Rico Planning Commission Memorandum

Date: November 8, 2024

TO:Town of Rico Planning CommissionFROM:Chauncey McCarthy, Rico Town ManagerSUBJECT:October Planning Commission meeting

#### **Rico Land Use Code global revision**

We will continue our review of the Rico Land Use Code global revision article 8 and definitions. Last month there were discussions regarding solar, tree, lighting, and fence regulations. Included in the packet are examples of regulations other municipalities implemented regarding these topics. Additionally, the Town of Rico's Historic district fence permit has been included which could be used for all fence permits. The planning commission should be prepared to discuss these materials.





DOLORES COUNTY, COLORADO INCORPORATED OCTOBER 11, 1879 2 North Commercial Street Post Office Box 9 Rico, Colorado 81332 Office # 970.967.2861 Fax # 970.967.2862 www.ricocolorado.org

#### **RLUC** Review

Date: 10.9.2024 Start: Review of the RLUC with Joint review Stopping point: Final review of Article I-V and Article VII

Notes:

-Pg 62 for the RLUC also for review.

- Solar: Where solar is located and inclusion of viewshed buffers. May have to look at legal aspect of the state laws that do or do not support this within the town limits. Permit solar installations.

-Clearing of lots of site trees: clear cutting a lot without a plan.

- Planning Commission interested in looking at other plans that try to provide some guidelines for removal of vegetation.

- The first review process is to go through the Manager response to comments seeking input from the manager on certain items. These are in blue of the attached packet material. The following items were discussed at this meeting:

\*Building Height: no changes requested from Planning Commission

\*Basements would not count but decks and other overhangs would

\*Minimum roof pitch: leave at the 7/12 and leave the lesser pitch an avenue for variance. There could be an addition of some variance language that doesn't require a hardship. Planning Commission is leaning on just a design review process. The design review process should tie to some component of the RLUC that lends toward some requirements that would be listed in the RLUC in this area. This would sit very similar to how Planning Commission reviews historic commercial.

\*Residential Zone Districts: There is some discussion of allowing a duplex. Primarily because housing is a concern. There is some discussion about moving a builder into doing two separate units that are not attached when there may be some benefit to allowing duplex. Separates are not exceeding two dwelling units.

\*204.3 Fences: A change with some concepts of having a set back of 1-3 feet and adjoining areas like right of way or intersection changing to include a setback. Also requiring a permit. The permit will be redrafted by staff for review.

\*405.1 is still in process with staff

\*Alley standards: The staff recommends what we have in the code currently is sufficient.

-Review of changes of Article VII: Manager quickly went through some changes and possibly have a joint meeting at the December 11<sup>th</sup> Planning Commission meeting.

Worksession ended: p.m.

Page 1



# County Land-Use Regulations for Solar Energy Development in Colorado

Allison Jackson,<sup>1</sup> Kate Doubleday,<sup>2</sup> Brittany Staie,<sup>2</sup> Allison Perna,<sup>2</sup> Mariel Sabraw,<sup>1</sup> Liz Voss,<sup>1</sup> Apolonia Alvarez,<sup>2</sup> Byron Kominek,<sup>1</sup> and Jordan Macknick<sup>2</sup>

Colorado Agrivoltaics Learning Center
 National Renewable Energy Laboratory

NREL is a national laboratory of the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy Operated by the Alliance for Sustainable Energy, LLC **Technical Report** NREL/TP-6A20-88556 April 2024

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Contract No. DE-AC36-08GO28308



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Allison Jackson,<sup>1</sup> Kate Doubleday,<sup>2</sup> Brittany Staie,<sup>2</sup> Allison Perna,<sup>2</sup> Mariel Sabraw,<sup>1</sup> Liz Voss,<sup>1</sup> Apolonia Alvarez,<sup>2</sup> Byron Kominek,<sup>1</sup> and Jordan Macknick<sup>2</sup>

1 Colorado Agrivoltaics Learning Center 2 National Renewable Energy Laboratory

#### **Suggested Citation**

Jackson, Allison, Kate Doubleday, Brittany Staie, Allison Perna, Mariel Sabraw, Liz Voss, Apolonia Alvarez, Byron Kominek, and Jordan Macknick. 2024. *County Land-Use Regulations for Solar Energy Development in Colorado*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-88556. <u>https://www.nrel.gov/docs/fy24osti/88556.pdf</u>.

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

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

Laboratory (NREL) at www.nrel.gov/publications. Contract No. DE-AC36-08GO28308

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This work was authored in part by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding at NREL provided by the InSPIRE project through U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office award DE-EE00038642. The views expressed herein do not necessarily represent the views of the DOE or the U.S. Government.

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### **Acknowledgments**

The Colorado Agrivoltaic Learning Center would like to thank the National Center for Appropriate Technology (NCAT) and the NCAT AgriSolar Clearinghouse for their financial support of this report. The authors wish to thank Megan Day, Anthony Lopez, Aaron Levine, Amy Brice, Mark Ruth, Caitlin Murphy, Dan Bilello, David Glickson, Jeff Cook, James McCall, Martha Symko-Davies, Mary Werner, William Livingood, Doug Arent, Juan Torres, Gian Porro, Kristen Boysen, and Wil Mannes for their insightful reviews and comments, and National Renewable Energy Laboratory team members Billy Roberts and Emily Horvath for their valuable contributions.

## **List of Acronyms**

Colorado Agrivoltaic Learning Center
Colorado Revised Statutes
community solar garden
U.S. Energy Information Administration
foot
gigawatts alternating current
gigawatts direct current
kilowatt
kilowatt-hour
megawatts alternating current
megawatts direct current
National Renewable Energy Laboratory
photovoltaic
Solar Energy Industries Association
U.S. Department of Agriculture

This report is available at no cost from the National Renewable Energy Laboratory at www.nrel.gov/publications.

### **Executive Summary**

The United States is experiencing rapid growth in ground-mounted solar, including in Colorado where utility-scale ( $\geq 1$  MW nameplate capacity) solar photovoltaic (PV) plants have been deployed in 28 of 64 counties (U.S. Energy Information Administration [EIA] 2023a). Groundmounted or free-standing solar uses an array of PV modules mounted on a racking system on the ground. It includes both large, utility-scale plants as well as smaller applications, such as customer-sited arrays at commercial or industrial facilities and community solar gardens. As solar deployment has increased, so have community concerns about impacts to the visual landscape, property values, community character, and the development of agricultural land (Nilson, Hoen, and Rand 2024). Agrivoltaics, a dual land use combining agriculture and groundmounted PV on the same land, is one possible solution to some of these challenges (Macknick et al. 2022). Agrivoltaics can include cultivating crops, beekeeping, and grazing livestock underneath and/or in between solar panels and can provide diversified income, water savings, and other synergistic benefits (Hernandez et al. 2019; Macknick et al. 2022; Nilson, Hoen, and Rand 2024). There is recent interest in agrivoltaics in Colorado, including successful commercial deployments as well as state-level grants and tax incentives for more demonstration sites (Jaffe 2022b; Colorado General Assembly 2023a).

Additionally, Colorado has a goal of achieving a 100% reduction in economy-wide greenhouse gas pollution by 2050, and the state's largest electricity provider, Xcel Energy, is targeting 100% carbon-free electricity by 2050 (Colorado General Assembly 2023b; Xcel Energy 2023). Since permitting authority for solar plants in Colorado lies with local governments, county land use codes and permitting processes play an important role in solar deployment (Lerner 2022; Lopez et al. 2023; Pascaris 2021). Counties commonly define zoning districts with different allowable uses and permitting processes for land-use changes, varying in their oversight and requirement complexity. Requirements can include maximum structure height; setbacks from property lines, roads, and structures; fencing or screening for safety or visual appeal; and other visual impact and vegetation management requirements, which can impact the design and viability of solar arrays (Daniels and Wagner 2022). In addition, agrivoltaic systems are a dual land use that might not fit neatly within existing zoning definitions or solar regulations that assume single land use. Each county generally adopts unique land use codes, causing high variability in solar regulations, which is a challenge for interested stakeholders, such as policymakers, solar developers, and researchers. In addition, county-level codes may be publicly available online in a document form such as a pdf, or they may not be available at all.

In this report, we present a comprehensive review of county-level policies across Colorado that regulate ground-mounted or free-standing solar, as opposed to rooftop or building-integrated solar, for both utility-scale and distributed applications. This review includes both solar-specific ordinances as well as general land-use code that might be applicable in counties without solar-specific policies. This report provides an accessible reference for stakeholders interested in identifying counties with particular regulations or in analyzing the diversity of regulations across Colorado. We defined a set of search criteria to find information on solar definitions and classifications, permitting processes, and use-specific requirements in each of Colorado's 64 counties. We reviewed relevant ordinances, land-use code, and comprehensive and master plans conforming to those criteria from March to November 2023. If any uncertainties were identified, we contacted county officials for clarification. The findings were categorized and mapped to

illustrate the distribution of key policies adopted across Colorado's counties on the following topics: solar definitions, solar siting policy documentation, categorization of PV systems for permitting, 1041 permitting, solar on agricultural land, panel height restrictions, fencing requirements, vegetation management, visual impacts, and plans and financial assurance for decommissioning. Additional topics relevant to solar permitting, such as wildlife impact mitigation, road impact fees, lot coverage restrictions, and setbacks are left for future work or are addressed elsewhere (e.g., Lopez et al. 2023). Appendix A lists the documents reviewed for each county, and other county-level results are available in the appendices.

As of November 2023, 39 of Colorado's 64 counties had documented solar land-use regulations that contain some or all of the information in the search criteria (Figure ES-1). Nineteen counties have no land-use code specific to ground-mounted solar. However, this landscape is continually evolving—the remaining six counties had moratoriums on large-scale solar applications in effect during the review and report preparation periods. Five of these moratoriums were instituted to provide sufficient time for land-use code revisions soon after large solar power plants were permitted or announced to the public, and county officials determined that existing regulations did not sufficiently address solar as a land use or sought to proactively address other community concerns (Witowski 2022; Bunton 2023; Turner 2023a; McDermott 2023; Sida 2023).





Counties with "Detailed Solar Land Use Regulations" have documentation on all the policies listed in the review's search criteria, and counties with "Some Solar Land Use Regulations" have documentation on some but not all.

While a few counties have adopted language similar to that of their neighbors, most counties have adopted their own definitions of solar energy systems and their own land-use requirements. The cumulative effect is a wide variety of potential regulations for utility-scale solar in Colorado, as summarized in Figure ES-2. When considering both solar-specific ordinances and general

land-use codes, the most common requirements regulate fencing and visual impacts, closely followed by required plans and financial assurance for decommissioning after the system's useful life. Particularly relevant for agrivoltaic installations, several counties have specific restrictions regarding solar or general development on irrigated land, and many counties have restrictions on the maximum panel height, although most restrictions are currently high enough for common agrivoltaic configurations. Unique to Colorado, many counties also have "1041" permit requirements that might apply to solar; 1041 powers refer to delegated powers from the state to local jurisdictions to regulate certain matters of statewide concern, and 1041 permits are generally more expensive, rigorous, and have a higher level of scrutiny than other permit types.



Figure ES-2. Summary of land-use policies and requirements that might apply to utility-scale solar across Colorado's counties

From the review results, we found the following key takeaways:

- Solar plant permitting requirements across Colorado are county-specific and highly variable. Counties often varied permitting requirements for PV systems based on their installed capacity, land area, and/or electricity end use. These groupings might not be applied as intended for new and emerging solar configurations due to gaps or ambiguity in definitions. For example, there might be fewer requirements for large off-grid PV arrays for commercial uses than grid-tied systems in counties that differentiate based on electricity end use. There can also be overlap with legacy 1041 regulations, in some instances requiring developers to complete both a 1041 permit and a conditional use or special use permit (County of Elbert 2018). Relatedly, two counties require 1041 permits at a lower installed nameplate capacity threshold for solar and wind compared to fossil fuel, biofuel, or similar power generating facilities.
- 75% of Colorado's existing utility-scale solar power plants and 89% of its installed solar capacity are located in 45% of its counties, each of which has documentation for all of the policies in the review. Once a county starts receiving applications for solar power plant permits, there appear to be two common drivers motivating the adoption of

solar-specific regulations: community response and clear gaps in the existing land-use code. The public processes required for land use code and zoning changes can help address community needs and concerns, and clearly documented policies lower risks for solar development.

• Some county policies existing at the time of the review could limit agrivoltaic deployment, including four counties restricting solar in some or all agricultural zones, several others considering agricultural impacts in the review process, four counties with 10–15-foot panel height limits, and six counties with higher permitting stringency for any development on irrigated land.

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## **1** Introduction

The United States is currently undergoing a large-scale build-out of rooftop and ground-mounted solar photovoltaic (PV) projects, with total installed capacity projected to nearly double from 189 gigawatts alternating current (GWac) in 2024 to 352 GWac in 2030<sup>1</sup> (Gagnon et al. 2023). For utility-scale solar power plants and community solar gardens (CSGs) as well as for large commercial and industrial customers consuming their own solar-generated electricity on-site, these installations are typically ground-mounted and can cover tens or up to thousands of acres (Ong et al. 2013). When trying to identify locations for large ground-mounted solar plants, the most promising sites for solar developers are often on large, cleared parcels close to existing transmission lines with strong solar resource, stable soil, and minimal slope (Arán Carrión et al. 2008). Much of the land that meets these needs is current or former agricultural land (Adeh et al. 2019). While solar development is generally supported in the United States (Carlisle et al. 2015), there can be opposition to projects, particularly with projects developed on farm or forest lands (Gaur et al. 2022). Community resistance to solar development has occurred in rural areas, as communities attempt to balance prime farmland conservation, support new economic opportunities, maintain local rural character, and achieve renewable energy targets (Jaffe 2022b; Richardson, Kirk Hall, and Morgan 2022; Sungu 2011).

One possible opportunity to address these challenges is agrivoltaics, a dual land use that combines agriculture and ground-mounted PV on the same land (Bessette et al. 2024; Dinesh and Pearce 2016; Kumpanalaisatit et al 2022; Macknick et al. 2022; Mamun et al. 2022). These dual land uses can include cultivating crops, beekeeping, and grazing livestock underneath and around solar panels (Macknick et al. 2022; Kolbeck-Urlacher 2023). In the right conditions and with the right hybrid design, agrivoltaics can provide an additional income stream for landowners, maintain farmland or pastureland in production, and provide other synergistic benefits (Hernandez et al. 2019; Jaffe 2022b; Macknick et al. 2022). These benefits have the potential to address some of the major sources of community opposition, although some of the impacts are still unclear or mixed. The potential visual and aesthetic impacts of solar on the landscape is a common reason for community opposition (Carlisle et al. 2015; Nilson, Hoen, and Rand 2024), and current literature does not find clear community preferences for the aesthetics of agrivoltaic systems (Pascaris et al. 2022; Schröter, Püttschneide, and Mergenthaler 2023). However, other studies have also found that solar projects would be more likely to be supported with the addition of agrivoltaics, and solar developers have reported sometimes adding agrivoltaics in response to community feedback (Pascaris et al. 2022; Nilson, Hoen, and Rand 2024). Pascaris et al. (2022) found that 82% of survey respondents stated they would be more likely to accept solar projects in their community if agrivoltaics were integrated, even more so if they provided fair economic opportunities to farmers and the surrounding community.

While proposing an agrivoltaic rather than a single-use PV system can impact a community's response to a permit application, it can also change how the application is handled during the permitting process. Based on the selected dual-use activities, an agrivoltaic PV array might be configured differently from a single-use utility-scale system (Macknick et al. 2022). For example, the PV panels might be mounted higher above the ground or with wider spacing

<sup>&</sup>lt;sup>1</sup> Based on NREL's Mid-case Standard Scenario with current policies (Gagnon et al. 2023).

between rows of panels to accommodate larger livestock, such as cattle, or agricultural equipment (Macknick et al. 2022). Due to these differences in use and configuration, agrivoltaic and single-use PV systems might also differ in where and how they can be successfully permitted for installation.

While national renewable energy policies focus on financial incentives, and state policies generally include a mix of incentives, land-use laws, and renewable portfolio standards, the final authority on whether solar is permitted for installation typically lies at the county or municipal level (Daniels and Wagner 2022; Kolbeck-Urlacher 2023; Pascaris 2021). Therefore, county zoning codes and permitting processes can have a significant impact on where and how groundmounted solar and/or agrivoltaic installations could be built (Lerner 2022; Lopez et al. 2023; Pascaris 2021). Counties commonly define zoning districts, such as industrial or agricultural, with different allowable uses (Daniels and Wagner 2022). Further, some uses might be allowed as the primary land use, whereas other uses might only be permitted as an accessory that is incidental to the primary use (Dillemuth and White 2013). Agrivoltaic installations are a dual land use that might not clearly fit within the existing zoning definitions (Pascaris 2021). Each zone can have its own requirements, such as maximum structure height, fencing or screening for safety or visual appeal, and minimum distance that structures are set back from the road (Dillemuth and White 2013). These requirements can impact the design and economic viability of ground-mounted solar and agrivoltaic installations. There are other siting considerations as well, such as minimizing impacts on wildlife, scenic vistas, and sensitive historical, cultural, or archeological resources.

For each zoning district within a county, counties specify the type of permit required for each allowable use in that district, such as an accessory or use-by-right permit, conditional use permit, or special use permit. Use-by-right permits have minimal if any requirements, conditional use permits have requirements that must be reviewed by the county administrator or land-use department, and special use permits require extensive documentation and are reviewed by the Board of County Commissioners in a public hearing (Daniels and Wagner 2022). Zoning codes often allow large-scale ground-mounted solar plants within certain zones subject to a special use permit process (Daniels and Wagner 2022).

Information on county-level regulations is not centrally located and can be time-consuming to review, presenting a challenge for stakeholders such as policymakers, solar developers, and researchers interested in accessing and analyzing that information. Guarino and Swanson (2023) conducted a review of local-level agrivoltaic regulations in Illinois, which to the best of our knowledge is the only such resource for agrivoltaics in the United States. Lopez et al. (2023) reviewed county-level ordinances in the United States and analyzed the impacts of wind and solar setbacks on land available for renewable development. Owusu-Obeng, Mills, and Craig (2024) developed a database of local zoning ordinances for the Great Lakes region and quantified the expected impacts of these ordinances on solar deployment. This report expands that knowledge pool by reviewing and reporting county-level land-use codes impacting ground-mounted solar and agrivoltaic development across all counties in Colorado. While both Guarino and Swanson (2023) and Lopez et al. (2023) only reviewed solar-specific ordinances, this review includes both solar-specific ordinances and generally applicable zoning standards for those counties that have not adopted solar-specific ordinances, offering a more comprehensive review of solar siting requirements in Colorado.

This report reviews the state of ground-mounted solar regulations in each Colorado county's land-use code by reviewing relevant documents and directly contacting county land-use departments, administrators, or commissioners. We also discuss how these regulations might impact the deployment of agrivoltaic systems; impacts to large, utility-scale solar deployment are outside of the scope of this report. Note that land-use policies are rapidly evolving due to the high demand for solar power. Six of Colorado's 64 counties have temporary moratoriums on solar or all land-use applications while they develop their regulations and permitting processes. Most of these moratoriums are planned to last for 6 to 18 months, but there is potential for early resolution or extension. In the remainder of this report, Section 2 reviews background information on current developments impacting solar power deployment in Colorado. Section 3 presents the review method and key search topics. Section 4 reports the review results, which are discussion of potential impacts on agrivoltaic deployment. Section 6 concludes. For more information on individual counties, detailed tables of the review results are available in the appendices.

### 2 Background

Colorado has multiple state, municipal, and corporate goals supporting the deployment of renewable resources to reduce greenhouse gas emissions and air pollution. Colorado previously established a renewable portfolio standard for 30% of electricity sold by investor-owned utilities to be produced from renewable resources by 2020 (U.S. Energy Information Administration [EIA] 2023a). Colorado has set a requirement for an 80% reduction in greenhouse gas emissions from electricity by 2030 and a goal of achieving a 100% reduction in statewide greenhouse gas emissions by 2050 (Colorado General Assembly 2019, Colorado General Assembly 2023b). The governor's office published a faster roadmap targeting 100% renewable energy by 2040 (Colorado Energy Office 2019). Colorado's two largest investor-owned utilities are on track to meet the 2030 target, and Xcel Energy has also set a corporate target of 100% carbon-free electricity by 2050 (Black Hills Energy 2023; Xcel Energy 2023). As of 2019, fourteen counties and towns<sup>2</sup> have also committed to their own 100% renewable goals (Colorado Energy Office 2019).

