing by the easement holder.
  - c. This use shall not have a significant adverse visual impact on the natural features or neighborhood character of the surrounding area and shall be located to minimize glare on adjacent properties and roadways.
  - d. Medium solar energy systems in the Forestry zone district will be permitted only if the area used has been contaminated or damaged in the past making it unsuitable for agricultural, forestry, or residential uses. These areas may include former landfills, brownfields, Superfund sites, and the like.
  - e. Medium solar energy systems cannot be located on areas with the following Boulder County Comprehensive Plan designations: Agricultural Lands of National Importance, Agricultural Lands of Statewide Importance, Agricultural Lands of Local Importance, Natural Landmarks and Areas, or Critical Wildlife Habitats .
  - f. Applications shall be reviewed with special consideration given to lands identified as Open Corridor, Roadside in the Boulder County Comprehensive Plan.
  - g. Roof-mounted systems proposed as a principal use may be mounted on any legal structure, subject to review through the building permit process. Roof-mounted systems shall be mounted as flush as possible to the roof in order to achieve proper solar orientation, panels may exceed the roofline by up to five feet or the maximum height of the zone district by up to five feet (whichever is more restrictive).

## **M . Small Solar Energy System or Solar Garden**

- 1 . Definition: A system composed of a solar energy collector which may include an energy storage facility, and components for the transmission and distribution of transformed energy.

# Attachment A: Existing Solar-Related Land Use Code Text

- 2 . Districts Permitted: By Site Plan Review in all districts if the system will have a rated capacity of 100 kW or less .  
By Limited Impact Special Review in all districts if the system will have a rated capacity greater than 100 kW but less than 500 kW.
- 3 . Parking Requirements: To be determined through the review
- 4 . Loading Requirements: None
- 5 . Additional Provisions:
  - a. This use is required to be located on a building lot or an outlot platted for this purpose.
  - b. If necessary for the system's effectiveness, ground-mounted solar energy collectors may be located within the minimum lot line setbacks for the subject property zoning district and within any applicable major road supplemental setback without the need for a variance, provided that the solar energy collector is located no less than five feet from lot lines and no less than 15 feet from road rights-of-way.
  - c. Ground-mounted solar energy collectors may not be located within utility easements or ditch easements unless authorized in writing by the easement holder.
  - d. This use shall not have a significant adverse visual impact on the natural features or neighborhood character of the surrounding area and shall be located to minimize glare on adjacent properties and roadways.
  - e. Applications shall be reviewed with special consideration given to lands identified as Environmental Resources and Open Corridor, Roadside in the Boulder County Comprehensive Plan.
  - f. If larger than 100 kW, this use cannot be located on areas with the following Boulder County Comprehensive Plan designations: Agricultural Lands of National Importance, Agricultural Lands of Statewide Importance, Agricultural Lands of Local Importance, Natural Landmarks and Areas, or Critical Wildlife Habitats.
  - g. Roof-mounted systems proposed as a principal use may be mounted on any legal structure, subject to review through the building permit process. Roof-mounted systems shall be mounted as flush as possible to the roof in order to achieve proper solar orientation, panels may exceed the roofline by up to five feet or the maximum height of the zone district by up to five feet (whichever is more restrictive).

## **4-516 Accessory uses**

### K . Accessory Solar Energy System

- 1 . Definition: A system composed of a solar energy collector which may include an energy storage facility, and components for the distribution of transformed energy, which may be attached to a residence or other structure.
- 2 . Districts Permitted: By right in all districts for roof-mounted systems. By Site Plan Review Waiver for ground-mounted systems.
3. Parking Requirements: None
4. Loading Requirements: None
5. Additional Provisions:
  - a. Ground-mounted systems are considered structures and must meet applicable setbacks for the zone district except as provided in 5 .d . below .
  - b. Ground-mounted systems shall not have a significant adverse visual impact on neighboring private and public property.

# Attachment A: Existing Solar-Related Land Use Code Text

- c. Roof-mounted solar energy systems shall be mounted as flush as possible to the roof. In order to achieve proper solar orientation, panels may exceed the roofline by up to five feet or the maximum height of the zone district by up to five feet (whichever is more restrictive).
- d. If necessary for the system's effectiveness, ground-mounted solar energy collectors may be located within the minimum lot line setbacks for the subject property zoning district and within any applicable major road supplemental setback without the need for a variance, provided that the solar energy collector is located no less than five feet from lot lines and no less than 15 feet from road rights-of-way.
- e. Ground-mounted solar energy collectors may not be located within utility easements or ditch easements.

## **4-802 Applicability and Scope of Site Plan Review Process for Development**

A. Site Plan Review shall be required for (unless not required or waived pursuant to sections B and C below):

- 13. A small solar energy system as a principal use

C. Site Plan Review may be waived for the following circumstances if the Land Use Director determines that there is no potential for any significant conflict with the criteria listed in Article 4-806 of this Code:

- 7. Any ground-mounted accessory solar energy system.

## **4-1003 Non-conforming uses- solar energy device**

(C) Enlargement or Alteration of a Nonconforming Use

2. An impermissible enlargement or alteration shall not include the following:

- d) the addition of a solar energy device to a structure containing a nonconforming use; or

## **Article 18 - Definitions:**

### **18-198 Solar Access**

The ability to receive sunlight across real property for any solar energy device.

### **18-199 Solar Energy Device**

A device which converts the sun's radiant energy into thermal, chemical, mechanical, or electric energy.

### **18-185 Power Plant**

An electrical energy generating facility with generating capacity of more than 50 megawatts and any appurtenant facilities.