As Colorado moves toward these renewable energy targets, solar PV installation in the state is rapidly increasing. Colorado has strong solar resource, particularly in the southcentral San Luis Valley and the southeastern plains (Figure 1). While there is limited electrical transmission from some of these high-resource areas to Colorado's Front Range urban load centers, a new set of transmission lines are currently in development to alleviate this limitation in the eastern plains (Xcel Energy 2021). Regions with available transmission capacity and sufficient land availability, particularly on the eastern plains, have a growing utility-scale solar market.

<sup>&</sup>lt;sup>2</sup> Denver, Pueblo, Boulder, Fort Collins, Summit County, Frisco, Aspen, Glenwood Springs, Breckenridge, Longmont, Lafayette, Nederland, and Golden



## Figure 1. Average solar resource and utility-scale (>1 megawatt [MW]) solar deployed by county as of October 2023 (EIA 2023b).

Installed capacity bubbles are centered in each county and are not indicative of actual distances from the solar power plants to the transmission lines. *Illustration by NREL* 

As of October 2023, 143 utility-scale (>1 megawatt alternating current [MWac]) solar projects have been deployed in 28 of Colorado's 64 counties (EIA 2023b). These plants have a combined capacity of almost 1.9 gigawatts alternating current (GWac), with another 1.3 GWac under construction or planned for installation by 2025 (EIA 2023b). Most of the existing capacity is concentrated in a few counties with very large solar power plants of tens to hundreds of MWac, with over half of the state's total solar capacity in Pueblo County alone (EIA 2023b, Figure 1). However, 43% of the total number of utility-scale plants are smaller CSGs with installed capacities of 1–4.8 MWac.

Agrivoltaic applications are being explored across this range of scales in Colorado, including both large, utility-scale solar plants and CSGs. One of the first agrivoltaic installations in Colorado was Jack's Solar Garden, a 5-acre, 1.2-megawatt direct current (MWdc) CSG in Boulder County that includes crop production, grazing, and pollinator habitat within the solar array (InSPIRE 2023; Jack's Solar Garden 2023). On the other end of the spectrum, Garnet Mesa Solar, a 383-acre, 80-MW utility-scale plant in Delta County, is in preconstruction and plans to support grazing of 1,000 head of sheep within its array (Jaffe 2022b; Garnet Mesa Solar 2023). Other current and planned deployments include three sheep-grazed CSGs, several small-scale agrivoltaic crop research sites operated by the National Renewable Energy Laboratory (NREL) and Colorado State University, and a community-supported agriculture program planned for a solar array at the Denver Botanic Gardens Chatfield Farm (InSPIRE 2023; Vickerman 2022). On the policy front, Colorado passed Senate Bill 21-235 in 2021 allocating \$150,000 to the "research, guidance, technical assistance, feasibility studies, and projects related to agrivoltaics" (Colorado General Assembly 2021). In 2023, Colorado passed another bill providing \$500,000 in grants for more agrivoltaic demonstrations in the state and offering a personal property tax exemption for equipment used in agrivoltaic systems with novel designs (Colorado General Assembly 2023).

Within this context, this report offers additional information for solar developers and policymakers interested in understanding how county-level land-use codes in Colorado might impact future agrivoltaic project development and ground-mounted solar project development in general. In addition to the commonly used accessory, conditional use, and special use permit categories, counties in Colorado also regulate solar power by a "1041 permit" unique to the state (Colorado Department of Local Affairs n.d.). Passed in 1974, the Areas and Activities of State Interest Act in the Colorado Revised Statutes (CRS § 24-65.1) created "1041" powers, named after the original legislation, Colorado House Bill 74-1041. These 1041 powers give local governments control over certain development projects in their jurisdictions that have statewide impacts (FindLaw Staff 2022). The bill includes 13 different areas and activities of interest that apply to their locality and adopting guidelines for their administration. One of these 13 areas and activities is the site selection and construction of major facilities of a public utility, which can include solar power plants. Therefore, this report also identifies which counties are opting to use this permitting process for solar power development.

### 3 Methods

To understand Colorado's county-level solar siting ordinances and land-use policies, we conducted a review of relevant publicly available data for each of the 64 counties. We first defined the review search criteria, then carried out a review for each Colorado county through document searches and by contacting planning departments and county commissioners, and finally categorized and mapped the data. The following subsections outline details for each step. Maps of these results are shown in Section 4. County-level findings are available in the appendices, and each county's land-use codes and other documents are listed in Appendix A. The document search occurred between April 5 and Nov. 1, 2023. Land-use code changes and moratoriums on solar developments passed or lifted after Nov. 1, 2023, are not included in this report, with the exception of Mesa County, which implemented a moratorium on solar applications starting Jan. 9, 2024, between the review completion and report publication.

### 3.1 Search Criteria

We selected pertinent information to include in the Colorado county-based solar siting policy review through first reviewing available information from counties with recently enacted solar siting regulations. The first two counties selected were Boulder County, which revised its Land Use Code in 2018, and Weld County, which added new solar siting regulations in 2021. After reviewing each county's regulations, we drafted a list of relevant policies and policy categories. The list was iteratively revised throughout the data collection process based on other counties' regulations. Through this iteration, some counties were revisited to ensure all criteria in the final review list had been reviewed for all counties. The final list of policy review criteria is outlined in Figure 2 and includes categories regarding county-specific definitions and classifications, permitting processes, zone-specific requirements, and decommissioning requirements. Several of these criteria, including permitting, height, setback, decommissioning, and financial assurance requirements, were similarly reviewed in Guarino and Swanson's (2023) analysis of Illinois's county-level solar requirements.



Figure 2. Policies and definitions reviewed for each Colorado county

#### 3.2 Document Search

With the list of solar siting policies selected, we conducted Google searches for publicly available information for each Colorado county. We reviewed documents like zoning ordinances, land-use codes, and comprehensive and master plans. In some cases, building codes were also reviewed, but because this report focuses on ground-mounted rather than rooftop solar, they were only relevant for certain items, such as panel height restrictions. In general, policies that were clearly intended to regulate rooftop solar were excluded, while policies that were ambiguous or applicable to both rooftop and ground-mounted solar were included. Policies addressing each element of the selected list of solar siting evaluation criteria by county were collected from the aforementioned documents.

For counties with no solar-specific policies, we used a list of keywords to search for relevant policies that apply to solar development. Keywords included height, vegetation management, reclamation, decommissioning, setback, agriculture, glare, noise, erosion, dust, energy, utility, power plant, and 1041. For example, many counties have general nuisance regulations, such as a requirement that a "use does not create excessive or offensive noise, vibration, smoke, dust, odors, heat, glare or light noticeable or extending beyond the property." These regulations are not specific to solar but may have implications for construction and operation of solar arrays.

#### 3.3 Contact With Planning Departments or County Commissioners

Following the review of publicly available documents, we identified a county contact, such as a county planner in the planning or land-use departments, a county administrator, or a county commissioner, based on the county's organization structure. If any uncertainties or missing information were identified in the document search, we followed up with this contact via phone or email to confirm the information and/or ask any questions that remained.

### 3.4 Categorization and Mapping of the Data

Once all the data were compiled, we focused on the following subset of topics from Figure 2 relevant to solar policy and development:

- Solar definitions
- Solar siting policy documentation and solar deployment
- Categorization of PV systems
- Solar on agricultural land
- 1041 permitting
- Panel height restrictions
- Fencing requirements
- Vegetation management
- Visual impacts
- Decommissioning plans
- Financial assurance for decommissioning.

We then mapped the data for each of these topics in QGIS (version 3.23.3) to visualize the range of solar policy across all 64 Colorado counties.

### **4** Results

Here, we present the key results of our solar siting policy review (Figure 2) to highlight common themes across Colorado's 64 counties. The land-use documents referenced for each county are listed in alphabetical order in Appendix A, and additional county-level details of the review findings are reported in the other appendices. Notably, six counties (9%) have passed temporary moratoriums on applications for solar energy systems and were revising their land-use codes at the time of the review and/or report preparation. Moratoriums are typically put in place to allow county officials time to revise statutes, usually with a target timeline (e.g., 6 to 18 months), although some are open-ended. For example, the moratorium in Montrose County was expected to be in place for 18 months, ending in October 2024. Chaffee County has had a moratorium on all land development applications since 2022 while they revise their land-use code. This includes most solar power plants with some exemptions, so for this analysis Chaffee County was classified as a moratorium. Mesa County implemented a 6-month moratorium on solar applications starting Jan. 9, 2024, after the review was completed; while no other land-use changes past Nov. 1, 2023, are reported, an exception was made to include Mesa here as under moratorium. For these six counties, we do not report any findings based on the previously adopted land-use codes, as we expect changes in the near future.

### 4.1 Solar Definitions

Establishing clear definitions for solar energy systems, which can have a variety of configurations and applications, creates a foundation for applying the appropriate permitting and planning requirements. The text of a definition determines what is and what is not regulated, or to what degree it is regulated. In some counties, land uses that are not explicitly defined are prohibited, while in others, undefined land uses are tacitly permitted, which can create uncertainty for solar developers (Pascaris 2021).

The review found solar-specific definitions in 38 Colorado counties (59%) (Figure 3). Most counties have unique definitions, which typically include a description of applicable technologies and/or a specification of what infrastructure is or is not included. For example, Pitkin County defines a Solar Energy Collector as "a device for the passive collection of solar energy for use in the heating of water or the generation of electricity, together with related wires and pipes necessary for operation." Many counties allow solar energy systems to include energy storage (e.g., Boulder, Chaffee, Crowley, Weld), although Arapahoe County specifically excludes battery storage from its Small Solar System Facility definition. There is one county, Morgan County, with both a solar-specific definition and a definition of an agrivoltaic system: "A system designed for the simultaneous use of areas of land for both groundmounted [sic] solar collectors and agriculture."

In 12 counties (19%), solar power plants are defined more broadly within the category of "facilities of a public utility." For example, Douglas County defines a power plant, which is one type of a major facility of a public utility, as "[a]ny electrical energy generating facility with an energy generation capacity of 50 megawatts or more, and Appurtenance(s)." Eight counties (13%) had no definitions relevant to solar siting. The full list of solar definitions is available in Appendix B.



Figure 3. Solar power or solar power zoning definitions in Colorado counties

### 4.2 Solar Siting Policy Documentation and Solar Deployment

Comprehensive solar siting and permitting documentation sets clear expectations for all stakeholders and enables solar developers to manage risk regarding projects with substantial upfront investments and long development timelines. Additionally, higher solar deployment has been observed in localities with documented solar siting policies (Cook et al. 2016; Lopez et al. 2023; Lerner 2022). Here, we present which Colorado counties have adopted policies addressing some or all of the items listed in the review criteria (Figure 2), as well as the current level of solar deployment in those counties.

As shown in Figure 4, 29 counties (45%) have detailed solar land-use regulations that address all the policies in Figure 2. One county, Gilpin, did not provide definitions for accessory or principal solar systems, but otherwise had detailed solar siting regulations using those terms. Another 10 counties (16%) have some solar land-use regulations, which address some but not all the policies outlined in the solar siting review. Other counties, 19 in total (30%), have no land-use code specific to ground-mounted solar or renewable energy resources. However, some of these counties have more general public utility, power plant, or general development regulations that are potentially applicable to ground-mounted solar, which are included in the findings in subsequent sections.



## Figure 4. Identification of which Colorado counties have implemented land-use policies regulating solar installations

By cross-referencing this data with the EIA data on solar deployments (EIA 2023b) shown in Figure 1, we found that 107 (75%) of Colorado's 143 utility-scale solar power plants<sup>3</sup> are located in counties with detailed solar land-use regulations, accounting for 1,675 MWac or 89% of Colorado's utility-scale installed solar capacity (Table 1). Ten projects (154 MWac) are located in counties that had some solar land-use regulations, and 16 projects (40 MWac) are located in counties with no code related to ground-mounted solar. Finally, 10 projects (24 MWac) were sited in counties where the solar siting policies are currently under revision or a moratorium. These data only include projects that are currently operational and not those that are in the development pipeline.

<sup>&</sup>lt;sup>3</sup> While ground-mounted systems can also include arrays of <1 MW nameplate capacity, the vast majority of ground-mounted solar is utility-scale and data on smaller systems is not readily available.

County Documentation of Solar Siting Policies	Project Count	Project Count (% of Total)	Installed Capacity (MWac)	Installed Capacity (% of Total)
Detailed Solar Land-Use Regulations	107	75%	1,675	89%
Some Solar Land-Use Regulations	10	7%	154	8%
No Code Related to Ground-Mounted Solar	16	11%	40	2%
Under Development, Revision, or Moratorium	10	7%	24	1%
Total	143		1,892	

 
 Table 1. Number and Installed Capacity of Solar Power Plants Located in Counties With Different Levels of Solar Siting Policy Documentation

### 4.3 Categorization of PV Systems

Within their solar ordinances, many Colorado counties implement a variation of permitting requirements, based on the expected impact of a solar array. For example, "medium"-sized arrays might require an administrative or minor impact review, while "large" arrays might require a major impact or special use review,<sup>4</sup> including one or more public hearings and approval by the Board of County Commissioners. Many counties also have simplified permit requirements for "small" solar energy systems designated as accessory to the primary land use, which are likely targeting rooftop systems, although some counties specifically allow ground-mounted systems as accessory uses (e.g., Eagle and Larimer counties). We found large diversity in how these permitting categories are implemented across Colorado counties, resulting in variability of potential requirements for PV systems of similar scale and use cases.

Three distinct methods for categorizing arrays were found in the review of Colorado counties: categorizing based on the installed capacity of the array (megawatts), based on the land area of the array footprint (acres), and/or based on the intended end use<sup>5</sup> for the electricity produced by the array. This final method could include categories for PV arrays intended to export electricity to the power grid for profit or for on-site self-consumption. For some counties, these categories are designated by the number of end users (e.g., one or more). Counties that regulate solar PV plants through existing public utility regulations applicable to multiple electricity generation technologies, rather than solar-specific ordinances, typically specify requirements based on the plant's installed capacity (in megawatts).

Thirty-nine percent of Colorado counties categorize their permit requirements based on one of these three methods, including ten counties (16%) categorizing solar arrays based on installed

<sup>&</sup>lt;sup>4</sup> The names of these permits differ by county, and include Modified Administrative Land Use Permit, Minor or

Major Impact Project, Land Development Agreement, Major Impact Review, or Limited Impact Special Review. <sup>5</sup> In this case, intended end-use refers to the interconnection method, such as behind-the-meter and front-of-the-meter solar systems.

capacity, eight counties (13%) categorizing based on the intended end use of the electricity, and seven counties (11%) categorizing based on the land area (Figure 5). In addition, 30% of counties apply two or more of these methods together.

The remaining 14 counties (22%) not under moratorium do not define different categories of PV systems. This group includes counties with no PV permitting information available as well as counties implementing a single permitting process regardless of the solar energy system dimensions and use case.



# Figure 5. Colorado counties' methods for categorizing solar power installations to determine which requirements to apply during the permitting process.

Figure 5 includes some categorization methods that are ambiguous about whether they apply to both groundmounted and rooftop solar systems. However, the figure might exclude some permit categories specifically for rooftop solar due to this review's focus on ground-mounted systems.

### 4.4 1041 Permitting (Areas and Activities of State Interest)

Some Colorado counties require certain solar development applicants to complete a 1041 permit rather than a more standard accessory use, conditional use, or special use permit. 1041 regulations are delegated powers from the state of Colorado to local jurisdictions to regulate matters of statewide concern, including utility infrastructure development. Additionally, these regulations serve as a means to safeguard particular geographical areas holding historical, cultural, or natural resources of statewide importance. Permitting processes per 1041 regulations are generally more expensive and rigorous and have a higher level of scrutiny than special review permitting processes, although requirements vary from county to county.

Our review found two ways that Colorado counties have implemented 1041 regulations that might apply to solar power plants. First, 1041 permits might be required for the site selection and

construction of a "major facility of a public utility," including power plants. Twenty-four counties (38%) in Colorado have adopted 1041 regulations for power plant siting that are or might be applied to ground-mounted solar power plants (Figure 6). Of these, 21 counties apply their 1041 regulations based on the power plant's generation capacity, acreage, or both, where power plants that exceed a threshold go through the 1041 permit process, and power plants under the threshold go through some other permit process. The threshold for power plant generation capacity varies from 0.5 MW to 50 MW,<sup>6</sup> and the threshold for land area varies from 0.25 acre to 320 acres. The remaining four counties (6%) have adopted 1041 regulations for siting of a major facility of a public utility, but do not specify what types or sizes of facilities would qualify. Some counties have explicitly integrated 1041 requirements into solar-specific permitting processes, while others have not, so there can be ambiguity about whether, in some instances, counties might choose to apply their 1041 regulations over a parallel solar permitting process.





While green, yellow, and red all indicate counties that have implemented 1041 regulations for siting a power plant or major facility of a public utility that might apply to solar, counties in red have not adopted capacity or acreage minimums to define the size of the facilities that qualify for the requirements.

Separate from 1041 regulations on siting of a major facility of a public utility, our review found that some counties have implemented 1041 regulations that might apply to solar power plants specifically when sited on agricultural land. 1041 permits can be required for developments of any type on historically irrigated land that plan a partial or complete "dry-up" of the land or

<sup>&</sup>lt;sup>6</sup> While some counties specify solar DC (or nameplate) capacity, many 1041 regulations are applied to power plants based on the "MW" capacity size, regardless of generation technology. This is a source of potential ambiguity in cases where DC vs. AC capacity has not been specified.

development of the land for any purpose other than irrigated agriculture, potentially impacting local water rights in the long term. Six counties (9%) require 1041 permits for any development on historically irrigated land, with minimum thresholds ranging from 3 acres to 10 acres of irrigated land. Five of these counties also have a power plant capacity and/or acreage threshold for 1041 permits, regardless of irrigation status. The full list of requirements for counties that have adopted specific capacity, acreage, and/or irrigated land development thresholds is available in Appendix C.

Not all counties or localities have adopted 1041 regulations. There are 33 counties (52%) that have either no 1041 regulations for any of the areas or activities of state interest, or no 1041 regulations specifically for site selection or the construction of major facilities of public utilities or development of irrigated land.

#### 4.5 Solar on Agricultural Land

Current or former agricultural land has many of the conditions favorable to solar development, including large, cleared parcels with strong solar resource and flat, stable ground (Arán Carrión et al. 2008; Adeh et al. 2019). Renewable development offers many potential local benefits, including job and tax revenue growth (The Western Way 2022). However, there are also concerns about siting solar development on agricultural lands, including potential impacts on food production, irrigated prime farmland, water rights, and local community character (Hunter et al. 2022). Therefore, Colorado counties are balancing these competing needs in their land-use codes, and some have instituted specific restrictions regarding solar development on agricultural lands in addition to the 1041 requirements for development of irrigated land discussed in Section 4.4.

In 40 (63%) of Colorado's counties, a solar energy system is allowed on agriculturally zoned or designated land (Figure 7), provided that the appropriate permit process is completed based on the zone and categorization system in Section 4.3. In addition to the permitting process, 11 counties (17%) have implemented specific policies that protect farmland in relation to solar energy development, which are detailed in Table 2. Two counties (3%), Fremont and Kiowa, do not allow solar energy systems on agriculturally zoned lands. Five counties (8%) do not have agriculturally zoned or designated lands and similarly have no related stipulations.



#### Figure 7. Regulation of solar power plants on agricultural land in Colorado counties

Counties	Policy or Statement
Arapahoe, Pueblo	Allow solar on some agriculturally zoned districts but not others.
Boulder	Restrict total disturbed areas associated with the ground-mounted PV system to 7 acres on parcels smaller than 70 acres in size, or 14 acres on parcels larger than 70 acres in size. Any application for a ground-mounted solar energy system with disturbed area greater than 0.5 acres on lands designated as Significant Agricultural Lands must include a Solar Energy System Development Report.
Broomfield, Larimer	Only allow solar on agricultural land as an accessory use for on-site consumption.
Cheyenne, Phillips, Sedgwick, Yuma	"Distributed and Utility-Scale Solar Energy Systems are encouraged to locate on predominantly (more than 60%) non-prime farmland."
Kit Carson, Morgan	"Protection of Agricultural Lands. The Wind or Solar Energy Facility shall not have a significant adverse impact on agricultural lands and agricultural operations above what is allowed for under landowner lease agreements."

Table 2. County Policies Specifically Protecting Agricultural Lanus Profit Solar Developine	Table 2. Co	ounty Policies	Specifically	Protecting	Agricultural La	nds From S	olar Developme
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### 4.6 Panel Height Restrictions

Some local authorities impose height restrictions on solar panels to maintain the visual harmony and aesthetics of a community and/or to ensure the safety of solar panel installations under high wind loading or extreme weather events. Restricting the height of solar panels can help mitigate these risks.

Restrictions on solar panel height vary across counties in Colorado (Figure 8). There are 33 counties (52%) that do not have specific height restrictions for solar panels. These include counties with no publicly available policies regarding height restrictions in general as well as counties where the height restriction for ground-mounted solar is determined by the general building height restriction for the underlying zoning district. For these counties, building and/or structure height restrictions range from 25 to 75 ft for principal use within the zone, which would typically not be a constraint for ground-mounted solar.



#### Figure 8. Maximum allowable height of solar panels in each Colorado county.

For counties with no restrictions specific to solar, the maximum allowable height typically defaults to the maximum building height in the underlying zoning district.

Ten counties (16%) have solar panel height restrictions of 25 ft or greater, typically in the range of 25 to 35 ft. Eleven counties (17%) have maximum allowable heights of 15 to 25 ft, and one county, Rio Grande County, restricts free-standing (i.e., ground-mounted) solar panels to 10 ft in height. Morgan County has different height restrictions for traditional solar projects (30 ft) and agrivoltaic projects (35 ft). There is also variability across the counties as to what aspect of the solar array is used to determined compliance with height restrictions. For example, Washington County measures the height from the equipment base to its highest point during operation, whereas Arapahoe County measures the height to the solar panel mounting point.

Three counties (Dolores, Douglas, and Huerfano) regulate panel height on a case-by-case basis. In Dolores County, the height restriction is determined during the land-use agreement process. Similarly, Douglas County determines maximum height during the use by special review process. Huerfano County's Board of Commissioners may exempt solar projects from maximum structure height restrictions on a case-by-case basis during the review process.

Panel height can also impact setback requirements in certain counties. In Boulder County, solar panels are restricted to 15 ft in height, unless a project has a site-specific need and has been approved through the review process. If taller panels are approved, setbacks are then increased by 75 ft from all property lines unless adequate vegetative screening can mitigate visual impacts. In Kiowa county, there are no height restrictions, but setbacks must be 1.2 times the height of the solar panels.

#### 4.7 Fencing Requirements

Solar arrays are typically fenced for protection, both to protect people and animals from the electrical equipment and to protect the solar array from accidental or intentional damage. However, fencing can also have negative impacts on wildlife habitat and migration patterns (Lovich and Ennen 2011; Sadoti et al. 2017).

Fifteen counties (23%) have specific requirements for fencing around solar arrays (Figure 9). Of these, four counties (Adams, Gilpin, Las Animas, and Washington) provide specific information about height and type of fencing, while the other counties require a fence, but do not provide height specifications. Another 17 counties (27%) have fencing policies that might apply to ground-mounted solar arrays. The remaining 26 counties (41%) that are not under moratorium have no requirements for fencing.



Figure 9. Fencing requirements for solar power installations in Colorado counties

#### 4.8 Vegetation Management

Vegetation management policies describe how vegetation such as trees, shrubs, and other plant life should be managed and/or preserved during a change in land use or the development of a property. The specifics of vegetation management can vary widely depending on local land-use codes and zoning regulations, but the general goals are to balance the preservation of natural landscapes and ground cover with the needs of development, while also managing stormwater runoff effectively.



Figure 10. Vegetation management requirements for solar power installations in Colorado counties.

About a quarter of Colorado counties (15 out of 64) have specific requirements regarding vegetation management during or after the construction of solar arrays (Figure 10). Another 8 counties (13%) have general vegetation management regulations for specific permits or general development standards that could be applied to the construction of solar arrays. The other 35 counties not undergoing a moratorium do not have specific policies relating to vegetation management.

Most of these vegetation management policies (18 out of 22) relate to minimizing disturbances (like grading, soil compaction, or vegetation clearing), revegetation requirements after construction to minimize erosion, and noxious weed management. Examples include Boulder County's Solar Energy System Development Report, which has plans to maintain or improve soil quality and agricultural integrity, and Chaffee County's Restoration and Revegetation of Disturbed Areas policy, which requires revegetation within one season using a mix of native, adaptive, and drought-tolerant grasses and groundcovers to prevent soil erosion and weeds.

Five counties have specific policies relating to wildfire mitigation and fuel reduction caused by vegetation. For example, Adams County requires a plan to keep vegetation to minimal levels around the facility perimeter through treatment, mowing, or other fuel reduction methods.

Finally, two counties have requirements to retain existing trees and vegetation where possible. Archuleta County regulations state, "Significant vegetation, including dominant or mature trees and shrubs and endangered species, should be retained where possible and in accordance with Community Wildfire Protection Plan requirements."

### 4.9 Visual Impacts

Common community concerns about solar PV arrays include visual changes in the landscape and aesthetic concerns (Carlisle et al. 2015). Proper siting, design, and mitigation policies, including visual screening through fencing or vegetation, can help minimize the perceived negative visual impacts. There can also be concerns about glare from solar panels impacting neighbors, motorists, and aviation, although PV is typically coated in antireflective materials, and research addressing these concerns has demonstrated that solar PV has similar reflectivity to smooth water (Riley and Olson 2011; Day and Mow 2018).

Twenty counties (31%) across Colorado have policies regulating the visual impacts of solar arrays (Figure 11). An additional 16 counties (25%) have visual impact policies that might apply to solar arrays. Three counties may require visual impact plans and mitigation on a case-by-case basis for specific sensitive locations or the size of the solar array. Other counties have visual impact policies applicable to any development within their jurisdiction that are not specific to solar. The other 22 counties (34%) not under a moratorium did not have any requirements related to visual impacts of new developments.





Seven counties require a visual impact plan or report as part of their permitting process. Lincoln County has the most extensive requirements, including multiple visual simulations for developments in a sensitive viewshed or with structures taller than 30 ft, and projects may be denied if significant visual impacts cannot be sufficiently mitigated. Thirteen other counties have visual impact policies related to nearby properties or rights-of-way. For example, Yuma County's policies state: "All Solar Energy Systems shall not have an adverse visual impact on the natural features or character of the surrounding area and shall be located to minimize glare on
adjacent properties and roadways." This is typical for counties that state that the solar array should not impact nearby land use but do not prescribe specifically how that should be done.

#### 4.10 Decommissioning Plans

Proper planning for decommissioning from the outset of a project can help mitigate potential environmental, financial, and regulatory challenges associated with the eventual end of the array's operations. Decommissioning plans state when and how solar array infrastructure is to be removed once it is no longer operational. Decommissioning plans can dictate how materials (steel, solar panels, wires, concrete, gravel, etc.) are to be handled upon removal (e.g., recycled, landfilled, or donated), expectations of the land's quality after decommissioning, and who is ultimately responsible for these costs (Curtis et al. 2021).

Twenty-seven counties across Colorado (42%) have policies related to solar array decommissioning and reclamation (Figure 12). Within this group, six counties mention decommissioning or reclamation in their solar specific policies, but do not have specific requirements and rely instead on the developer to formulate an adequate plan during application. The other 21 counties have specific requirements for decommissioning plans. Cheyenne, Yuma, and Sedgewick counties have the most extensive requirements for decommissioning, which include structure and cabling removal and soil and vegetation restoration. These policies also provide clear guidelines of the owner or operator's financial and legal obligations and the county's power to review and approve the decommissioning plan or, if necessary, complete the decommissioning if it does not proceed in compliance with the plan.





Nine other counties require a reclamation or decommissioning plan for any development within their jurisdiction, not just specific to solar energy systems. The other 22 counties not under moratorium did not have any decommissioning requirements relevant to solar arrays.

#### 4.11 Financial Assurance for Decommissioning

In addition to a decommissioning plan, a form of financial assurance is often required to ensure for the removal of the solar array infrastructure at the end of its useful life, even if the plant operator faces financial hardship or bankruptcy in the interim. Financial assurance can take various forms like a self-bond, bond, federally insured certificate of deposit, government-backed securities, corporate guarantee, letter of credit, or cash. Financial assurance is usually a certain percentage of the total value of the project or a valuation of the funds needed to remove the solar equipment minus its salvage value. Several counties, including Cheyenne, Lincoln, and Sedgwick counties, require this value to be reevaluated every 3 to 5 years, starting either postconstruction or toward the middle of the project's lifespan after 10–15 years.

Financial assurance or decommissioning bonds are required for solar energy facilities in 18 Colorado counties (28%) (Figure 13). For example, El Paso County requires a financial assurance deemed acceptable to the county equal to the cost of decommissioning, as estimated by a professional engineer. Some counties require financial assurance from the outset, while other counties such as Kit Carson do not require the financial assurance until partway through the system's lifespan (e.g., 10 years), unless there is abandonment or decommissioning of the project prior to that time. An additional 19 counties (30%) have financial assurance in their landuse code that is not specific for solar energy facilities but may be applicable to them. Park County's policies are not specific to solar, but state: "The County may require monetary deposits, bonds, and/or written agreements to provide for a sufficient financial guarantee, as determined by the County, for restoration and cleanup of site access or other County property or interests." The remaining 21 counties (33%) not under moratorium do not have any requirements for financial assurance in their land-use codes.



Figure 13. Financial assurance requirements for decommissioning solar power installations for Colorado counties

## **5** Discussion

Our review of Colorado's county-level solar ordinances and land-use codes illustrates that there is currently high variability in requirements and permitting rigor for ground-mounted solar across Colorado. Depending on the county, solar arrays of similar size, configuration, and application might be required to complete one of various permitting requirements up to and including 1041 permits (e.g., Prowers County) or might not require a permit at all (e.g., Baca County, which is Prowers County's neighbor). This regulatory landscape for ground-mounted solar is also continuously evolving, with six county moratoriums currently in effect, many of which were motivated in part by community concerns about solar. Counties that have already adopted solarspecific ordinances commonly include requirements addressing community concerns, including visual impacts, safety, and changes to agricultural land. Dual-use agrivoltaic systems are one approach to address community concerns about converting agricultural land to solar, and agrivoltaics have been deployed in multiple Colorado counties, although only Morgan County has codified a definition for agrivoltaics thus far. Our review of regulations finds that some county-level policies might impact the feasibility of agrivoltaic deployments, while other policies protecting irrigated land might be more compatible with agrivoltaic deployments than traditional utility-scale solar arrays that include a permanent dry-up.

In this section, we discuss some of these major findings, including the interactions between solar deployments and the adoption of solar-specific ordinances and moratoriums, variability in solar ordinances across Colorado, and potential impacts of county-level regulations on agrivoltaic deployments and state-level renewable energy targets.

## 5.1 Solar-Specific Ordinances, Deployment, and Community Response

We found that the majority of Colorado's utility-scale<sup>7</sup> solar power plants (75%) and installed capacity (89%) are located in counties with documentation on all of the policies we reviewed (Figure 2). This is consistent with other analyses that find correlation between localities with solar ordinances and where solar is being deployed (Day 2015; Cook et al. 2016; Lopez et al. 2023; Lerner 2022). Additionally, Lerner (2022) notes that counties tend to adopt renewable energy ordinances when their neighbors adopt ordinances or begin building renewable energy projects. There are potential interactions between solar ordinance and solar deployment, where the demand for solar deployment can motivate solar ordinance adoption, which can in turn enable further solar developments. Solar projects require substantial up-front investments and often have long development timelines. A typical utility-scale solar PV project can take up to 4–5 years from planning to the completion of an operational solar energy facility (SEIA 2013). Regulation changes or revisions can disrupt project planning and execution; therefore, documented permit and planning requirements enable interested landowners and solar developmers to make informed decisions and manage project risk.

To investigate the interdependence of solar ordinances and adoption, we reviewed the timeline of solar ordinance adoption for the five counties with the highest number of utility-scale solar

<sup>&</sup>lt;sup>7</sup> While ground-mounted systems can also include arrays of <1 MW nameplate capacity, the vast majority of ground-mounted solar is utility scale, and data on smaller systems are not readily available.

projects and the five counties with the highest installed capacity (Figure 14).<sup>8</sup> The dates of solar ordinance adoption and amendment are compared to the year that utility-scale solar capacity became *operational* in that county; note that the year of operation likely lags the year each solar power plant was first proposed to the community due to permitting and construction timelines. Figure 14 illustrates that these Colorado counties typically adopted solar-specific ordinances after one or more solar power plants were planned in their jurisdictions. Garfield, Alamosa, El Paso, and Arapahoe counties adopted regulations around the same time as their first few solar power plants were becoming operational and then implemented amendments a few years later as more and larger solar power plants were developed. Adams, Weld, and Pueblo counties allowed for the permitting and construction of several projects prior to the adoption of solar-specific regulations. While the regulatory certainty from documented solar siting policies might reduce permitting risk for future solar developments, this analysis does not address other factors influencing solar developers to target land in these counties, such as solar resource, available interconnection capacity, land prices and availability, or expectations about community response.



## Figure 14. Timelines of solar deployment, adoption of solar-specific ordinances or definitions, and amendments to those ordinances for Colorado counties with high solar deployment to date.

Solar ordinance and amendment dates were determined by a review of county documents and personal communication with county officials. Blue dots show when a utility-scale solar power plant became operational according to the EIA (EIA 2023b), which lags the date that the project applied for county permitting. The top five counties in the EIA data in terms of number of projects (Adams, Weld, Alamosa, Arapahoe, Garfield) or installed capacity (Pueblo, Alamosa, Adams, El Paso, Weld) are shown.

Once a county starts receiving applications for solar power plant permits, there appear to be two common drivers motivating the adoption of solar-specific regulations: community response and clear gaps in the existing land-use code. More recently, from 2022 to 2023, several counties, including Morgan, Phillips, Washington, and Logan, have enacted and resolved temporary moratoriums on solar power plant applications to provide land-use departments with sufficient

<sup>&</sup>lt;sup>8</sup> Three of the counties (Adams, Alamosa, and Weld) are included in top five counties for both number of projects and installed capacity, so only seven counties were reviewed.

This report is available at no cost from the National Renewable Energy Laboratory at www.nrel.gov/publications.

time to draft suitable regulations for local needs. Current moratoriums are in effect for Chaffee, Delta, Montrose, San Miguel, Rio Blanco, and Mesa counties. Chaffee County has had an ongoing moratorium for multiple land-use categories while it completes broader updates to its land-use code (Ark Valley Voice Staff 2022; Chaffee County 2022); the other five counties instituted moratoriums soon after large solar power plants were announced for development or solar permit processes were resolved, as shown in Figure 15 (Chaffee County 2022; Montrose County 2022b; Delta County Board of Commissioners 2022; Tuttle 2023; Mesa County 2024; Turner 2023b; SolarGen 2022; McDermott 2023; Garnet Mesa Solar 2023; Bunton 2023; NextEra Energy 2023; Sida 2023).



# Figure 15. Timelines of current county-level solar moratoriums in Colorado, including public announcement or permit approval of key solar power plants planned in each county. The planned capacity and/or acreage of each solar plant is indicated.

This timeline focuses on key developments and is not intended to be a comprehensive review of solar developments in each county. Chaffee, Montrose, Rio Blanco, and Mesa also had relatively small (1–8 MWac) solar power plants developed in 2012–2020 (EIA 2023b) prior to this 18-month timeline.

Several of these solar projects elicited strong community response, both positive and negative, and county officials reported feeling that their existing land-use code was insufficient to address concerns (Witowski 2022; Bunton 2023; Turner 2023a; McDermott 2023; Sida 2023). In Delta County, an 80-MW solar project that was initially rejected by county commissioners for concerns of losing farmland was approved after the addition of sprinkler and drip irrigation to support agrivoltaic sheep grazing below the panels (Jaffe 2022a; Witowski 2022). Two weeks after the approval, the county commissioners implemented a moratorium on all utility-scale solar projects to develop relevant solar policy for future projects (Delta County Board of Commissioners 2022). Similarly, a few weeks after a large-scale solar project was proposed in Montrose County, county commissioners enacted a 6-month moratorium on all solar projects, or "until appropriate facility standards are incorporated into the Montrose County zoning regulation, whichever comes first" (McDermott 2023; Montrose County 2022b). In San Miguel County, a solar project proposal caused locals to raise concerns around visual impacts and impacts on recreation, hunting, and wildlife (Bunton 2023). Amid feelings at the county that the existing code is "lagging behind," San Miguel County commissioners approved a 6-month

moratorium 1 week later to make the application process fair and "to respond intelligently for both our citizens (and) also for future applicants" (Bunton 2023; Tuttle 2023).

In this ordinance development process, each county is balancing local needs, and many counties have implemented solar-specific policies to proactively address community concerns, such as visual impacts (31% of counties). However, a side effect of this county-by-county approach is that the solar permitting landscape across Colorado is varied, resulting in a regulatory variance that can present a challenge to solar developers and interested landowners where there are ambiguities and gaps in local ordinances.

#### 5.2 Variability in Solar Permitting Across Colorado's Counties

Due to the county-by-county approach to developing ordinances, there is variability of permitting rigor for solar power plants across Colorado. Counties commonly apply varying permitting requirements for different types of PV systems, categorized based on installed capacity (MWdc, MWac, or MW), land area (acres), and/or electricity end use (self-consumption vs. grid export). Additionally, some counties have adopted 1041 regulations that are explicitly integrated into solar-specific permitting processes, while in other counties have adopted 1041 requirements without further definitions of what constitutes a "major facility of a public utility," while many other counties have defined specifications of which power plants qualify. In aggregate, this presents a variance of potential requirements across the state for landowners and solar developers interested in developing projects.

At the same time, the three commonly used permitting categorization methods have potential gaps or limitations that might inadvertently impact the types of solar deployments a county is intending to support. When considering the installed capacity, PV systems have two ratings to consider: the DC capacity (MWdc), which is the total capacity of the PV modules, and the AC capacity (MWac), which is the rating of the inverters that interface between the PV modules and the electric grid. Due to the higher relative cost of inverters, PV systems are commonly built with a DC-to-AC capacity ratio of 1.3 or more, although including energy storage can increase this ratio (Bolinger et al. 2023). Some counties specifically define which capacity they are referring to in their solar permitting regulations, such as Garfield and Lincoln counties, but other counties simply refer to the "MW" capacity without clarifying their definitions. While the DC installed capacity is commonly referenced by the solar industry, this ambiguity in definitions may be more prevalent for counties that use the same permitting processes across multiple types of power plant technologies, for which the AC capacity is the default rating under consideration.

When categorizing based on either land area or installed capacity, permitting requirements and land-use restrictions might not be applied as intended for new and emerging solar configurations. Currently, utility-scale solar arrays require an average of 5.75 acres per MWdc<sup>9</sup> of installed solar capacity, equating to a capacity density of 0.17 MWdc/acre (U.S. Department of Energy 2021). However, there is variability in this capacity density due to topography and technology choices; for example, optimized tracking systems can enable higher densities. In other cases, lower

<sup>&</sup>lt;sup>9</sup> Solar Futures Study reports typical land use requirements of 7.5 acres/MWac and inverter loading ratios of 1.3, which are converted here into acres per MWdc.

densities are intended and desired, such as in agrivoltaics configurations with wider row spacing to prioritize use of arable land and improve access for labor and equipment (Macknick et al. 2022). In very widely spaced arrays, the system might include far fewer PV module rows and have a lower impact on the land compared to a traditionally configured array on the same area, leading to smaller energy generation per acre when compared to traditional utility-scale designs. Further, advances in PV technology, including module efficiency, layout, and tracking optimization, could continually impact the solar capacity density that is considered typical. Due to the variability in capacity density, establishing requirements based on either land area or installed capacity may result in situations that may or may not align with the original intention of the regulations. For example, a county that requires 1041 permits for any plant greater than 5 acres might require a 1041 permit for both a 1-MWdc (~5.75 acres) traditional utility-scale solar plant and a 0.5-MWdc agrivoltaic plant with twice the row spacing.

When categorizing PV systems based on the expected electricity end use, such as commercial vs. noncommercial use or self-consumption vs. electricity export to the grid, counties are potentially balancing private property rights and expected land impacts. While PV systems for noncommercial use or self-consumption might typically be expected to be small rooftop mounted systems, there are also emerging applications for large ground-mounted, off-grid PV systems. These include large commercial and industrial customers, such as data centers, mining operations, or indoor agricultural grow centers, powering their own on-site operations (Peacock 2021; Schoenberg 2020; Sandfire 2024). These applications could impact significant land areas but may or may not fall into the intended permit category based on an end-use categorization. Finally, many counties categorize PV systems based on some combination of these three methods, which might be a source of ambiguity or confusion, particularly as new PV configurations and use cases emerge, and counties might need to update their approaches to match their intended outcomes.

At the state level, this variance in local permitting regulations has raised concerns within the legislature about uneven deployment and the impact on broader statewide goals for renewable energy deployment, including Colorado's target to achieve 100% renewable energy by 2040 (Brasch 2024; Colorado Energy Office 2019). In response to concerns about the rate of deployment, Colorado lawmakers are currently drafting legislation that would establish a standardized process for local government reviews of renewable energy proposals, including limits on the durations of moratoriums and setback restrictions (Brasch 2024). With a similar approach, Illinois passed a law in 2023 mandating review procedures, timelines, and standards for county-level permitting of utility-scale wind and solar projects (Granholm, Antoniolli, and Montgomery 2023). Other states, including Connecticut, Maine, Michigan, Ohio, New Hampshire, New York, Oregon, and Vermont, have opted to establish state-level siting authorities for new energy-generating facilities over a certain capacity or acreage (Ellison and Orner 2023; State of Oregon 2024; Farm and Energy Initiative 2024; Ohio Power Siting Board n.d.). For example, New York has a state-level process for renewable projects larger than 25 MW, while Vermont's Public Utilities Commission has authority over all solar array siting (Farm and Energy Initiative 2024). In Oregon, large PV systems are subject to siting by the state, depending on the acreage and whether the proposed location is on farmland (State of Oregon

2024). It is likely too early to assess the efficacy of these state approaches compared to countybased approaches in meeting state goals for renewable deployment.

Separately from the development of state-level siting boards, other efforts have focused on developing model land-use codes and educating local officials on best practices in solar permitting regulations. These programs include the U.S. Department of Energy's SolSmart program, which provides no-cost technical assistance to local governments to implement best practices and offers Bronze through Platinum designations based on the locality's processes (SolSmart 2023), and International City/County Management Association's Solar@Scale program, which helps local governments overcome common barriers to utility-scale solar deployment (ICMA 2024). A variety of other organizations have developed model solar ordinances, which often target a particular state (Energy, Policy, and Innovation Center n.d.; Dillemuth and White 2013). While the Colorado Energy Code Board has published a Solar Ready Code package that targets rooftop solar, there is not currently a state-level model ordinance package for utility-scale solar in Colorado, although the Colorado Department of Local Affairs plans to release a Template Land Development Code in 2024 that includes some specifics on ground-mounted solar systems (personal communication). Additionally, the Colorado Solar & Storage Association has published a recommended guide of best practices from a solar developer's perspective (Colorado Energy Office 2024; Colorado Solar & Storage Association 2022). While each locality has unique circumstances to consider, there are many commonalities and standardized practices that can decrease the burden of code development for resource-limited local governments while also decreasing permitting uncertainty for solar developers.

#### 5.3 Agrivoltaics and Solar Land-Use Code

Agricultural land is often well suited for solar development (Adeh et al. 2019), yet 5 out of the top 10 agricultural producing counties in Colorado currently have no deployed solar (Yuma, Kit Carson, Prowers, Washington, and Phillips counties) (Colorado Department of Agriculture n.d.; U.S. Department of Agriculture [USDA] NASS 2017; Figure 1). Demand for solar development in some of these counties may increase with the completion of the Colorado Power Pathway, which will expand transmission capacity to the southeastern corner of Colorado (Xcel Energy 2021). Solar development restrictions or challenges often arise from local land-use policy or lack of community acceptance (Carlisle et al. 2015; Kolbeck-Urlacher 2023; Lopez et al. 2023). To address these challenges, agrivoltaics has been proposed as a potential solution to keep agricultural land in production and increase local acceptance of solar projects (Pascaris et al. 2022). However, some Colorado county-level policies may unintentionally restrict agrivoltaics by limiting solar development on agricultural land and/or restricting panel height. These two topics are each discussed below, including considerations and potential impacts.

#### Solar Development on Agricultural Land

Agricultural land made up 48% (31.8 million acres) of Colorado's land in 2017 (USDA NASS 2017). Farm and ranchlands are abundant in Colorado and are often available at a lower cost than other land types. An average acre of commercial or residential land costs \$11,600 in Colorado (Morris 2023) compared to \$1,770/acre for agricultural land (USDA NASS 2022). This contributes to making farms and ranches attractive options for solar developers who require large

contiguous areas for their installations. However, converting agricultural land into solar arrays can have multiple trade-offs.

Communities across the state have debated the use of agriculturally zoned land for solar projects, as it could compete with food production, raise rental prices for farmers and ranchers, and increase development around rural communities (Hunter et al. 2022). Due to these concerns, some local governments have enacted policies that restrict the development of solar arrays on agriculturally zoned land. Such policies restrict the size/output of solar arrays, add permitting requirements, or ban solar energy systems on agricultural land altogether (e.g., Fremont and Kiowa counties). Counties that prohibit solar energy infrastructure on agricultural lands also prevent the addition of agrivoltaics.

Some counties do not ban solar development of farmland but restrict or discourage solar development on "prime"<sup>10</sup> or "significant"<sup>11</sup> agricultural lands (Cheyenne, Phillips, Sedgewick, Yuma, and Boulder counties). In 2017, Colorado had 1.4 million acres of prime farmland (National Resource Conservation Service 2017) and in 2016, the state had 5.6 million acres of nationally significant agricultural land (American Farmland Trust n.d.). Policies that limit solar development on prime farmland might also impact the deployment of agrivoltaic systems.

Further, six counties (Alamosa, Bent, Cheyenne, Otero, Prowers, and Sagauche) have irrigated land clauses in their 1041 regulations that may also impact agrivoltaic deployment. These clauses are intended to prevent the sale of water rights separately from the land and prevent the dry-up of irrigated agricultural land. However, the water redistribution and lower evaporation rates under solar panels could allow for decreased irrigation or the cessation of irrigation altogether. A recent study found that for semiarid C3 grassland growing beneath an agrivoltaic system in Colorado, the aboveground net primary productivity was reduced by only 6%–7% with no irrigation in the past 3 years (Kannenberg et al. 2023). Permitting that allows for the dry-up of land but continued agricultural production, such as grazing and hay production, would allow agrivoltaic systems to be developed on these lands.

In addition, agrivoltaics has shown to provide local community and farmer benefits. Solar panels redistribute moisture to the edges of their panels that can enable deeper soil moisture retention (Sturchio et al. 2023). Solar panels also provide shade to the ground, which can lower soil and plant temperatures while reducing evaporation rates from the soil (Barron-Gafford et al. 2019). These benefits are especially important in semiarid climates like Colorado because they can help lower irrigation requirements. The shade and lowered air temperatures may assist with lowering health-related illnesses in farmworkers (Ghosh 2023). However, solar panels may come with trade-offs, such as lowering the total amount of arable land to farming or impacting current farming practices due to the placement of the structures (Pascaris et al. 2020). Early collaboration with farmers during the project design phase can help mitigate these impacts (Macknick et al. 2022). Policies that forego any possibility of solar development on agricultural

<sup>&</sup>lt;sup>10</sup> USDA designation of high-quality farmland of major importance in meeting national needs for food and fiber production, including cultivated land, pastureland, and forestland. <sup>11</sup> Nationally significant agricultural land is the "land best-suited to long-term, intensive crop production" (American

Farmland Trust n.d.).

land can inadvertently prevent landowners from accessing solar land leases for agrivoltaic systems that potentially allow for greater farm viability and more diversified income.

#### **Panel Height**

Agrivoltaic systems often require alternative configurations to traditional utility-scale PV designs to permit agricultural activities (Macknick et al. 2022). This can include various design changes, such as increasing the height of panels. In cropping systems, some agrivoltaic designs are elevated up to 12–15 ft to allow for maximum crop growth height, larger agricultural equipment (Marrou et al. 2013; Weselek et al. 2019), and optimal diffusion of sunlight for plant growth (Faizi et al. 2022). Some agrivoltaic orchards are built even higher, with panel heights up to 16.4 ft (Juillion et al. 2022). In orchards, elevated solar panels may offer the additional benefit of hail protection to the crops (Willockx et al. 2024).

For grazing systems, most solar arrays of traditional height will accommodate the integration of sheep, but panels often require higher elevation for the integration of cattle (Macknick et al. 2022). Cattle are an important market for Colorado farmers and ranchers, valued at \$2 billion in 2020 (USDA NASS 2021). In 2021, Colorado had 2.7 million head of cattle but only 445,000 head of sheep (USDA NASS 2021), leading to a smaller agrivoltaic grazing market if panel height is restricted. The panels also offer potential benefits to cattle, such as access to shade, reduced radiant heat load (Maia et al. 2020), and lower respiration rates and body temperatures (Sharpe et al. 2021). In one study, cattle preferred the shade of the panels over a shade cloth (Maia et al. 2020).

Some Colorado counties limit the panel height of solar panels (e.g., a 10-ft restriction in Rio Blanco County and a 15-ft restriction in Pitkin, Arapahoe, and Larimer counties). This restriction could potentially limit the types of agrivoltaic systems that could be incorporated into the PV structure, such as taller cropping systems (e.g., fruit trees) and cattle grazing. All other county panel restriction heights are higher than 15 ft and would have a low probability of interfering with agrivoltaic systems. While allowing flexibility for solar designs can be important to the success of agrivoltaic projects, it is important to note that there can be trade-offs for alternative designs, such as increased costs (Horowitz et al. 2020) and increased risk in areas with high wind or snow loads (Macknick et al. 2022).

#### 5.4 Future Research

#### Extensions to the Current Report on Colorado's County Policy Landscape

While this report focused on reviewing and summarizing the current county policies applicable to ground-mounted solar development, additional analyses quantifying the impacts of these local policies on land availability for solar development would be a valuable extension, similar to those in Lopez et al. (2023) and Owusu-Obeng, Mills, and Craig (2024). This review focused on many of the key policies of interest for siting and permitting ground-mounted solar, but there are additional policies that would be valuable to add, including lot coverage restrictions, impact fees for heavy machinery use on roadways during construction, and wildlife impact mitigation requirements, which can be a significant factor in the permitting process (e.g., Park County Board of County Commissioners 2021). Future research area could also include actual or expected impacts on zoning differentiation on deployment patterns throughout Colorado. Finally, a review of recent solar permit applications denied by counties could provide valuable lessons

learned for other counties and solar developers to understand and prepare for key issues that are arising across the state.

#### Comprehensive Analysis of Local Solar Regulations in the United States

While analysis of local solar regulations has been completed in Illinois (Guarino and Swanson 2023), the Great Lakes region (Owusu-Obeng, Mills, and Craig 2024), and now Colorado, data are limited across the United States. Comprehensive state-by-state analysis of local solar regulations could help inform developers and policymakers of local solar policies and their potential diversity. Lopez et al. (2023) have performed a similar analysis that examines local setback requirements across the United States, but further variables explored in this report (e.g., panel height restrictions, vegetation management plans, decommissioning requirements) could be relevant to add. This analysis could also include the impact of statewide regulations that have been used to create consistency for solar regulations throughout other states (e.g., Connecticut, Vermont, New Hampshire, Maine, New York [Farm and Energy Initiative 2024]) to understand the impact of statewide versus local codes on solar development. As evidenced by the Colorado example, the solar industry is rapidly expanding, and state and local governments are presently trying to update their codes and regulations to match this pace of development. Future analyses and overviews of local policies would be most useful in a dynamic format that could be readily adjusted as states and counties update their policies.

#### Socioeconomic Solar Analysis

While research has been limited, several studies have reviewed the impact of solar policy or solar deployment on environmental justice or socioeconomic factors (Si and Stephens 2021; Lukanov and Krieger 2019). Si and Stephens (2021) found that while low-income households were represented in the 2020 Solar Massachusetts Renewable Target (SMART) Emergency Regulation, they had less political power and representation than other groups (e.g., corporations). Lukanov and Krieger (2019) found that solar adoption levels were disproportionally lower in disadvantaged communities in California. High-level state and county data comparisons of renewable energy deployment and environmental justice factors have also been initiated by the Deployment Gap Model Education Fund (2023) through their found that 82% of Dashboard. Using a similar but more detailed and policy-related framework, socioeconomic analysis throughout the cities and counties of Colorado could help to determine the impact of local solar regulations on inclusivity of environmental justice and disadvantaged communities in policymaking and solar deployment. This analysis could include use of EPA's Environmental Justice Screening and Mapping Tool to evaluate local variables such as environmental justice indexes, pollution and sources, socioeconomic indicators, health disparities, climate change data, critical service gaps, and demographics (EPA 2024).

## 6 Conclusion

The state of Colorado has experienced the rapid expansion of solar projects over the past few years (EIA 2023a). Solar policy across Colorado counties can impact the types, sizes, and locations of solar projects approved, the complexity and cost of the permitting and construction process, and ability to incorporate agrivoltaic systems. This report presents an overview of the status of county-level solar policy across the state of Colorado as of November 2023. By reviewing county documents, such as land-use codes, zoning ordinances, and comprehensive and master plans, this report summarizes regulations that can impact the permitting, design, and viability of ground-mounted solar arrays. These policy topics include regulation requirements, 1041 permitting, solar on agricultural land, panel height restrictions, fencing requirements, vegetation management, visual impacts, and decommissioning plans and financial assurance.

While we found that the majority of counties have some solar-specific definitions in their landuse code, less than half have documented requirements on all the policy topics reviewed here. The vast majority (89%) of Colorado's utility-scale installed solar capacity is located in counties with at least some documentation of the policies reviewed. Some counties also regulate solar projects on a case-by-case basis, which presents unclear requirements and guidelines for solar development. As solar power plants have long development timelines from planning to completion, regulation changes or revisions can disrupt project planning and execution. Therefore, documented permit and planning requirements enable interested landowners and solar developers to make informed decisions and manage project risk. Colorado's policy landscape is also continually evolving, with many counties adopting and amending solar-specific code in the last few years. Additionally, six counties had moratoriums on solar development in effect during the review to allow time for county staff to review and update land use.<sup>12</sup>

Due to Colorado's county-by-county approach to regulating solar, we also found variation in solar permitting requirements across the state. Counties often apply different permitting requirements to PV systems based on their installed capacity, land area, and/or electricity end use. Due to gaps or ambiguity in definitions, these groupings might not be applied as intended for new and emerging solar configurations, such agrivoltaic systems with low capacity density (MW/acre) or large off-grid commercial and industrial applications. There are also potential ambiguities in permitting requirements from overlap with legacy 1041 regulations, in some instances requiring developers to complete both a 1041 permit and a conditional use or special use permit (e.g., County of Elbert 2018) at the expense of additional developer and county time and resources.

Lopez et al. (2023) show that certain local permitting policies have the possibility to affect solar deployment, which could impact broader state-wide goals for renewable energy deployment, such as the Colorado governor's goal of 100% renewable energy by 2040 (Colorado Energy Office 2019). In response to similar concerns about meeting state renewable goals, other states have opted to either regulate and standardize local permitting requirements or establish state-level siting authorities for large renewable projects (Granholm, Antoniolli, and Montgomery

<sup>&</sup>lt;sup>12</sup> Including Mesa County, which instituted a moratorium after the review had completed but during the report preparation period.

2023; State of Oregon 2024; Farm and Energy Initiative 2024). As of February 2024, Colorado lawmakers are drafting legislation that would establish a standardized process for local government reviews of renewable energy proposals, including limits on the durations of moratoriums and setback restrictions (Brasch 2024). While it is likely too early to assess the efficacy of these state approaches compared to county-based approaches, we expect solar policy in Colorado to continue to evolve alongside the expansion of solar energy in the state.

Finally, this report also considered the potential impact of county policies on agrivoltaics deployment. While agrivoltaics projects have been deployed in multiple Colorado counties, only Morgan County has a definition for agrivoltaics in its land-use code. In other counties, certain policies might limit the deployment of agrivoltaics. This includes four counties that restrict solar on some or all agricultural zones, several counties that consider agricultural impacts in the solar review process, four counties with 10–15-ft panel height limits, and six counties with higher permitting stringency for any development on irrigated land.

## Glossary

Term	Definition
Agrivoltaics	Co-location of agriculture and solar photovoltaics on the same land.
Dry-up	Permanent cessation of irrigation.
Ground-mounted solar	An array of solar photovoltaic modules mounted on a racking system on the ground, as opposed to a rooftop-mounted system.
Prime farmland	USDA designation of high-quality farmland of major importance in meeting national needs for food and fiber production, including cultivated land, pastureland, and forestland.
Utility-scale solar	Solar generators for electric utilities with nameplate capacity of 1 MW or greater. Almost all utility-scale solar is ground-mounted, but ground-mounted solar can also include small or off-grid applications.

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# Appendix A. County Land-Use and Permitting References

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#### Table A-1. County Documents Referenced in the Review Results

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## **Appendix B. Solar Definitions by County**

Table B-1 quotes each county's solar definitions, which are presented in the review results in Section 4.1. Definitions include solar-specific definitions as well as definitions applied more broadly to public utilities and/or power plants. Definitions are gathered from the references listed for each county in Appendix A.

County	Solar Definitions
Adams County	Solar Energy System. Any device or structural design feature whose primary purpose is to provide for the collection, storage, or distribution of solar energy for space heating, space cooling, electricity generation, or water heating. Solar Energy System, Small Scale. Solar Energy Systems that encompass less than 35 acres of surface area. Solar Energy System, Medium Scale. Solar Energy Systems that encompass greater than 35 and less than 320 acres of surface area Solar Energy System, Large Scale. Solar Energy Systems that encompass 320 acres or more of surface area.
Alamosa County	Utility-Scale Solar Facility. in Alamosa County is defined as either covering more than 5 acres or producing more than 10 megawatts. Power Plant. Any electrical energy generating facility which either utilizes more than 5 acres of land regardless of its generating capacity, or any electrical energy generating facility with a generating capacity of greater than or equal to 10 megawatts or more, regardless of how much acreage is utilized, and any facilities appurtenant thereto, or any addition thereto increasing the existing design capacity of the facility by a combined 10 megawatts or more. Solar panel field. An experimental, demonstrational, or commercial facility utilizing energy to produce other forms of energy, including but not limited to: equipment used to capture solar energy (e.g., photoelectric panels, mirrors); equipment that converts solar power to other power, including electrical generators; ancillary and associated equipment, including water treatment plants, power lines, substations, cooling equipment and any other equipment or facility necessary for the successful operation of the facility. Utility, minor. All utility facilities not considered major, including, but not limited to neighborhood-serving facilities such as pump stations, telephone exchanges, lift stations, electric substation, and storm water detention facilities, or any similar use. Utility, major. A large-scale utility such as electrical generation plant; solar or wind energy farms; experimental, demonstration or commercial energy generation facilities
Arapahoe County	Small Solar System <b>Facility or Facilities.</b> A definable area where an Applicant has disturbed or intends to disturb the land surface in order to locate a solar power generating facility designed to produce electricity with a maximum capacity of 5 Megawatts (MWac) alternating current, or MW capacity whichever is greater. A small solar system does not include battery storage equipment of facilities. SOLAR FACILITY OR FACILITIES. Is a facility or facilities that use solar energy to generate electricity through the use of solar panels, racking structures, inverters, transformers, overhead or underground wiring, and associated roads intended to generate power for a utility. A solar facility or facilities does not include any facility or facilities that exceed two megawatts (2 MW) in power generation or twenty (20) acres in size.
Archuleta County	Electric Power Onsite Generation. A typical Accessory Use, electric energy generating facility with capacity of ten (10) kWh [kilowatt-hours] or less, and any appurtenant facilities thereto

#### Table B-1. Solar Siting Definitions by County

County	Solar Definitions
	Electric Power Distributed Generation. Any electric energy generating facility with capacity between ten (10) kWh and ten (10) megawatts, and any appurtenant facilities thereto Electric Power Generation Facility. Any electric energy generating facility with capacity of ten (10) megawatts or more, and any appurtenant facilities thereto
Baca County	No relevant definitions present.
Bent County	No relevant definitions present.
Boulder County	Large Solar Energy System. 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 usersthe system has a rated capacity greater than 2 MW but does not meet the Land Use Code definition of Power Plant. Medium Solar Energy System or Solar Garden. 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 the rated capacity of the system will be at least 500kw but not more than 2 MW. Small Solar Energy System or Solar Garden. 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 the system will be at least 500kw but not more than 2 MW. Small Solar Energy System or Solar Garden. 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 the system will have a rated capacity of 100 kW or less. Power Plant. An electrical energy generating facility with generating capacity of more than 50 megawatts and any appurtenant facilities.
Broomfield County	Public Utility. Any person, firm or corporation operating heat, power or light systems, communication systems, water, sewer or scheduled transportation systems, and serving or supplying the public under a franchise granted by the City.
Chaffee County	Power Plant. A facility that converts one or more energy sources, including but limited to water power, geothermal resources, fossil fuels, nuclear, wind, or solar power into electrical energy or steam, for commercial uses. A power generation plant may also perform either or both of the following: (a) operation of a transmission system that conveys the energy from the generation facility to a power distribution system; (b) operation of a distribution system that conveys energy from the generation facility or the transmission to the final consumers. Solar Energy Device. A device which converts the sun's radiant energy into thermal, chemical, mechanical, or electric energy. Solar Energy System. A system composed of a solar energy collector, an energy storage facility, and components for the distribution of transformed energy, which may be attached to a residence or other structures. Small Scale Renewable Energy System. A renewable energy system including wind, solar, hydro-electric or geothermal sources that are primarily intended to serve the on-site use, but which may be grid-connected Electric Power Generation Facility. Any electric power generating facility and appurtenant facilities with generating capacity of ten (10) megawatts or more
Cheyenne County	Small. Single residential or small business-scale solar energy conversion system. A system consisting of roof panels, ground-mounted solar arrays, or other solar energy fixtures, and associated control or conversion electronics with a rated capacity of less than 500 kW, occupying no more than 2.5 acres of land, and that will be used to produce utility power to on-site uses. Medium. Distributed solar energy system. Solar electrical power generation that occurs

#### County Solar Definitions

	close to where the power is consumed and is primarily used on site by the system owner. A private on-site solar energy conversion system consisting of many ground-mounted solar arrays in rows or roof panels, and associated control or conversion electronics, occupying more than 2.5 acres and no more than 30 acres of land, and that will be used to produce utility power to on-site uses Large. Utility-scale solar energy conversion system. A system consisting of many ground- mounted solar arrays in rows, and associated control or conversion electronics and includes substations, MET stations, cables/wires, energy storage and other buildings and structures accessory to such facility, occupying more than 30 acres and that will be used to produce utility power to off-site customers. Generative Facility (Commercial). A facility capable of producing electricity by means of gas, oil, steam, nuclear fuel, waterpower, solar energy, or wind power. Generative Facility (Private). A small facility capable of producing electricity to be used on-site, as specified in Colorado HB-1160
Clear Creek County	Solar Energy System. Related equipment that relies upon direct sunlight as an energy source, a substantial purpose of which is to transform solar energy into thermal, mechanical, chemical, or electrical energy. Small Solar Energy System. A solar energy system that is used to generate thermal, mechanical, chemical, or electrical energy accessory to the use(s) on the same parcel(s) of land. It may be free-standing, or attached to an existing permitted structure. Distributed Solar Energy System. A solar energy that is used to generate thermal, mechanical, chemical, or electrical energy that is used to produce energy for more than one (1) user. Such systems may be free-standing, or attached to an existing permitted structure. Utility Scale Solar Energy Facility. A power plant that directly converts solar energy into usable thermal mechanical, or electrical energy, including such devises as solar energy systems and supporting structures and such directly connected equipment as generators, alternators, inverters, batteries and associated control equipment.
Conejos County	<ul> <li>Major Electrical or Natural Gas Facilities. Major electrical or natural gas facilities include one or more of the following:</li> <li>1. Electrical generating facilities.</li> <li>2. Substations used for switching, regulating, transforming, or otherwise modifying the characteristics of electricity.</li> <li>3. Transmission lines operated at a nominal voltage of sixty-nine thousand volts or greater.</li> <li>4. Structures and equipment associated with such electrical generating facilities, substations, or transmission lines.</li> <li>5. Structures and equipment utilized for the local distribution of natural gas service including, but not limited to, compressors, gas mains, and gas laterals.</li> <li>(Considers solar plants of the community solar garden size and larger to be Major Electrical Facilities)</li> </ul>
Costilla County	Major Facility of a Public or Private Utility. Any electric transmission lines, power plants, or substations of electric utilities; major gas regulator stations, transmission and gathering pipelines, and storage areas of utilities providing natural gas or petroleum derivatives; and their appurtenant facilities. Major electrical or natural gas facilities include one or more of the following: 1. Electrical generating facilities, including wind and solar facilities []
Crowley County	Public Utility and Public Service Structures. Private energy generation structures, including wind, solar, nuclear, coal, natural gas, and geo-thermal facilities, and all necessary substations, gas regulator stations, communications equipment and buildings, pumping stations and reservoirs, transmission lines and pipelines.

County	Solar Definitions		
	Solar Access. The ability to receive sunlight across real property. Solar Energy Device. A device which converts the sun's radiant energy into thermal, chemical, mechanical, or electrical energy. Solar Energy System. A system comprised of a solar energy collector, an energy storage facility and components for the distribution of transformed energy, which may be attached to a residence or other structures Solar Panels, Solar Arrays (Solar Energy). A device consisting of solar cells that convert light into electricity (panel), or an electrical device consisting of a large array of connected solar cells (arrays)		
Custer County	No relevant definitions present.		
Delta County	Renewable Energy Facility. Commercial facility for the production of more than 100 kW of renewable energy (e.g., solar, wind, or geothermal). Renewable energy facilities include necessary transmission. The phrase "renewable energy facility" does not include the generation of renewable energy to cover the energy demands of the principal land use, even if the demands exceed 100 kW.		
Denver County	Major impact utility. including solar generating stations with a gross site area of 10,000 square feet or greater (SIC group 4911) Minor impact utility, Above-grade utilities of less than 10,000 square feet of gross site area that have a localized impact on surrounding properties and are necessary to provide essential services, including 4911 Electric services		
Dolores County	Public or private utilities, major facilities and utility lines. Utilities include suppliers of water, electricity, natural and other gases, petroleum products of any kind, telephone communication and television broadcasts.		
Douglas County	<ul> <li>Utility - Major Facility: Power Plant. Any electrical energy generating facility with an energy generation capacity of 50 megawatts or more, and Appurtenance(s);</li> <li>Utility Service Facility. Any Neighborhood Substation, Personal Wireless Communication Facility, Water Storage/Treatment Facility:</li> <li>Neighborhood Substation: Any facility used for the purpose of reducing voltages to levels of 115 kV, or less, for distribution to individual users;</li> </ul>		
Eagle County	Ancillary Solar Energy System. Any Solar Energy System which purpose is to provide up to 120% of the energy to support other structures and/or on-site uses contained upon a subject property. Such systems are incidental to other primary use(s) on the property and may be structure-integrated or ground mounted. Solar Energy System. A system of solar collectors and associated equipment to provide for the collection, conversion, storage, and transmission of radiant energy from the sun for electricity generation, space heating, space cooling or water heating. Solar Farm. Parcel or land area primarily utilized as a Ground-mounted Solar Energy System. Ground-Mounted Solar Energy System. A Solar Energy System which is free-standing and constructed upon a natural and/or improved surface, including but not limited to pedestal mounted collectors, tracking devices, including associated infrastructure and site improvements.		
El Paso County	Solar Energy Generation Facility. A large-scale electrical energy generation facility with a minimum energy generation capacity of 500 kilowatts typically consisting of photovoltaic panels, heliostats (mirrors), collection tower(s), turbine(s), collection lines, electrical substation(s), transmission line(s), and other appurtenant facilities.		
County	Solar Definitions		
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	Energy Generation Facilities. An electrical energy generating facility with generating capacity of less than 50 megawatts for commercial delivery and any appurtenant facilities.		
Elbert County	Solar Power Plant. The entire exterior or perimeter envelope, or outermost boundary for a solar power plant facility, to include all infrastructure and equipment, including exterior fencing. Solar Energy System, Accessory. Facilities are generally generating electricity from sunlight primarily to reduce onsite consumption of utility power for residential or agricultural applications Solar Energy System, Small Commercial. Facilities are generally generating electricity from sunlight primarily to reduce onsite consumption of utility power for commercial, and industrial applications		
Fremont County	No relevant definitions present.		
Garfield County	Solar Energy System, Accessory. A device and/or system that has a combined name plate DC rating of less than 15 kilowatt and includes the equivalent kilowatt measurement of energy for systems other than photovoltaic that converts the sun's radiant energy into thermal, chemical, mechanical, or electric energy. Solar Energy System, Small. A device and/or system that has a combined name plate DC rating of 15 kilowatt to 500 kilowatt and includes the equivalent kilowatt measurement of energy for systems other that photovoltaic that converts the sun's radiant energy into thermal, chemical, mechanical, or electrical energy. Solar Energy System, Large. A device and/or system that has a combined name plate DC rating of greater than 500 kilowatt and includes the equivalent kilowatt measurement of energy for systems other than photovoltaic that converts the sun's radiant energy into thermal, chemical, mechanical, or electrical energy.		
Gilpin County	, SOLAR ENERGY SYSTEM, PRINCIPAL <sup>13</sup> SOLAR ENERGY SYSTEM, ACCESSORY		
Grand County	Public Utility. The term public utility includes every common carrier, pipeline corporation, gas corporations, electrical corporation, telephone corporation, water corporation, person, or municipality operating for the purpose of supplying the public for domestic, mechanical, or public uses and every corporation, or person declared by law to be affected with a public interest		
Gunnison County	Solar-Generated Electricity. The production of electric current in a solid material with the aid of sunlight by direct conversion of light into electricity by use of photovoltaic (PV) cells		
Hinsdale County	No relevant definitions present.		
Huerfano County	Solar energy device. A solar collector or other device or a structural design feature of a structure which provides for the collection of sunlight and which comprises part of a system for the conversion of the sun's radiant energy into thermal, chemical, mechanical or electrical energy.		
Jackson County	No relevant definitions present.		

<sup>&</sup>lt;sup>13</sup> Solar Energy System, Principal and Accessory, are both listed without a specific definitions

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County	Solar Definitions		
Jefferson County	Energy Conversion Systems (ECS). includes Solar Energy Conversion Systems (SECS). Solar Energy Conversion System. A system whose purpose is to harvest energy by transforming solar energy into another form of energy or transferring heat from a collector to another medium using mechanical, electrical, or chemical means. Non-commercial ECS. This ECS shall only serve the principal and accessory uses of the property and shall not be designed with the intention of generating excess energy that can be sold to neighboring properties or to the public utility. However, this provision shall not be interpreted to prohibit the sale of excess energy generated from the system back to the public utility Commercial ECS. This ECS shall have the primary purpose of research and development of ECS technology, or the generation of electrical power for sale, resale, or off-site use.		
Kiowa County	Power Plant means (a) any electrical generating facility regardless of power source or generating capacity, including but not limited to wind, solar, or geothermal generating facilities, which utilizes more than five (5) acres of land; (b) any electrical generating facility which has a generating capacity of ten (10) megawatts or more regardless of how much acreage is utilized; and (c) any addition to, or modification of, any existing electrical generating facility which addition or modification has the effect of increasing the existing design capacity of the facility by a combined ten (10) megawatts or more		
Kit Carson County	Solar Energy Facility. An electricity generating facility consisting of one or more solar panels under common ownership or operating control, and includes substations, cables/wires and other buildings accessory to such facility, whose main purpose is to supply electricity to off-site customer(s) with equal to or greater than 100 kilowatts in total nameplate capacity.		
La Plata County	Solar Energy Facility. Those solar energy facilities defined in C.R.S. § 39-4-101 or any solar energy facility utilizing more than five (5) acres of land regardless of generating capacity. Power Plant. Any solar energy facility or wind energy facility which either utilizes more than five (5) acres of land regardless of its generating capacity, or any solar or wind electrical energy generating facility with a generating capacity in excess of two (2) megawatts, regardless of how much acreage is utilized and any appurtenant facilities thereto, or any addition or series of additions thereto increasing the existing design capacity of the facility in excess of two (2) megawatts.		
Lake County	Solar Energy Device. A solar collector or other device or design feature of a structure which provides for the collection of sunlight and which comprises part of a system for the conversion of the sun's radiant energy into thermal, chemical, mechanical or electrical energy. Solar Energy Equipment. Items including, but not limited to, solar panels, lines, pumps, batteries, mounting brackets, framing, and foundations used for or intended to be used for the collection of solar energy in connection with a building. Solar energy equipment and its use is accessory to the principal use of the property.		
Larimer County	Small Solar Energy Facility. A facility which is used for the production of electrical energy from energy collected by the sun including solar energy collectors, power generation facilities, facilities for storing and transforming energy, other appurtenant facilities, and any transmission lines, which is developed for the purpose of supplying or distributing electrical energy to users, a customer, or customers. (Note: this could include a solar garden that has a disturbed area of five or fewer acres.) Solar Garden. A community solar garden as defined in section 40-2-127 (2) of the Colorado Revised Statues [sic] Power plant. A facility designed, constructed and operated to generate electric power by steam, wind, solar, water or other means.		

County	Solar Definitions		
	Solar Energy System. A system which is used for the production of electrical energy from energy collected by the sun including solar energy collectors, power generation facilities, facilities for storing and transforming energy, and any other appurtenant facilities, which is designed to supply power to principal use(s) on the lot.		
	Las Animas uses its wind farm regulations to regulate solar		
Las Animas County	Small wind energy system. A wind energy conversion system consisting of a wind turbine, a tower and associated control or conversion electronics, which has a rated capacity of not more than one hundred (100) kW and which is intended to primarily reduce on-site consumption of utility power		
	Wind farm. A single wind-driven machine or a collection of wind-driven machines or turbines that convert wind energy into electrical power for the primary purpose of sale, resale or offsite use		
	Solar energy device. A solar collector or other device or a structural design feature of a structure which provides for the collection of sunlight and which comprises part of a system for the conversion of the sun's radiant energy into thermal, chemical, mechanical or electrical energy		
Lincoln County	Community solar garden. A solar electric generation facility with a nameplate rating of two megawatts (2 MWDC) or less that is located in or near a community served by a qualifying retail utility where the beneficial use of the electricity generated by the facility belongs to the subscribers to the community solar garden. There shall be at least ten subscribers. The owner of the community solar garden may be the qualifying retail utility or any other for-profit or nonprofit entity or organization, including a subscriber organization that contracts to sell the output from the community solar garden to the qualifying retail utility. A community solar garden shall be deemed to be "located on the site of customer facilities. Small scale solar. Development systems with a 50 kWDC generation capacity or less serving a single user Large scale solar facility. A system with a nameplate rating of greater than two megawatts, Direct Current (2 MWDC) generation capacity providing power to one or mor users, which may include components for the transmission and distribution of energy.		
Logan County	Solar Energy Facility. An electricity generating facility consisting of one or more solar panels under common ownership or operating control, and includes substations, cables/wires and other buildings accessory to such facility, whose main purpose is to supply electricity to off-site customer(s) with equal to or greater than 100 kilowatts in total nameplate capacity.		
Mesa County	Private Utility. A business or service which is engaged in regularly supplying the public / with some commodity or service which is of public consequences and need, such as electricity, gas, transportation or communication		
Mineral County	Alternative Energy System. a form of energy derived from a natural source, and includes all but not limited to, solar, wind and hydro power.		
Moffat County	Solar Collector. For the purpose of this Resolution; Solar collector, heat pump, storage facilities and distribution components for space heating and cooling and water heating, whether attached or unattached to a structure		

County	Solar Definitions		
Montezuma County	No relevant definitions present.		
Montrose County	Solar Energy Facility. A generation facility which uses solar energy and the required components to distribute the transformed solar energy. Power Generation. An electrical generating facility for the purpose of generating power for public use. This does not include alternative onsite energy generation (distributed solar is included in this category)		
Morgan County	Agrivoltaic Systems. A system designed for the simultaneous use of areas of land for both ground-mounted solar collectors and agriculture. Solar Collector: A photovoltaic (PV) panel, array of panels or other solar energy device, the primary purpose of which is to provide for the collection, inversion, storage, and distribution of solar energy for electricity generation, space heating, space cooling, or water heating. Ground-mounted solar collector includes agrivoltaic systems and parking canopy solar systems when installed on surface parking lots. Building-mounted solar collector includes parking canopy solar systems when installed on the roof of a parking garage.		
Otero County	Solar Energy Device. A device which converts the sun's radiant energy into thermal, chemical, mechanical or electric energy. Solar Energy System. A system composed of a solar energy collector, an energy storage facility and components for the distribution of transformed energy, which may be attached to a residence or other structures. Solar Panels, Solar Arrays (Solar Energy). A device consisting of solar cells that convert light into electricity (panel), or an electrical device consisting of a large array of connected solar cells (arrays) "Power plant". means any electrical energy generating facility which either utilizes more than five (5) acres of land regardless of its generating capacity, or any electrical energy generating facility with a generating capacity of greater than or equal to ten (10) megawatts or more, regardless of how much acreage is utilized, and any facilities appurtenant thereto, or any addition thereto increasing the existing design capacity of the facility by a combined ten (10) megawatts or more.		
Ouray County	Public Utility. Transmission, generation and storage and treatment facilities of providers of electrical, water, gas, and other like services.		
Park County	Small Solar Energy System. Equipment that converts solar energy into electrical energy solely for consumption by a lawful use on the lot that the equipment is located on, except that if the lot is connected to a distribution line owned by a utility company excess energy not needed for the lot's primary use may be used by the utility company (i.e. net metering). Utility Facility, Major. An underground, surface or overhead structure or facility or an area of land used to generate, store, transmit, distribute or regulate electricity, oil, gas, or water; to pump or chemically treat water, sewage or solid waste; or for storm water drainage exceeding one hundred and twenty square feet in area. A major utility facility may include accessories such as poles, wires, mains, drains, vaults, culverts, sewers, pipes, signals or pumps. Specifically included as a major utility facility are transmission lines capable of the transmission of electricity more than 115 kilovolts (KV), water pipelines with a capacity of 30,000 gallons or more of water. (Although this definition does not say it includes solar, any array with distributed energy and built for more than one user is considered a major utility facility according to the senior planner).		

County	Solar Definitions	
Phillips County	Solar Energy System, Residential. A single residential or small business-scale solar energy conversion system consisting of roof panels, ground-mounted solar arrays, or other solar energy fixtures, and associated control or conversion electronics with a rated capacity of less than 500 kW, occupying no more than 2.5 acres of land, and that will be used to produce utility power to on-site uses. Solar Energy System, Utility-Scale. A utility-scale solar energy conversion system consisting of many ground-mounted solar arrays in rows, and associated control or conversion electronics, occupying more than 30 acres and that will be used to produce utility power to off-site customers.	
Pitkin County	Solar Energy Collector. means a device for the passive collection of solar energy for use in the heating of water or the generation of electricity, together with related wires and pipes necessary for operation. Ground-Mounted Solar Energy Collector. means any solar energy collector that is not directly attached to a building via any ancillary development (racking assembly, balancing system, etc.) Solar Farm. means any collection of ground-mounted solar generators that occupies one- quarter (1/4) acre of land or more but generates less than two (2) Mega-Watts (MW). Solar Facility. means any ground-mounted solar generators that occupy one-quarter (1/4) acre of land or more and generates two (2) Mega-Watts (MW) or more. Solar Facilities are considered Major Public Utilities.	
Prowers County	Solar Energy Facilities. Solar collector or other device that provides for the collection of sunlight for the conversion of sunlight to energy.	
Pueblo County	<ul> <li>Solar Facility, Small-Scale. A solar facility of less than one (1) acre. This size is approximately equivalent to a rated capacity of about ten (10) kilowatts (kW) to 250 kW alternating current. Facilities are generally generating electricity from sunlight primarily treduce onsite consumption of utility power for residential, agricultural, commercial, and industrial applications.</li> <li>Solar Facility, Medium-Scale. A facility between one (1) acre and ten (10) acres. This si is approximately equivalent to a rated capacity of about 250 kW to one (1) megawatt (MW) alternating current. Facilities are generally generating electricity from sunlight primarily to reduce onsite consumption of utility power for commercial and industrial applications.</li> <li>Solar Facility, Utility-Scale. A solar facility of more than ten (10) acres. This size is approximately equivalent to a rated capacity of acres. This size is approximately equivalent to a rate capacity of more than ten (10) acres. This size is approximately equivalent to a rated capacity of more than ten (10) acres. This size is approximately equivalent to a generating current or greater. Facilities are general generating electricity from sunlight to provide electricity to a utility provider.</li> </ul>	
Rio Blanco County	Major Electrical or Natural Gas Facilities. (Article 14 - Areas and Activities of State Interest only) Major electrical or natural gas facilities include one or more of the following: 1. Electric power generation	
Rio Grande County	Solar Energy Facility. A solar energy collector and the required components to the distribute the transformed solar energy. Public Utilities. Electricity, natural gas, water and wastewater service, wire telephone service, and similar public services. The term "public utilities" does not include wireless telecommunication facilities.	
Routt County	Production Facility, Renewable Energy. Production Facilities, Renewable Energy are relating to the operation of solar, wind, hydrologic, bio-fuels or other energy production not based on fossil fuels such as coal, oil, gas or coal bed methane (see also Solar Energy System).	

County	Solar Definitions		
	Solar Energy System. 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 sized to 120% of the average annual load of the use by right and/or an approved use. Public Utilities – Major Facilities. Major facilities of electrical utilities including: 1) Electrical generating plants and associated facilities designed for, or capable of, operation at a capacity of ten megawatts or more.		
Saguache County	Power plant. means any electrical energy generating facility with a generating capacity of fifty (50) megawatts or more, and any facilities appurtenant thereto, or any addition thereto increasing the existing design capacity of the facility by fifty (50) megawatts or more, with a generating source of natural gas, coal, geothermal resources or solar energy.		
San Juan County	No relevant definitions present.		
San Miguel County	Renewable Energy Facility (solar, wind). A facility designed to produce energy, through, either: (a) A series of solar photovoltaic cells in panels used to convert sunlight into electricity (often integrated with agriculture) Solar Energy Collector. Solar panels used to power a farm, home or business.		
Sedgewick County	Distributed Solar Energy System. Solar electrical power generation that occurs close to where the power is consumed and is primarily used on site by the system owner. A private on-site solar energy conversion system consisting of many ground-mounted solar arrays in rows or roof panels, and associated control or conversion electronics, occupying more than 2.5 acres and no more than 30 acres of land, and that will be used to produce utility power to on-site uses. Residential Solar Energy System. A single residential or small business-scale solar energy conversion system consisting of roof panels, ground-mounted solar arrays, or other solar energy fixtures, and associated control or conversion electronics with a rated capacity of less than 500 kW, occupying no more than 2.5 acres of land, and that will be used to produce utility power to on-site uses		
Summit County	Solar Energy System. A system that converts the sun's radiant energy into thermal or electrical energy. For purposes of this Code, solar energy systems are classified as follows: a. Small Scale: Small scale solar energy systems shall be used primarily for on-site purposes. Excess power may be sold back to a utility company, but is not the primary purpose of the system. b. Large Scale: Large scale solar energy systems generate power primarily to be sold for use off-site.		
Teller County	Public utility. Every common carrier, pipeline corporation, gas corporation, electrical corporation, telephone corporation, telegraph corporation, water corporation, or person, individual, firm, partnership, other corporation, or other entity, operating for the purpose of supplying the public for domestic, mechanical, or public uses; and every person, individual, firm, corporation, partnership, and/ or other entity, declared by law to be affected with a public interest; each of which is subject to the jurisdiction, control, and regulation of and by State and /or Federal law.		
Washington County	Solar Power Production Facility (SPPF). A utility on an area of land over one-half acre designated for the purpose of producing photovoltaic electricity with a nameplate capacity of over 1/2 megawatt (500,000 kilowatts [sic]) and includes, but is not limited to, an assembly of solar panels and solar equipment that convert sunlight into electricity and		

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County	Solar Definitions	
	then stores and/or transfers that electricity. Solar Power Production Facilities may include mechanical buildings, transmission lines, and other uses that are typical to a SPPR, however offices and other commercial uses are prohibited.	
Weld County	Solar Energy Facility. means a commercial facility whose primary purpose is to supply electricity and consists of one or more solar arrays and other accessory structures, equipment, including substations, switchyards, battery storage, electrical infrastructure, generators, transmission lines, communications infrastructure, and other appurtenant structures and/or facilities. Large scale solar facility. A facility which is used for the production of electrical energy from energy collected by the sun including solar energy collectors, power generation facilities, facilities for storing and transforming energy, other appurtenant facilities and any transmission lines, which is developed for the purpose of supplying or distributing electrical energy to users, a customer or customers and will have a rated capacity greater than thirty (30) megawatts. This designation shall not include roof and/or ground mounted solar systems located on permitted principal and accessory buildings and designed to supply power to the principle use(s) on site.	
Yuma County	Residential Solar Energy System. A single residential or small business-scale solar energy conversion system consisting of roof panels, ground-mounted solar arrays, or other solar energy fixtures, and associated control or conversion electronics with a rated capacity of less than 500 kW, occupying no more than 2.5 acres of land, and that will be used to produce utility power to on-site uses. Distributed Solar Energy System. Solar electrical power generation that occurs close to where the power is consumed and is primarily used on site by the system owner. A private on-site solar energy conversion system consisting of many ground-mounted solar arrays in rows or roof panels, and associated control or conversion electronics, occupying more than 2.5 acres and no more than 30 acres of land, and that will be used to produce utility power to on-site uses. Utility Scale Solar Energy System. A utility-scale solar energy conversion system consisting of many ground-mounted solar arrays in rows, and associated control or conversion electronics, occupying more than 30 acres and that will be used to produce utility power to off-site customers.	

## **Appendix C. 1041 Permit Thresholds by County**

As discussed in Section 4.4, some Colorado counties have adopted thresholds triggering a 1041 permit under their 1041 power to regulate the siting of major facilities of a public utility. Additionally, some counties also have adopted 1041 regulations about the development of historically irrigated land for purposes other than irrigated agriculture, including development causing permanent or partial cessation of irrigation and/or transfer of water rights. Some counties have included their 1041 requirements as part of a solar-specific permitting process, while others have 1041 regulations in parallel with a solar-specific permitting process, which might or might not be applied to a given project. Table C-1 reports counties that have adopted specific thresholds that might impact the permitting of solar power plants. Data are gathered from the references listed for each county in Appendix A.

	1041 Thresholds for a Solar Power Plant or "Major Facility of a Public Utility"		1041 Threshold for
County	Generation Capacity (MW)	Land Area (acres)	Irrigated Land (acres)
Alamosa	2 MW	n/a	3 acres
Arapahoe	5 MW	n/a	n/a
Bent	n/a	n/a	10 acres
Boulder	50 MW	n/a	n/a
Cheyenne	10 MW	5 acres	3 acres
Clear Creek	1 MW	n/a	n/a
El Paso	0.5 MW (500 kW)	n/a	n/a
Elbert	1 MW	10 acres	n/a
Huerfano	50 MW	n/a	Required, no minimum
Kiowa	10 MW	5 acres	n/a
La Plata	2 MW	5 acres	n/a
Larimer	n/a	5 acres	n/a

## Table C-1. Colorado County Thresholds Potentially Triggering a 1041 Permitting Process for Solar Power Plants in Those Counties

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	1041 Thresholds for a Solar Power Plant or "Major Facility of a Public Utility"		1041 Threshold for
County	Generation Capacity (MW)	Land Area (acres)	Irrigated Land (acres)
Las Animas	50 MW <sup>14</sup>	n/a	n/a
Morgan	50 MW	n/a	n/a
Otero	10 MW	5 acres	3 acres
Pitkin	2 MW	1/4 acre	n/a
Prowers	25 MW	5 acres	5 acres
Pueblo	1 MW	1 acre on some agricultural zones	n/a
Routt	10 MW	n/a	n/a
Saguache	5 MW	n/a	3 acres
Weld	30 MW	160 to 320 acres (zone specific)	n/a

<sup>&</sup>lt;sup>14</sup> Las Animas currently permits solar power plants through its wind power plant regulations. Wind power plants are specifically exempted from this 1041 permit requirement. However, 1041 permits would also be required on some zoning districts.

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## **Appendix D. Panel Height Restrictions by County**

Table D-1 lists the review data on panel height restrictions presented in Section 4.6. Data are gathered or quoted from the references listed for each county in Appendix A. Some counties reference specific solar definitions related to panel height restrictions, where each county's solar definitions are available in Appendix B. This table only includes restrictions specific to ground-mounted solar. Neither height restrictions pertaining to rooftop systems (i.e., restrictions on height above a roof) nor general structure height restrictions, which are typically 35 ft or greater, are included. Counties without relevant height restrictions are omitted.

County	Maximum Panel Height Restrictions
Adams	20 ft measured from the highest grade below each solar panel
Arapahoe	15 ft at the solar mounting point for Small Solar Systems
Boulder	15 ft Systems exceeding 15 ft in height require an increased setback of 75 ft from all property lines unless visual impacts are mitigated In no case shall a system exceed 25 ft in height
Clear Creek	35 ft
Dolores	Determined through the Land Use Agreement Process
Douglas	Determined through the use by special review process specific to each site
Eagle	15 ft measured from the highest point of the improvement to existing or finished grad, whichever is more restrictive
El Paso	15 ft
Garfield	15 ft for Accessory solar systems, which is not directly applied to utility- scale systems. Utility-scale system need only demonstrate structure can support wind load (Personal Communication).
Gilpin	20 ft measured from highest grade below each solar panel
Jefferson	25 ft measured from the average natural ground level adjacent to the base of the array to the highest point of the array
Kiowa	No height restrictions but the solar array must be 1.2 times the maximum height from the property lines
Kit Carson	The height and location of any structure within the Wind or Solar Energy Facility shall be subject to FAA approval
La Plata	20 ft

#### Table D-1. Height Restrictions on Solar Panel Heights by County

County	Maximum Panel Height Restrictions
Lake	25 ft
Larimer	15 ft
Moffat	35 ft
Montezuma	35 ft
Morgan	The maximum height of the solar panels shall not exceed 30 feet in height or 35 feet in height for agrivoltaics when oriented at maximum tilt
Ouray	35 ft Any project located within 1.5 miles of the centerline of roads or highways is allocated a maximum of 5 "points" to use for size and height. For height, the project gets .3 points for each ft of the maximum height structure and for size, .1 points for 100 sq. ft.
Pitkin	15 ft measured from natural grade or finished grade, whichever is more restrictive, except to accommodate site specific needs if approved through special review
Pueblo	Solar Facility Narrative must contain an inventory with description of all proposed structures and uses including Battery Energy Storage Facilities, inverters, substations, and all structures over 60 ft. in height.
Rio Grande	10 ft
Summit	25 ft
Washington	20 ft measured from grade at the base of the equipment to its highest point during operation
Weld	25 ft measured from the highest grade below each solar panel to the highest extent of the solar panel rotation

## **Appendix E. Fencing**

Table E-1 lists the review data on fencing requirements presented in Section 4.7. Data are gathered or quoted from the references listed for each county in Appendix A. This table includes both fencing requirements specifically intended for ground-mounted solar, as well as fencing requirements intended more generally for different types of development, which might include solar. Some counties reference specific solar definitions related to fencing restrictions, where each county's solar definitions are available in Appendix B. Counties are omitted in cases where the review did not find relevant fencing requirements.

County	Fencing Requirements
Adams	All solar panels and equipment (excluding poles and wires necessary to connect to facilities of the electric utility) shall be enclosed by a fence at least six (6) feet high. Wildlife-friendly fence options are encouraged.
Alamosa	No standard requirements but off-site impact is considered during permit process; fencing/screening has been required for some permits
Arapahoe	Landscaping or fencing around the perimeter of the land occupied by the Facility shall be installed concurrently with the Small Solar System Facility's completion. The screening shall be designed to minimize visual impacts from adjacent properties and the nearest streets.
Bent	In the special review process: Uses with unsightly aspects, odors, or noise are set back a sufficient distance from adjacent property boundaries and proper fencing or screening is provided to that adjacent property is not adversely affected
Boulder	In areas where the facilities will have a substantial visual impact on the surrounding area, landscaping or screening of the site, or the use of less intrusive equipment, may be required. Specific landscaping or screening requirements may include, but are not necessarily limited to, establishing and properly maintaining ground cover, shrubs, and trees; shaping cuts and fills to appear as natural forms; designing the operation to utilize natural screens; or constructing fences for use with or instead of landscaping.
Cheyenne	For large solar energy systems: Fencing or other barriers acceptable to the County shall be installed to prevent unauthorized access to solar collectors and equipment and BESS battery enclosures
Clear Creek	Screening techniques should be considered and utilized depending on site conditions, including landscaping, berming, camouflaging, screening, and fencing, where appropriate.
Denver	In development intended for nonresidential uses and located near or abutting Residential Zone Districts, provide fences, walls or year-round screen planting when necessary to shield adjacent residential districts from parking lot illumination, headlights, fumes, heat, blowing papers and dust and to reduce the visual encroachment of commercial architectural, signs and activity on residential privacy and residential neighborhood character.
Eagle	The project applicant shall demonstrate through visual impact analysis, materials, and/or screening to the extent practicable, that the project will not create adverse visual impact to neighboring properties, surrounding

#### Table E-1. Fencing Requirements by County

County	Fencing Requirements
	areas, and community buffers as further detail necessary to support Section 5-250.B.4 Design Minimizes Adverse Impact.
El Paso	Requirements for fencing will be determined during the permitting process.
Garfield	Where proposed development is located next to existing agricultural operations, partition fences must either exist or be installed to separate the proposed development from adjoining agricultural land or stock drives.
Gilpin	All solar panels and equipment (excluding poles and wires necessary to connect to facilities of the electric utility) shall be enclosed by a fence at least eight (8) feet high. Wildlife friendly fence options are encouraged.
Grand	Fencing may be required as determined during the permitting process.
Gunnison	<ul> <li>Fencing or plant material can be used to fulfill screening and buffering requirements: Every land use change that is classified as Minor or Major Impact Projectshall provide landscaped buffering between adjacent uses when topographical or other natural barriers do not provide reasonable screening and when the County finds that:</li> <li>a. NEIGHBORING PROPERTIES. There is a need to shield neighboring properties from any adverse external effects of a proposed land use change; or</li> <li>b. ADVERSE IMPACTS. There is a need to shield the land use change from negative impacts or adjacent land uses in high-density land use changes, and/or when building design and siting do not provide privacy</li> </ul>
Jefferson County	Required in site plan: warning signs, fencing, and access restrictions
Kit Carson	Fencing, or other barriers acceptable to the County, shall be installed to prevent unauthorized access to the Wind or Solar Energy Facility substations. All access doors to Wind Turbine towers or Solar Energy Facilities and electrical equipment shall be lockable
Larimer	<ul> <li>Ground-mounted mechanical equipment located within view of customer entrances or public rights-of-way shall be integrated into the overall site design, the architectural design of the building, and screened from public view using one or a combination of the following:</li> <li>1) Decorative wall, fence or enclosure that is constructed of materials that are compatible with the overall architectural design of the equipment to be screened; or</li> <li>2) Landscaping that is of sufficient height at maturity and of opacity to effectively soften and screen the equipment, and that is integrated into the overall landscape plan.</li> </ul>
Las Animas	Determined during the permitting process, based on recommendations by state parks service based on wildlife in the area
Lincoln	For large solar energy systems: An appropriate security/livestock fence (height and material to be established through the use by special review

County	Fencing Requirements
	process) shall be placed around the perimeter of the solar power plant and maintained by the facility operator.
Logan	Determined during the permitting process, and other barriers as acceptable to the County may be used in place of a fence.
Mesa	Determined during the permitting process
Mineral	Might be required during Conditional use process
Moffat	Uses permitted under a Conditional Use Permit which are found to be obnoxious or offensive because of odor, dust, smoke, gas, noise or vibration may require fencing or screening to a minimum height of 8 feet.
Montrose	Any combination of setbacks, berms, fencing, landscaping, and arrangement of uses on the site to effectively insulate adjacent uses from adverse impacts of the commercial uses.
Morgan	The setback requirement from inhabited structures may be reduced if appropriate screening through landscape or an opaque fence is installed.
Phillips	Fencing or other barriers acceptable to the County shall be installed to prevent unauthorized access to solar collectors and equipment.
Pitkin	Any ground-mounted solar energy collecting system using a quarter (1/4) acre of land or more shall be considered a Solar Farm and be subject to special review pursuant to section 2-40-20 (with total land used calculated by accounting for total land area needed to develop the ground-mounted system, including but not limited to, storage sheds, access, grading, fencing, revegetation, mounting equipment, panels, etc.).
Prowers	The Solar Energy Facilities shall be enclosed with a security fence as approved pursuant to a fencing plan submitted to the Prowers County Land Use Administrator. Appropriate signage shall be placed upon such fencing that warns the public of the high voltage therein.
Routt	Proposed landscaping, screening, fencing and other visual impact mitigation shall be approved by the Planning Director, Planning Commission or Board of County Commissioners prior to operation.
San Juan	In order to minimize visual impacts to view sheds and view corridors, additional setbacks, landscaping, screening or design requirements may be required by the County to preserve the natural beauty and historical resources of the area.
Teller	Appropriate screening, fencing, enclosing, and buffering of certain uses, primarily Special Review Uses, is required in order to adequately screen the use from public rights-of-way and adjoining and/or adjacent properties. It may be that if the proposed use can not be adequately screened, the site is not an appropriate location for that use.
Washington	SPPFs shall be screened or shall be enclosed by fencing a minimum of six (6) feet in height. Screening and/or fencing shall be consistent with the surrounding character and utilize landscaping and/or native vegetation strategies to screen the facility from routine view of public right-of-way or adjacent residential property. When fencing is used, the type and style of

County	Fencing Requirements		
fencing shall also reflect any safety concerns specific to the gene and adjacent wildlife.			
	Entrances must be gated and locked		
Weld	Small Solar System - shall be enclosed with a security fence as approved pursuant to a fencing plan submitted to the Department of Planning Services.		
Yuma	Utility Scale Solar Energy Systems: Fencing or other barriers acceptable to the County shall be installed to prevent unauthorized access to solar collectors and equipment.		



Archuleta County Development Services—Building Division 1122 HWY 84 / P. O. Box 1507 Pagosa Springs, Colorado 81147 970-264-1390 Fax 970-264-3338

## Archuleta County Solar Panel Policy

All solar projects require a state electrical permit.

## Solar panel projects that require a building permit.

- Free standing detached solar panels
- Solar panels attached or detached from a home creating an overhead structure or roof.

## Solar panel projects that do not require a permit.

- Roof top units installed to an existing structure.
  - It is the responsibility of the contractor and homeowner to verify the structural integrity of the existing structure.

## What is needed to obtain a permit for solar projects that require a permit.

- Site plan prepared by a licensed professional surveyor.
  - May be possible to redline an existing site plan/PILC decided upon review.
- Completed utility application for permit.
- Engineered plans stamped by a licensed professional that shall include.
  - Foundation plans and details
  - An elevation plan
  - Wind load criteria 115 ULT
  - Ground snow load 93 psf. Roof snow load 65 psf.

## Inspections required by the Building Department

- Pier inspection prior to pour
- Final inspection

# Do not pour without an inspection. If the concrete is placed without inspection, you will be required to provide a letter from an engineer stating the foundation is acceptable. If a letter cannot be obtained the concrete shall be removed.

The inspector will call the customer requesting a desired inspection time after the schedule has been set. The inspector will provide an **approximate** time of the inspection. If you do not hear from the building department, the customer may call the building department after 9:30 am to get an ETA.

Thank you, Tim Hatch Archuleta County Building Official Thatch@archuletacounty.org 970-264-1390



## **PHOTOVOLTAIC SOLAR PERMIT APPLICATION**

## **OVERVIEW**

Photovoltaic solar arrays are an allowed use in all city residential zones per section 3-5-2-6 of the LUDC, provided height and setback requirements are met. In commercial and mixed-use zones, PV arrays are considered an accessory use and also must comply with maximum height and setback restrictions per section 3-5-3-2 of the LUDC. Additionally, PV arrays in commercial, mixed use, and multifamily zones must be approved by the Durango Fire Protection District, who will also require an inspection upon completion of the project. Installations in areas of the City that are zoned as a planned development or have an Owner's Association may be required to go through a design review process or receive HOA approval prior to submitting this application. Solar permits are issued to ensure compliance with the above standards, and must be obtained prior to submitting a net metering application to La Plata Electric Association. The issuance of this PV Solar Permit from the City of Durango DOES NOT guarantee approval from LPEA.

## **REQUIRED SUBMITTAL MATERIALS**

#### Your application cannot be processed without the following information:

- 1. A completed, signed application.
- 2. \$20 application fee.
- 3. A site plan or aerial photos showing exact locations of the proposed arrays and connections to the electrical grid. For commercial or multifamily installs, a detailed roof plan will be required. The site plan should be scaled or include measurements.
- 4. Building elevations or pictures showing the proposed location of arrays in relation to the building. Elevations should be scaled or include measurements.
- 5. Manufacturer's specifications for the proposed photovoltaic system.
- 6. For commercial, mixed use, and multi-family proposals, proof of submittal to the Durango Fire Protection District is required.
- 7. Proof of design review or owner's association approval, if applicable.

## **CONTACT & PROPERTY INFORMATION**

PROJECT ADDRESS:		
	BUSINESS	LICENSE:
PHONE:	E-MAIL:	
PROPERTY OWNER:		
OWNER ADDRESS:		
OWNER PHONE:	EMAIL:	
PROJECT TYPE: RESIDENTIAL		
PROPERTY ZONING:	SUBDIVISION:	

## **PHOTOVOLTAIC SOLAR PERMIT APPLICATION**

## PROPOSED PV ARRAY INFORMATION

Array Location (Roof or ground mount)	Array LocationDimensionsRoof or ground mount)(Length x Width)		<b>Height</b> (ground to top of array)
	TOTAL SQ. FOOTAGE	=	
ACKNOWLEDGMENT A	ND AUTHORIZATION		
The undersigned authorize plication under the require undersigned acknowledge erected prior to the issuand Applicant:	s the Community Develop ments of the City of Duran es that the photovoltaic so ce of this permit.	ment Department to p ngo Land Use and Dev lar array described ab <b>Date:</b>	proceed with processing this ap- elopment Code (LUDC). The pove shall not be placed or
DEPARTMENT USE ONLY	1		
Application/Fee Received By	:	Date:	Receipt #:
Zoning:	Maximum Height:	Setba	ck:
Has the project recieved DFPD approval?		No	□N/A
Are any modifications require	ed? Yes No		
If yes, what?			
Comments:			
I hereby authorize the issue listed above. This authorizo	ance of a permit for the pr tion is good for a period o	oposed PV solar array, f 1 year, and does not	subject to any modifications guarantee approval from LPEA.
Auth	orizing Staff Member		Date
Permit Number:			

## City of Durango Solar Permit Checklist





**\$20** solar permit fee must be paid when permit is issued

Prior to installation, applicants will also need to obtain an electrical permit from the State of Colorado Electrical Inspector's Office and submit an Interconnection / Net Metering Application to La Plata Electric Association (LPEA) lpea.coop, 247-5786

Issuance of a City of Durango Photovoltaic Solar Permit does not guarantee approval by LPEA

Section 13.24. - Solar and wind energy facilities permitting.

- A. Application Types.
  - 1. Tier 1 wind and solar facilities require Section 13.23, Site Plan approval.
  - 2. Tier 2 wind and solar facilities are processed through Section 13.12, Conditional Use Permit Review.
- B. Additional Information.

Tier 2 applications shall include the following information:

- 1. Approved net metering agreement(s) and copies of applications to or approved permit from applicable state and federal agencies.
- 2. A landscape plan showing that all areas occupied by the facility that are not utilized for access to operate and maintain the installation shall be planted and maintained with a native shade tolerant grass or other vegetation for the purpose of soil stabilization or other methods approved by the zoning administrator.
- 3. A storm water management plan showing existing and proposed grading and drainage demonstrating no net increase in runoff.
- 4. A preliminary transportation plan describing ingress and egress to the proposed project site to deliver equipment and provide access during and after construction. Such plan shall describe any anticipated improvements to existing roads, bridges, or other infrastructure, as well as measures which will be taken to restore damaged or disturbed access routes following construction.
- 5. An environmental assessment that analyzes the impact of the proposed project regarding on-site and site-adjacent floodways, riparian corridors, open water, wildlife migration routes, protected habitat, protected plant species, and other environmentally sensitive areas as identified by the County, City, State, or federal government, along with proposed mitigation recommendations.
- 6. A decommissioning plan.

## **Tree Retention Plans for Development**



When preparing to submit your development permit, please use this checklist to ensure the application is complete to prevent delays. A Tree Retention Plan is required for any scope of work requiring approval through a development permit unless exempted by <u>Kirkland Zoning Code Chapter 95 – Tree Management and Required</u> Landscaping.

Exemptions may apply for building additions and remodels of existing improvements in which the total square footage of the proposed improvements is less than 50 percent of the total square footage of the existing footprint on the subject property **and** where no development activity is proposed within the critical root zone of regulated trees.

The Holmes Point Overlay (HPO) area within the Finn Hill Neighborhood has unique development-related tree protection codes. Refer to <u>Kirkland Zoning Code Chapter 70</u> for more information.

## **Key Definitions**

Regulated Tree: A tree that is at least six inches DBH that is not listed on the Prohibited Plant List.

Landmark Tree: A regulated tree with a minimum 26-inch DBH.

**Grove:** A group of three or more viable regulated trees with overlapping or touching crowns that are located on a proposed development site; one of which is located in a required yard.

**Critical Root Zone (CRZ):** The area encircling the trunk of a tree equal to one foot radius for every inch of DBH. Example: a 24-inch DBH tree has a 24-foot radius CRZ measured from the face of the trunk.

**Inner Critical Root Zone:** An area half the distance of the CRZ that, when impacted, may compromise the structural integrity of the tree. Example: a 24-inch DBH tree has a 12-foot radius inner critical root zone measured from the face of the trunk.

**Tree Protection Zone (TPZ):** A defined area within and including an outer boundary, as determined by a qualified professional arborist, in which certain activities are prohibited or restricted to prevent or minimize potential impacts from construction or development, applicable to individual trees or groups of tree trunks, roots and soil. TPZ is measured in feet from the face of the trunk and may be determined using critical root zone, dripline, exploratory root excavations or other methodologies. The TPZ is variable depending on species, age and health of the tree, soil conditions and proposed construction. TPZ denotes the location of tree protection fencing.

**High Retention Value (HRV):** The Planning Official's designation of a tree based on information provided by a qualified professional arborist that is one of the following:

- 1) Grove
- 2) Landmark tree

3) A viable tree with any portion of the trunk located in a required yard, land use buffer, and/or common open space

**Diameter at Breast Height (DBH):** The diameter or thickness of a tree trunk measured at 4.5 feet above average grade.

## **Tree Retention Plans for Development**



**Qualified Professional Arborist:** An individual with relevant education and training in arboriculture or urban forestry, having two or more of the following credentials:

- International Society of Arboriculture (ISA) Certified Arborist;
- Tree Risk Assessor Qualification (TRAQ) as established by the ISA (or equivalent);
- American Society of Consulting Arborists (ASCA) registered Consulting Arborist;
- Society of American Foresters (SAF) Certified Forester for Forest Management Plans;
- Board Certified Master Arborist as established by the ISA.

Use the Find an Arborist Tool to research qualified professional arborists.

**Viable Tree:** A regulated tree on proposed development sites that fits the viable criteria in Table 95.30.2 based on the tree condition ratings pursuant to KZC 95.30. A tree that is not viable is also a tree in an area where removal is unavoidable due to the anticipated development activity after having applied the provisions in this chapter.

## Tree Inventory

- □ <u>Tree Inventory Table with Existing Trees</u> (must be tagged using a number system consistent with the arborist report and site plan)
  - Trees ≥ 6" Diameter at Breast Height (DBH) on site
  - Trees ≥ 6" DBH that have Critical Root Zones (CRZs) extending onto the subject property
  - All trees in the public right-of-way, regardless of DBH
  - Document tree species, size (DBH), and viability per KZC 95.30(3)(c)
  - Recommended CRZ specified in feet from the face of each trunk
  - Identification of all High Retention Value Trees, including Landmark Trees and Groves

## Site Plan (drawn to scale)

Proposed Improvements & Modifications to Existing Infrastructure (including building footprint(s), proposed access, driveway(s), utilities (including stormwater detention), right-of-way improvements, required yards & landscaping, retaining walls, fences, and buffers)

## □ <u>Tree Retention Plan with Proposed Tree Actions</u> (indicate tree # on site plans)

- Surveyed location of regulated trees on-site
- Approximate location of regulated trees on adjacent properties
- Trees labeled corresponding with tree inventory
- Trees to be preserved clearly noted
- Trees to be removed, marked with an 'X' or ghosted out
- High Retention Value trees, including Landmark & Grove trees, denoted with unique identifier
  - Example: Note 'H', 'L' or 'G' before Tree # (e.g., H-21, L-45, G-22)



## □ <u>Tree Protection</u>

- Critical Root Zones (CRZs) drawn to scale around all trees impacted by development (including neighboring trees)
- Tree Protection Zones (TPZs) labeled in feet from the face of each trunk to tree fencing for trees retained (including neighboring trees) drawn in a linear fashion that represents chain-link fencing
- Disturbances associated with over-excavation of foundations, retaining walls, or similar improvements called out on plans
- Specific tree protection standards during construction, as described in <u>KZC 95.32</u> or recommended by a qualified professional arborist, shown on demolition, grading, and building plans

## □ Supplemental Trees

- Total Tree Density Credits (TDCs) to be preserved and/or planted (see KZC 95.34)
- Locations of trees to be planted (include size, species)

## Arborist Report

## Review the <u>Guide to Arborist Reports</u> for more information.

□ <u>Condition & Viability Ratings</u> (for not viable trees per <u>KZC 95.30(3)(c)</u>, provide a description of defects or concerns)

## □ <u>Tree Protection Measures</u>

- Proposed action (retain/remove)
- Description of the method(s) used to determine TPZs
- Special instructions for work within the CRZ of retained trees (i.e., protection from soil compaction, hand-digging, tunneling or boring, root pruning, mitigating grade changes, arborist monitoring, watering, mulching and aftercare)
- Discussion of timing and installation of tree protection fencing, including anticipated changes to fencing, removal of trees within the tree fencing, or other activity in the CRZ (e.g., material delivery, equipment access, landscaping)
- Impacts to retained trees from tree removals, including those on adjacent properties

## □ High Retention Value (HRV) Trees

 <u>High Retention Value Tree Checklist</u>. If HRV trees are proposed to be removed or impacted, the HRV Tree Checklist is <u>required</u> and must be uploaded to <u>MyBuildingPermit.com</u> along with the associated application file.

□ **<u>Supplemental Trees</u>** (proposed location and species of replacement trees to be planted)



## **Recommended Permit Sequence**

#### Step 1 - Review the <u>Tree Retention Plan Checklist</u> items listed above for required documents.

#### Step 2 - Assess existing trees

1. Applicant obtains a preliminary Tree Inventory Table (prepared by a Qualified Professional) to assess the condition of existing regulated trees and presence of High Retention Value Trees on-site.

#### Step 3 - Conceptual design

- 1. Applicant prepares conceptual design, including house layout, access, and utilities that will prioritize tree retention.
- 2. Provide conceptual plans to the applicant's arborist to comment on retention feasibility.
- 3. For High Retention Value (HRV) trees, explore development standards in KZC 95.30(4) or (5) (whichever is applicable) to support retention.
- 4. <u>Pre-submittal conference</u> Meeting to review conceptual design (both the project arborist & City arborist are encouraged to attend) and discuss proposed removal of High Retention Value (HRV) trees. At this time, the City will discuss whether the plans meet KZC 95 standards and whether additional site plan alterations, arboriculture practices, and/or variations to development standards in KZC 95.30 should be considered prior to permit submittal.

#### Step 4 - Application submittal

- 1. Prior to submittal, applicant to provide final plans to their project arborist to prepare an Arborist Report with specific tree protection recommendations during construction. See the <u>Guide to Arborist Reports</u> for more information.
- 2. Prepare and submit the <u>High Retention Value Tree Checklist</u>. This checklist is <u>required</u> if HRV trees exist on the project site and will be impacted or removed. This checklist must be submitted to <u>MyBuildingPermit.com</u> along with your other application materials.

## GUIDELINES FOR GOOD EXTERIOR LIGHTING PLANS

2020

These guidelines have been developed in consultation with lighting professionals (with experience in developing good lighting plans) to aid communities wishing to control light pollution and preserve a view of the stars in the night sky.

## Outdoor lighting should be carefully designed with regard to placement, intensity, timing, duration, and color. Good lighting will:

## • Promote Safety

*"More light" is not necessarily" better light".* If fixtures are not designed and installed correctly, unsafe glare can result, reducing the effectiveness of lighting, which can contribute to reduced visibility and accidents. Lighting that is too bright can interfere with the eye's ability to re-adapt to darker areas.

**Crime Prevention Through Environmental Design (CPTED**) stresses that lighting systems should "minimize glare, shadow, light pollution, and light trespass". Lighting that protects our night sky and nocturnal environment also improves visibility and safety by enhancing night vision.

## • Save Money

Adhering to professionally recommended light levels provides adequate illumination. Shielded fixtures with efficient light bulbs are more cost-effective because they use less energy by directing the light toward the ground. See this website for cost comparisons: http://darkskysociety.org/lightcost/index.php

#### Conserve Natural Resources

Inappropriate or excessive lighting wastes our limited natural resources and pollutes the air and water by unnecessarily burning our limited supply of fossil fuels.

## • Be Better Neighbors

Excessive or misdirected lighting can intrude on the privacy of others when light or glare trespasses over property lines.

## • Retain Community's Character and Reduce Skyglow

Our clear view of the starry night sky is a resource to be preserved and protected. Stray and excessive lighting contributes to "light pollution", clutter, and unnatural "sky glow".

## • Protect Ecology of Flora and Fauna

Research studies indicate that artificial night lighting disrupts the migrating, feeding, and breeding habits of many wildlife species, as well as growth patterns of trees. See references in The Ecological Consequences of Artificial Night Lighting.

## • Reduce Health Risks

Light at night not only disrupts your sleep but also interferes with your circadian rhythms. Recent research indicates that intrusive lighting may reduce the production of melatonin, a beneficial hormone, and a resulting raise in the rates of breast and other cancers.

The American Medical Association (AMA) endorses dark-sky friendly lighting at or below 3000 Kelvin to reduce hazardous glare (especially for older drivers) and excessive light trespass which has many implications for human health including the correlation of melatonin suppression with the growth of cancerous tumors. In 2009 the AMA passed a resolution urging federal, state, and local legislative action to reduce light pollution.

## Included: 1. Diagrams of Acceptable/Unacceptable Lighting Fixtures

- 2. How to Develop an Acceptable Lighting Plan
- 3. Definitions of lighting Fixtures
- 4. Lighting Plan Submissions
- 5. Recommended Illumination Levels for various tasks

## Examples of Unacceptable/Acceptable Fixture Types



Diagrams courtesy of Bob Crelin

Ask your local electrical suppliers for IES designated "Zero Uplight" or "Fully Shielded" light fixtures. Once you have selected fixtures which are compatible with your architecture and community, contact the manufacturer's representative to see a sample of the fixture(s), the "cut sheet" to show your client and municipal officials, and to ask for a free lighting plan. If you have a CAD file, the plan can be easily provided in a short period of time.

\*\*\*Definition of "Fully Shielded/Zero Uplight": A light fixture with an opaque shield above the lamp (bulb), so that, as designed and installed, the light fixture projects all its light below the horizontal plane through the lowest light emitting part of the fixture.

Most lighting manufacturers have Application Departments which will execute free lighting plans to meet local lighting codes if they are provided these Guidelines.

## How to Develop an Acceptable Lighting Plan

Deliver these requirements to a manufacturers' representative or send to the manufacturers applications department with a site plan (CAD file) shading in the areas to be illuminated and the hours of anticipated use for each area. Manufacturers will provide a lighting plan at no costs once you and your client have chosen the style of fixture that meets your aesthetic design.

**1. Identify where as well as when lighting is needed.** Minimize lighting to the extent necessary to meet safety purposes. Plans should define the areas for which illumination is needed for safe pedestrian passage and indicated when those areas are expected to be used. Itemize each area (e.g. parking lot, doorways, walkways, signage, foliage) with the anticipated hours of use. Commercial outdoor lighting should be used for safe pedestrian passage and property identification, and lit during active business hours and shut off afterward. Use a highlighter on a site plan for those areas to be lit to professional recommendations.

**2. Direct light downward by choosing the correct type of light fixtures**. (See Appendix 3). Specify IES (Illuminating Engineering Society) "Zero Uplight" or "fully shielded" fixtures, so that no light is emitted above the lowest light emitting part of the fixture. Top mounted sign lighting is recommended with "RLM" (dish) type shields, and aimed so that the light falls entirely on the sign and positioned so that the light source (bulb) is not visible from any point off the property or into the roadway to reduce glare. For each one square foot of sign, usually no more than 200 lumens is necessary for good visibility.

**3.** Select the correct light source. Compact fluorescent (2700K or less) or High Pressure Sodium is recommended unless the light is motion sensor activated, in which case LED, incandescent, or the instant start compact fluorescent bulbs can be used. Metal Halide (due to its higher costs, energy use, impact on the environment, and greater contribution to "sky glow") is discouraged, as well as LED light sources rated over 2300 Kelvin. Outdated Mercury Vapor bulbs are prohibited. Limit the use of LEDs to fixtures that are motion sensor activated and with less than 2300 Kelvin; or in 1800 Kelvin fixtures that are not operated dusk to dawn.

4. Utilize "shut off" controls such as sensors, timers, motion detectors. Automatic controls turn off lights (or sections of lights) when not needed. Interior and exterior lights should be extinguished no later than one half hour after the close of business. Additional motion sensor activated lighting can be used for emergency access. Avoid "dusk-to-dawn" sensors without a middle-of-night shut off control. Lights alone will not serve to "protect" property and are a poor "security" device. Examine other means of protecting property to discourage criminal activity. Let your local police know that you have a "lights out" policy so that they can investigate if they see lights "on" after hours.

**5. Limit the height of fixtures.** Locate fixtures no closer to the property line than four times the mounting height of the fixture, and not to exceed the height of adjacent structures. (Exceptions may be made for larger parking areas, commercial zones adjacent to highways, or for fixtures with greater cut off shielding behind the pole mount in commercial zones.)

**6. Limit light crossing property lines, i.e. "light trespass".** Limit spill light across the property lines. Light levels at the property line should not exceed 0.1 footcandles (fc) adjacent to business properties, and 0.05 fc (the brightest moonlight is 0.01 fc) at residential property boundaries. Utility leased floodlight fixtures mounted on public utility poles in the public right-of-way or on property lines shall not be used for private property due to excessive light trespass "spill light".

7. Use the correct amount of light. Light levels and uniformity ratios should not exceed recommended values, per IESNA RP-33 or 20. (See Appendix 5, Recommended Illumination Levels for

various tasks). "Lumen cap" recommendations for areas to be illuminated should not exceed: commercial properties in non-urban commercial zones = 25,000 lumens per acre; for projects in residential and LBO zones = 10,000 lumens per acre. For residential properties: for suburban: 50,000 lumens per acre cap, and in urban areas: 100,000.

**8.** Ask for Assistance Your Planning Department and local lighting sales representatives can assist you in obtaining the necessary information for good lighting. For large projects over 15,000 lumens: greater energy conservation and control of light pollution, light trespass and glare, may be achieved with the help of a professional lighting designer with "dark sky" lighting plan experience.

**9.** A post installation inspection should be conducted to check for compliance with a light meter against the approved lighting plan. Substitutions by electricians and contractors are common and should not be accepted.

**10.** Design interior lighting so that it does not illuminate or project glare to the outdoors. Provide interior lighting photometrics for the building's perimeter areas, demonstrating that the interior lighting falls substantially within the building and not through the windows. When glass or windows on a commercial use property face a public right of way or a residential property, a lighting plan shall be submitted that demonstrates that all interior light fixtures shall be located, aimed, or shielded so that the light source and all parts of the fixture which transmit light shall not be visible at the property line or into the right of way. Shield glare from bare bulbs. After closing, interior lighting needs to be extinguished by the use of shut off timers. Avoid "wall washing" (upwardly directed lighting to illuminate the building).

**11. Free Lighting plans** can be provided by a lighting manufacturers' Applications Departments. Select a manufacturer based on the type and range of fixtures. Submit criteria (attached) along with a site plan (electronic preferred) that has been marked with a highlighter on those areas that are to be lit for pedestrian safety and where pedestrians and cars are in conflict. Separate areas that are to be lit at different times so that they can be placed on separate circuits. Specify motion sensors to be used on all areas and doorways that are not active during nighttime hours.

**12. Flag Lighting** can be accomplished with a top mounted fixture with automated shutoffs for middle of the night energy conservation. Flags are not required to be lit.

## Definition of Acceptable Fixtures: "Fully Shielded" (Zero Uplight) and RLM shields.

"Fully Shielded" or "Zero Uplight" fixtures are independently certified by the manufacturers, and do not allow light to be emitted above the lowest light emitting part of the fixture. Manufacturers provide cutoff designations for their fixtures to indicate the percentage of light that is emitted in various directions. Up, Back, Forward in High, Medium, Low angles.



- If the manufacturer is unable to provide the cut off characteristics for a fixture (also called a "luminaire"), the following definition needs to be met, which can sometimes be determined by a visual inspection of the fixture or a cut sheet (it is best to have the photometric data):
  - "Fully Shielded": a fixture constructed and installed in such a manner that all light emitted by it, either directly from the lamp (bulb) or a diffusing element, or indirectly by reflection or refraction from any part of the fixture, is projected below the horizontal. This can be determined by a "field test" or a visual assessment of an operating sample or by examining a manufacturer's supplied cut sheet photograph.
- Manufacturers and their representatives can provide photographs of light fixtures as "cut sheets" as well as literature confirming the independently tested "cut off" characteristics of their products. These IES files may be assessed for compliance in a computer program: <u>http://www.3dop.com/index1.html</u>
- Photometric layouts for various heights, light sources, and wattages are also available as "IES" files upon request or through manufacturers' websites.
- Fixtures must be installed properly, so that the bottom of the fixture is level with the ground. Exceptions are often given for sign lighting which requires vertical lighting, provided that the light source (bulb) is shielded from view from off the property or into a roadway.
- Sign lighting shall be mounted above the sign, lamped so that the footcandle maximum on the face of the sign does not exceed 2 footcandles (fc).



Example of an"RLM" sign lighting shield:

## Lighting Plan Submissions

The following information needs to be provided to your municipality's review board which will enable them to evaluate the Site Plan for proper exterior lighting:

The Lighting Plan should be depicted on a site plan, indicating the location of each current and proposed outdoor lighting fixture with projected hours of use. This plan will need to be stamped and certified by a licensed professional, such as an architect or engineer. Many lighting manufacturers can provide free photometric layouts on prepared site plans, to conform to your local requirements.

(1) (2)

- The lighting plan should include the following information for all proposed and existing:
  - Type and number of luminaire equipment (fixtures), including the "cut off characteristics", indicating manufacturer and model number(s).
  - Lamp source type (bulb type, i.e. high pressure sodium), lumen output, and wattage.
  - Mounting height with distance noted to the nearest property line for each luminaire.
  - Types of timing devices used to control the hours set for illumination, as well as the proposed hours when each fixture will be operated.
  - Total Lumens for each fixture, and total square footage of areas to be illuminated.
  - For all plans of more than three fixtures: A Calculation Summary indicating footcandle levels on the lighting plan, noting the maximum, average, and minimum, as well as the uniformity ratio of maximum to minimum and average to minimum levels\* to avoid "hot" spots of light.
- (3) Lighting manufacturer-supplied specifications ("cut sheets") that include photographs of the fixtures; and for fixtures that are rated to exceed 2000 lumens, submit the certified BUG (Zero Up Light) designation for the fixture or fixtures.
- (4) For a lighting design with multiple fixtures (e.g. parking lots and walkways) a Lighting Plan shall include light levels in footcandles on the ground at the designated mounting heights for the proposed fixtures. Maximum illuminance levels should be expressed in footcandle measurements on a grid of the site showing footcandle readings in five foot grids. The grid shall include light contributions from all sources (i.e. pole mounted, wall mounted, sign, and street lights.) Show footcandle measurements five feet beyond the property lines.
- (5) If requested by the reviewing agency, a statement from a lighting design professional that a plan, other than that required is needed to meet the intent of these standards.
- (6) An environmental impact statement may be required as to the impact of the exterior lighting proposed on adjacent preserves or waterways to include flora, fauna, and the night sky. Location of species sensitive to light at night or the proximity to nature preserves or astronomical observatories or "Dark Sky Parks", needs to be indicated.
- (7) On the Approved Plan it should be noted that no substitutions, additions, or changes may be made without prior approval by the governing authority; and that all lighting not on the plan shall be removed and no additional lighting shall be installed without prior approvals.

## Recommended Illumination Levels for various tasks\*

Task Area	Avg. or	Not to exceed:
1. Active Building Entrance	2.0 fc	5 fc
Approach	0.2 fc	
2. Gas Station Approach		2 fc
3. Gas Station Pump Area		avg: 5 fc
4. Gas Station Service Area		avg. 3 fc
5. Sidewalks	0.2 fc	5 fc
6. Surface of signs		2 fc

#### I. Table of Limits of Illumination, measured in footcandles (fc) at ground level unless noted:

<u>II.</u>	Ave	<u>rage/Minimum/</u>	<u>Uniformity</u>	Ratio I	<u>Limits f</u>	<u>or Parkin</u>	<u>g Lots</u>	<u>(RP</u>	20 - 14	<u>) LZ 1</u>	1/2
		C	•	Minimu	um .	Average/	Minim	um	Maxim	um/I	Minimum
	1. 5	Small Commercial	lots	0.5 fc		4:01				15:01	

1.	Small Commercial lots	0.5 IC	4:01	15:01
2.	Public larger lots	1.0 fc	4:01	15.01

#### OR:

**III.** If illuminance grid lighting plans cannot be reviewed or if fixtures do not provide IES designations and photometrics and the light sources (bulbs) are rated less than 2000 lumens, use these guidelines:

<u>1.</u>	Pole position shall	be no greater	in height than	<u>n four times the</u>	e distance to the	e property
	line.	-	_			

2. <u>Maximum Lumen Levels</u> for different fixture heights:

Mounting Height (Feet)	Recommended Lumen Maximums
6	500 - 1000 lumens
8	600 - 1,600 lumens
10	1,000 - 2,000 lumens
12	1,600 - 2,400 lumens

FOOTCANDLE: ("FC") – Is the basic unit of illuminance (the amount of light falling on a surface).

Footcandle measurement is taken with a hand held light meter. One footcandle is equivalent to the illuminance produced on one square foot of surface area by a source of one candle at a distance of one foot. Horizontal footcandles measure the illumination striking a horizontal plane. Footcandle values can be measured directly with certain handheld incident light meters.

LUMEN – A unit used to measure the actual amount of light that is produced by a bulb.

The lumen quantifies the amount of light energy produced by a lamp at the lamp, not by the energy input, which is indicated by the "wattage". For example, a 75-watt incandescent lamp can produce 1000 lumens while a 70-watt high-pressure sodium lamp produces 6000 lumens. Lumen output is listed by the manufacturer on the packaging.

\* IES, Recommended Practices, (RP-33-99): <u>Lighting for Exterior Environments</u>; and (RP-20): <u>Parking Lots</u>. The Illuminating Engineering Society of North America (IES or IESNA), is an organization that establishes updated recommendations, standards, and illumination guidelines for the lighting industry. <u>http://www.iesna.org</u>

#### ORDINANCE NO. 2019-06

AN ORDINANCE OF THE TOWN OF RIDGWAY, COLORADO REPEALING AND REPLACING CHAPTER 6, SECTION 5 OF THE RIDGWAY MUNICIPAL CODE REGARDING OUTDOOR LIGHTING REGULATIONS.

WHEREAS, The Town of Ridgway established dark skies-oriented regulations for outdoor lighting via Ordinance 3-1997; and

WHEREAS, the Ridgway Town Council amended the Outdoor Lighting Regulations by Ordinance 4-2017 that provide for appropriate illumination of public art on public property that respects the "dark skies" desire of the community while providing for some illumination of public art in public places; and

WHEREAS, the 2019 Ridgway Master Plan contains the following:

Policy ENV-4.4 Dark Skies: Continue to prioritize efforts to reduce light pollution and enhance the appearance of the night sky.

Action ENV-4f: Continue to protect our dark skies as a valuable community resource; and

WHEREAS, glare and light pollution can result in safety concerns, diminish the ability to view the night sky, and impact community character; and

**WHEREAS,** the Ridgway Town Council desires to pursue certification through the International Dark-Sky Association to become an International Dark Sky Community; and

WHEREAS, the Ridgway Planning Commission reviewed previous drafts of edits to the Outdoor Lighting Regulations at the March 5<sup>th</sup>, June 25<sup>th</sup>, and July 30<sup>th</sup>, 2019 meetings which provided opportunity for public feedback and input; and

WHEREAS, the Town of Ridgway has invested, and continues to invest, in protecting the important dark sky resource.

NOW THEREFORE BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF RIDGWAY, COLORADO, as follows:

<u>SECTION 1.</u> RIDGWAY MUNICIPAL CODE CHAPTER 6, SECTION 5 IS REPEALED AND REPLACED AS FOLLOWS:

#### 6-5-1 GENERAL PROVISIONS.

(A) All non-exempt outdoor light fixtures and illuminating devices permanently or temporarily installed outdoors, including but not limited to devices to illuminate signs, shall meet the following requirements:

(1) They shall be shielded so no light rays are emitted at angles which will allow the light to pass directly off of the premises appurtenant to the fixture.

(2) They shall be shielded so that all light rays are emitted by the installed fixture at angles below the horizontal plane.

(3) All fixtures designed to illuminate signs or structures shall be mounted above the area of the sign or structure to be illuminated.

- (4) Blinking, flashing, rotating or moving lights are prohibited.
- (5) Correlated color temperature (CCT) is limited to 3000 kelvin per fixture.
- (6) The following lumen limits are established to prevent over lighting and are not intended to be achieved. Each site should use the lowest amount of lumens needed for the site to provide for safety and functionality.
  - (a) Single-Family Residential Sites shall be limited to 5,100 lumens. Single-Family Residential Sites that include an accessory dwelling unit shall be limited to 6,500 lumens. Each lighting fixture shall be limited to 850 lumens.
  - (b) Multi-Family Residential Sites, Mixed-Use Sites, and Non-Residential Sites shall be limited to 25,000 lumens per net acre plus 2,000 lumens per unit beyond the first. Each lighting fixture shall be limited to 1,500 lumens.
- (7) Lighting for all non-residential uses shall be extinguished one hour after close of business unless there is a public safety hazard that is best mitigated by the use of lighting. Lighting intended for security purposes shall use Adaptive Controls.
- (8) If any of the above are in conflict with the Town building codes, adopted pursuant to RMC 6-1, the regulations of the adopted building code shall apply.
- (B) The following are exempt from the provisions of Subsection (A).

(1)Lights used to illuminate athletic fields or other community special event areas. Such lights shall be turned off one hour after the conclusion of the event and should be designed or placed to minimize light falling beyond the area in use. (2) Signs which are illuminated by interior light sources, such as neon signs, provided such signs are lit only during the property owner's business hours.

(3) Official traffic control devices and lights owned and operated by or pursuant to proper authority of the United States of America, the State of Colorado or any of their agencies, and such other lights as are specifically required by federal or state law.

- (4) Official traffic control lights owned and operated by the Town of Ridgway.
- (5) Repealed by Ordinance 16-2006
- (6) Lawful vehicle lights.
- (7) Repealed by Ordinance 10-2007
- (8) Holiday lights. Holiday lights should only be in use from November 15 to January 31.
- (9) Repealed by Ordinance 2-2002
- (10) Artwork that is outdoors and on public property. Such artwork shall receive a permit by the Town of Ridgway prior to installation. Such artwork shall be public and accessible to all people and may be illuminated, pursuant to the following:

(a) Artwork shall not contain lighting that exceeds 500 lumens within the entire structure, nor more than 2500 degrees kelvin.

(b) All public art that is illuminated shall include a dimmer and timer to aid the compliance with the Dark Skies Association's Outdoor Lighting Requirements, and shall have the ability to be automatically turned off. In any event such lighting shall be automatically turned off by 10 p.m. nightly.

(c) No structure may contain lighting that is cast upward or outward, but may be diffused in a way such that the lighting emits a soft glow.

(d) All structures shall be lit internally.

(e) All illuminated public art is subject to review and approval by Town staff for compliance with these regulations.

(C) Public Outdoor Lighting

- New public lighting, owned and operated by the Town of Ridgway, including street lights, walkway lights, external buildings lights, holiday lights, and other lights to ensure safety, shall be allowed as recommended by the Town Manager in situations where a public health hazard exists which can only be mitigated by artificial light at night and shall be in compliance with Subsection (A).
- (2) Adaptive Controls or curfews shall be employed in all new public outdoor lighting installations.
- (3) All Town owned lighting shall comply with the requirements of Section 6-5 within five years from the effective date of this ordinance.

## 6-5-2 NONCONFORMING LIGHTS.

(A) Lights which were lawfully existing and in use at the time they became nonconforming with the requirements of this Section 6-5 by virtue of the initial adoption of this Section, subsequent amendment to this Section or by annexation into the Town, may continue to be used and operated subject to the limitations of this Section.

- (B) The right to operate a lawful nonconforming light shall terminate upon any of the following:
  - (1) Replacement of the light fixture.
  - (2) Non-use of the light fixture for a period of six months.
  - (3) Repealed by Ordinance 16-2006
  - (4) Damage to the light fixture so that the cost of repair is 50% or more of the cost to replace it with a conforming fixture.
- (C) The right to exceed the lumen limits <u>established in RMC 6-5-1</u> as a lawful nonconforming site shall terminate upon any of the following:
  - (1) Replacement of 50% or more of the light fixtures on the site.
  - (2) Damage to the light fixtures so that the cost of repair is 50% or more of the cost to replace them with conforming fixtures.
- (D) No alteration may be made to lighting on a site which would increase the amount or degree of the nonconformity.

#### 6-5-3 ADMINISTRATION AND ENFORCEMENT.

(A) The provisions of this Section shall be administered by the building official or other authorized Town officer or employee.

(B) It shall be unlawful to violate any provision of this Section.

(C) Any continuing violation of this Section is hereby declared to be nuisance, which may be abated by the Town in any lawful manner, or enjoined by a court of competent jurisdiction.

(D) No building permit or occupancy permit shall be issued for work which has noncomplying light fixtures.

## 6-5-4 APPEALS AND VARIANCES.

(A) Any person aggrieved by an interpretation of this Section or decision of the Town made in the administration of this Section, may appeal the interpretation or decision to the Board of Appeals pursuant to the review procedure of Section 6-1-5 of the Ridgway Municipal Code upon payment of a \$250.00 application fee.

(B) (1) Any person may apply for a variance to the Planning Commission from the provisions of this Section upon payment of the \$250.00 application fee in accordance with the review procedure of Section 7-3-18 of the Ridgway Municipal Code.

(2) The Planning Commission may grant a variance only upon a determination that the following criteria are met:

- (a) The variance will be consistent with the public health, safety and welfare.
- (b) The variance is justified by unreasonable hardship not created by the activities of the applicant or strict compliance is unfeasible.
- (c) The variance will be substantially consistent with the purposes of this Section to avoid nuisances to others, preserve the ability to observe the night sky, conserve energy, reduce glare, promote traffic and pedestrian safety, preserve the small town character of Ridgway and promote the Town's master plan.
- (d) The variance will not compromise any Dark Skies Certification, if such certification is in place at the time the variance is requested.

## 6-5-5 PURPOSE
To protect the dark sky resource, maintain nighttime visibility, minimize light pollution and glare, promote energy conservation, promote traffic and pedestrian safety, help mitigate wildlife sleep and mitigation related issues, and preserve the small-town character of the Town.

### 6-5-6 DEFINITIONS

- (A) Adaptive Controls: devices such as timers, motion-sensors and light-sensitive switches used to actively regulate the emission of light from light fixtures.
- (B) Mixed-Use Site: an undivided or combination of undivided lots under one or more ownership or lease agreement used for a mixture of commercial, industrial, institutional, and residential uses.
- (C) Multi-Family Residential Site: an undivided or combination of undivided lots under one or more ownership or lease arrangements occupied by multiple dwelling units.
- (D) Non-Residential Site: an undivided or combination of undivided lots under one or more ownership or lease agreement used for commercial, industrial, or institutional uses.
- (E) Single-Family Residential Site: an undivided or combination of undivided lots under one ownership occupied by a single-family residential structure and related accessory structures.

\* \* \*

### SECTION 2. ORDINANCE EFFECT

All Ordinances of the Town, or parts thereof, inconsistent or in conflict with this Ordinance are hereby repealed, replaced and superseded to the extent only of such inconsistency or conflict.

### SECTION 3. SEVERABILITY

The Provisions of this Ordinance are severable, and the invalidity of any section, phrase, clause or portion of this Ordinance as determined by a court of competent jurisdiction shall not affect the validity or effectiveness of the remainder of this Ordinance.

### SECTION 4. EFFECTIVE DATE.

This Ordinance shall take effect 30 days after adoption.

#### SECTION 5. PUBLIC HEARING.

A public hearing on this Ordinance was held on the \_\_\_\_\_ day of \_\_\_\_\_, 2019, in the Town Council Chambers, 201 N. Railroad Street, Ridgway, CO 81432.

INTRODUCED, READ AND REFERRED to public hearing before the Town Council of the Town of Ridgway, Colorado, on the 14<sup>th</sup> day of August, 2019.

TOWN OF RIDGWAY, COLORADO, A HOME RULE MUNICIPALITY

By:\_\_\_\_\_

JOHN CLARK, Mayor

ATTEST:

PAM KRAFT, Town Clerk

HEARD AND FINALLY ADOPTED by the Town Council of the Town of Ridgway, Colorado, this \_\_\_\_\_ day of \_\_\_\_\_\_, 2019.

TOWN OF RIDGWAY, COLORADO, A HOME RULE MUNICIPALITY

Ву:\_\_\_\_\_

JOHN CLARK, Mayor

ATTEST:

PAM KRAFT, Town Clerk

Approved as to Form:

BO JAMES NERLIN, Town Attorney

## **Fence Permit**

Fence Permits are required for all fences the except the following:

- Fences in the front yard that to not exceed four (4) feet in height and that are constructed with wood, logs, bark, slab, stone, wrought iron or any combination of those materials.
- Fences in the back yard that to not exceed six (6) feet in height and that are constructed with wood, logs, bark, slab, stone, wrought iron or any combination of those materials.

# **Fence Permit Process Chart**

Schedule a preapplication meeting with the Town Manager / Planner. Fill out the application and provide the documents and payment as shown on the check list.

Review of application by Town Manager / Planner for application completeness.

Schedule hearings before the Rico Planning Commission.

# **Fence Permit Process Chart**

Applicant shall notice neighbors within 200 feet of subject property 20 days prior to scheduled hearings. The Rico Planning Commission hears the request and either approves, denies or approves with conditions. If the approval is conditional, the applicants must show that they have met the required conditions prior to final approval.

Issuance of permit

The Rico Planning Commission will review the permit application according to the following standards:

- Special circumstances related to lot size, shape, area, topography, surrounding conditions, access and location that do not generally apply to properties in the same area and zone district.
- Fences should not negatively impact snow removal, streetscapes, separation of buildings for fire protection, off-street parking areas, solar access, view corridors. Attention shall be given to impacts on neighbors.
- Fences shall not constitute a material detriment to public welfare or injury to the use of property in the vicinity.

### **Special Use Permit**



Applicant Name	Phone Number	
Address	Cell Phone Number	
Email	Fax Number	
Street Address of Subject Property		
Legal Description of Subject Property		
Zone District of Subject Property		

#### **Attachments Required:**

 $\Box$  2 paper copies and one electronic copy of a drawing or photograph of the proposed fence and a drawing indicting where on the lot the fence is to be located.

 $\Box$  Description of the materials to be used on the fence.

 $\Box$  Letter of agency if applicant is other than the owner of the property

 $\Box$  An application fee in the amount of \$25.00

A narrative describing the requested fence design variances, the applicant's reason for such variances and why the proposed design is compatible with the general purpose of the fence regulations.

A Certificate of Mailing with names, addresses, and property owned of property owners within 200 feet of subject property.

 $\Box$  A copy of the deed for the property.

I swear that the information provided in this application is true and correct and that I am the owner of the property or otherwise authorized to act on behalf of the owner of the property.

Signature: \_

\_ Date \_\_\_\_\_

Date Application Received	Application Reviewed by
Application Fee Received	Date of Hearing
Application Complete	Rico Planning Commission Action
Mailing Notice Complete	Approval Subject to Conditions

Other comments: