

DELTA COUNTY PLANNING COMMISSION

Delta County Roubideau Room
320 W. 5th Street, Delta, CO 81416
Wednesday, July 13, 2022 @ 5:30 p.m.

Tom Kay, Chair
Tate Locke, Vice-Chair
Carl Holm, Director

Agendas and attachments are available on our website at:

<https://www.deltacounty.com/725/Agendas-and-Minutes>

To be notified when new agendas and minutes have been published, sign up on the “Notify Me” page and manage your notification preferences (email, text, or both).

Instructions for Public Participation via Zoom:

The public can join the meeting remotely by registering in advance of the meeting at:
<https://us02web.zoom.us/meeting/register/tZUzd-qprDIoG9R-tqe6-Mwj0Dd64-Xbmm4>
After registering, you will receive a confirmation email containing information about joining the meeting.

REGULAR AGENDA

5:30 P.M. – CALL TO ORDER

ROLL CALL

DISTRICT 1

Cindy Watson
Steve Schrock
Steve Shea
Michelle Roberts, Associate

DISTRICT 2

Layne Brones
Tate Locke, Vice Chair
Hardy Hutto
Vacant, Associate

DISTRICT 3

Jacob Gray
Tom Kay, Chair
Kate Darlington
David Marek, Associate

A. PUBLIC HEARING ITEMS

Public Hearing Items are noticed and open for public comment.

1. PLN22-084/Garnet Mesa Solar (Guzman Energy)

Consider a Use Permit to install and operate an 80MW ground mounted solar photovoltaic energy generating facility. The project involves two sites generally located; 1) west of 2200 Road and 2) southwest corner of G Road and 2100 Road with a total combined area of 472+ acres, approximately 2.2 miles east of Delta (Parcels: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020).

RECOMMENDATION: Staff recommends that the Planning Commission (PC) recommend the following action(s) to the Board of County Commissioners (BoCC):

- a. Find that PLN22-084 complies with the Master Plan and Land Use Code; and
- b. Approve PLN22-084, a Use Permit for an 80MW ground mounted solar photovoltaic energy generating facility developed over three (3) parcels totaling 472.85 acres generally located between 2200 Road on the east and

CERTIFICATION OF POSTING

On July 7, 2022 at 9:30am PM, Kim Henderson did post the above AGENDA as public notice of the July 13, 2022 meeting. The official notice is placed on the front entrance of the Delta County Courthouse located at 501 Palmer, Delta, Colorado and a courtesy copy is sent to the Delta County website at www.deltacounty.com.

2050 Road on the west, north and south of G Road, Delta (Parcel: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020), subject to conditions.

B. PUBLIC MEETING ITEMS

The public can attend and listen to the following Public Meeting Items, but will not be afforded the opportunity to speak on these items, unless the Commission, through the Chair, opens an item up for comment.

1. Meeting Minutes

a. June 22, 2022

RECOMMENDATION: Approve the action minutes as presented.

2. Land Use Code Update – Work Session

Work Session to consider redline drafts of various sections of the Land Use Code.

RECOMMENDATIONS: Staff recommends that the Planning Commission set a date for a Special Meeting to consider redline drafts of the Land Use Code.

C. DEPARTMENT REPORT

This is time set aside for the Director to report on matters affecting the Department.

D. COMMISSIONER COMMENTS, REQUESTS AND REFERRALS

This is time set aside for the Commission to comment, request, or refer a matter that is not on the agenda for future consideration.

ADJOURNMENT

Next Meeting: Wednesday, July 27, 2022 at 5:30 pm in Delta, CO.

CERTIFICATION OF POSTING

On July 7, 2022 at 9:30am PM, Kim Henderson did post the above AGENDA as public notice of the July 13, 2022 meeting. The official notice is placed on the front entrance of the Delta County Courthouse located at 501 Palmer, Delta, Colorado and a courtesy copy is sent to the Delta County website at www.deltacounty.com.



STAFF REPORT

Delta County Planning Commission

**Delta County Roubideau Room
320 W. 5th Street, Delta, CO 81416**

Wednesday, July 13, 2022 @ 5:30 p.m.

PLN22-084/Garnet Mesa Solar LLC (DMEA/Guzman Energy)

Consider a Limited Use Permit to install and operate an 80MW ground mounted solar photovoltaic energy generating facility. The project involves two sites generally located; 1) west of 2200 Road and 2) southwest corner of G Road and 2100 Road with a total combined area of 472+ acres, approximately 2.2 miles east of Delta (Parcels: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020).

PROJECT INFORMATION:

Property Owner: Garnet Mesa Land LLC
Applicant: Garnet Mesa Solar LLC
Representative: Matthew Kosakowski, Citra Power
Site Address: 20426 G Road, Delta
Location: Section 23, Township 15S, Range 95W, 6thPM
Parcel ID: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020
Parcel Size: 240 Ac, 41.8 Ac, 191 Ac (472.8+ Ac total)
Zoning: A-20, A-5

RECOMMENDATION:

Staff recommends that the Planning Commission recommend that the Board of County Commissioners:

- a. Find that PLN22-084 complies with the Master Plan and Land Use Code;
and



- b. Approve PLN22-084, a Limited Use Permit for an 80MW ground mounted solar photovoltaic energy generating facility developed over three (3) parcels totaling 472.85 acres generally located between 2200 Road on the east and 2050 Road on the west, north and south of G Road, Delta (Parcel: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020), subject to conditions.

A draft resolution for the Board of County Commissioners (BoCC) is attached with draft findings and conditions to consider.

SUMMARY:

Garnet Mesa Land LLC, a subsidiary of Guzman Energy, owns multiple parcels where they propose to develop a utility-scale ground mounted solar power generating facility. DMEA would use about 20% of the power generated by this facility, the rest would be sold to other entities. Through the review/hearing process for PLN21-030, project details evolved to add landscaping, screen the substation on site, and add an off-site park and ride lot to reduce traffic during construction. The reports and minutes from those hearings are available for review to provide more background to the project.

On March 2, 2022, the Board of County Commissioners voted 2-1 to deny PLN21-030 - an application for an 80 MW, ground mounted, solar photovoltaic generating facility and collector substation. Potential impact to irrigated Ag lands was identified as a significant reason for the BoCC action. This includes the ability to irrigate the subject lands, but also concern about potential for more solar projects impacting agricultural lands.

On May 26, 2022, Citra Power, representing Guzman Energy, submitted an "Irrigation Feasibility Evaluation" prepared by Morales Engineering & Consulting to address concerns about the viability to continue irrigating the sites for grazing purposes (sheep). This Evaluation considered three (3) alternatives and identifies the best system for these sites, including consultation with local experts like NRCS, Conservation District, CSU and the prior owner. The project has been modified to utilize recommendations from Morales Engineering. The Director determined that this information, added to information provided as part of PLN21-030, was a material change to consider the project as a new application (PLN22-084).

The project involves multiple sites:

- 1) Northeast Site. One (1) parcel consisting of approximately 191 acres generally located west of 2200 Road with access just north of Arroyo Drive. Generally, this property is zoned A-20, with about 50% of the property used for irrigated agriculture, with the remainder being undeveloped lands. A 60-foot-wide easement over Parcel 345513100022 (6687 2200 Road, Norell) provides access from 2200 Road.
- 2) Southwest Site. Two (2) parcels totaling about 280 acres located at the southwest corner of G Road and 2100 Road. Both parcels are zoned A-



20. Most of this property is used for irrigated agriculture and grazing. An existing homestead and corrals are located along G Road.
- 3) Utility Easement. The applicant acquired a 25-foot-wide utility easement over Parcel 345513300009 (5990 2100 Road, Hofschulte) for underground power line(s) that connect the two sites.

Based on the design as submitted in the permit package, the solar panels would cover about 129 acres of the total 473 acres, which is about 27% coverage. A Traffic Plan includes traffic controls at the main access on G Road and a temporary access on 2100 Road during a 4-month construction period. This facility will be designed with strings of panels mounted on rows of single axis trackers (posts) that are 5-6 feet tall, which can be monitored and operated remotely 7 days/week, 24 hours/day to track performance, diagnose issues, and schedule on-site maintenance. At sunset, the solar array trackers will enter a “sleep” mode where they are held still (quiet) in the most stable position to protect against any night winds. Each site will be secured with a 7-foot-tall wire mesh fence with wood posts (similar to orchards), and landscaping will be installed to help screen the site from surrounding areas. The substation includes a walled perimeter to help screen and reduce noise from that facility.

Commercial renewable energy facilities are a Limited Use in all zoning designations. Limited Use is a discretionary permit that can be approved Administratively upon a finding of compliance with applicable requirements of the LUC (Chapters 3-5).

The Director determined that the project may have material impacts on neighboring properties, and involves material potential for reasonable disagreement whether the proposed development complies with the standards of the LUC. Therefore, this application is being referred to the Planning Commission (PC) to make a recommendation to the Board of County Commissioners (BoCC). As such, this Limited Use application is processed as a Conditional Use.

Staff finds that the application has met the standards set forth in the LUC (setbacks, site design, environmental stewardship, etc.). All development has some level of impact. In this case, staff finds that the applicant has attempted to reduce negative impacts as much as feasible through project design and leading practices. Some areas of concern (e.g., aesthetics, property values, benefits) are not standards in the LUC.

Ultimately, the decision-makers shall determine if the application complies with the Land Use Code to approve, approve with conditions, or deny this application. Staff has prepared a draft BoCC resolution with recommended findings and conditions (**Attached**). Conditions are designed to try to provide clear parameters for the project, including bonding to help ensure the project functions as expected.



In a meeting between staff and the neighbors, views were identified as a significant issue. One part is the view of panels, but also noted was a concern about the transmission poles/towers being 90-120 feet tall. It was requested that the lines be required to be placed underground to help reduce this concern.

Another concern was about site selection, possible use of BLM land, and the potential number of solar applications. The applicant commented that BLM land was included in their search, but they did not find land that met their criteria. Staff noted that land use applications are reactive, meaning we evaluate what is proposed, not what else could be considered. Separate from this application, the County could consider implementing a moratorium on future solar applications until the LUC is updated where we can assess the amount of solar and standards for such projects – would not affect this application.

DISCUSSION:

Guzman Energy is responsible for sourcing the energy that DMEA ultimately distributes to the community. Guzman is the parent company (owns) for the two project LLCs; 1) Garnet Mesa Land, LLC owns the land, and 2) Garnet Mesa Solar, LLC holds all of the assets of the solar project. The Solar LLC will have a lease with the Land LLC which will give the solar project the right to construct on the property. Citra Power is working under contract to Guzman Energy and performing all of the project development work.

Background (PLN21-030):

On January 5, 2021, Delta County adopted a new Land Use Code. Actions included repealing former land use regulations like Specific Development. A moratorium was established that prevented applications being submitted prior to April 1, 2021.

Executive Order 14008 as of January 27, 2021, prioritized BLM's attention to improve the permitting process to facilitate responsible renewable energy development on public lands. Solar energy development projects on BLM-managed public lands are authorized as rights-of-way consistent with appropriate BLM land use plans. Regulations at 43 CFR 2800 identify requirements for solar development application and permitting. Applications for solar energy uses on public land are subject to paying cost-recovery fees and all proposals are subject to review under the National Environmental Policy Act and other applicable laws and regulations.

On April 29, 2021, Mr. Matthew Kosakowski with Citra Power, representing Garnet Mesa Solar LLC submitted a pre-application form (PLN21-030/Garnet Mesa) for an approximately 360-acre ground mounted solar photovoltaic generating facility and collector substation.



On June 7, 2021, a Pre-Application Conference was held between the applicant's representatives (Citra Power, DMEA) and County Planning, Engineering, Economic Development and Road & Bridge. Staff had questions/comments that came up during the pre-application conference for the applicant to consider/answer. The applicant presented their proposed operation and answered a number of questions.

On August 24, 2021, a number of documents were submitted with the application that provided information about this project.

On November 17, 2021, the Planning Commission (PC) held a noticed public hearing and voted 6-2 to recommend approval of the subject Use Permit. The PC accepted staff's recommended conditions and added other conditions to address issues raised during the public hearing. Some of the main points addressed included utility lines (height, design), irrigation (drainage, easements), sound/noise (substation), traffic, and screening/landscape.

On December 8, 2021, the Planning Commission Chair called a Special Meeting to hold an executive session regarding new information received relative to this project.

On December 15, 2021, the Planning Commission held a Special Meeting and requested items be placed on January 12, 2022 to consider a motion to rescind the November 17th action and (re)consider the project (should the motion to rescind pass).

On December 16, 2021, the applicant submitted supplemental information to address comments/questions expressed by the PC at the November hearing.

On January 12, 2022, the Planning Commission (PC) unanimously voted to rescind the November 17th action and then voted 6-2 to recommend approval of the subject Use Permit, subject to 13 conditions. The majority supported the renewable energy project finding that it complies with the Delta County Master Plan and Land Use Code based on the information and testimony provided. The minority expressed support for renewable energy, but expressed preference for not impacting lands that have been actively irrigated for agricultural purposes and concerns for the surrounding neighborhood.

On February 16, 2022, the Board of County Commissioners (BoCC) held a Special Meeting to conduct a public hearing on the subject application. Staff presented information from the application (applicant and public), Land Use Code, and the Planning Commission recommendations. Some of the main points of discussion were related to: utility lines (EMF as it relates to transmission lines), drainage (easements), sound/noise, and screening/landscape (watering). This matter was continued to March 2nd (Special Meeting) to receive additional information relative to EMF and drainage.



On February 23rd, the applicant submitted:

- EMF Data. Although infrastructure for a public utility is not subject to local jurisdiction review, other than to permit utility work within a County Right-of-Way, the project and DMEA want to mitigate concerns from the County if possible. The applicant provided documentation on Electric and Magnetic Fields (EMF) associated with the use of electric power, including a summary of EMF studies along with a Q&A document prepared by health professionals. Specifically, the BoCC was interested in safety associated with transmission lines.
- Signed letter of agreement regarding a drainage agreement with Mr. Long, neighboring property owner (3 L Bar Ranch).
- Noise Assessment associated with tracker equipment. Since the BoCC had questions related to the noise of the motors which allow the panels to track the sun, the applicant asked their noise consultant to provide definitive clarity around the noise generated. This report found that noise levels fall well below the required thresholds.

On March 2, 2022, the Board of County Commissioners held a Special Meeting to conduct a public hearing on the subject application. The BoCC voted 2-1 to deny PLN21-030 citing potential impact to irrigated Ag lands as a significant reason for the BoCC action. There was also question about relocating the project with recent legislation opening BLM lands to solar.

On May 26, 2022, the applicant submitted an "Irrigation Feasibility Evaluation" prepared by Morales Engineering & Consulting (dated 16 May 2022). The prior project (PLN21-030) has been modified to utilize recommendations from Morales Engineering. Since final action was taken by the BoCC, this is considered a new application so it was assigned a new project number (PLN22-084).

On June 27, 2022, the project team held a meeting where immediate neighbors were invited. Staff was informed that about 7-8 neighbors attended that meeting. Also on June 27th, the project team hosted an open house for the public to attend. Staff attended that meeting, which included an estimated 30+ people from the public. The format of the open house had an informational slide show running, and there were four stations where members of the project team was there to answer questions.

July 6, 2022, staff met with a group of neighbors at the County offices. This meeting was an opportunity to talk about differing information and how the LUC applies. The applicant was not included in this meeting. Some of the comments have been addressed throughout the report. A summary of this meeting is provided in the "Other Agency" section of this report.

PLN22-084:



Following the BoCC action, the applicant states that they consulted local livestock agents, CSU extension office in Montrose, and local irrigation engineers to address concerns about the viability to flood irrigate and continue agricultural (grazing) operations. On May 26, 2022, they submitted an "Irrigation Feasibility Evaluation" prepared by Morales Engineering & Consulting (MEC), dated 16 May 2022 (**Attached**). This Evaluation reports that MEC consulted the Natural Resources Conservation Service (NRCS) and the Colorado River Water Conservation District.

The project is generally the same size and design, so much of the project materials presented for PLN21-030 remain the same (as amended through the hearing process). However, the project has been modified to utilize recommendations from Morales Engineering, who had worked with the prior owner to design an updated irrigation system. The Evaluation recommends using a sprinkler system suspended under the array for the Southwest Tract, and using a gated pipe system for the Northeast Tract for the portions previously irrigated. If the applicant wants to irrigate previously unirrigated portions, then MEC recommends the inverted sprinkler design.

The Director determined that this information qualified as a material change of circumstances that justifies consideration of an otherwise substantially similar application. Since final action was taken by the BoCC, this is considered a new application so it was assigned a new project number (PLN22-084).

Proposed plans include use of five (5) parcels between 2200 Road on the east and 2050 Road on the west, north and south of G Road. These parcels have been separated into two groups as follows:

1. Three parcels (totaling about 472.85 acres) are the primary sites for installing solar arrays:
 - a. Southwest (West Phase).
 - i. Parcel 345523100001 (G Road/2100 Road) 240 Acres of irrigated farmland, Zoned A-20.
 - ii. Parcel 345523200009 (20426 G Road) 41.8 Acres of irrigated farmland with a homestead, Zoned A-20.
 - b. Northeast (East Phase).
 - i. Parcel 345513300020 (2200 Road); 191.0469 Acres with areas of irrigated farmlands, Zoned A-20, will be used for the project.
2. Two parcels include easements that support the project:
 - a. Parcel 345513300009 (5990 2100 Road, Zoned A-5). A 15.4393-acre parcel owned by Hofschulte with a 25-foot-wide utility easement (Reception #: 696085, 06/19/2017). This easement is a part of the project to allow for the two phases to be connected. There would be no solar components on this parcel.



- b. Parcel 345513100022 (6687 2200 Road, Zoned A-20). A 67.55-acre parcel owned by Kenneth Norell with a 60-foot-wide easement providing access from 2200 Road to the East Phase project site (Norell Ranch Survey Plat, Reception #: 727607, 03/29/2021).

Based on the design as submitted in the permit package, the solar panels would cover about 129 acres of the total 473 acres, which is about 27% coverage. This facility will be designed with strings of panels mounted on rows of single axis trackers (posts), which can be operated remotely to track the sun during daylight hours. At sunset, the solar array trackers will enter a “sleep” mode where they are held still in the most stable position to protect against any night winds. Each site will be secured with a 7-foot-tall wire mesh fence with wood posts, and landscaping will be installed to help screen the site from the public right-of-way.

Inverters within the sites will convert the Direct Current (“DC”) power (how the power is generated) into Alternating Current (“AC”) power (how the power is used in households) before it is transmitted through the DMEA system. The system would generate about 120MWdc of raw power that, once converted, would produce 80MWac of usable power.

There is a wetland that will not be impacted by boring the line under this area. A right-of-way use (utility) permit will be required to bore under the County roadway, at the corner of G Road and 2100 Road.

Process:

Under the 2021 Delta County Land Use Code, a Renewable Energy Facility is a Limited Use (any zoning designation) subject to Administrative Review (Director approval) with no public hearing. Renewable Energy Facility is defined as a commercial facility producing more than 100 kW.

The Director determined that the project may have material impacts on neighboring properties, and involves material potential for reasonable disagreement whether the proposed development complies with the standards of the LUC. Therefore, this application is being referred to the Planning Commission (PC) to make a recommendation to the Board of County Commissioners (BoCC). As such, this application is processed as a Conditional Use.

Assessment:

The PC/BoCC shall determine if the application complies with the Land Use Code to approve, approve with conditions, or deny this application. The Land Use Code (LUC) establishes standards to assess certain development applications; Chapter 3 (Lot Dimensions, Bulk Standards); Chapter 4 (Site Design & Environmental Stewardship); and Chapter 5 (Public Facilities, Infrastructures and Services). Also see findings in the BoCC draft resolution (**Attached**).



Staff reports for PLN21-030 identified and addressed a number of documents submitted as part of the application and in support/opposition of the project.

The Master Plan is an advisory document. Principal goals identified in the Master Plan include; Preserve agricultural lands and open space; Protect private property rights, Maintain the rural lifestyle, Scarce domestic water, and Lack of land use planning. Growth and development should support the community's desired future. On one hand, the desire is to preserve lands in agriculture. On the other hand, an owner is not required to use their land for agriculture. The Land Use Code was adopted based on policies established in the Master Plan.

The proposed project is located in an area designated in the Master Plan as "Agriculture with Residential Interface". The Master Plan also includes a map of solar energy potential, showing the area from the City of Delta east just past the Gunnison River as having high solar potential, which includes BLM lands east of the Peach Valley.

Delta County's Land Use Code (LUC) is a regulatory document that establishes standards and processes for what is allowed on property, depending on the zoning. The subject property is zoned A-20 with A-5 zoning located between the two sites. Lands east of the project are zones A-35 transitioning to BLM land.

Renewable Energy Facility, defined in the 2021 Delta County Land Use Code (LUC) as "*a commercial facility for the production of more than 100 kW of renewable energy*", is identified as a Limited Use in all zoning designations. Under the LUC, a Limited Use is subject to Administrative Review (Director approval) with no public hearing. Administrative approvals and permits (Allowed Use, Permitted Use, Limited Use) are issued upon finding of compliance with applicable requirements of the LUC, which generally are located in Chapters 3-5.

Standards established in the LUC are intended to, in part, protect the character of existing rural neighborhoods. The LUC does not have use specific standards for renewable energy; however, the application package includes a number of documents that address leading standards for this type of development, including but not limited to:

- a. *Traffic Management Plan with appropriate level traffic studies.* Submitted with permit application (Exhibit 3.O). Primary traffic is during construction where the plan calls for flagging and routing controls.
- b. *Bond for road damage.* Recommended condition requires a \$100,000 "Road Inspection & Repair Bond". County Road & Bridge will inspect haul routes before and after construction. The bond is to guarantee repairs are made to the County's satisfaction.
- c. *Construction traffic track out mitigation plan for public roads.* Section SM-4 in Exhibit C of Exhibit 3.K of the application package. Through the



processing of PLN21-030, the applicant identified an off-site park and ride location to reduce daily construction traffic in the neighborhood.

- d. *Bond for continuation of irrigation and agriculture practices.* Technically, the applicant could decide to terminate irrigation of these properties. However, they are committed to continue irrigating and grazing these lands. Recommended condition requires a “Landscape/Vegetation Bond” in the amount equal to the cost of installing landscape. Said bond would be retained for 10 years to insure that landscaping and agricultural practices are working as presented. This bond ensures landscaping is maintained per the plan, and that it is well established before the bond is released. In addition, 10 years is enough time to demonstrate that the agricultural operation succeeds as planned. If not, the applicant must revise the plan and implement measures accordingly.
- e. *NRCS approved (or other qualified agency) irrigation and grazing plan.* Agricultural Management Plan submitted (Exhibit 4.A). Supplemental letter from Sperry Livestock Corporation submitted for grazing sheep. Irrigation Feasibility Evaluation prepared by licensed Engineer in consultation with Natural Resources Conservation Service and Colorado River Water Conservation District. The applicant also consulted the CSU extension in Montrose and the prior land owner(s).
- f. *Bond for site reclamation and restoration.* Recommended condition to include a \$4.4M “Decommissioning Bond”.
- g. *Reclamation and Restoration Plan.* Submitted with permit application (Exhibit 3.P).
- h. *Construction Plan with schedule.* Submitted with permit application (Exhibit 3.R). The scheduled dates have changed but the timeline remains the same for the major construction (4-5 months).
- i. *CPW review and approval.* Staff referred the project to CPW and received a letter dated 10/5/2021. Recommended conditions include recommendations from CPW.
- j. *Archaeological clearance with SHPO concurrence.* Submitted with permit application (Exhibit 3.G).
- k. *Wetlands Delineation with setbacks identified.* Submitted with permit application (Exhibits 3.E and 4.C).
- l. *Dust Abatement Plan.* Section EC-14 in Exhibit C of Exhibit 3.K of the application package.
- m. *Hazardous Material and Waste Management Plan.* Emergency Response Plan submitted with application package (Exhibit 3.I). Hazardous materials consist of herbicides for weed control, lead acid battery for backup power, and mineral oil for transformer cooling. Waste generated as a result of damage or replacement if managed following equipment manufacturing recommendations (see Item “n; if there is a spill from equipment damage).
- n. *Spill prevention and Emergency Response Plan.* Emergency Response Plan submitted with application package (Exhibit 3.I). A “Spill Prevention, Control, and Countermeasure Plan” is required pursuant to Title 40, Code



- of Federal Regulations (CFR), § 112 (40 CFR § 112) prior to the facility becoming operational. The full and final design of the facility and identification of responsible individuals is needed to complete the plan, which as a result cannot be completed at this stage.
- o. *Noise Abatement Plan*. Submitted with permit application (Exhibits 4.D). Supplemental information about noise provided in a memo (Item #3) dated 2/21/2022 for the 3/2/22 BoCC hearing.
 - p. *Wildfire Control Plan*. Submitted with permit application (Exhibits 2.G).
 - q. *Surface and Groundwater Monitoring and Reporting Plan*. EPA requirements for surface and groundwater monitoring are not applicable to solar facilities as they do not produce any hazardous waste discharge. Items “m” and “n” address hazardous materials and spills that could affect irrigation and/or ground water.
 - r. *Stormwater Pollution Prevention and Erosion Controls*. Draft SWMP, Exhibit 3.K (effective 2/1/2021) submitted with application.
 - s. *Solar Washing Plan with listed chemicals used wash water*. Pure water is used for panel washing, if needed. The baseline operation relies on rainfall and wind such that solar panel washing is not required.
 - t. *Solar Panel, Structure, and Facilities Recycling Plan*. Included with Decommissioning Plan submitted with permit application (Exhibits 3.P).
 - u. *Landscaping Plan and bond with mitigation for neighboring properties*. Landscaping Plan submitted with the application (Exhibit 3.M). This Plan includes mature plant sizes and photo simulations for how the screening should look in 1 and 10 years. The Plan was amended through the hearings for PLN21-030 to include screening for additional areas. Recommended condition requires a “Landscape/Vegetation Bond” in the amount equal to the cost of installing landscape. The Irrigation Plan includes recommendations for perimeter landscape.
 - v. *Geotech and Hydrology investigation and report*. Submitted with permit application (Exhibits 3.H and 3.J).
 - w. *Noxious Weed Control Plan and bond*. Submitted with permit application (Exhibit 3.L). Maintenance is covered under the “Landscape/Vegetation Bond” for 10 years.
 - x. *Avian and Bat Conservation Plan*. Biological Report submitted with the application (Exhibit 3.E). CPW reviewed the plan and provided a letter dated 10/5/2021. Recommended conditions include recommendations from CPW.

An Annual Operating Plan (AOP), submitted to the County annually, can be required to include planned construction or repair/replacement activities as well as updated hazardous waste, emergency response, stormwater, irrigation/grazing, noxious weed and dust control plans (**Condition 12**). An AOP should also be required to include updated contact information for local and corporate responsible persons. An Annual Report would include a summary of irrigation and agricultural practices, surface and groundwater testing and analysis, reporting any chemical or waste spill, citation or reports (local, state,



federal), avian and bird fatalities, traffic increase/decrease, county road repairs, number of panels replaced and recycling report (**Condition 14**).

Part of having a discretionary permit includes site inspections to perform condition compliance monitoring. If a permit is found out of compliance, the first step would be to inform the responsible persons including corrective actions required. If corrective action is not taken timely, there would be bonds that could be enforced, and/or a citation process. That includes calling the decommissioning bond if the facility is not operating as permitted/expected.

There are two main points that have been the focus of discussions:

- 1) *Site Selection*. The project team used a suite of public layer data from many sources to evaluate the Delta/Montrose region searching for a project site that satisfies all of the following criteria:
 - Site Size. Large contiguous parcels supporting a 400-acre (+/-) project.
 - Location. Highest solar irradiance zone.
 - Appropriate zoning. Satisfy all County land use code requirements for use as a solar generating facility.
 - Topography. Compatible terrain with limited slopes.
 - Geotechnical compatibility. Not too rocky.
 - Avoidance of environmental impacts.
 - Interconnection requirements. The applicant noted the need to be located in close proximity to where the 46kV (DMEA Transmission) and 115kV (Tri-State Transmission) intersect. DMEA's infrastructure is limited and there are only three (3) substations fitting these criteria where the requisite acreage is available.

This was narrowed to Garnet Mesa because it had the least number of residential properties around and has the most favorable topography and geology (less rocky). Site selection was also, to a certain extent, evaluated based on financial considerations.

The project team only made contact with a landowner after sufficient desktop analysis to believe that a project may be feasible on that land. Outreach was done directly via phone to answer questions and explain the process. There were other properties which satisfied this preliminary analysis which warranted outreach prior to finalizing on Garnet Mesa, but following this direct outreach we were forced to cross them off the list for a handful of reasons which were revealed during those follow-up conversations.

BLM land was included in the original land investigations, but failed to satisfy the requirements needed for interconnection, taking into account multiple variables (aside from cost and process considerations). The



applicant explored a search radius of several miles from all qualifying substations; however, they were not able to identify BLM land available at the acreage needed that could support the project. Also, BLM lands in the region is too steep and constrained by rock and drainage issues, that the constraints represent physical impossibilities to constructing a technically and commercially feasible solar power plant.

Guzman has stated that the land they are proposing is the best fit for solar in Delta County as it is the best option they found coming out of this investigation. The Garnet Mesa location, even after all follow-up work and investigations, continues to remain compliant with all required criteria and therefore the proposed ideal location. Selecting sites that do not require extensive grading and pile driving through existing vegetation avoids downstream impacts to soils, water and visual appearance.

- 2) *Agriculture.* Aerial imagery shows irrigated agricultural lands, and the proposed location for the operation would be in an area of the site that would impact the irrigated area. County GIS prepared a Custom Soil Resource Report for this area (**Attached**). Farmland Mapping shows the Southwest site as predominantly “Prime Farmland if irrigated” with some areas “Not prime farmland”. The Northeast site is about 50:50 (prime, not prime). The applicant states they did not specifically seek out irrigated land for the project; however, the best land available satisfying all requirements happened to be irrigated.

Staff expressed a desire to continue agricultural operations on these properties (e.g., grazing-sheep, honey bees, etc.), which can also address fire (fuel) management and vegetation management (weed control). Based on the proposed design (as presented in the application package), the solar panels would cover 513,243 square feet (or 129.049 acres) of the total 463.365 acres equates to 27.85% coverage. The applicant states they will not have the final, exact, number until equipment is procured and the design is finalized since module technology continues to advance. However, final numbers will be in this general ballpark.

There are multiple canals/ditches that traverse the project area, which create prescriptive easements for users to access any point at any time. However, the site will be secured from access. A Drainage Access Plan addresses how these facilities will allow access for maintenance and operation of the users. At the BoCC request, the applicant provided a signed letter of agreement regarding a drainage agreement with Mr. Long (neighbor).

The application package provides the applicant’s Agriculture Management Plan, which includes grazing sheep on these properties. In response to a PC request, the applicant provided a letter from a local farmer about how



to best irrigate these sites. The package submitted on 12/16/2021 included a letter from Joe Sperry (Sperry Livestock Corporation), who is under contract to manage the site for grazing sheep.

Morales Engineering and Consulting (MEC) has prepared an “Irrigation Feasibility Evaluation” for this project, dated 16 May 2022 (**Attached**). This Evaluation considered three alternative techniques to flood irrigation: drip irrigation, gated pipe and sprinkler. It recognizes challenges such as the soil type and working around/within solar panels, and that further testing should be completed to provide a better and more complete picture.

The two tracts of land allow/offer different methods of irrigation based on different conditions:

- Southwest Tract. The report recommends some type of sprinkler system mounted underneath the solar array structure using inverted sprinkler nozzles, operating when the panels are flatter and there is less wind (early morning, late evening).
- Northeast Tract. The report recommends a gated pipe system on portions that have previously been irrigated. If adding areas not previously irrigated, it is recommended those areas use a sprinkler system as noted for the Southwest site.

The Land Use Code (LUC) was created with a purpose to increase understanding between private property rights and public interests. The County’s strong commitment to private property rights is tempered by a desire to not adversely impact neighboring property owners. In that context, the LUC establishes standards that must be met, and states that if those standards are met then a permit will be issued. During hearings for PLN21-030, the public and decision-makers expressed questions and concerns about compatibility, benefits and property values. These are not part of the standards in the LUC for finding if a permit application complies with the applicable requirements.

Property Values

It has been alleged that property values will decline for the homes adjacent to this project. However, protection of property values is not a standard required by the LUC. The subject project is located on two sides of a residential neighborhood that was created in an otherwise rural part of the county.

Each case study has unique facts that drive the analysis, and conclusion. Staff has found studies that generally would suggest that there is potential impact when located in a suburban area but, while property values may not have increased at the same rate as other areas, there is less potential for impact when located in more rural areas.



An article by the American Society of Farm Managers & Rural Appraisers (dated 02-15-2021) titled “Solar’s Impact on Rural Property Values” finds no associated impact on property values for solar farms in rural areas. However, that may not be the case for suburban residential properties.

Chisago County, Minnesota was similarly concerned about a 1,000-acre project with the facility located in an area of agriculture with residential development. As such, the County Assessor has been monitoring property sale values in that area since 2017 and found that there was no apparent negative impact on surrounding property values.

Cohn Reznick, financial consultants, conducted a real estate impact study for Kane County, IL to determine whether existing solar farm uses under study have had any consistent and measurable impact on the value of adjacent properties. Based upon examination, research, and analyses of the existing solar farm uses, the surrounding areas, and an extensive market database, the study concluded that no consistent negative impact has occurred to adjacent property that could be attributed to proximity to the adjacent solar farm, with regard to unit sale prices or other influential market indicators. This conclusion was confirmed by numerous County Assessors who have also investigated this use’s potential impact.

Benefits

Questions have been raised about the benefits of this project to Delta County. A project is not required to benefit the County. However, the following points have been addressed through this process:

- *Local hire.* The applicant estimates 350-400 temporary construction jobs for civil contractors, electricians, laborers and support services. Preference will be given to local individuals and businesses, which keeps a significant portion of investment within the community. However, there are requisite qualifications for this type of work that must be met. Given the large number of staff required, the applicant also anticipates the need to draw from outside the greater Delta community. During the work week, staff from outside the region typically stay in local hotels and RV parks near the project site, creating potential investment into local businesses for lodging, food, and entertainment. Once operational, the project is expected to create 1-2 new full-time jobs for local site management personnel in addition to the sheep grazing and farm management jobs.
- *Energy Goals.* DMEA has goals for the amount of renewable energy they have in their portfolio, and this is a key project for that. Colorado Renewable Energy Standards (RES) is a law, established in 2004, that requires utility companies to source a certain amount of the electricity sold from renewable sources, such as wind or solar. HB10-1001 required 30% for investor-owned utilities (IOUs) by 2020; 10-20% for municipalities and electric cooperatives depending on size. Additionally, in 2019, Colorado enacted legislation requiring utilities serving 500,000 or more customers to



supply 100% of retail sales with clean energy sources by 2050 so long as meeting such requirements *is* technically and economically feasible *and in the public interest*.

- **Agriculture.** The project proposes, and is conditioned to maintain irrigation and agriculture on this site. The applicant is under contract for grazing sheep on the property, and is also looking at generating honey (honey bees) as types of agriculture that has worked in other areas. When/if the site is decommissioned, then the irrigated agriculture operation remains viable.
- **Revenue.** The numbers will vary based on the final design, and revenue is not a factor for issuing a permit. That said, there are a couple sources of revenue that would be a result of this project. Construction costs are anticipated to fall between \$75-80 million, and approximately \$20 million of this total is allocated for labor expenses. The applicant has stated their intent to buy, and apply sales tax, locally. Property taxes will increase once the site is reassessed based on the development. The current (2022) total assessed value is \$40,969:

- o Northeast Site. Total Assessed Value (2022) = \$12,122

- o Southeast Site. Total Assessed Value (2022) = \$10,365 + \$18,482

The project is expected to generate \$13 million in property taxes over 15 years. Staff contacted the Assessor's office who provided a state (DOLA) contact noting that the Solar Facility would be "state assessed" and the state does a business valuation more than a development cost valuation. There are some unknown variables but an 80 MWac facility would be valued at around \$10,512,000. The goal of the renewable assessment methodology is to more or less levelize the property taxes over time. A template (**Attached**) shows that in the bottom table where the estimated property taxes are level (except for the years with the 26.4% assessment rate). The actual value and taxes will vary slightly year to year but this is a pretty good estimate, which shows a projected property tax payment of about \$321,000 per year. Neighbors noted that this revenue estimate would be reduced if surrounding property values decline.

- **Rates.** Solar is the least costly energy production. DMEA would contract with Guzman to use about 20% of the power generated by this facility (20-year contract). Adding solar power to DMEA's portfolio will not prevent rates from increasing, but can help keep electricity rates from increasing as fast for a period of time.

Transmission Lines

Power lines are currently about 40 feet tall in this area. It was noted that transmission lines will need to be revised to carry the additional load from this solar project. The applicant contacted the FAA to address any issue with their new facilities and the existing airfield(s). There have been questions about the alignment and height of poles where they could possibly impact neighboring properties with aircraft that is not regulated through the FAA.



Transmission lines are not included with the permit because, as a public utility, DMEA is regulated by the Public Utilities Commission (PUC). What a public utility does with their infrastructure is not subject to local jurisdiction review other than to permit utility work within a County Right-of-Way. As such, transmission line design is outside the purview of this permit, and the County regulatory authority in general, and engineering and electrical code compliance will dictate the design to a large extent. Also, the final design is contingent on field conditions that will be evaluated if a permit is approved.

That said, preliminary engineering estimates assume 16 poles for this transmission route, ranging from 90-120 feet in height. The applicant's first choice is to use a wood pole. Alternatively, the applicant proposes using a "rusty" finish if steel is the final Engineering determination. In addition, it was determined that FAA does not require top of pole lighting for any structure under 200 feet tall.

The neighbors have requested a condition be added requiring the lines to be placed underground. Generally, it is County policy for utilities to be placed underground, *except transmission lines* (Chapter 4, Section 4.D). While there are still aesthetic concerns for the panels themselves, the neighbors feel it would be a good-neighbor gesture to mitigate the aesthetic concerns as much as possible. The applicant has indicated they would not accept this condition. If the County adds this condition, DMEA could appeal that condition to the PUC.

Electric and Magnetic Fields (EMF)

A package of information was provided by Sandra Wolfe with concerns over EMF. The applicant provided a summary of EMF studies addressing concerns related to EMF exposure associated with electric power transmission.

OTHER AGENCIES INVOLVED:

Planning Staff sent the entire application package to the Review Agencies for comment on September 14, 2021 (PLN21-030). Comments were received by UVWUA, County Engineering, City of Delta, CDOT, CO Dept of Natural Resources (DNR), and CO Dept of Parks and Wildlife (CPW). The additional information for PLN22-084 pertains to irrigating the lands, so the application was not re-circulated to review agencies.

Planning has not received feedback from any other review agencies. Adjoining Property Owners (within a 0.5-mile radius from all applicable parcels) were also sent a Public Notice for this application, including the applicant.

UVWUA: This acreage has irrigation water delivered by the Uncompahgre Valley Water Users Association. The irrigation water for this tract of land will be delivered through the existing head gates. They request that the owners be responsible for necessary easements (**Condition 2**). At the request of the



BoCC, the applicant obtained a signed letter of agreement regarding a drainage agreement with Mr. Long, neighboring property owner.

County Engineering: Identifies right-of-way widths based on the road classification and notes existing conditions. Structural setbacks are also noted. County Engineering finds that additional right-of-way (20 feet) is required along the west side of 2100 Road (**Condition 3**).

City of Delta: No comment.

CDOT: No comment.

DNR: No issues.

Colorado Parks and Wildlife: CPW recognized the applicant's noxious weed and reclamation plans. Solar facilities are required to be fully secured, which can impact wildlife movement. CPW provided several recommendations to help minimize impact to wildlife (**Condition 4**). Recommendations include preventing impact to the riparian corridor, which is excluded from proposed development, and located outside of the perimeter (security) fence.

Public Comments: Planning Staff has received comments from numerous neighbors. Comments received since May 26, 2022 (when the engineering report was filed) are attached. Concerns are generally focused on proximity to residential areas, views, health concerns, and taking Ag out of production.

On July 6th, staff met with a group of 13 residents, representing 8-9 properties. Comments/issues included:

- Phase the project with success criteria to prove that the Ag Irrigation Plan will work as expected.
- Moratorium to prevent additional (unlimited) solar applications until the County amends the LUC include standards for renewable energy.
- Alternative sites (BLM).
- Underground the utility lines.
- Construction Plans (lack of detail). Raising panels to 20 feet to accommodate sprinkler irrigation (based on an article on agrophotovoltaics)
- Reduce property values
- Aesthetics of panels (within views of surrounding features - Grand Mesa, West Elks)
- Question financial benefit to the County.
- No guarantee DMEA will not increase rates.

Staff explained that applications are reactive, meaning we review projects as they are presented to us. We do not evaluate other types of uses or other locations; however, we did request the applicant to justify how/why they selected



these parcels (addressed in the report above). In addition, staff explained that the level of review is limited to standards established in the LUC. Some issue/concerns have been raised that have been identified and addressed but are not part of the findings relative to issuing the permit. Conditions have been drafted to help define what is allowed under this permit. Any modification will require processing an amendment to the permit.

A significant concern expressed by the Board for PLN21-030 was potential impact to Ag lands. First, there was a question if the irrigation operation would work, and second the potential for unlimited solar projects around the County taking out other lands currently being farmed. Firms have been soliciting property owners to see if they would be interested in a solar project on their property...without any regard to taking lands out of production. Neighbors suggested phasing the project to demonstrate that the irrigation plan works as expected. Staff noted conditions include bonds to ensure performance. One of the bonds is for reclamation at the end of the project. A couple arials have been submitted showing that there is sufficient BLM land east of the site that meets the size criteria; however, those area have not been evaluated for meeting other criteria (topography, soil/rocks, etc.). Staff has included conditions for an annual report that will evaluate if the project is operating as expected. If not, the operator will be afforded time to take corrective actions. As a last resort, the County could call the bond to implement corrective actions. If the County wishes to prevent unlimited application, a moratorium could be enacted for a period of time. This would allow time to develop regulations specific to commercial/utility solar facilities.

As noted in the report, the County could consider applying a condition that would require placing the transmission lines underground. The applicant has indicated they would not accept this condition, and could appeal that condition to the PUC.

The Planning Commission could recommend that the Board implement a moratorium on solar applications for a period of time, until the Land Use Code gets amended. Staff intends to recommend modifications to the LUC establishing standards for solar projects. Such action cannot be applied retroactively, so it would not affect this application.

Staff verified that the sprinkler design would not affect the height of the panels from what has been proposed. Based on the project renderings, the height of the panels would be comparable to the fence height when in the upright position (about 8-9 feet tall) and would lay flat at a height of 5-6'. Final plans are not required with a land use application. Without building codes, there no set point to review final plans.

Other items raised at the meeting have been addressed in the report above.

Prepared by: Carl P. Holm, AICP, Planning Director



970.874.2110
cholm@deltacounty.com
June 28, 2022

Attachment(s):

- Draft BoCC Resolution (Recommended Findings and Conditions)
- Irrigation Evaluation by Morales Engineering
- NRCS Soil Resource Report (1/12/2022)
- Project Team Communications (since 5/26/2022)
- Public Comments/Information (since 5/26/2022)
- State Tax Factor Template - Garnet Mesa Estimate

Other reference materials available: the project is generally the same size and design, so much of the project materials presented (and amended) through the hearing process for PLN21-030 remain the same. Information relative to this project (including PLN21-030) is available here:

<https://www.deltacounty.com/763/Land-Use-Projects-Set-for-Hearing> due to the amount of and the size of some files, plans, reports, etc.:

- Development Application
- Correspondence
- Staff Reports and PowerPoints (PLN21-030)
- PC and BoCC Minutes (PLN21-030)

[NOTE: Some of these documents are large files. If a member of the public would like to receive a zip file with these documents, please email planning@deltacounty.com]

**RESOLUTION
OF THE
BOARD OF COUNTY COMMISSIONERS
OF THE COUNTY OF DELTA,
STATE OF COLORADO**

RESOLUTION NO. 2022-R-____

APPROVING A LIMITED USE PERMIT TO INSTALL AND OPERATE AN 80MW GROUND MOUNTED SOLAR PHOTOVOLTAIC ENERGY GENERATING FACILITY. THE PROJECT INVOLVES TWO SITES CONSISTING OF THREE (3) PARCELS TOTALING 472+ ACRES GENERALLY LOCATED WEST OF 2200 ROAD AND AT THE SOUTHWEST CORNER OF G ROAD AND 2100 ROAD, APPROXIMATELY 2.2 MILES EAST OF DELTA (PARCELS: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020). [PLN22-084/GARNET MESA SOLAR LLC (DMEA/GUZMAN ENERGY)]

RECITALS

WHEREAS, Garnet Mesa Land, LLC, a Colorado Limited Liability Company, d.b.a. Guzman Energy Group, collectively referred to as “Owner” or “Owners(s)” are the property owners of record of the real property consisting of 191.0469 acres generally located west of 2200 Road with access just north of Arroyo Drive, Delta (Parcel 3455-133-00-020, Northeast Site); and

WHEREAS, Garnet Mesa Land, LLC, a Colorado Limited Liability Company, d.b.a. Guzman Energy Group, collectively referred to as “Owner” or “Owners(s)” are the property owners of record of the real property consisting of about 281.86 acres located at southwest corner of G Road and 2100 Road, Delta (Parcels: 3455-231-00-001 and 3455-232-00-009, Southwest Site); and

WHEREAS, on January 5, 2021, Delta County Board of County Commissioners adopted the Delta County Land Use Code (LUC). Resolution No 2021-R-001 repealed regulations regarding land use and subdivision and adopted a new land use code (including zoning maps); and

WHEREAS, the property is zoned Agricultural/20-Acres (“A-20”), which requires a minimum of 20.0 acres per parcel; and

WHEREAS, on April 29, 2021, a pre-application was submitted for a 360-acre ground mounted solar photovoltaic generating facility and collector substation; and

WHEREAS, on June 7, 2021, a pre-application conference was held between the applicant representative from Citra Power and staff from Delta County to review

preliminary materials to help identify potential issues and applicable review procedures; and

WHEREAS, on June 11, 2021, a letter was sent to the Owners summarizing the pre-application conference, an application form and checklists identifying materials required with the application; and

WHEREAS, on August 24, 2021, an application for an 80MW (AC) Renewable Energy Facility was submitted to the Planning Department; and

WHEREAS, on August 26, 2021, the application package was determined to be complete by the Planning Department; and

WHEREAS, pursuant to Table 2.b ("Land Use by Zoning District") of the LUC a Renewable Energy Facility is a Limited Use in the A-20 zoning district; and

WHEREAS, applications for a Limited Use are a discretionary action subject to consideration by the Director of Community Development and Natural Resources (Administrative Review); and

WHEREAS, the Director referred this matter to the Planning Commission (PC) to review and make a recommendation to the Board of County Commissioners (BoCC) because the project may have material impacts on neighboring properties or public resources that are unusual in kind or degree due to the unusual nature (scale) of the project; and

WHEREAS, Chapters 3-5 of the LUC establish standards to assess certain development applications; and

WHEREAS, the proposed Renewable Energy Facility has been reviewed to ensure it is designed to meet applicable development standards relative to land use (site design, environmental stewardship, etc.), public facilities and infrastructure (access, water, and septic, etc.), and impacts (mitigation, fees); and

WHEREAS, the proposed Renewable Energy Facility has been reviewed to ensure proper access to utilities and services (water, electricity, septic, etc.), including easements where necessary; and

WHEREAS, on September 14, 2021, County sent the Application Package along with a summary to the Review Agencies for comment (21-day comment period) for PLN21-030; and

WHEREAS, on March 2, 2022, the Board of County Commissioners held a duly noticed public hearing to consider the matter and voted 2-1 to deny PLN21-030,

a Use Permit for an 80MW renewable energy facility; and

WHEREAS, on May 26, 2022, Citra Power, representing Guzman Energy, submitted an "Irrigation Feasibility Evaluation" prepared by Morales Engineering & Consulting to address concerns about the viability to continue agricultural operations on the sites; and

WHEREAS, the Director determined that this information, added to information provided as part of PLN21-030, was a material change to consider the project as a new application (PLN22-084); and

WHEREAS, on June 29, 2022, notice was sent to adjacent property owners and County staff posted the property with signs informing the public of the date, time and place for the Planning Commission to consider this matter; and

WHEREAS, on July 13, 2022, the Delta County Planning Commission held a duly noticed public hearing to consider PLN22-084, a Limited Use Permit for an 80MW renewable energy facility, including information presented as part of PLN21-030; and

WHEREAS, on [REDACTED], 2022, notice was sent to adjacent property owners and County staff posted the property with signs informing the public of the date, time and place for the Board of County Commissioners to consider this matter; and

WHEREAS, on August 16, 2022, the Delta County Board of County Commissioners held a duly noticed public hearing to consider PLN22-084, a Limited Use Permit for an 80MW renewable energy facility, including information presented as part of PLN21-030.

DECISION

NOW, THEREFORE, BE IT RESOLVED, having considered all the written and documentary evidence, the administrative record, and other evidence presented, the Delta County Board of County Commissioners (BoCC) does hereby:

- A. FIND that the PLN22-084/Garnet Mesa Solar LLC (DMEA/Guzman Energy), as designed and conditioned, meets applicable standards of the Delta County Land Use Code (LUC), as follows:
 1. Master Plan, Chapter 2.7 (Energy Development). The Master Plan was adopted May 2018. Goal 7.1 encourages responsible and beneficial development of private, commercial and public renewable energy. Strategy 7.1.0 is to develop clear standards for commercial renewable energy. An exhibit for "Solar Energy Potential" in the Master Plan identifies that the subject site is located in an area shown to be "High"

potential. The Delta County Land Use Code (adopted January 2021) identifies Renewable Energy Facilities as a Limited Use in all zoning districts. On February 23, 2022, the applicant provided information about Electric and Magnetic Fields (EMF) associated with the use of electric power.

2. Chapter 3, Section 1 LUC (Lot Dimensions, Bulk Standards). The project site meets minimum standards for lot size. Southwest Site consists of two parcels totaling 281.8 acres with a 60-foot wide access easement from 2200 Road across Parcel 3455-131-00-022. Northeast Site consists of one parcel totaling 191.0469 acres. There is also a 25-foot wide utility easement along the western boundary of Parcel 3455-133-00-009 connecting the two sites. Based on the design as submitted in the permit package, the solar panels would cover about 129 acres of the total 473 acres, which is about 27% coverage.
3. Chapter 4, Section 1 LUC (Site Layout). Site selection was determined based on being located in close proximity to where the 46kV (DMEA Transmission) and 115kV (Tri-State Transmission) intersect. There are three (3) substations fitting these criteria where the requisite acreage is available. The preferred site was narrowed to Garnet Mesa because it had the least number of residential properties around and has the most favorable topography and geology (less rocky). The layout is designed to retain irrigation ditches and access for maintenance of those ditches. The applicant has attempted to reduce negative impacts as much as feasible through project design and leading practices. **Condition 5** requires a \$4.4M "Decommissioning Bond".
4. Chapter 4, Section 2.C LUC (Circulation Objectives), Chapter 4 Section 2.G (Site-Specific Determination-parking), Chapter 4, Section 7.K (Truck Routing Plan). A Level I Traffic Study was provided per LUC Chapter 5. A Traffic Study Letter, prepared by Kimley-Horn & Associates was prepared for this project. Traffic consists primarily of temporary construction traffic, with supplemental information addressing Construction Traffic provided December 16, 2021. Generally, the South-West site will be used for staging materials and employees until the rest of the project is completed. All construction traffic will enter off G Road at the northern end near the substation site where the existing access is located. Construction traffic will exit the site onto 2100 Road just south of Solar Court. A Flagger will be present during AM and PM peak traffic periods, which according to the Traffic Study is expected between 7:00-10:00 AM and 3:00-7:00 PM. **Condition 15** requires a Final Traffic Plan that incorporates this new construction traffic information, including a designated truck route to be determined in consultation with the City of Delta. Once completed, the traffic generation is de minimus from existing conditions.
5. Chapter 4, Section 2.D (Right of Way). County Engineer provided a memorandum dated June 7, 2021 assessing G Road, 2100 Road, and 2050 Road Rights-of-Way (ROW). Additional ROW is needed on the west

side of 2100 Road. BoCC Policy is that dedication be provided in Fee Title (Grant/Warranty Deed). **Condition 7** requires a \$100,000 "Road Inspection & Repair Bond". County Road & Bridge will inspect haul routes before and after construction. The bond is to guarantee repairs are made to the County's satisfaction.

6. Chapter 4, Section 5.B (Ag Operations and Prime Ag Soil). Aerial imagery shows irrigated agricultural lands, and the proposed location for the operation would be in an area of the site that would impact the irrigated area. NRCS Farmland Mapping identifies most of the lands as "Prime Farmland if irrigated" with about 20-30% Not Prime Farmland. County policy is to limit impact to irrigated (agricultural) lands. A local farmer (Sperry Livestock Corp) is under contract to irrigate and graze sheep on the property. The applicant's Agriculture Management Plan includes irrigating fields and grazing sheep on these properties in order to continue agricultural use on these properties, and can also address fire (fuel) management. A letter from Mr. Sperry, with experience grazing in Delta County, confirms the ability for this plan to work in these conditions. **Condition 6** requires a "Landscape/Vegetation Bond" in the amount equal to the cost of installing landscape. Said bond would be retained for 10 years to insure that landscaping and agricultural practices are working as presented. This bond ensures landscaping is maintained per the plan, and that it is well established before the bond is released. In addition, 10 years is enough time to demonstrate that the agricultural operation succeeds as planned. If not, the applicant must revise the plan and implement measures accordingly.
7. Chapter 4, Section 5.C (Historic or Archaeological Resources). ERO Resources Corp prepared a Cultural Resource Survey dated June 2021. The Study identifies six previously documented or newly recorded resources or linear resources within or overlapping the area of potential effect (APE). This report recommends avoidance, and if that is done then a determination of "no adverse effect to historic properties" is recommended.
8. Chapter 4, Section 5.D (Wildlife). CO Dept of Parks and Wildlife (CPW) provided a letter in response to referral agency review. Recommendations of CPW are included in **Condition 4**.
9. Chapter 4, Section 5.E (Wetlands). A Wetlands Delineation and Biology Report, prepared by ERO Resources Consultant (dated June 21, 2021). One wetland was identified where the utility easement is located on Parcel A. As proposed, a utility line would bore under the wetland to avoid impact. Also, the subdivision file references an arroyo on Parcel II that requires a 100-foot set back. The perimeter fence for the Northeast site is located at least 100 feet from the edge of the arroyo.
10. Chapter 4, Section 5.F (Irrigation Systems), Chapter 5, Section 2 (Soil Suitability & Drainage), Chapter 5, Section 3.E (Irrigation Water). Preliminary Geotechnical Report by Buckhorn Engineering (dated 5/27/21), Hydrology Study by Sierra Overhead Analytics, Inc. (dated

8/5/2021). For SWMP and Water Quality, the applicant provided information about CO Discharge Permit System (CDPS) Water Quality Control Division) – General Permit #CO400000. The applicant will retain irrigation ditches to continue irrigating the pastures, and the project engineer will consult Sperry Farms to make sure this condition is met (Also See Finding #5 above). On February 23, 2022, the applicant provided a letter of agreement with 3 L Bar Ranch documenting terms of an agreement relative to drainage/ditch irrigation. An “Irrigation Feasibility Evaluation” prepared by Morales Engineering & Consulting addresses concerns about the viability to continue agricultural operations on the sites. This Evaluation considered three alternatives and identifies the best system for these sites, including consultation with local experts (NRCS, Conservation District, CSU and the prior property owner). The project has been modified to utilize recommendations from Morales Engineering.

11. Chapter 4, Section 5.G (Scenic Impacts). The LUC is designed to protect views from within $\frac{1}{4}$ mile of designated scenic by-way. There are no standards protecting private views, which were raised as an issue during public hearings. The applicant provided photo simulations reflecting existing conditions plus fencing and landscaping. Perimeter fencing would be 7-foot tall wire mesh with wood posts (to resemble the type of fencing around an apple orchard), and the panels would be set back about 60 feet from 2100 Road to provide space for landscaping. A solid fence will be constructed around the substation to mitigate sight and sound (**Condition 9**). The applicant has agreed to amend the Landscape Screening Plan adding landscaping along the south end of the South-West site (**Condition 10**). Lighting is required at the facility, but that lighting would be off except when personnel are present (safety). **Condition 11** requires a Lighting Plan to identify where lighting is located and shielded as much as possible for this type of facility. Said Plan should also include notes about the operation; lights will remain off not unless needed for personnel (safety), hooded, etc.
12. Chapter 4, Section 7.C (Noise). Specifies that development shall not exceed the thresholds set out in State statute. Properties surrounding the site are predominately rural residential and agriculture uses. At sunset the solar array trackers will enter a “sleep” mode where they are held still in the most stable position to protect against any night winds. The power inverters will enter a low energy state—similar to a phone when it’s not in use. Transformers will be technically on, but because no power is being generated they will be quiet. Motors are 30 dBA. Inverters and transformers are 80 dBA but located toward the middle of an array so a good distance from the property line. Based on the Noise Assessment provided with the application, a noise mitigation plan is not required in this case. Information relative to the noise generated by trackers that move the panels was submitted in a supplemental assessment by Kimley-Horn & Associates (dated 2/21/2022). In response to County questions related to the noise of the motors which allow the panels to track the sun, the

applicant's noise consultant provided evidence that noise levels fall well below required State thresholds.

13. Chapter 4, Section 7.G (Weed Control). A Preliminary Vegetation Management Plan was submitted with the application (dated 7/15/2021). This plan addresses seed mixture and control of noxious weeds or invasive species. Part of the plan includes sheep grazing to help maintain vegetation. Maintenance is covered under the "Landscape/Vegetation Bond" for 10 years.

B. APPROVE PLN21-030, a Limited Use Permit for an 80MW ground mounted solar photovoltaic energy generating facility developed over three (3) parcels totaling 472.85 acres generally located between 2200 Road on the east and 2050 Road on the west, north and south of G Road, Delta (Parcel: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020), subject to conditions of approval attached hereto and incorporated herein by reference as Exhibit A.

ADOPTED AS SET FORTH ABOVE on this ____ day of August, 2022.

BOARD OF COUNTY COMMISSIONERS
COUNTY OF DELTA
STATE OF COLORADO

ATTEST:

Don Suppes, Chair

Wendell Koontz, Vice Chair

Teri Stephenson
Delta County Clerk & Recorder

Mike Lane, Commissioner

EXHIBIT A

Conditions of Approval - BoCC Garnet Mesa Solar Facility (PLN22-084) July 13, 2022

1. Development of the Garnet Mesa Solar array shall be in accordance with approved plans and supplemental documentation to the satisfaction of the Director of Community Development and Natural Resources, including but not limited to:
 - a. Site Plan, Attachment 2.F.b dated 12/3/2021
 - b. Fuel Management Plan, Attachment 2.G dated 7/13/2021
 - c. Wetland/Biological Delineation, Attachment 3.E dated 6/21/2021
 - d. Prelim Geotechnical Report, Attachment 3.H dated 5/27/2021
 - e. Emergency Response Plan, Attachment 3.I dated Aug 2021
 - f. Hydrology Study, Attachment 3.J dated 8/5/2021
 - g. Draft SWMP, Attachment 3.K effective 2/1/2021
 - h. Vegetation and Noxious Weed Control Plan, Attachment 3.L dated 7/15/2021
 - i. Landscape Screening Plan, Attachment 3.M dated 12/3/2021 (as amended)
 - j. Traffic Management Plan, Construction Traffic Plan. Exhibits 3.O and 3.K (Section SM-4 in Exhibit C) submitted 8/25/2021 (as Amended). Also, see Condition #15.
 - k. Decommissioning Plan, Attachment 3.P dated 8/6/2021
 - l. Construction Schedule, Attachment 3.R dated Aug 2021
 - m. Agriculture Management Plan, "Irrigation Feasibility Evaluation" prepared by Morales Engineering & Consulting, dated 16 May 2022. Also, see Condition #8.
 - n. Drainage Access Plan, Attachment 4.B submitted 8/25/2021
 - o. Dust Abatement Plan, Attachment 3.K (Section EC-14 in Exhibit C) submitted 8/25/2021
 - p. Operational Noise Assessment, Attachment 4.D dated 7/14/2021, and supplemental memo dated 2/21/2022.
 - q. Emergency Response Plan, Attachment 3.I submitted 8/25/2021
 - r. Existing Property Conversion Plan, Attachment 4.E submitted 8/25/2021
- Any significant modification shall require an amendment to be considered by the Planning Commission and Board of County Commissioners.
2. Parcel owners shall be responsible for any necessary easements or water delivery systems and for the removal of tail/wastewater back to the U.V.W.U.A. water delivery system for each lot (per letter dated September 27, 2021). [UVWUA]

3. Applicant/Owner/Operator shall offer for dedication to Delta County, 20-feet along the west side of 2100 Road for the purposes of public right-of-way. [County Engineering]
4. Applicant/Owner/Operator shall implement recommendations for wildlife movement in accordance with CO Parks and Wildlife letter dated October 5, 2021, including but not limited to: [CPW]
 - a. Apply CPW standards for exclusionary fencing that is safe for wildlife, and to avoid entrapping wildlife within the facility during construction.
 - b. Avoid riparian areas, including a development buffer of 300 feet from the riparian edges.
 - c. Design security lighting to minimize light pollution and reduce impacts to wildlife (Also see Condition 11).
 - d. Conduct new surveys closer to the construction start date to identify and species of concern and to implement any necessary protections for said species (e.g. raptor nesting).
 - e. Develop a program that monitors avian and bat fatalities due to collision with solar panels or other infrastructure (post-construction).
 - f. During construction, install trench plugs, earth ramps or other means that would allow wildlife to escape from open trenches.
 - g. BMPs for methods to reduce impact of avian species from transmission line in this project area.
 - h. Retain sheep grazing within the security fence, and avoid grazing near riparian areas
5. Prior to beginning any construction activity, the applicant shall provide to the County a "Decommission Bond" in an amount that is at least equal to the cost estimate for decommissioning (\$4.4M). Said bond shall be held by the County as a financial guarantee until the facility is fully decommissioned and the site is restored.
6. Prior to beginning any construction activity, the applicant shall provide to the County a "Landscape/Vegetation Bond" in an amount that is at least equal to the cost of installing landscaping per the Landscape Screening Plan (contractor's estimate). Said bond shall be held by the County as a financial guarantee for success of the landscaping vegetation screening, noxious weed management, and continuation of irrigation/agricultural practices until the applicant has demonstrated compliance with applicable Plans/Conditions as determined by the Director of Planning, but no less than 10 years.
7. Prior to beginning any construction activity, the applicant shall provide to the County a "Road Inspection & Repair Bond" in an amount of \$100,000. Said bond shall be held by the County as a financial guarantee for any damage to County roads until the County has inspected and accepted the road conditions following completion of the facility construction.

8. Prior to beginning any construction activity, the applicant shall submit a final Agriculture Management Plan for review and approval by the Director of Planning. Said Plan shall include a Flood Irrigation Plan in accordance with a local irrigating expert.
9. A solid fence shall be installed around the substation that can mitigate sight and sound. Said design shall resemble the Option 3/Figure 3 of Exhibit 4.d provided with the supplemental application materials dated 12/16/2021.
10. Prior to beginning any construction activity, the applicant shall submit a final Landscape Screening Plan for review and approval by the Director of Planning. Said Plan shall include revisions such as adding screening along the south end of South-West Site.
11. Hooded lighting, turned off except for emergency maintenance. Lighting can be incorporated into the Operation Plan – identify where lighting is located, not unless needed for emergency, hooded, etc.
12. Annual Operating Plan (AOP), submitted to the County annually, can be required to include planned construction or repair/replacement activities as well as updated hazardous waste, emergency response, stormwater, irrigation/grazing, noxious weed and dust control plans. An AOP should also be required to include updated contact information for local and corporate responsible persons.
13. The applicant shall be responsible to keep the site, and surrounding areas, in a neat and orderly condition at all times, including any cost to address trash generated at the Project site, or by Project employed personnel while on site, if the trash is blown or transported off site.
14. An Annual Report can be required to include a summary of irrigation and agricultural practices, surface and groundwater testing and analysis, reporting any chemical or waste spill, citation or reports (local, state, federal), avian and bird fatalities, traffic increase/decrease, county road repairs, number of panels replaced and recycling report
15. Prior to beginning any construction activity, the applicant shall submit a final Construction Traffic Plan for review and approval by the Director of Planning. Said Plan shall include/reflect:
 - a. Supplemental information submitted 12/16/2021
 - b. Truck route during construction, based on consultation with, preference of, the City of Delta
 - c. Truck speeds in the project vicinity

16 May 2022

TO: Dan Ryan, Citra Power
Matthew Kosakowski, Citra Power

RE: Citra Power Irrigation Feasibility Evaluation located at G road and 2100 Rd area of Delta County, Colorado.

SUMMARY:

On May 3, 2022, Morales Engineering & Consulting (MEC) was approached by Dan Ryan of Citra Power to investigate and determine the feasibility of alternative methods of irrigation other than flood irrigation on their tentative future project site. MEC specializes in the design of agricultural irrigation and water conveyance systems and has 20 years of experience in its field. MEC works in collaboration with partners such as the Natural Resources Conservation Service and the Colorado River Water Conservation District, and has extensive experience in the Uncompaghre Valley.

Citra Power's goal is to efficiently irrigate hay pasture below the solar panel arrays that will support a sheep grazing operation. On May 12, 2022, I, Fernando Morales, made an initial site visit to the project area. The project area consists of two tracts of land, one located on the southwest corner of G and 2100 road (approximately 270 acres); and the other located just northeast of said intersection (approximately 170 acres). I completed a visual survey of the two sites noting geography, geology, soils, existing vegetation, and water availability.

The southwest tract consists mainly of pasture hay and is currently flood irrigated. Predominate soils are of the Montrose and Killpack soil series. There are large drainage ditches throughout, suggesting historical high-water tables. Aerial imagery also shows smaller wet spots. Pasture vegetation is mostly uniform. Terrain is generally uniform and slopes towards the north northeast. The headgate is located approximately 3000ft south of tract property line and is pressurized with a working head of around 30psi.

The northeast tract consists of vacant land; however, remnants of previous irrigation and agricultural development are present in those areas that were irrigated through some type of furrow irrigation. Soils consist mainly of the Montrose, Killpack and Persayo-Fruita complex series. The tract slopes consistently towards the south in those places that historically could be irrigated. From aerial imagery, a little over half of the tract is vacant and appears to have never been irrigated. Irrigation water is received through the UYWUA GKB lateral canal, which lies north and adjacent to the previously irrigated areas.

DISCUSSION:

Implementing an irrigation system under a solar panel array in the Peach Valley poses unique challenges. Firstly, any irrigation system must be able to operate with solar panel arrays that are spaced at 21 feet between rows; panels that track the sun throughout the day; panels that are installed six feet above ground at the pivot point; and arrays that are installed exactly in the north-south direction. Secondly, any system should take in to account costs, and the long-term effects to the environment, particularly deep percolation and leaching of salts, particularly selenium, which are of concern in the Uncompaghre Valley. Lastly, the system must irrigate pasture with livestock present. These considerations offer three alternatives: drip, sprinkler, and gated pipe irrigation.

Drip irrigation – It is possible to install a drip system on the project property, but the system would need to be installed below the surface (subsurface drip irrigation, SDI) to avoid livestock. Initial capital costs are high, and SDI requires diligent operation and maintenance to operate correctly. It is highly efficient (~90%), but because of the higher soil and water pH and calcium levels, maintaining good soil health and a functional system become a challenge. Because of the high capital cost and maintenance requirements, drip irrigation is the least favored alternative.

Gated pipe – Gated pipe is an alternative very common throughout the Uncompaghre valley. It has lower initial capital costs and is a flexible method for irrigating, particularly for a pasture system. For these two particular tracts of land, gated pipe poses some challenges. Over time, the pasture will need to be re-marked so that irrigation water can remain flowing in the desired direction. As a result, the direction of irrigation must be in the same direction as the solar panel arrays so that pastures marks/furrows can be regularly maintained with equipment. Changing the direction of irrigation would possibly require land leveling, which is risky because of the high water tables and the shallowness of some soils. Furthermore, gated pipe like flood irrigation, requires tail water ditches which may interfere with solar array maintenance. Gated pipe also has a wide variation in irrigation efficiency (35-55%), depending on how it is operated. As a result, it is unknown how much of an impact on deep percolation gated pipe would have in the project boundaries.

Sprinkler – Sprinkler irrigation is an alternative of high irrigation efficiency (~70%) and high initial capital costs. There is a large variety of sprinklers, but the solar panel arrays severely limit the type of sprinkler system to utilize. Sprinklers require slightly more maintenance than gated pipe, and much less than a SDI system. Because application rates can be precisely calculated, deep percolation can be controlled, and tailwater ditches are not required. Furthermore, the system can be installed in the direction of the solar arrays, independent of existing direction of irrigation. Wind is also of concern, with overspray wetting and depositing minerals on the solar panels, thus lowering system and irrigation efficiency. Because of array spacing and livestock,

only a sprinkler with a lower throw distance and height that will not be damaged by livestock can be used. This limits sprinkler choice to something closer to a micro-sprinkler system.

The two tracts of land allow for two different alternative methods of irrigation. The southwest tract, because of different directions of irrigation; various wet spots throughout (suggesting a higher water table); flatter grades; better pasture conditions; and access to a pressurized headgate provide for satisfactory conditions to implement a sprinkler system. High efficiency irrigation could be utilized which would also prevent aggravation of some of the deficits the tract has, such as the wet spots and high water table in localized areas. Furthermore, a well-designed sprinkler system will help to keep the salts pushed down in the soil profile while minimizing deep percolation. Although gated pipe would have lower initial costs, it is anticipated that utilizing gated pipe would have minimal improvement over current methods of irrigation.

The northeast tract provides for conditions that could utilize either gated pipe or sprinkler; however, because of the lack of any pressurized headgate, utilizing a sprinkler system would require energy to pump water and pressurize the irrigation system on all but the portions of lowest elevation. In addition, the current direction of irrigation is generally towards the south on all previously irrigated portions requiring minimal adjustment to marks/furrows to match solar array layout. No water table or wet spots were found. When considering initial and operation costs, gated pipe makes for a better choice even though efficiency and deep percolation would only be minimally improved.

RECOMMENDATION:

Southwest Tract - It is recommended that some type of sprinkler system that can be mounted and suspended underneath the solar array structure using inverted sprinkler nozzles be investigated and installed. This setup does severely restrict the type of sprinkler nozzle that can be utilized. If during the design phase a nozzle cannot be found that satisfies uniformity and crop requirements, installation of a sprinkler system using upright sprinkler nozzles should be used. Furthermore, because of the solar panel tracking the sun throughout the day, it is recommended that a small trial be installed during the design stage to determine the portions of the day that the sprinklers should not be operating (early morning and late evening) due to the large tilt of the solar array.

Northeast Tract – It is recommended that a gated pipe system be installed on the portions that have previously been irrigated. If irrigation of other portions of the tract that have not been previously irrigated are anticipated to be irrigated, than a sprinkler system identical to the southwest tract should be investigated and installed.

This feasibility evaluation is based on visual observations and client goals and requirements. Further soils test and sampling should be completed to give a better and more complete picture

of soil health on the two tracts. Likewise, if further cost details are required, a benefit/cost analysis or economic analysis should be performed.

If there are any questions, please contact me. I can be reached by email and phone.

Thank you,

A handwritten signature in blue ink, appearing to read "Fernando M. Morales", is centered within a light pink rectangular box.

Fernando M. Morales, PE
Civil Engineer



United States
Department of
Agriculture

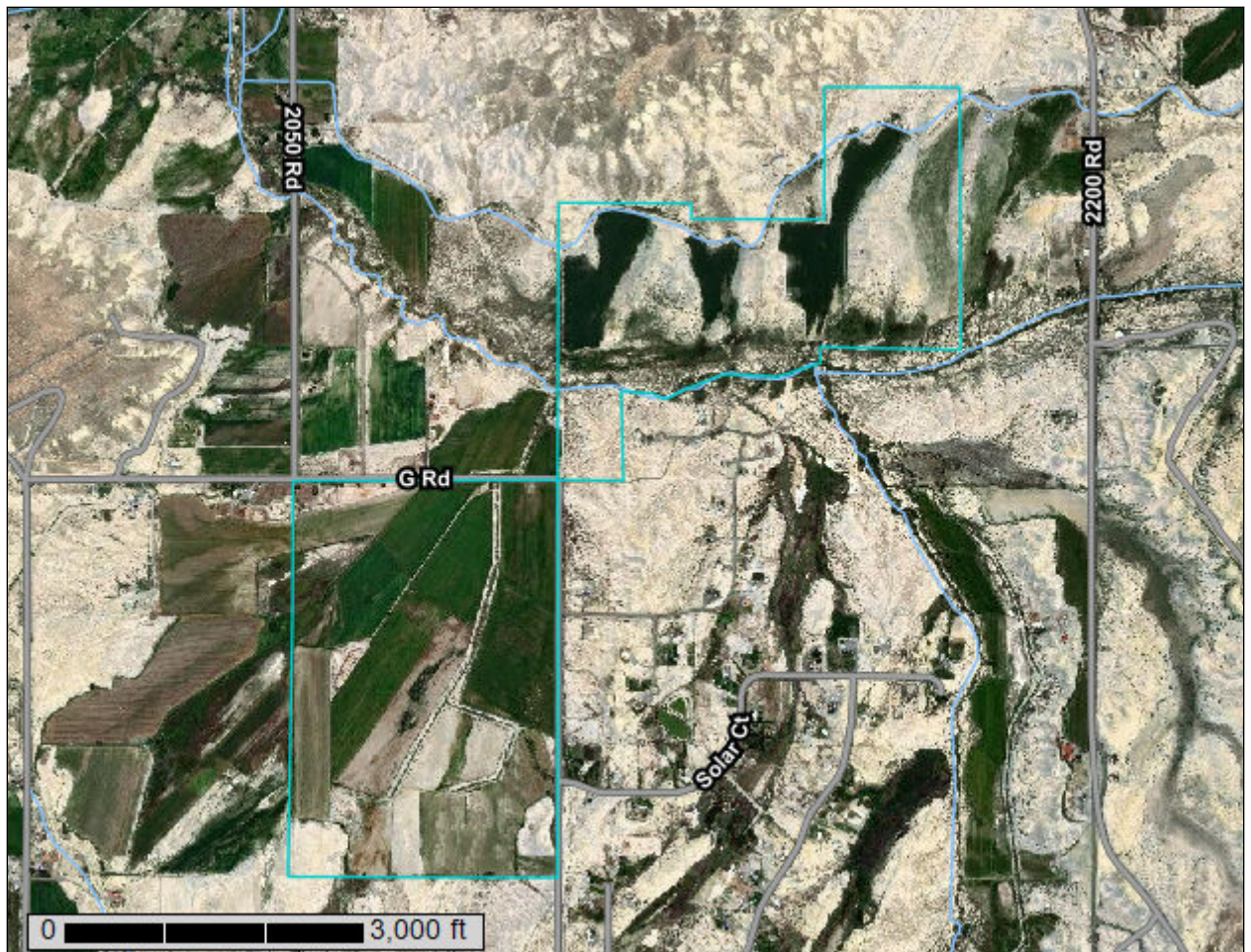
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties

**Parcels: 3455-231-00-001,
3455-232-00-009, 3455-133-00-020**



January 12, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and	
Ouray Counties.....	13
701—Montrose silty clay loam, 0 to 2 percent slopes.....	13
703—Sagers silty clay loam, 2 to 7 percent slopes.....	14
730—Killpack silty clay loam, 0 to 2 percent slopes.....	16
731—Killpack-Persayo complex, 2 to 8 percent slopes.....	17
731a—Persayo-Killpack complex, 0 to 6 percent slopes.....	19
740—Persayo-Fruita complex, 0 to 12 percent slopes.....	21
790—Briny clay loam, 0 to 3 percent slopes, rarely flooded.....	23
800—Persayo loam, 4 to 25 percent slopes.....	24
801—Persayo-Badland complex, 25 to 75 percent slopes.....	25
Soil Information for All Uses	28
Suitabilities and Limitations for Use.....	28
Land Classifications.....	28
Farmland Classification (Solar Farm Parcels: 3455-231-00-001,	
3455-232-00-009, 3455-133-00-020).....	28
Soil Reports.....	34
Land Classifications.....	34
Prime and other Important Farmlands.....	34
References	37

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

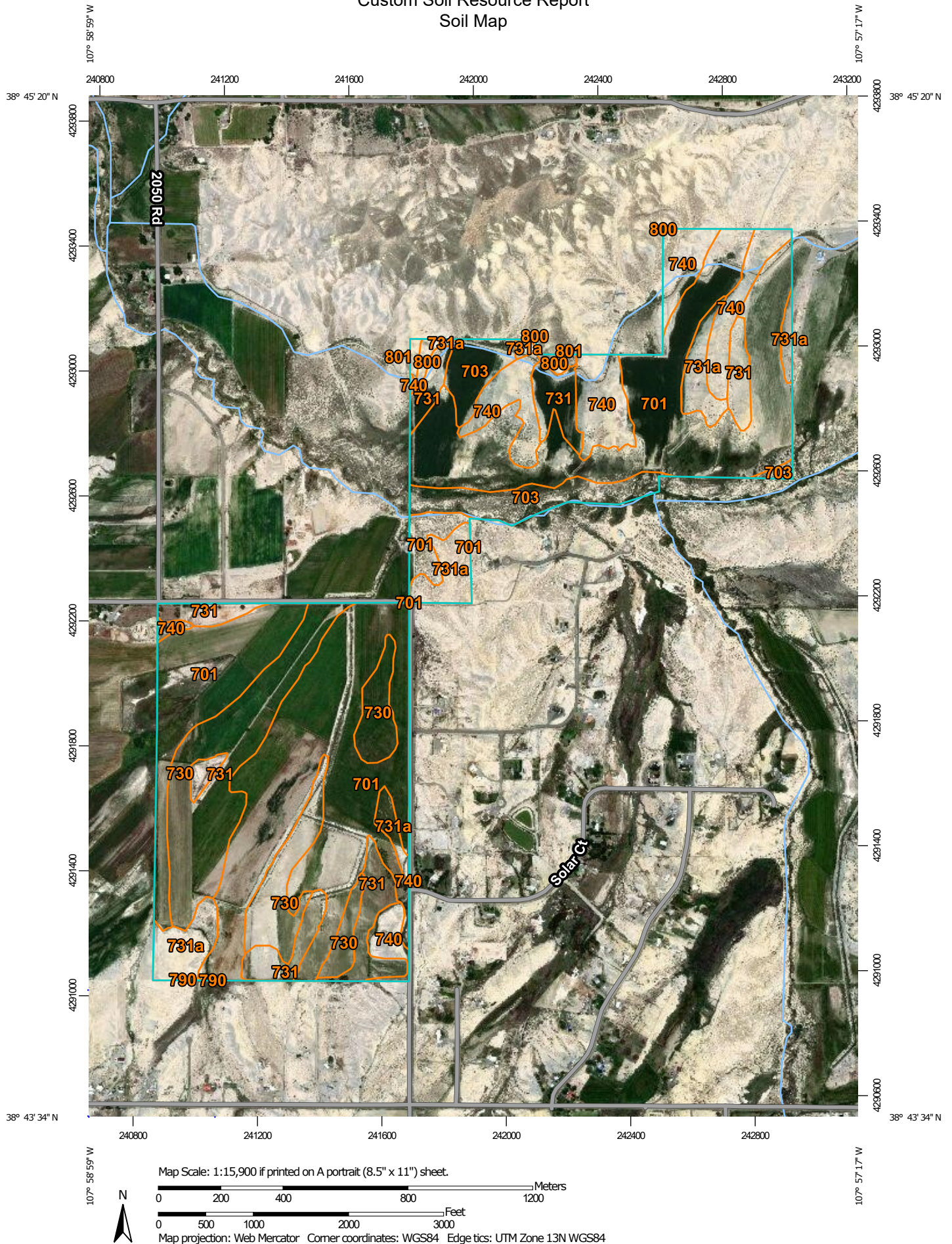
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties

Survey Area Data: Version 13, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Jul 7, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
701	Montrose silty clay loam, 0 to 2 percent slopes	229.7	51.6%
703	Sagers silty clay loam, 2 to 7 percent slopes	26.6	6.0%
730	Killpack silty clay loam, 0 to 2 percent slopes	69.7	15.7%
731	Killpack-Persayo complex, 2 to 8 percent slopes	40.0	9.0%
731a	Persayo-Killpack complex, 0 to 6 percent slopes	29.7	6.7%
740	Persayo-Fruita complex, 0 to 12 percent slopes	46.1	10.3%
790	Briny clay loam, 0 to 3 percent slopes, rarely flooded	0.1	0.0%
800	Persayo loam, 4 to 25 percent slopes	2.3	0.5%
801	Persayo-Badland complex, 25 to 75 percent slopes	1.2	0.3%
Totals for Area of Interest		445.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They

generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties

701—Montrose silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k2f9
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Montrose and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Montrose

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam
Bt - 4 to 13 inches: silty clay
Btz - 13 to 36 inches: silty clay
C - 36 to 65 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.07 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R034BY104UT - Desert Clay (Shadscale)
Hydric soil rating: No

Minor Components

Fruita

Percent of map unit: 10 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY106UT - Desert Loam (Shadscale)
Hydric soil rating: No

Briny, rarely flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R034BY006UT - Alkali Flat (Greasewood)
Hydric soil rating: Yes

Killpack

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY117UT - Desert Shallow Clay (Mat Saltbush)
Hydric soil rating: No

703—Sagers silty clay loam, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: k2fd
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Sagers and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale

Typical profile

A - 0 to 4 inches: silty clay loam
Bw - 4 to 15 inches: silty clay loam
Bk - 15 to 24 inches: silt loam
BCK1 - 24 to 49 inches: silt loam
BCK2 - 49 to 63 inches: silt loam

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R034BY104UT - Desert Clay (Shadscale)
Hydric soil rating: No

Minor Components

Persayo

Percent of map unit: 5 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)
Hydric soil rating: No

Briny, rarely flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY006UT - Alkali Flat (Greasewood)
Hydric soil rating: Yes

Montrose

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY104UT - Desert Clay (Shadscale)
Hydric soil rating: No

730—Killpack silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k2fj
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Killpack and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Killpack

Setting

Landform: Strath terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium over residuum weathered from shale

Typical profile

Ap - 0 to 8 inches: silty clay loam
Bw - 8 to 28 inches: silty clay loam
BCy - 28 to 36 inches: silty clay loam
Cr - 36 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high
(0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 6 percent
Maximum salinity: Nonsaline to slightly saline (1.0 to 5.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R034BY117UT - Desert Shallow Clay (Mat Saltbush)

Hydric soil rating: No

Minor Components

Persayo

Percent of map unit: 10 percent

Landform: Strath terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)

Hydric soil rating: No

Montrose

Percent of map unit: 5 percent

Landform: Strath terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R034BY104UT - Desert Clay (Shadscale)

Hydric soil rating: No

731—Killpack-Persayo complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: k2fk

Elevation: 4,500 to 5,800 feet

Mean annual precipitation: 6 to 9 inches

Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 140 to 180 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Killpack and similar soils: 65 percent

Persayo and similar soils: 30 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Killpack

Setting

Landform: Strath terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium over residuum weathered from shale

Typical profile

Ap - 0 to 8 inches: silty clay loam

Bw - 8 to 28 inches: silty clay loam

BCy - 28 to 36 inches: silty clay loam

Custom Soil Resource Report

Cr - 36 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 4 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Gypsum, maximum content: 6 percent

Maximum salinity: Nonsaline to slightly saline (1.0 to 5.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0

Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R034BY117UT - Desert Shallow Clay (Mat Saltbush)

Hydric soil rating: No

Description of Persayo

Setting

Landform: Strath terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Slope alluvium over cretaceous source residuum weathered from shale

Typical profile

A - 0 to 4 inches: silt loam

C - 4 to 16 inches: silty clay loam

Cr - 16 to 59 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Gypsum, maximum content: 4 percent

Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): 6s

Land capability classification (nonirrigated): 6s

Custom Soil Resource Report

Hydrologic Soil Group: D

Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)

Hydric soil rating: No

Minor Components

Montrose

Percent of map unit: 5 percent

Landform: Strath terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R034BY104UT - Desert Clay (Shadscale)

Hydric soil rating: No

731a—Persayo-Killpack complex, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: jy81

Elevation: 4,500 to 5,800 feet

Mean annual precipitation: 6 to 9 inches

Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 140 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 70 percent

Killpack and similar soils: 25 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Strath terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: silt loam

C - 4 to 16 inches: silty clay loam

Cr - 16 to 36 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 4 to 20 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high
(0.00 to 0.28 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)
Hydric soil rating: No

Description of Killpack

Setting

Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium over residuum weathered from shale

Typical profile

Ap - 0 to 8 inches: silty clay loam
Bw - 8 to 28 inches: silty clay loam
BCy - 28 to 36 inches: silty clay loam
Cr - 36 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 6 percent
Maximum salinity: Nonsaline to slightly saline (1.0 to 5.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R034BY117UT - Desert Shallow Clay (Mat Saltbush)
Hydric soil rating: No

Minor Components

Montrose

Percent of map unit: 5 percent
Landform: Strath terraces

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY104UT - Desert Clay (Shadscale)
Hydric soil rating: No

740—Persayo-Fruita complex, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: k2fn
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 55 percent
Fruita and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: silty clay loam
C - 4 to 13 inches: silty clay loam
Cr - 13 to 41 inches: bedrock
R - 41 to 74 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: More than 80 inches; More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high
(0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)
Hydric soil rating: No

Description of Fruita

Setting

Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale

Typical profile

Ap1 - 0 to 2 inches: silty clay loam
Ap2 - 2 to 7 inches: silty clay loam
Bt - 7 to 16 inches: silty clay loam
Btky - 16 to 28 inches: clay loam
Btk1 - 28 to 34 inches: clay loam
Btk2 - 34 to 52 inches: sandy clay loam
Bk - 52 to 65 inches: paragravelly sandy clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 14 percent
Gypsum, maximum content: 39 percent
Maximum salinity: Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R034BY106UT - Desert Loam (Shadscale)
Hydric soil rating: No

Minor Components

Montrose

Percent of map unit: 5 percent
Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY104UT - Desert Clay (Shadscale)
Hydric soil rating: No

Killpack

Percent of map unit: 5 percent
Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R034BY117UT - Desert Shallow Clay (Mat Saltbush)
Hydric soil rating: No

790—Briny clay loam, 0 to 3 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: k2fq
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Briny, rarely flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Briny, Rarely Flooded

Setting

Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Cretaceous source alluvium derived from shale

Typical profile

Az - 0 to 8 inches: clay loam
Bzg - 8 to 26 inches: silty clay loam
Czg1 - 26 to 42 inches: silty clay
Czg2 - 42 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 14 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Strongly saline (30.0 to 50.0 mmhos/cm)

Custom Soil Resource Report

Sodium adsorption ratio, maximum: 100.0

Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 7s

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R034BY006UT - Alkali Flat (Greasewood)

Hydric soil rating: Yes

Minor Components

Killpack

Percent of map unit: 5 percent

Landform: Strath terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R034BY117UT - Desert Shallow Clay (Mat Saltbush)

Hydric soil rating: No

Mesa

Percent of map unit: 5 percent

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R034BY106UT - Desert Loam (Shadscale)

Hydric soil rating: No

800—Persayo loam, 4 to 25 percent slopes

Map Unit Setting

National map unit symbol: k6jx

Elevation: 4,500 to 5,800 feet

Mean annual precipitation: 6 to 9 inches

Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 140 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Pediments

Down-slope shape: Convex

Across-slope shape: Convex

Custom Soil Resource Report

Parent material: Cretaceous source colluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: loam
C1 - 4 to 13 inches: silty clay loam
C2 - 13 to 16 inches: silty clay loam
Cr - 16 to 59 inches: bedrock

Properties and qualities

Slope: 4 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)
Hydric soil rating: No

Minor Components

Badland

Percent of map unit: 10 percent
Hydric soil rating: No

Sagers

Percent of map unit: 5 percent
Landform: Pediments
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: R034BY104UT - Desert Clay (Shadscale)
Hydric soil rating: No

801—Persayo-Badland complex, 25 to 75 percent slopes

Map Unit Setting

National map unit symbol: k2fs
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches

Custom Soil Resource Report

Mean annual air temperature: 50 to 55 degrees F

Frost-free period: 140 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 60 percent

Badland: 30 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Pediments

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Cretaceous source colluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: loam

C1 - 4 to 13 inches: silty clay loam

C2 - 13 to 16 inches: silty clay loam

Cr - 16 to 59 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Gypsum, maximum content: 4 percent

Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 8

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D

Ecological site: R034BY109UT - Desert Loamy Clay (Shadscale)

Hydric soil rating: No

Description of Badland

Interpretive groups

Land capability classification (irrigated): 8

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 5 percent

Hydric soil rating: No

Briny, rarely flooded

Percent of map unit: 5 percent

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: R034BY006UT - Alkali Flat (Greasewood)

Hydric soil rating: Yes

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification (Solar Farm Parcels: 3455-231-00-001, 3455-232-00-009, 3455-133-00-020)

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Map—Farmland Classification (Solar Farm Parcels: 3455-231-00-001, 3455-232-00-009, ...)



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of statewide importance, if drained
-  Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if irrigated

-  Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if irrigated and drained
-  Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
-  Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if warm enough
-  Farmland of statewide importance, if thawed
-  Farmland of local importance
-  Farmland of local importance, if irrigated

-  Farmland of unique importance
-  Not rated or not available

Soil Rating Lines

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Custom Soil Resource Report

	Prime farmland if subsoiled, completely removing the root inhibiting soil layer		Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season		Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium		Farmland of unique importance		Prime farmland if subsoiled, completely removing the root inhibiting soil layer
	Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60		Farmland of statewide importance, if irrigated and drained		Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season	Soil Rating Points			Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
	Prime farmland if irrigated and reclaimed of excess salts and sodium		Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season		Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season		Not prime farmland		Prime farmland if irrigated and reclaimed of excess salts and sodium
	Farmland of statewide importance		Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer		Farmland of statewide importance, if thawed		Prime farmland if drained		Farmland of statewide importance
	Farmland of statewide importance, if drained		Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60		Farmland of local importance		Prime farmland if protected from flooding or not frequently flooded during the growing season		Farmland of statewide importance, if drained
	Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season				Farmland of local importance, if irrigated		Prime farmland if irrigated		Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
	Farmland of statewide importance, if irrigated						Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season		Farmland of statewide importance, if irrigated

Custom Soil Resource Report

	Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season		Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium		Farmland of unique importance
	Farmland of statewide importance, if irrigated and drained		Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season		Not rated or not available
	Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season		Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season	Water Features	
	Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer		Farmland of statewide importance, if warm enough		Streams and Canals
	Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60		Farmland of statewide importance, if thawed		Rails
			Farmland of local importance		Interstate Highways
			Farmland of local importance, if irrigated		US Routes
					Major Roads
					Local Roads
				Background	
					Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties
Survey Area Data: Version 13, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Jul 7, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Farmland Classification (Solar Farm Parcels:
3455-231-00-001, 3455-232-00-009, 3455-133-00-020)**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
701	Montrose silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated	229.7	51.6%
703	Sagers silty clay loam, 2 to 7 percent slopes	Prime farmland if irrigated	26.6	6.0%
730	Killpack silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated	69.7	15.7%
731	Killpack-Persayo complex, 2 to 8 percent slopes	Prime farmland if irrigated	40.0	9.0%
731a	Persayo-Killpack complex, 0 to 6 percent slopes	Not prime farmland	29.7	6.7%
740	Persayo-Fruita complex, 0 to 12 percent slopes	Not prime farmland	46.1	10.3%
790	Briny clay loam, 0 to 3 percent slopes, rarely flooded	Not prime farmland	0.1	0.0%
800	Persayo loam, 4 to 25 percent slopes	Not prime farmland	2.3	0.5%
801	Persayo-Badland complex, 25 to 75 percent slopes	Not prime farmland	1.2	0.3%
Totals for Area of Interest			445.5	100.0%

**Rating Options—Farmland Classification (Solar Farm Parcels:
3455-231-00-001, 3455-232-00-009, 3455-133-00-020)**

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Prime and other Important Farmlands

This table lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate

quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Unique farmland is not based on national criteria. It commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be *farmland of local importance* for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Report—Prime and other Important Farmlands

Prime and other Important Farmlands—Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties		
Map Symbol	Map Unit Name	Farmland Classification
701	Montrose silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated
703	Sagers silty clay loam, 2 to 7 percent slopes	Prime farmland if irrigated
709	Montrose silty clay loam, 2 to 6 percent slopes	Prime farmland if irrigated
721	Gyrochmesa-Gypimack complex, 2 to 5 percent slopes	Farmland of statewide importance
722	Gyrochmesa gravelly loam, 5 to 15 percent slopes	Not prime farmland

Custom Soil Resource Report

Prime and other Important Farmlands—Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties		
Map Symbol	Map Unit Name	Farmland Classification
730	Killpack silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated
731	Killpack-Persayo complex, 2 to 8 percent slopes	Prime farmland if irrigated
731a	Persayo-Killpack complex, 0 to 6 percent slopes	Not prime farmland
732	Fruita silty clay loam, 0 to 5 percent slopes	Prime farmland if irrigated
740	Persayo-Fruita complex, 0 to 12 percent slopes	Not prime farmland
760	Mesa clay loam, 0 to 2 percent slopes	Prime farmland if irrigated
790	Briny clay loam, 0 to 3 percent slopes, rarely flooded	Not prime farmland
800	Persayo loam, 4 to 25 percent slopes	Not prime farmland
801	Persayo-Badland complex, 25 to 75 percent slopes	Not prime farmland
807	Mesa-Waterdog complex, 0 to 5 percent slopes	Not prime farmland

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf



May 26, 2022

Delta County Planning and Community Development
Attn: Carl Holm, Director of Community Development and Natural Resources
295 W. 6th Street
Delta, CO 81416

SUBJECT: PLN21-030/Garnet Mesa Solar Material Modification Use Permit Resubmittal

Director Holm:

The Garnet Mesa Solar project team remains committed to working collaboratively with the County to ensure the project successfully integrates into the community. Following the Use Permit denial at the Board of County Commissioner's meeting on March 2nd, the project team reconnected to start work on a revised plan to address the concerns raised by Commissioners Koontz and Lane.

Based on comments made at the March 2nd meeting related to their no-vote and subsequent public comments by Commissioners Koontz and Lane, both feel strongly in preserving irrigated agricultural land in the County. Specifically, there were doubts raised related to the project's proposed flood irrigation being sufficient to sustain the ground cover needed to support the proposed agricultural grazing activities.

The project team is in full agreement with the stated goals of the County Commissioners. We have developed the Garnet Mesa project to integrate continued agricultural activities in addition to solar generation from day one. This *Agrivoltaic* ideal is one we are committed to getting right, and we welcome the opportunity to refine our approach to ensure we are successful.

To that end, in the two months since the Board of County Commissioner's meeting, the project team has had conversations with local livestock agents, the CSU extension office in Montrose, and local irrigation engineers to update our permit application to address the County's concerns. The feedback received from all parties has been consistent: a forced irrigation system via drip, sprinklers, or gated pipes will outperform flood irrigation in all cases and be the best means of guaranteeing success on this land.

Ultimately, the project has partnered with Fernando Morales of Morales Engineering & Consulting based out of Montrose to support all phases of design and construction of the project irrigation system. Coincidentally, Mr. Morales was previously engaged by the prior landowner to design an updated irrigation system for the south-west parcel prior to the Garnet Mesa project purchasing the land, and he already has an intimate knowledge of the site. Mr. Morales has completed an evaluation of an existing ground mounted solar facility to understand the specific issues we will face in designing a solution for



the Garnet Mesa Project. We are happy to provide his assessment of the properties and recommendations for irrigation systems attached to this memo.

By modifying the project plan to utilize the recommendations of Morales Engineering, the project is confident that we can successfully keep the properties under productive agricultural use for the duration of the project life as desired by the County. Additionally, by implementing these irrigation changes the project can now confidently say that the project will be **increasing** the total viable agricultural land in the county by improving soil quality and ground cover on the northeast property.

Therefore, the project is pleased to submit for reconsideration of a Limited Use Permit pursuant to Chapter 9, Section 3 of the Delta County Land Use Code with a proposed material modification to install a sprinkler and gated pipe irrigation system in accordance with the recommendations stated in the memo from Morales Engineering & Consulting.

As always, the team is available to answer any questions you may have. Please feel free to reach out at your convenience.

Sincerely,

Matthew Kosakowski
Project Manager and Owner's Representative
kosakowski@citrapower.com
303-884-5598

Attached: Morales Engineering & Consulting Irrigation Feasibility Evaluation dated May 16, 2022



June 15, 2022

Delta County Planning and Community Development
Attn: Carl Holm, Director of Community Development and Natural Resources
295 W. 6th Street
Delta, CO 81416

SUBJECT: PLN22-084/Garnet Mesa Solar Criteria Questions

Director Holm:

The Project team is in receipt of your email from June 14, 2022 requesting comment on the Project's alignment to the Solar Land Use Checklist used by the BLM for solar developments on BLM land. A copy of the checklist provided in the email is attached to this memo for ease of reference.

The Project acknowledges your claim in the email that Delta County does not have similar criteria and these criteria are not required for solar developments in the County on private land; the list is only being forwarded for review and commentary as a framework to aid the County in their analysis.

Below we have excerpted from the referenced memo and are pleased to provide the requested commentary.

- A) Traffic management plan with appropriate level traffic studies
 - Submitted as Exhibit 3.O in original permit application
- B) Bond for road damage
 - Accepted by the Project and already incorporated as a condition of approval
- C) Construction traffic track out mitigation plan for public roads
 - Submitted as part of Exhibit 3.K in origination permit application. Section SM-4 in Exhibit C in particular.
- D) Bond for continuation of irrigation and agriculture practices
 - Vegetation bond accepted by the Project and already incorporated as a condition of approval
- E) NRCS approved (or other qualified agency) irrigation and grazing plan
 - Irrigation plan stamped by licensed Colorado engineer submitted as part of the Material Modification Resubmittal on May 26, 2022.
 - Agricultural Management Plan submitted as Exhibit 4.A in original permit application
 - Sperry Livestock Corporation letter of support submitted as Exhibit 4.A prior to the original BoCC meeting for the Project



- F) Bond for site reclamation and restoration
 - Decommission bond accepted by the Project and already incorporated as a condition of approval
- G) Reclamation and restoration plan
 - Submitted as Exhibit 3.P in original permit application
- H) Construction plan with schedule
 - Submitted as Exhibit 3.R in original permit application. The Project acknowledges that the schedule submitted is out of date as a result of the ongoing permitting process. The construction durations remain accurate, but until a permit is finalized the Project can not provide a definitive construction start date.
- I) CPW review and approval
 - CPW review and approval received October 5, 2021. All conditions in CPW memo have been accepted and already incorporated as conditions of approval.
- J) Archeological Clearance with SHPO concurrence
 - Submitted as Exhibit 3.G in original permit application.
- K) Wetlands delineation with setbacks identified
 - Submitted as Exhibit 3.E and 4.C in original permit application.
- L) Dust abatement plan
 - Submitted as part of Exhibit 3.K in origination permit application. Section EC-14 in Exhibit C in particular.
- M) Hazardous material and waste management plan
 - Covered within emergency response plan submitted as Exhibit 3.I in original permit application
 - The project would like to emphasize that the only hazardous materials planned for use on the Project are 1) herbicides as required to comply with Delta County noxious weed ordinances (same as all agricultural properties in the County), 2) lead acid batteries used for backup power purposes (same as in all vehicles), and 3) mineral oil for project transformer cooling.
 - The facility does not generate any waste during normal operations. Any waste generated is the result of equipment damage or replacement and is disposed of following original equipment manufacturer recommendations.
- N) Spill prevention and Emergency Response plan
 - Emergency response plan submitted as Exhibit 3.I in original permit application
 - A Spill Prevention, Control, and Countermeasure Plan is required pursuant to Title 40, *Code of Federal Regulations* (CFR), § 112 (40 CFR § 112) only prior to the facility becoming operational. The full and final design of the facility and identification of responsible individuals is needed to complete the plan, which as a result cannot be completed at this point in development.
- O) Noise Abatement Plan
 - Submitted as Exhibit 4.D in original permit application
 - Supplemental tracker noise memo dated February 21, 2022 submitted as BoCC Follow-Up Submittal item #3



- P) Wildfire control plan
- Submitted as Exhibit 2.G in original permit application
- Q) Surface and groundwater monitoring and reporting plan
- EPA requirements for surface and groundwater monitoring are not applicable to solar facilities as they do not produce any hazardous waste discharge.
- R) Stormwater pollution prevention and erosion controls
- Submitted as Exhibit 2.K in original permit application
- S) Solar panel washing plan with listed chemicals used in wash water
- The location of the project receives sufficient rainfall and wind such that solar panel washing is not in the baseline operational plan for the project. Nevertheless, chemicals are not used in cleaning solar panels. Pure water is used for panel washing.
- T) Solar panel, structure, and facilities recycling plan
- Submitted as Exhibit 3.P in the original permit application
- U) Landscaping plan and bond with mitigation for neighboring properties
- Submitted as Exhibit 3.M in the original permit application and subsequently amended to expand vegetation region as Exhibit 4.E prior to the original BoCC meeting for the Project.
 - Landscape bond accepted by the Project and already incorporated as a condition of approval
- V) Geotech and hydrology investigation report
- Submitted as Exhibit 3.H and Exhibit 3.J in the original permit application
- W) Noxious weed control plan and bond
- Submitted as Exhibit 3.L in the original permit application
 - Bonding covered under landscape bond accepted by the Project and already incorporated as a condition of approval
- X) Avian and bat conservation plan
- Biological report submitted as part of Exhibit 3.E in original permit application
 - CPW review and approval received October 5, 2021. All conditions in CPW memo have been accepted and already incorporated as conditions of approval.

Sincerely,

Matthew Kosakowski
Project Manager and Owner's Representative
kosakowski@citrapower.com
303-884-5598

Attached: BLM Solar Land Use Checklist from Delta County Email dated June 14, 2022

Solar Land Use

- A. If at all possible utility scale solar fields should be on non-irrigated ground. Soils identified by NRCS as prime farm ground if irrigated should not be considered for utility scale solar development.
- B. Either for irrigated or non-irrigated location, stipulations for site construction and deconstruction with leading practices standards should include (no particular order):
 - a. Traffic management plan with appropriate level traffic studies
 - b. Bond for road damage
 - c. Construction traffic trackout mitigation plan for public roads
 - d. Bond for continuation of irrigation and agriculture practices
 - e. NRCS approved (or other qualified agency) irrigation and grazing plan
 - f. Bond for site reclamation and restoration
 - g. Reclamation and restoration plan
 - h. Construction plan with schedule
 - i. CPW review and approval
 - j. Archeological clearance with SHPO concurrence
 - k. Wetlands delineation with setbacks identified
 - l. Dust abatement plan
 - m. Hazardous material and waste management plan
 - n. Spill prevention and Emergency Response plan
 - o. Noise Abatement Plan
 - p. Wildfire control plan
 - q. Surface and groundwater monitoring and reporting plan
 - r. Stormwater pollution prevention and erosion controls
 - s. Solar panel washing plan with listed chemicals used in wash water
 - t. Solar panel, structure, and facilities recycling plan
 - u. Landscaping plan and bond with mitigation for neighboring properties
 - v. Geotech and hydrology investigation and report
 - w. Noxious weed control plan and bond
 - x. Avian and bat conservation plan

C. Plans for operational phase of project that would include leading practices which should include (no particular order):

- a. Annual Operating Plan submitted to County by Jan 15 of each year. AOP to include planned construction or repair activities, updated hazardous waste, emergency response, stormwater pollution prevention, irrigation and grazing, and noxious weed and dust control plans. AOP should include updated contact information for local and corporate responsible persons.
- b. Annual Report for prior year submitted to County by Jan 31 of each year to include summary of irrigation and agricultural practices, surface and ground water testing and analysis, reporting of any chemical or waste spills, county, state or federal citations or reports, avian and bird fatalities, traffic increases or decreases, county road repairs, number of solar panels replaced and recycling report.
- c. Delta County and its agents reserve the right to conduct site inspections for compliance monitoring.

Fwd: Solar project in Peach Valley

1 message

Carl Holm <cholm@deltacounty.com>
To: Kim Henderson <khenderson@deltacounty.com>

Mon, Jun 6, 2022 at 11:17 AM

Please add tpo Garnet Mesa file

Carl P. Holm, AICP
Director of Community Development and Natural Resources
Phone (o): 970-874-2105
Email: cholm@deltacounty.com

----- Forwarded message -----

From: **Don Suppes** <dsuppes@deltacounty.com>
Date: Mon, Jun 6, 2022 at 8:46 AM
Subject: Fwd: Solar project in Peach Valley
To: Carl Holm <cholm@deltacounty.com>

----- Forwarded message -----

From: **Renee Deal** <reneejdeal@gmail.com>
Date: Fri, Jun 3, 2022, 3:21 PM
Subject: Solar project in Peach Valley
To: <wkoontz@deltacounty.com>, <dsuppes@deltacounty.com>, <mlane@deltacounty.com>

Commissioners Koontz, Lane and Suppes,

Attached is a letter in support of the solar project in Peach Valley and the DCI article referenced in my letter. It is my understanding that Garnet Mesa Solar, LLC has submitted a revised plan and I would like to explain a little more about how this will help our family ranching operation continue to be viable in Delta County.

Also attached is a recent article from the American Lamb Board on other solar grazing operations in various parts of the U.S. Delta County has the opportunity to be a leader in Colorado in bringing a unique solution of Ag + Energy to the forefront. I hope you will carefully consider the updated proposal and reach out to me personally if you have any questions or concerns regarding our participation in the proposed project.

Thank you for your time, consideration & service to Delta County.

Respectfully,
Renee Deal
Sperry Livestock Corp.
[20215 F Rd](#)
[Delta, CO 81416](#)
970-929-5152

<https://www.lambresourcecenter.com/weekly-news/beneath-the-panels-sharing-american-lambs-solar-grazing-story>

NOTICE: This email transmission from the County of Delta, and any documents, files, or previous email messages attached to it, are intended solely for the individual(s) to whom it is addressed and may contain information that is confidential, legally privileged, and/or exempt from disclosure under applicable law. If you are not the intended recipient, you are hereby notified that any unauthorized review, forwarding, printing, copying, distribution, or use of this transmission or the information it contains is strictly prohibited. A misdirected transmittal of this email does not constitute waiver of any applicable privilege. If you received this transmission in error, please immediately notify the sender and delete the original transmission and its attachments. Notwithstanding the foregoing, sender

and receiver should be aware that all incoming and outgoing emails may be subject to the Colorado Open Records Act, C.R.S. 24-72-200.1 et seq. Thank you.

NOTICE: This email transmission from the County of Delta, and any documents, files, or previous email messages attached to it, are intended solely for the individual(s) to whom it is addressed and may contain information that is confidential, legally privileged, and/or exempt from disclosure under applicable law. If you are not the intended recipient, you are hereby notified that any unauthorized review, forwarding, printing, copying, distribution, or use of this transmission or the information it contains is strictly prohibited. A misdirected transmittal of this email does not constitute waiver of any applicable privilege. If you received this transmission in error, please immediately notify the sender and delete the original transmission and its attachments. Notwithstanding the foregoing, sender and receiver should be aware that all incoming and outgoing emails may be subject to the Colorado Open Records Act, C.R.S. 24-72-200.1 et seq. Thank you.

2 attachments



Letter to Delta County Commissioners.pdf

328K



DCI Article 2001.pdf

337K

Renee Deal
Sperry Livestock Corporation
20215 F Rd
Delta, CO 81416
June 3, 2022

Delta County Board of County Commissioners:
Commissioner Mike Lane, District 1
Commissioner Don Suppes, District 2
Commissioner Wendell Koontz, District 3

Re: Garnet Mesa Solar, LLC Project in Peach Valley

Dear Commissioners:

As a long-time resident and representative of our family agricultural business in Delta County, I would like to express my support for the Garnet Mesa Solar, LLC project in Peach Valley. Our family has been in agriculture for four generations and we hope to be able to continue the tradition. My father, Joe Sperry, was born in Paonia and graduated from Delta High School in 1967. My grandfather Lee Sperry and great-grandfather Joseph Francis Sperry ran cattle in Delta and Gunnison Counties from 1928 until 1976. In 1976 Joe and Lee switched to sheep and we have raised sheep ever since. Lee served on the Delta County Planning Commission for 16 years before resigning in 2001 for health reasons (see attached article). I was born in Delta and graduated from Cedaredge High School in 1991. I grew up on the ranch and left to pursue a career in engineering for 10 years before moving back to support the ranch with my husband Lonnie in 2001. I also taught preschool and secondary math in Delta and Cedaredge for 13 years and all three of my children graduated from Cedaredge High School. My brother, Vaughn Sperry, also partners with us on our multi-generational, family ranch.

As you are well aware, agriculture in Colorado has not fared too well in the last few years. The climate and culture of Colorado is changing. We are experiencing unprecedented drought along with social and legislative pressures that have made staying in agriculture an extremely challenging endeavor. We have not been able to use our BLM winter grazing allotment in Wells Gulch for 4 years due to ongoing drought and do not realistically expect to be able to return. We have also lost several of our private pasture leases due to property sales to buyers who do not want to lease their property to ag producers. This has created a difficult grazing situation for the winter months. The opportunity to partner with Garnet Mesa Solar, LLC will allow us to utilize more pasture in the winter and spring while keeping the solar grounds irrigated, healthy and regenerative year-round. We are already active participants in the design of the irrigation, fencing and seeding of the proposed solar grounds and will continue to contribute to the long-term maintenance of the property, if the project is approved. This is a win-win opportunity for energy and agriculture in Delta County.

Colorado Lamb and wool is well-known all over the US and we are proud to provide these quality products from right here in Delta County. This unique partnership has offered us renewed hope and excitement about our ability to continue our agricultural heritage. We are also eager to demonstrate how new opportunities can create resiliency and sustainability for the future of agriculture in Colorado. I am asking you to support this project, not only for the sustainability of our ranch and the model it could provide for other potential collaborations, but for the economic and energy credit benefits to all of the citizens of Delta County.

Sincerely,



Renee Deal
970-929-5152

Longtime member resigns planning commission post

By Annette Brand
Staff Writer

"It was an honor to serve on the Delta County Planning Commission. I would like to have stayed on, but my health — I'm anemic — wouldn't permit it. I just didn't have the energy," Lee Sperry explained about his recent resignation from the Delta County Planning Commission after 16-plus years of service.

County commissioners Jim Ventrello, Wayne Wolf and Ted

Hayden accepted Sperry's resignation with deep regret and expressed their appreciation for his many years of dedication, insight and courage in making decisions regarding planning in the county.

"There has been a lot of transition, a lot of new members. It takes a period of time, at least a year, for a planning commission member to become effective. I think I could have helped new members with understanding the process if I could have stayed on," Sperry said.

When Sperry came on the planning commission there was very little subdivision activity in the county. "It was not very important that we try to preserve open space and ag land. We pretty much approved anything anyone wanted to do, and the way they wanted to do it. As more growth has taken place, we really have to do planning a little differently."

Sperry says he worked on the county's master plan from the beginning. "I was never enthusiastic about regulations and plans, but

I didn't oppose the regulations or the master plan. I just took a different point of view — the common sense point of view.

"I was an amateur when I started on the planning commission and I tried very hard to keep my amateur status to the end. When you become 'professional,' you lose the point of view of the people you are trying to regulate."

Sperry says he was very reluctant about the specific development regulation the county adopted last fall but knew the county had to have it. "I tried to keep it as unobtrusive as possible and to get the people through the process as quick as possible.

"Regulations take time. Time costs money. The final user is the one who pays. When you're on the commission you tend to forget that what you do costs someone else.

"The money is tied up, costing, let's say, 10 percent interest a year — I always think about what interest costs. It's affected my point of view on the planning commission. Delay affects both parties — buyer and seller. The buyer can't get the operation running and begin making money. If he has borrowed money for the operation, he's pay-

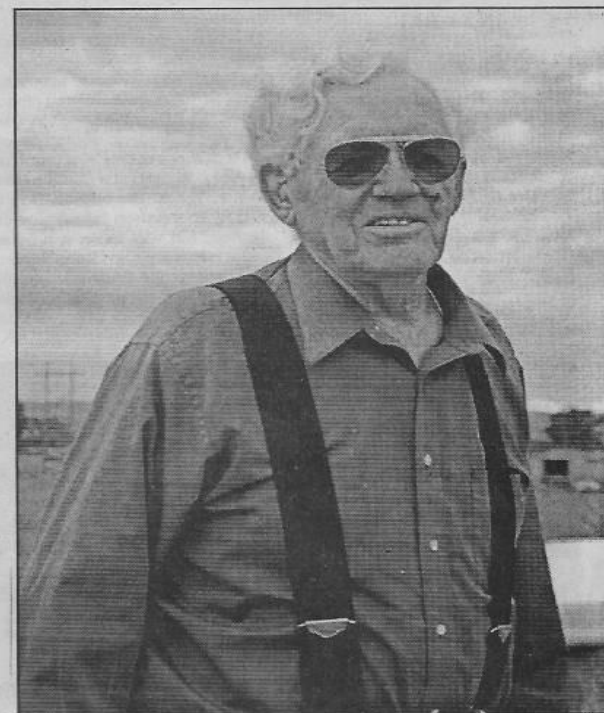
ing interest on top of not being able to make any money. It's a double whammy. The seller is losing money every day the transaction can't go forward.

"I remember one time when it took 18 months to get a simple subdivision through. Some people were dragging their feet, trying to slow things down. The person who buys the lot pays for the delay. In reviewing subdivisions, I always felt I had to be careful to consider the economics involved and not do something that would damage the farmer in the long run," he says.

Sperry says the change of use regulation provides significant changes. "I pushed hard to keep them moving, kept ag out as much as I could, and opposed a great many things in it. It came out pretty fair. I voted for it but it's one more regulation. We're regulated to death as it is," he says, adding, "I'm a strong property rights advocate."

He says the area planning committees let him know what was acceptable to the public in the area, but their review has prolonged the process considerably.

The mandate of the area planning committees is to preserve as much ag land, as much open space



LEE SPERRY served for 16-plus years on the Delta County Planning Commission before retiring recently for health reasons.

as possible and to maintain the rural lifestyle.

"Ag in general is a hard way to make a living. It's harder in Delta County than a lot of places. Planning people like to zone land as agriculture and not allow development. I think that's detrimental to farmers who may have to sell part of their land to stay in business — or sell all of their land. We need to be conscious that we don't shoot the farmer in the foot. He needs the opportunity to sell to the highest buyer. We can't make the farmer stay in business to keep the country green. Unless he can make a living at farming, the open space won't be there," he says.

In regard to growth, Sperry says, "People need homes and it's important we recognize that and save what we can and give up what we have to. You'd be surprised at how cooperative most people are, how willing they are to put their house in a different place or accept setbacks, although that's an extra cost to them in utilities and gravel."

About the planning commission itself, Sperry says, "I had the desire to treat people in a considerate manner, to have them feel they had been treated fairly by the planning commission when they left. I didn't always succeed, but that was my goal.

"The planning commission is an advisory group. We advise the county commissioners of our opinions on certain subdivisions. The buck stops with the commissioners. They generally listened, but if they didn't, I didn't feel bad. The big responsibility is theirs.

"It just takes time to do the job. I could do this because I had a very capable son I could depend on, who worked hard and left me freedom to serve on the planning commission.

"It was a rewarding experience for me. I appreciate the consideration the county commissioners, the people on the planning commission and the staff — Susan Hansen, Kelly Yeager, Barb Ball and Ruth Carson — gave me. The reward was in the job itself," Sperry said.

Please note this quote by my grandfather in 2001, just 4 months before he passed away. His insight reflects a different perspective than I had considered. This project creates a unique opportunity to "keep the country green" symbiotically with ag+energy. Knowing how forward-thinking he always was, he would have been excited to be a part of this project. Thank you for your time, consideration and service to Delta County.

Fwd: Fw: solar projects documentation

1 message

Carl Holm <cholm@deltacounty.com>
To: Kim Henderson <khenderson@deltacounty.com>

Wed, Jun 8, 2022 at 9:30 AM

For the file, and contact list.

Carl P. Holm, AICP
Director of Community Development and Natural Resources
Phone (o): 970-874-2105
Email: cholm@deltacounty.com

----- Forwarded message -----

From: **sandra Wolfe** <sandra_wolfe_dk@yahoo.com>
Date: Tue, Jun 7, 2022 at 3:56 PM
Subject: Fw: solar projects documentation
To: cholm@deltacounty.com <cholm@deltacounty.com>

Thank you for listening to my concerns. When the Air Force Academy took down their industrial solar array about six years ago or so after babysitting it for five years, and the engineer for the project said it wasn't cost-effective to keep it up, I started looking into solar a bit harder. All I had really known before that was that the team in charge of reviewing solar back in the nineties when I worked at Florida Power Corporation had concluded the production was too weak and the costs were prohibitive. Those same factors still plague these projects unless Federal money impels the buildout.

I am forwarding you the same articles I collected for Robbie LeValley and the county commissioners.

----- Forwarded Message -----

From: sandra Wolfe <sandra_wolfe_dk@yahoo.com>
To: rlevalley@deltacounty.com <rlevalley@deltacounty.com>
Cc: mlane@deltacounty.com <mlane@deltacounty.com>; dsuppes@deltacounty.com <dsuppes@deltacounty.com>; wkoontz@deltacounty.com <wkoontz@deltacounty.com>
Sent: Friday, June 3, 2022, 12:19:55 PM MDT
Subject: solar projects documentation

Dear Robbie,

I am hoping to attend the Delta County commissioners' meeting next week (6-7-2022). You and I had talked on the phone last month, and I mentioned I would send some information I have found. The two I plan to print out are PDF files:

2012 03 03 OAK-AG EMF Guideline
StetzerLetterHead_StetzerElectricInc

At the bottom of the '2012 03 03 OAK-AG EMF Guideline' is a recommendation for a medical questionnaire. I feel the other documents and links I am sending raise enough questions about the practicality of industrial solar applications to also raise the

question of how these installations might impact the region and people's health. At this time perhaps any installations should be backed by funding from the company for (at the least) medical history support for any concerned residents.

Four of the files I am sending are 'rtf' files I created with Wordpad. If you would like any of them in PDF form I am hoping to convert them tomorrow when I print out four copies of the two files I plan to bring on the 7th of June.

Attached:

2012 03 03 OAK-AG EMF Guideline.PDF :

This is a consensus paper of the Austrian Medical Association's EMF Working Group on electrosmog - electric field, magnetic field and electromagnetic field effects - and how to address the health impacts of exposed individuals.

2016-11-solar-island-effect-large-scale-power.PDF :

A concern from experienced residents is that large-scale solar power plants raise local temperatures, so I pulled this file in reference to that.

2022 engineering tips site.rtf :

This contains a link to a forum that covers a lot of engineering information from the working engineer or technician's view.

2022 Indiana solar concerns.rtf :

Concerned citizens in Indiana put together a blog page (the link in this file) of some of the negatives they found concerning industrial solar.

A Mostly Wind- & Solar-Powered US Economy Is A Dangerous Fantasy _
ZeroHedge.PDF :

on a serious note, from a forensics engineer

May2022 blog - ShieldYourBodydotcom.rtf :

serious marketing for the problem with EMF

New England petition - dirty and heat from solar with links.rtf :

Concerned citizens in New England put together a petition (the first link in this file) of some of the negatives they found concerning industrial solar with several interesting references at the bottom of the file.

Oversensitive-How-The-IPCC-hid-the-Good-News-on-Global-Warming.PDF :

I found this climate-change document referenced on the engineering tips forum.

StetzerLetterHead_StetzerElectricInc.PDF :

Stray voltage is an old term, but it is relevant for any large-scale solar 'farms'.

Yours truly,
Sandra Wolfe
(719)493-2181

NOTICE: This email transmission from the County of Delta, and any documents, files, or previous email messages attached to it, are intended solely for the individual(s) to whom it is addressed and may contain information that is confidential, legally privileged, and/or exempt from disclosure under applicable law. If you are not the intended recipient, you are hereby notified that any unauthorized review, forwarding, printing, copying, distribution, or use of this transmission or the information it contains is strictly prohibited. A misdirected transmittal of this email does not constitute waiver of any applicable privilege. If you received this transmission in error, please immediately notify the sender and delete the original transmission and its attachments. Notwithstanding the foregoing, sender and receiver should be aware that all incoming and outgoing emails may be subject to the Colorado Open Records Act, C.R.S. 24-72-200.1 et seq. Thank you.

9 attachments



2012 03 03 OAK-AG EMF Guideline.pdf

239K



2016-11-solar-island-effect-large-scale-power.pdf

181K



2022 engineering tips site.rtf

1K



2022 Indiana solar concerns.rtf

4K



A Mostly Wind- & Solar-Powered US Economy Is A Dangerous Fantasy _ ZeroHedge.pdf

167K



May2022 blog - ShieldYourBodydotcom.rtf

6550K



New England petition - dirty and heat from solar with links.rtf

8K



Oversensitive-How-The-IPCC-hid-the-Good-News-on-Global-Warming.pdf

1235K



StetzerLetterHead_StetzerElectricInc.pdf

305K

Guideline of the Austrian Medical Association (ÖÄK) for the diagnosis and treatment of EMF-related health problems and illnesses (EMF syndrome)

Consensus paper of the Austrian Medical Association's EMF Working Group (ÖÄK AG-EMF)

Adopted at the meeting of environmental medicine officers of the Regional Medical Association's and the Austrian Medical Association on 3rd March 2012 in Vienna.

Introduction

There has been a sharp rise in unspecific, often stress-associated health problems that increasingly present physicians with the challenge of complex differential diagnosis. A cause that has been accorded little attention so far is increasing electrosmog exposure at home, at work and during leisure activities, occurring in addition to chronic stress in personal and working life. It correlates with an overall situation of chronic stress that can lead to burnout.

How can physicians respond to this development?

The Austrian Medical Association has developed a guideline for differential diagnosis and potential treatment of unspecific stress-related health problems associated with electrosmog. Its core element is a patient questionnaire consisting of a general assessment of stress symptoms and a specific assessment of electrosmog exposure.

The guideline is intended as an aid in diagnosing and treating EMF-related health problems.

Background

Many people are increasingly exposed, to various degrees, to a combination of low and high frequency electric fields (EF), magnetic fields (MF) and electromagnetic fields (EMF) of different signal patterns, intensities and technical applications for varying periods of time, colloquially referred to as electrosmog.

Physicians are often confronted with unspecific complaints without clearly identifiable causes (Huss and Rösli 2006). It has been suspected that environmental conditions such as increasing exposure of the population to radio waves, emanating e.g. from cordless phones, mobile phone base stations, cell phones, GPRS, UMTS, data cards for laptop and notebook computers and wireless LAN (WLAN), but also exposure to electric and magnetic fields emanating from power lines, devices and equipment, may play a causal role (Blake Levitt and Lai 2010). For the medical profession, this raises new challenges in diagnosis and treatment. A central issue for

the causal attribution of symptoms is the assessment of variation in health problems depending on time and location, which is particularly relevant for environmental causes such as EMF exposure.

Austria is currently rolling out the fourth generation of mobile telephony (LTE), as well as smart metering (for electricity, gas and water consumption), resulting in additional EMF exposure of the population.

New radio technologies and applications have been introduced without certainty about their health effects, raising new challenges for medicine. For instance, the issues of so-called non-thermal effects and potential long-term effects of low-dose exposure were hardly investigated at all prior to introduction. Some patients suspect a link between EMF exposure and their health problems. Moreover, physicians are increasingly confronted with health problems with unidentified causes. Pursuing an evidence-based treatment strategy in this context is a challenge for differential diagnosis.

In Austria, there are no democratically legitimized limits to protect the general population from EMF exposure. The recommendations of the WHO, compiled by the International Commission on Non-Ionizing Radiation Protection (ICNIRP 1998), are based on a thermal model. These recommendations were adopted by the EU in its Council Recommendation of 1999 (EU-Ratsempfehlung 1999) and by Austria in its pre-standard ÖVE/ÖNORM E 8850:2006 02 01 (ÖNORM 2006) without taking into account long-term non-thermal effects.

In August 2007, the BioInitiative, an international group of experts, published a comprehensive report calling for preventive measures against EMF exposure based on the scientific evidence available (BioInitiative 2007). Consequently, the European Environment Agency compared electrosmog to other environmental hazards such as asbestos or benzene (EEA 2007).

In April 2009, a resolution of the European Parliament called for a review of the EMF limits in the EU Council Recommendation of 1999, which was based on the guidelines of the ICNIRP, with reference to the BioInitiative Report (EU Parliament 2009).

In May 2011, the Parliamentary Assembly of the Council of Europe adopted the report "The potential dangers of electromagnetic fields and their effect on the environment" (PACE 2011). The report calls for a number of measures to protect humans and the environment, especially from high-frequency electromagnetic fields. One of the recommendations is to "take all reasonable measures to reduce exposure to electromagnetic fields, especially to radio frequencies from mobile phones, and particularly the exposure to children and young people who seem to be most at risk from head tumours".

Also in May 2011, a group of experts at the International Agency for Research on Cancer, an agency of the WHO, classified radiofrequency electromagnetic fields as possibly carcinogenic (Group 2B) for humans (IARC 2011).

A representative telephone survey (n=2048, age >14 years) carried out in 2004 in Switzerland yielded a frequency of 5% (95% CI 4-6%) for a self-attributed “diagnosis” of electrosensitivity (Schreier et al. 2006).

In another survey carried out in Switzerland, in 2001, 394 respondents attributed specific health problems to EMF exposure. Among others, the following symptoms were reported as occurring frequently: sleep problems (58%), headaches (41%), nervousness (19%), fatigue (18%) and difficulty concentrating (16%). The respondents listed mobile phone base stations (74%), cell phones (36%), cordless phones (29%) and high-voltage lines (27%) as causes. Two thirds of respondents had taken measures to reduce their symptoms, the most frequent measure being to avoid exposure. Remarkably, only 13% had consulted their physicians (Röösli et al. 2004).

While a 2006 study by Regel et al. described no exposure effects, two provocation studies on exposure of “electrosensitive” individuals and control subjects to mobile phone base station signals (GSM, UMTS or both) found a significant decline in well-being after UMTS exposure in the individuals reporting sensitivity (Zwamborn et al. 2003, Eltiti et al. 2007). Analysis of the data available on exposure of people living near mobile phone base stations has yielded clear indications of adverse health effects (Santini et al. 2002, Navarro et al. 2003, Hutter et al. 2006, Abdel-Rassoul et al. 2007, Blettner et al. 2008).

Based on the scientific literature on interactions of EMF with biological systems, several mechanisms of interaction are possible. A plausible mechanism at the intracellular and intercellular level, for instance, is interaction via the formation of free radicals or oxidative and nitrosative stress (Friedmann et al. 2007, Simkó 2007, Pall 2007, Bedard and Krause 2007, Pacher et al. 2007, Desai et al. 2009). It centres on the increased formation of peroxynitrite (ONOO-) from a reaction of nitrogen monoxide (NO) with superoxide (O₂⁻). Due to its relatively long half-life, peroxynitrite damages a large number of essential metabolic processes and cell components.

This approach can serve as a plausible explanation of many of the health problems, symptoms and their progression observed in the context of EMF exposure. There are increasing indications that EMF syndrome (EMFS) should be counted among multi-system disorders (Pall 2007) such as Chronic Fatigue Syndrome (CFS), Multiple Chemical Sensitivity (MCS), fibromyalgia (FM) and Post Traumatic Stress Disorder (PTSD).

In Sweden, EMF syndrome is designated as electrohypersensitivity (EHS), considered a physical impairment and recognized as a disability. With reference to UN Resolution 48/96, Annex, of 20 December 1993 (UN 1993), local governments grant support to individuals with EHS. Employees with EHS have a right to support from their employers so as to enable them to work despite this impairment. Some hospitals in Sweden provide rooms with low EMF exposure.

The Austrian Medical Association considers it its duty and its mission to provide members of the medical profession with a compilation of the current state of the scientific and political debate from a medical perspective and with specific recommendations for action in this first guideline. The guideline can only be improved by suggestions, criticism and amendments. Due to the rapid development of various technologies, the recommendations need to be adapted on an ongoing basis. We therefore invite all medical professionals to send contributions to the next edition of the guideline to the following email address: post@aerztekammer.at

What to keep in mind when dealing with patients and EMF

In the case of unspecific health problems (see patient questionnaire) for which no clearly identifiable cause can be found, EMF exposure should in principle be taken into consideration as a potential cause, especially if the patient suspects that it may be the cause.

How to proceed if EMF-related health problems are suspected

The recommended approach to diagnosis and treatment is intended as an aid and should, of course, be modified as each individual case requires.

1. History of health problems and EMF exposure
2. Examination and findings
3. Measurement of EMF exposure
4. Prevention or reduction of EMF exposure
5. Diagnosis
6. Treatment

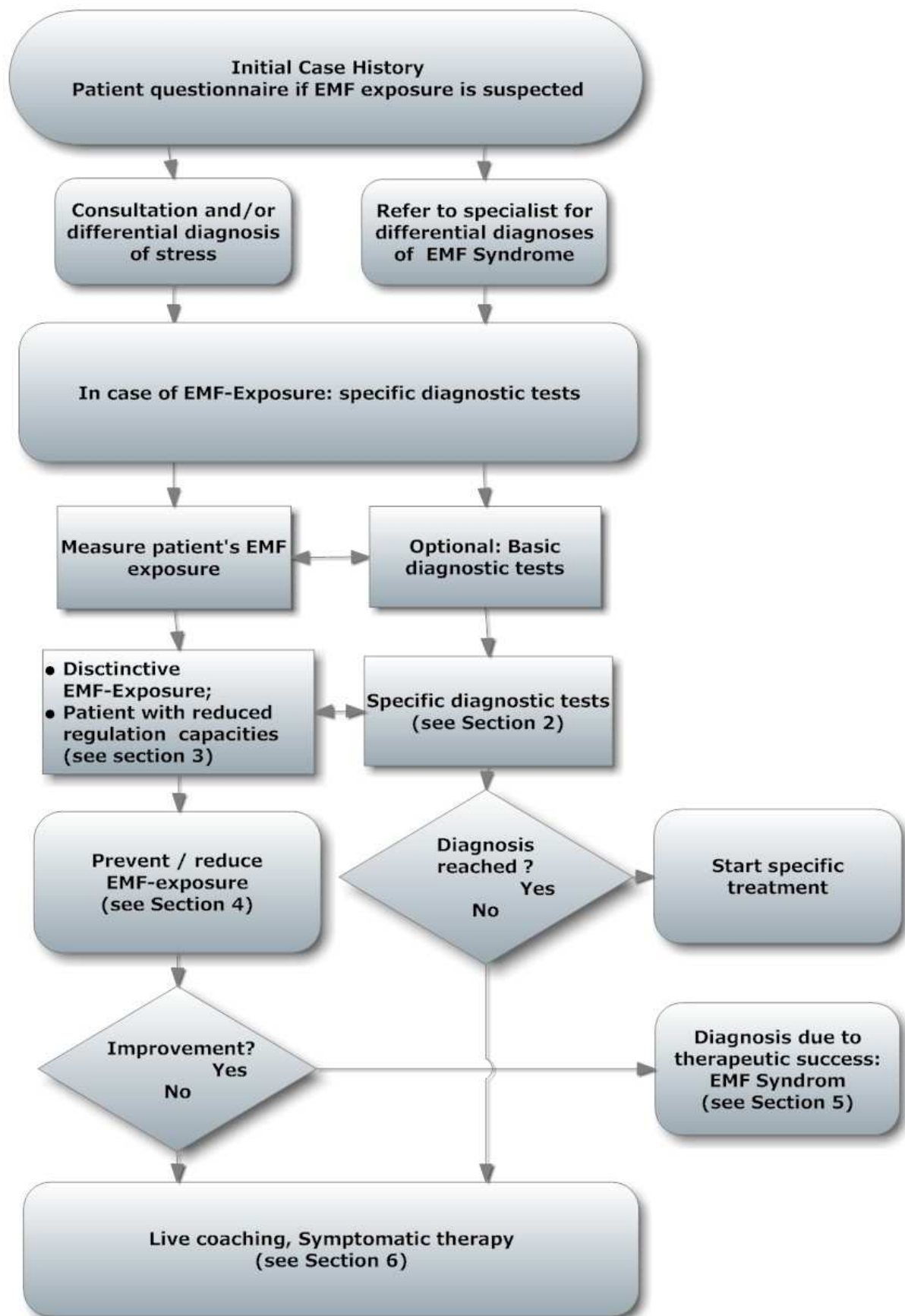


Fig. 1: Flow chart for diagnosing EMF-related health problems

1. History of health problems and EMF exposure

A **patient questionnaire** to facilitate a systematic history of health problems and EMF exposure, compiled by the Austrian Medical Association's EMF Working Group, is available for download at: www.aerztekammer.at/referate Umweltmedizin.

The patient questionnaire consists of three sections:

- a) List of symptoms
- b) Variation of health problems depending on time and location
- c) Assessment of EMF exposure

a) List of symptoms

The list of symptoms in the patient questionnaire serves to systematically quantify stress-related health problems regardless of their causes. It also includes questions on when the health problems first occurred. Most EMF-related symptoms fall within the scope of so-called stress-related health problems, e.g. sleep problems, fatigue, exhaustion, lack of energy, restlessness, heart palpitations, blood pressure problems, muscle and joint pain, headaches, depression, difficulty concentrating, forgetfulness, anxiety, urinary urgency, anomia, dizziness, tinnitus and sensations of pressure in the head and the ears.

The health problems may range in severity from benign, temporary symptoms, such as slight headaches or paraesthesia in the head when using a cell phone, to severe, debilitating symptoms that drastically impair physical and mental health.

b) Variation of health problems depending on time and location

The answers to questions on when and where the health problems occur or recede, and when and where the symptoms increase or are particularly evident, provide indications as to whether the health problems may be related to specific times and locations. They must be interpreted in the context of the patient's living conditions and circumstances.

c) Assessment of EMF exposure

Regardless of whether or not the patient suspects EMF exposure as a cause, these questions should be used to assess the kind of exposure that exists. It is important to note that only certain types of EMF exposure can be assessed by means of the questionnaire, such as use of cell phones and cordless phones. Detection of other types of EMF exposure, e.g. due to high frequency transmitter sites or the electric or magnetic fields of power lines, generally requires measurements (see section 3: Measurement of EMF exposure). In principle, questions should be asked to assess EMF exposure at home and at work, keeping in mind that the degree of EMF exposure may vary at different times.

2. Examination and findings

There are no findings specific to EMF, which makes diagnosis and differential diagnosis a considerable challenge. A method that has proven useful is to use stress-

associated findings for diagnosis and follow-up and to evaluate them synoptically. Basic diagnostic tests should be carried out as a first step, followed by measurements of EMF exposure as a second step. Only then can specific diagnostic tests be considered.

Cardiovascular system

Basic diagnostic tests

- Blood pressure and heart rate (in all cases resting heart rate in the morning while still in bed), including self-monitoring, possibly several times a day, e.g. at different places and with journaling of subjective well-being for a week.

Specific diagnostic tests

- 24-hour blood pressure monitoring (absence of night-time decline)
- 24-hour ECG (heart rhythm diagnosis)
- 24-hour heart rate variability HRV (autonomous nervous system diagnosis)

Laboratory tests

Basic diagnostic tests

- Early morning urine
 - Adrenaline
 - Noradrenaline
 - Noradrenaline/adrenaline quotient
 - Dopamine
 - Serotonin
- Early morning urine
 - 6-OH melatonin sulphate
- Saliva
 - Cortisol (8 am, 12 am and 8 pm)
- Blood
 - Blood count and differential blood count
 - Fasting blood glucose and postprandial blood glucose
 - HBA1c
 - TSH

Additional diagnostic tests – specific individual parameters depending on symptoms

- Late morning urine
 - Histamine, glycine
 - Gamma-aminobutyric acid GABA
 - Glutamate
- Saliva
 - Alpha amylase A (10 am)
 - Dehydroepiandrosterone DHEA (8 am and 8 pm)
- Blood
 - Homocysteine
 - Intracellular ATP

- Intracellular glutathione (redox balance)
- Malondialdehyde (lipid peroxidation)
- 8-hydroxydeoxyguanosine (DNA oxidation)
- Interferon-gamma (IFNg)
- Interleukin-1 (IL-1)
- Interleukin-6 (IL-6)
- Interleukin-10 (IL-10)
- Tumour necrosis factor alpha (TNFa)
- NF-kappaB
- Vitamin B2 (FAD and riboflavin) (whole blood)
- Vitamin B6 (whole blood)
- Vitamin D
- Ubichinon (Q 10)
- Selenium (whole blood)
- Zinc (whole blood)
- Magnesium (whole blood)
- Differential lipid profile

3. Measurement of EMF exposure¹

In general, a wide variety of forms of EMF exposure (e.g. from cordless phones, wireless internet access, electrical installations and electrical devices in the building, mobile phone base stations, radio and TV transmitters, high-voltage lines or transformer stations) may be the root causes of health problems.

EMF measurements should be planned and carried out by specially trained and experienced measurement engineers.

See e.g. http://www.salzburg.gv.at/adressen_elektrosmog.htm.

After the measurements have been commissioned by the patient and carried out, the results should be discussed with the attending physician or a physician familiar with the issue.

The measurements should be carried out in accordance with relevant standards, e.g. the guidelines of the Professional Association of German Building Biologists (VDB-Richtlinien). In addition to the readings, the measurement report should include suggestions for a potential reduction of exposure.

Basic measurements

Low-frequency alternating magnetic fields

Isotropic magnetic field sensor (for all spatial axes) in the frequency range from 5 Hz to 2 kHz, e.g. near the bed, near the desk with source identification (short-term orientation measurement); in addition, long-term measurements e.g. during the night can be useful.

Low-frequency alternating electric fields

¹ EMF measurements are not covered by statutory health insurance.

Isolated isotropic electric field sensor (for all spatial axes) in the frequency range from 5 Hz to 2 kHz, e.g. near the bed, near the desk with source identification.

High-frequency electromagnetic radiation

Broadband measurements and/or band-selective measurements of common frequencies in the high frequency range, e.g. GSM base stations (900 and 1800 MHz), DECT base stations (1900 MHz), UMTS (2100 MHz), WLAN (2450 and 5000 MHz), possibly WiMAX (3400-3600 MHz), LTE (2500-2700 MHz), within a defined measurement space such as the head and torso area on the bed, or the desk chair, with source identification (e.g. acoustic diagnosis); identification of maximum reading; peak detector.

Additional measurements

High-frequency electromagnetic radiation

Frequency-selective measurements (individual frequencies) of common frequencies in the high frequency range, within a defined measurement space such as the head and torso area on the bed, or the desk chair, with source identification; identification of maximum reading; peak detector. The measurements should be adapted to each individual case, e.g. to account for short-wave transmitters, radar, “dirty power” and other high frequency sources.

Benchmarks

The following aspects should be taken into account when evaluating the readings in each case: duration of exposure, exposure during the night or the day, multiple exposure to different EMF sources, additional exposure to noise, chemicals etc., patient’s individual regulation capacity status. Based on epidemiological studies (BioInitiative 2007, Kundi and Hutter 2009) and measurements relevant in practice (Standard of Building Biology Testing Methods, SBM 2008), the Austrian Medical Association’s EMF Working Group has recommended preliminary benchmarks.

Irrespective of the ICNIRP recommendations for acute effects, the following benchmarks apply to regular exposure of more than four hours per day.

High-frequency electromagnetic radiation (as power flow density)

- | | |
|--|-----------------------|
| ▫ $\geq 1000 \mu\text{W}/\text{m}^2$ ($\geq 1 \text{ mW}/\text{m}^2$) | very far above normal |
| ▫ $10\text{-}1000 \mu\text{W}/\text{m}^2$ ($0.01\text{-}1 \text{ mW}/\text{m}^2$) | far above normal |
| ▫ $1\text{-}10 \mu\text{W}/\text{m}^2$ ($0.001\text{-}0.01 \text{ mW}/\text{m}^2$) | slightly above normal |
| ▫ $\leq 1 \mu\text{W}/\text{m}^2$ ($\leq 0.001 \text{ mW}/\text{m}^2$) | within normal limits |

The benchmarks listed are intended to be applied to individual types of radiation, e.g. GSM, UMTS, WiMAX, TETRA, radio, TV, DECT or WLAN, and refer to peak levels. The benchmarks do not apply to radar, which must be evaluated separately. Highly critical types of radiation, such as periodic signals (mobile telephony, DECT, WLAN, digital broadcasting...), should be critically evaluated, especially if levels are far above normal, while less critical types, such as non-pulsed or non-periodic signals (USW, shortwave, medium and long wave, analogue broadcasting), may be considered more leniently.

Low-frequency alternating magnetic fields

- | | |
|--|-----------------------|
| ▫ $\geq 400 \text{ nT}$ ($\geq 0.4 \mu\text{T}$) | very far above normal |
| ▫ $100\text{-}400 \text{ nT}$ ($0.1\text{-}0.4 \mu\text{T}$) | far above normal |

- 20-100 nT (0.02-0.1 μ T) slightly above normal
- ≤ 20 nT (≤ 0.02 μ T) within normal limits

The benchmarks are intended to be applied to the range up to and around 50 Hz; higher frequencies and distinct harmonics should be more critically evaluated. Mains current (50 Hz) and traction current (16.7 Hz) should be assessed separately. Long-term measurements should be carried out – also and especially during the night – if intense and frequent field variations occur over time; in such cases, evaluation should be based on the arithmetic mean over the period of exposure.

Low-frequency alternating electric fields

- ≥ 10 V/m very far above normal
- 1.5-10 V/m far above normal
- 0.3-1.5 V/m slightly above normal
- ≤ 0.3 V/m within normal limits

The benchmarks (potential-free measurement) are intended to be applied to the range up to and around 50 Hz; higher frequencies and distinct harmonics should be more critically evaluated.

4. Prevention or reduction of EMF exposure

Preventing or reducing EMF exposure after consultation of a measurement engineer is advantageous for several reasons:

- a) to prevent and reduce risks to the individual and to public health,
- b) to treat the causes of EMF syndrome and
- c) to aid in identifying any links to health problems.

There are numerous potential causes for EMF exposure above normal limits, and this guideline can only give a few examples. Further information can be found, for instance, in the building biology checklist “Gebäudecheckliste Baubiologie” (Land Salzburg and VDB 2009) as well as in the information folder on electrosmog (Land Salzburg 2009), which also lists contact data of measurement engineers, sources for measurement devices and materials to reduce exposure. In most cases, it will be necessary to consult an experienced measurement engineer.

Based on documented cases, it is useful to recommend that patients take certain measures (also as preventive measures) to eliminate or reduce EMF exposure, which may lead to an alleviation of health problems within days or weeks. Such measures include the following:

- Disconnecting (unplugging) the power supply of all DECT cordless phones – the use of “classical” cord phones is recommended instead.
- Disconnecting (unplugging) the power supply of all WLAN access points or WLAN routers. (NB: Many LAN routers now come equipped with additional WLAN.)
- Disconnecting the power supply in the bedroom (switching off the fuse) while sleeping. – NB: The benefits should be weighed against the potential risk of accidents and the use of a flashlight should be recommended.
- Disconnecting the power supply to all non-essential electric circuits, possibly in the entire flat or building. NB: See note above.
- Moving the bed or desk to a different place with lower exposure, such as another room or floor; in case of external high frequency sources, rooms facing away from the source should be chosen.
- Discontinuing use of certain appliances and lamps.

- Retrofitting the electrical wiring of the building to reduce residual current and equalising current (installation of a residual current device RCD).

We also recommend following the 10 medical rules for cell phone use published by the Vienna Medical Association :

http://www2.aekwien.at/media/Plakat_Handy.pdf.

5. Diagnosis

A diagnosis of EMF syndrome will largely be based on a comprehensive case history, focusing in particular on correlations between health problems and times and places of EMF exposure, as well as the progression of symptoms over time. In addition, measurements of EMF exposure and the results of additional diagnostic tests (laboratory tests, cardiovascular system) serve to support the diagnosis. Moreover, all other potential causes should be excluded as far as possible.

We recommend that the code Z58.4 (Exposure to radiation) under the International Classification of Diseases (ICD-10) be used for EMF syndrome for the time being.

6. Treatment

The primary method of treatment should consist in the prevention or reduction of EMF exposure, taking care to reduce or eliminate all sources of EMF if possible. Many examples have shown that such measures can prove effective.

Since sufficient EMF reduction is not possible in all cases, other measures can and must be considered. These include not only keeping additional exposure to a minimum, but also enhancing and increasing resistance to EMF. In some cases, positive effects of holistic medicine treatments have been reported.

We take it as given that appropriate treatment will be initiated after diagnosis if the patient presents manifest illness. Regardless of such treatment, the above-mentioned measures to reduce exposure should also be taken.

There is increasing evidence that a main effect of EMF on patients is the reduction of oxidative and nitrosative regulation capacity. This hypothesis also explains observations of changing EMF sensitivity and the large number of symptoms reported in the context of EMF exposure. From the current perspective, it appears useful to recommend a treatment approach such as those gaining ground for multi-system disorders, with the aim of minimizing adverse peroxynitrite effects.

In summary, the following treatment measures appear advantageous, depending on the individual case:

a) **Reduction of exposure** to electric and magnetic fields and high frequency electromagnetic waves.

For more information see e.g. the information folder on electrosmog at www.salzburg.gv.at/infomappe-elektrosmog.pdf.

- b) **Lifestyle coaching** (exercise, nutrition, addictive substances, sleeping habits etc.) and stress reduction measures (reduction of general stress and work stress), as well as methods to increase stress resistance (autogenic training, yoga, progressive muscle relaxation, breathing techniques, meditation, tai chi, qui gong).
- c) **Holistic treatments** such as anti-oxidative and anti-nitrosative therapies, trace elements, vitamins, amino acids.
- d) **Treatment of symptoms** until the causes have been identified and eliminated.

References

- Abdel-Rassoul G, El-Fateh OA, Salem MA, Michael A, Farahat F, El-Batanouny M, Salem E. 2007. Neurobehavioral effects among inhabitants around mobile phone base stations. *Neurotoxicology*. Mar; 28(2): 434-40.
- Blake Levitt B and Lai H. 2010. Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. *Environ. Rev.* 18: 369-395. Doi:10.1139/A10-018.
- Bedard K and Krause KH. 2007. The NOX Family of ROS-Generating NADPH Oxidases: Physiology and Pathophysiology. *Physiol. Rev.* 87: 245-313.
- BioInitiative. 2007. Bioinitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF).
<http://bioinitiative.org/freeaccess/report/index.htm>
- Blettner M, Schlehofer B, Breckenkamp J, Kowall B, Schmiedel S, Reis U, Potthoff P, Schüz J, Berg-Beckhoff G. 2008. Mobile phone base stations and adverse health effects: phase 1 of a population-based, cross-sectional study in Germany. *Occup. Environ. Med.* 2009 Feb; 66(2):118-23. Epub Nov. 18.
- Desai NR, Kesari KK, Agarwal A. 2009. Pathophysiology of cell phone radiation: oxidative stress and carcinogenesis with focus on male reproductive system. *Reprod. Biol. Endocrinol.* Oct. 22; 7:114.
- Eltiti S, Wallace D, Ridgewell A, Zougkou K, Russo R, Sepulveda F, Mirshekar-Syahkal D, Rasor P, Deeble R, Fox E. 2007. Does short-term exposure to mobile phone base station signals increase symptoms in individuals who report sensitivity to electromagnetic fields? A double-blind randomized provocation study. *Environ. Health Perspect.* Nov; 115(11):1603-8.
- EU Parliament 2008: European Parliament resolution of 2 April 2009 on health concerns associated with electromagnetic fields ([2008/2211\(INI\)](http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0216+0+DOC+XML+V0//EN)).
<http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0216+0+DOC+XML+V0//EN>
- EU-Ratsempfehlung 1999: EMPFEHLUNG DES RATES vom 12. Juli 1999 zur Begrenzung der Exposition der Bevölkerung gegenüber elektromagnetischen Feldern (0 Hz – 300 GHz) (1999/519/EG).

EEA 2007: European Environment Agency, Radiation risk from everyday devices assessed. www.eea.europa.eu/highlights/radiation-risk-from-everyday-devices-assessed

Friedmann J, Kraus S, Hauptmann Y, Schiff Y, Seger R, 2007. Mechanism of short-term ERK activation by electromagnetic fields at mobile phone frequencies. *Biochem. J.* 405, 559–568.

Huss A and Rösli M. 2006. Consultations in primary care for symptoms attributed to electromagnetic fields--a survey among general practitioners. *BMC Public Health* Oct. 30; 6:267.

Hutter HP, Moshhammer H, Wallner P, Kundi M. 2006. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. *Occup. Environ. Med.* 63:307-313

IARC 2011: IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS 31 May 2011.

http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf

ICNIRP 1998: Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). International Commission on Non-Ionizing Radiation Protection. *Health Phys.* 1998 Apr; 74(4):494-522.

Kundi M and Hutter HP. 2009. Mobile phone base stations – Effects on wellbeing and health. *Pathophysiology* 2009 Aug; 16(2-3):123-35. Epub Mar. 4.

Land Salzburg and VDB. 2009. Gebäudecheckliste Baubiologie. www.baubiologie.net

Land Salzburg. 2009. Informationsmappe Elektromog.

www.salzburg.gv.at/infomappe-elektromog.pdf

Navarro EA, Segura J, Portolés M, Gómez-Perretta de Mateo C. 2003. The Microwave Syndrome: A Preliminary Study in Spain. *Electromagnetic Biology and Medicine* (formerly *Electro- and Magnetobiology*), 22 (2003) 161 – 169.

ÖNORM 2006: Vornorm ÖVE/ÖNORM E 8850:2006 02 01, Elektrische, magnetische und elektromagnetische Felder im Frequenzbereich von 0 Hz bis 300 GHz - Beschränkung der Exposition von Personen.

Pall ML. 2007. Explaining “Unexplained Illnesses”: Disease Paradigm for Chronic Fatigue Syndrome, Multiple Chemical Sensitivity, Fibromyalgia, Post-Traumatic Stress Disorder, Gulf War Syndrome, and Others. Harrington Park Press.

PACE 2011: Council of Europe – Parliamentary Assembly. The potential dangers of electromagnetic fields and their effect on the environment. Resolution, Doc. 1815, Text adopted by the Standing Committee, acting on behalf of the Assembly, on 27 May 2011.

<http://www.assembly.coe.int/Mainf.asp?link=/Documents/AdoptedText/ta11/ERS1815.htm>

Pacher P, Beckman JS, Liaudet L. 2007. Nitric oxide and peroxynitrite in health and disease. *Physiol Rev.* 2007 Jan; 87(1):315-424.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248324/pdf/nihms38119.pdf>

- Regel SJ, Negovetic S, Rösli M, Berdiñas V, Schuderer J, Huss A, Lott U, Kuster N, Achermann P. 2006. UMTS base station-like exposure, well-being, and cognitive performance. *Environ. Health Perspect.* Aug; 114(8):1270-5.
- Rösli M, Moser M, Baldinini Y, Meier M, Braun-Fahrlander C. 2004. Symptoms of ill health ascribed to electromagnetic field exposure – a questionnaire survey. *Int. J. Hyg. Environ. Health* 207, 141–150.
- Santini R, Santini P, Danze JM, Le Ruz P, Seigne M. 2002. Investigation on the health of people living near mobile telephone relay stations: I/ Incidence according to distance and sex. *Pathol. Biol. (Paris)* Jul; 50(6):369-73.
- Schreier N, Huss A, Rösli M. 2006. The prevalence of symptoms attributed to electromagnetic field exposure: a cross-sectional representative survey in Switzerland. *Soz. Präventivmed.* 51, 202–209.
- Simkó M. 2007. Cell Type Specific Redox Status is Responsible for Diverse Electromagnetic Field Effects. *Current Medicinal Chemistry*, 2007, 14, 1141-1152.
- SBM 2008: Standard der baubiologischen Messtechnik (SBM-2008); <http://www.baubiologie.de/downloads/standard2008.pdf>
- UN 1993: UN Resolution 48/96, Annex, 20 December 1993. <http://www.un.org/esa/socdev/enable/dissre00.htm>
- VDB-Richtlinien Band 1 Physikalische Untersuchungen. <http://www.baubiologie.net/verband/richtlinien/>
- WHO position on EMF Standards and Guidelines. <http://www.who.int/peh-emf/standards/en/>
- Zwamborn APM, Vossen SHJA, van Leersum BJAM, Ouwens MA, Mäkel WN (TNO Physics and Electronics Laboratory). 2003. Effects of Global Communication system radio-frequency fields on Well Being and Cognitive Functions of human subjects with and without subjective complaints. TNO-report FEL-03-C148, September 2003. www.ez.nl/beleid/home_ond/gsm/docs/TNO-FEL_REPORT_03148_Definitief.pdf

Download of guidelines and patient questionnaire and contact to the Austrian Medical Association :
www.aerztekammer.at/referate Umweltmedizin

Patient questionnaire

Last name, first name, Mr/Ms

Place, date

a) List of symptoms

How often have you experienced the following health problems in the past 30 days?
Please mark the appropriate box in every line.

Symptoms	Never	Rarely	Someti mes	Often	Very often	If yes, since when (month/year)
Anxiety	☐	☐	☐	☐	☐	/
Tightness in chest	☐	☐	☐	☐	☐	/
Depression	☐	☐	☐	☐	☐	/
Difficulty concentrating	☐	☐	☐	☐	☐	/
Restlessness, tension	☐	☐	☐	☐	☐	/
Hyperactivity	☐	☐	☐	☐	☐	/
Irritability	☐	☐	☐	☐	☐	/
Exhaustion	☐	☐	☐	☐	☐	/
Fatigue	☐	☐	☐	☐	☐	/
Anomia (difficulty finding words)	☐	☐	☐	☐	☐	/
Forgetfulness	☐	☐	☐	☐	☐	/
Headaches	☐	☐	☐	☐	☐	/
Dizziness	☐	☐	☐	☐	☐	/
Sleep problems	☐	☐	☐	☐	☐	/
Noise sensitivity	☐	☐	☐	☐	☐	/
Sensation of pressure in the ears	☐	☐	☐	☐	☐	/
Ear noises, tinnitus	☐	☐	☐	☐	☐	/
Burning sensation in the eyes	☐	☐	☐	☐	☐	/
Nervous bladder, urinary urgency	☐	☐	☐	☐	☐	/
Heart palpitations	☐	☐	☐	☐	☐	/
Blood pressure problems	☐	☐	☐	☐	☐	/
Muscle tension	☐	☐	☐	☐	☐	/
Joint pain	☐	☐	☐	☐	☐	/
Skin conditions	☐	☐	☐	☐	☐	/
Other (please state)	☐	☐	☐	☐	☐	/
Other (please state)	☐	☐	☐	☐	☐	/

b) Variation of health problems depending on time and location

Which health problems do you perceive to be the most severe?	
Since when have you been experiencing these health problems?	
At what times do the health problems occur?	
Is there a place where the health problems increase or are particularly severe? (e.g. at work, at home)	
Is there a place where the health problems recede or disappear altogether? (e.g. at work, at home, other places, at the home of a friend, on holiday, at your weekend home, in the woods)	
Do you have an explanation for these health problems?	
Are you experiencing stress, e.g. due to changes in your personal life or at work?	
Please list any environmental assessments made, measurements or measures taken up to now.	
Please list any environmental medicine diagnoses and treatments given up to now.	
Other	

c) Assessment of EMF exposure at home and at work

1. Do you use a cell phone at home or at work?

How long have you been using it (years/months)? _____

How much do you use it to make calls per day (hours/minutes)? _____

Have you noticed any relation to your health problems?

2. Do you have a cordless phone (DECT base station) at home (H) or at work (W)?

How long have you had it (years/months)? _____

How much do you use it to make calls per day (hours/minutes)? _____

Have you noticed any relation to your health problems?

3. Do you use wireless internet access (WLAN, WiMAX, UMTS) at home (H) or at work (W)?

If yes, how long have you been using it (years/months)? _____

How much do you use it per day (hours/minutes)? _____

Have you noticed any relation to your health problems?

4. Do you use energy-efficient light bulbs in your immediate vicinity (desk lamp, dining table lamp, reading lamp, bedside lamp) at home (H) or at work (W)?

If yes, how long have you been using them (years/months)? _____

For how long are you exposed to them per day (hours/minutes)? _____

Have you noticed any relation to your health problems?

5. Is there a cell tower (mobile phone base station) near your home (H) or your workplace (W)?

If yes, how long has it been there (years/months)? _____

At what distance is it from your home/workplace? _____

Have you noticed any relation to your health problems?

6. Are there any power lines, transformer stations or railway lines near your home (H) or your workplace (W)?

If yes, for how long are you exposed to them per day (hours/minutes)? _____

Have you noticed any relation to your health problems?

6. Do you use Bluetooth devices in your car?

If yes, how long have you been using them? _____

Have you noticed any relation to your health problems?

Researchers discover solar heat island effect caused by large-scale solar power plants

7 November 2016, by Graham Binder



Credit: University of Maryland

Large-scale solar power plants raise local temperatures, creating a solar heat island effect that, though much smaller, is similar to that created by urban or industrial areas, according to a new study.

The finding by Mitchell A. Pavao-Zuckerman, an assistant professor from the University of Maryland's College of Agriculture and Natural Resources, and colleagues from the University of Arizona, University of Madison-Wisconsin, and the Nevada Center of Excellence appears to contradict previous theoretical work and modeling studies predicting [solar power](#) installations would decrease temperatures around them by intercepting some of the sun's potentially warming energy and converting it into electricity.

"The understanding of energy balance - how heat moves in and out of ecosystems that change from natural to built settings is a big game changer for the future. Consider how PV [solar] panels absorb and reflect certain types of radiation which prevents the soil beneath from cooling like it would under a regular night sky," said Pavao-Zuckerman. "With this knowledge at our fingertips, we can mitigate environmental impacts by creating novel

systems to make PV power plants work more efficiently and produce other co-benefits."

The multidisciplinary team examined the "heat island" effect of solar energy installations using experiments that spanned three different desert ecosystems in Arizona:

1. a natural desert ecosystem,
2. the traditional built environment of a parking lot surrounded by buildings and
3. a photovoltaic (PV) power plant. Prior studies on the "heat island" effect of solar power installations have been confined to just one biome or ecosystem.

For this study, the team defined the heat island effect as the difference in ambient air temperature around the solar power plant compared to that of the surrounding wild desert landscape. Findings demonstrated that temperatures around a [solar power plant](#) were 5.4-7.2 °F (3-4 °C) warmer than nearby wildlands.

The result demonstrates that there are potential heat costs to generating green power although the added heat dissipates quickly and can't be measured 100 feet away from the power plants. Considering the external costs of solar power, the discovery of this [heat island effect](#) may affect future decisions on when and where to convert natural ecosystems into large-scale solar facilities.

Pavao-Zuckerman, lead author Greg Barron-Gafford of the University of Arizona School of Geography and Development, and their research colleagues recently published their findings in the journal *Nature Scientific Reports* in a paper titled "The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures."

Continuing studies by the group will focus on determining how far away from solar power plants the temperature increases reach, and on mitigating impact through such strategies as growing plants next to and under solar panels.

Provided by University of Maryland

APA citation: Researchers discover solar heat island effect caused by large-scale solar power plants (2016, November 7) retrieved 3 June 2022 from <https://phys.org/news/2016-11-solar-island-effect-large-scale-power.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.

www.eng-tips.com

I searched 'Industrial Solar', for a start.

NO INDUSTRIAL SOLAR POWER PLANTS

Copyright © 2022 NO INDUSTRIAL SOLAR POWER PLANTS | Brought to you by Good and Concerned Neighbors of Posey County, Indiana

<http://noindustrialsolarpowerplants.com/blog/>

Concerns about Industrial Solar Panel Plants

Here are quick reasons why Industrial Solar Panel Farms should NOT be put next to residential homes and consume agricultural land:

One of the biggest issues is water runoff. Instead of having 3,000 acres of soil that holds onto the rainfall, we would have 3,000 acres of property that the water would not be able to infiltrate and would runoff. There are already problems, when we get large rains, with the ditches and creeks being able to manage all of the water overflows. The extra water runoff would flood and wash out farm fields, roads, and houses especially if the houses have basements.

There are also problems with chemical leaching. Cadmium, which is extremely toxic, is in the solar panels. If they suffer damage from hail or anything else, the cadmium would be released into the groundwater, and then into the well water of all of the houses in Marrs Township.

The panels are also cooled with antifreeze, which would create the same problems as the cadmium.

Children are more at risk due to their small stature and a higher likelihood to be in closer contact with soil (playing outside). These panels will only be 100 feet from our homes

The fact that these panels will take Prime Production farmland for 35 years we know it will be very expensive and nearly impossible to restore the land for farming ever again.

There are more studies being done on decreased property values but it's common sense a property like that will not sell easily. But the Solar Panel Companies just state: "Your home value won't decrease". Would YOU want to buy a piece of property surrounded on three sides of panels, 100' from your property line?

We are unsure of how fire insurance for dwellings will either increase or be difficult to purchase, especially if you sell your home and someone new is coming in. This is still being looked into.

Many local farmers rent land from landowners. If landowners decide to rent (because they're being offered a very high price) they will be out of money and a job. There are many who will be forced to find new employment if this goes through.

Solar farm fires, although not super frequent, they do happen. And it can be as simple as a bird landing on them and acting as a conductor. Our small volunteer fire department does not have the capacity to handle these fires

The energy may not benefit us in this area. We will continue to have the same high prices with Vectren and get our energy from the coal-fired power plants. Many other plants send their energy to other areas, it is unknown if that will be the case here. If and when we have to come up with another energy source, we are going to be out of the land because these companies are selling power to other areas, and where will we get our energy at that point?

A Mostly Wind- & Solar-Powered US Economy Is A Dangerous Fantasy



BY TYLER DURDEN

THURSDAY, APR 28, 2022 - 05:00 AM

[Authored by Francis Menton via The Gatestone Institute.](#)

- **When President Biden and other advocates of wind and solar generation speak, they appear to believe that the challenge posed is just a matter of currently having too much fossil fuel generation and not enough wind and solar;** and therefore, accomplishing the transition to "net zero" will be a simple matter of building sufficient wind and solar facilities and having those facilities replace the current ones that use the fossil fuels.
- **They are completely wrong about that.**
- The proposed transition to "net zero" via wind and solar power is not only not easy, but is a total fantasy. It likely cannot occur at all without dramatically undermining our economy, lifestyle and security, and it certainly cannot occur at anything remotely approaching reasonable cost. At some point, the ongoing forced transition... will crash and burn.
- [I]t doesn't matter whether you build a million wind turbines and solar panels, or a billion, or a trillion. On a calm night, they will still produce nothing, and will require full back-up from some other source.
- **If you propose a predominantly wind/solar electricity system, where fossil fuel back-up is banned, you must, repeat must, address the question of energy storage.** Without fossil fuel back-up, and with nuclear and hydro constrained, storage is the only remaining option. How much will be needed? How much will it cost? How long will the energy need to remain in storage before it is used?
- There should be highly-detailed engineering studies of how the transition can be accomplished.... But the opposite is the case. At the current time, the government is paying little to no significant attention to the energy storage problem. There is no detailed engineering plan of how to accomplish the transition. There are no detailed government-supported studies of how much storage will be needed, or of what technology can accomplish the job, or of cost.
- It gets worse:.... Ken Gregory calculated the cost of such a system as well over \$100 trillion, before even getting to the question of whether battery technology exists that can store such amounts of energy for months on end and then discharge the energy over additional months. And even at that

enormous cost, that calculation only applied to *current* levels of electricity consumption.... For purposes of comparison, the entire U.S. GDP is currently around \$22 trillion per year.

- **In other words: we have a hundred-trillion-or-so dollar effort that under presidential directive must be fully up and running by 2035, with everybody's light and heat and everything else dependent on success, and not only don't we have any feasibility study or demonstration project, but we haven't started the basic research yet, and the building where the basic research is to be conducted won't be ready until 2025.**
- Meanwhile the country heads down a government-directed and coerced path of massively building wind turbines and solar panels, while forcing the closure of fully-functioning power plants burning coal, oil and natural gas. It is only a question of time before somewhere the system ceases to work.... [I]t is easy to see how the consequences could be dire. Will millions be left without heat in the dead of winter, in which case many will likely die? Will a fully-electrified transportation system get knocked out, stranding millions without ability to get to work? Will our military capabilities get disabled and enable some sort of attack?
- **No sane, let alone competent, government would ever be headed down this path.**

The Biden Administration's proposed transition to "net zero" via wind and solar power is not only not easy, but is a total fantasy. It likely cannot occur at all without dramatically undermining our economy, lifestyle and security, and it certainly cannot occur at anything remotely approaching reasonable cost. At some point, the ongoing forced transition will crash and burn.



(Photo by VCG via Getty Images)

With or without Congressional support, President Joe Biden has determined to move the U.S. as quickly as possible toward an economy predominantly powered by wind- and solar-sourced electricity. In his earliest days in office, Biden issued multiple Executive Orders directing the federal bureaucracy to bend all efforts to achieve this goal. [One of those early Executive Orders](#), dated January 27, 2021 and titled "Tackling the Climate Crisis At Home and Abroad," stated:

"It is the policy of my Administration to organize and deploy the full capacity of its agencies to combat the climate crisis to implement a Government-wide approach that reduces climate pollution in every sector of the economy..."

When burned to generate energy, fossil fuels -- coal, oil and natural gas -- all emit carbon dioxide, otherwise known in Biden-speak as "climate pollution." Thus, under Biden's directive, they are all to be suppressed. The alternative of expanding nuclear power has meanwhile equally been made impractical by regulatory obstruction; and our potential hydro-electric capacity is already mostly in use. That leaves as the principal remaining option the generation of more electricity from wind and solar facilities; and indeed, the wind/solar electricity option is currently the subject of great regulatory favor, including extensive government subsidies and tax benefits.

On last year's Earth Day, April 22, 2021, Biden [issued a press release](#) expanding on his Executive Orders and setting specific goals for the elimination of fossil fuels from the U.S. economy. Although Congress has not acted on any such proposals, the Earth Day press release supposedly committed the United States by unilateral executive action to "100 percent carbon pollution-free electricity by 2035," and to a "net zero emissions economy by no later than 2050."

We are thus as a country embarked on a government-ordered crash program to eliminate our fossil fuel electricity generation within a very short 13-year period, and to eliminate all usage of fossil fuels within a not-much-longer 28 years. When Biden and other advocates of wind and solar generation speak, they appear to believe that the challenge posed is just a matter of currently having too much fossil fuel generation and not enough wind and solar; and therefore, accomplishing the transition to "net zero" will be a simple matter of building sufficient wind and solar facilities and having those facilities replace the current ones that use the fossil fuels.

They are completely wrong about that.

The green energy advocates, including our President and his administration, entirely misperceive the challenge at hand. The proposed transition to "net zero" via wind and solar power is not only not easy, but is a total fantasy. It likely cannot occur at all without dramatically undermining our economy, lifestyle and security, and it certainly cannot occur at anything remotely approaching reasonable cost. At some point, the ongoing forced transition, should it continue, will inevitably hit physical and/or financial limits, and will crash and burn. But the circumstances under which the crashing and burning will occur are currently unknown. Thus, worse than being a mere fantasy, the attempt to accomplish a "net zero" transition is a highly *dangerous* fantasy, putting the lives, health, and security of all Americans at risk as the attempted transition proceeds to its inevitable failure.

The root of the mostly-unrecognized problem is that wind and solar generation facilities produce something fundamentally different from what fossil fuels produce. Fossil fuels produce energy that is reliable and dispatchable, that is, available when wanted and needed. The wind and sun produce energy that is intermittent, that is, available only when weather conditions permit, which often does not correspond to consumer demand.

Here is something that ought to be blindingly obvious, but unfortunately goes largely unmentioned in discussions of the green energy transition: **No amount of incremental wind and solar power generation on their own can ever provide a reliable 24/7 electricity grid.** Electricity gets produced the moment it is consumed, and therefore a reliable grid must provide electricity to meet consumer demand at all hours. To take just the most obvious example, wind turbines produce nothing when the wind is calm, and solar

panels produce nothing at night; and therefore, a combined wind/solar system produces nothing on a calm night. Unfortunately, peak electricity demand often occurs in the evening, shortly after sunset, when the wind is calm or close to it. Without full back-up from some source, an electrical grid powered by the wind and sun will experience, as just this one example, a full blackout on every calm night. And it doesn't matter whether you build a million wind turbines and solar panels, or a billion, or a trillion. On a calm night, they will still produce nothing, and will require full back-up from some other source.

Fossil fuels, and particularly natural gas, are fully capable of providing the back-up needed by a principally wind/solar electricity generation system. But our President now directs that fossil fuel back-up is "carbon pollution" and must be eliminated. The remaining option is storage of the energy from the time when it is produced (e.g., in the case of a wind/solar system, at noon on a windy June day) until the time when it is needed for consumption (e.g., 7 PM on a calm December night).

Which brings us to blindingly obvious statement number two: **If you propose a predominantly wind/solar electricity system, where fossil fuel back-up is banned, you must, repeat must, address the question of energy storage.** Without fossil fuel back-up, and with nuclear and hydro constrained, storage is the only remaining option. How much will be needed? How much will it cost? How long will the energy need to remain in storage before it is used? And, do storage systems exist that can store the energy for that period of time and return it without significant loss and at the rate required to keep the lights on?

If our government officials were remotely competent, while proposing a green energy transition for the country over a short period of years -- and with hundreds of billions of dollars, if not trillions, being spent on the imminent transition -- these questions should be at the forefront of their attention every day. Long before the U.S. ever got committed to transition to an energy system based mostly on wind and sun, it should quite obviously have been far down the road toward demonstration of the feasibility and cost of the energy storage systems that are capable of enabling the transition.

There should be highly-detailed engineering studies of how the transition can be accomplished. The requirements for amounts of batteries measured in gigawatt hours should be known at a high level of precision. The amounts of materials needed to produce the batteries should be known with an equally high level of precision. The technological capabilities of the batteries should be known with an also equally high level of precision (e.g., What is the optimum chemistry of the batteries to be used in the system? What will be loss of energy between input into the battery and consumption? How much in the way of additional generation facilities must be built to provide for this loss? How long can the batteries hold the charge? If charge added in June needs to be stored until December, do the proposed batteries have that capability? Do the proposed batteries need expensive climate control systems to enable them to hold the charge before it is used? And so on, and so on.)

Indeed, by this time, supposedly only 13 years from when we will have a carbon-free electricity system, there should be existing demonstration projects showing clearly what technology will be used, and that the proposed technology works and can be deployed at grid scale and at reasonable cost.

But the opposite is the case. At the current time, the government is paying little to no significant attention to the energy storage problem. There is no detailed engineering plan of how to accomplish the transition. There are no detailed government-supported studies of how much storage will be needed, or of what technology can accomplish the job, or of cost.

It gets worse: In the absence of any serious government effort to address the engineering challenge of energy storage necessary to back up a predominantly wind/solar electricity system,

the task has instead fallen to a small number of volunteer amateurs, mostly retired engineers of one sort or another. Several such people have produced credible calculations indicating that backing up a predominantly intermittent wind/solar electricity system using only battery storage will require storage in the range of approximately 30 days of average usage to avoid significant risk of the batteries running out of charge and the system crashing. The high amounts of storage required are largely a consequence of the seasonality inherent in either wind or solar generation, e.g., solar facilities produce far more electricity in the summer than the winter.

One example of a serious effort to determine how much and what type of energy storage would suffice to back up a fully wind/solar electricity system was produced in 2018 by a man named Roger Andrews, a retired engineer then living in Mexico. Andrews's work [appeared](#) on a website called Energy Matters in November 2018. Andrews considered two cases, one for California and the other for Germany, and obtained detailed data of electricity usage and of production by existing wind and solar facilities in those places in order to make his calculations.

Andrews' spreadsheets, and charts appearing in his post, demonstrate that, largely due to seasonality of production from both the sun and wind, it would take approximately 30 days of stored electricity usage to get through an entire year with a wind/solar system. Andrews showed that batteries to hold that amount of charge would cost in excess of a full year's GDP for either California or Germany, although, based on existing technology, batteries even at such enormous cost would not have the capability to hold the charge for sufficient months to fulfill their task. At the end of his post, Andrews concluded: "[B]attery storage is clearly not an option for a low-cost 100% renewable future."

In a more recent example, in January 2022, a man name Ken Gregory -- a retired engineer living in Calgary, Canada -- undertook to produce a spreadsheet calculating storage requirements and costs for backing up a wind/solar electricity system for the case of the entire United States. Gregory's work is accessible [at this link](#). Gregory's spreadsheet is based on detailed (in this case, hourly) data for actual consumption and generation from existing wind and solar facilities, with their wildly fluctuating output.

Gregory's principal result is that full back-up by storage of the U.S. electricity system at current levels of consumption, and assuming all generation comes from wind and solar, would require something in the range of 250,000 gigawatt hours of battery capacity. Some of that energy would need to remain in storage for over six months, and be discharged over the course of months. Since U.S. electricity consumption is currently in the range of [3.7 million GWH per year](#), the 250,000 GWH storage requirement calculated by Gregory represents about 24 days of average usage, a result in the same range as the result reached by Andrews. Gregory calculated the cost of such a system as well over \$100 trillion, before even getting to the question of whether battery technology exists that can store such amounts of energy for months on end and then discharge the energy over additional months. And even at that enormous cost, that calculation only applied to *current* levels of electricity consumption. The Biden "net zero" plan for 2050 involves the approximate *tripling* of electricity consumption, which by Gregory's calculations would drive the cost of the necessary storage up to the range of some \$400 trillion. For purposes of comparison, the entire U.S. GDP is currently around \$22 trillion per year.

Obviously Gregory's calculations could be questioned or modified as to many of his assumptions, and perhaps his calculation of the cost of such a system is too high -- or maybe, too low. The fact remains that if the U.S. government were even slightly competent, it would have its own detailed engineering studies of how to accomplish its coerced energy transition, let alone, at this late date, demonstration projects for

small cities or towns establishing the feasibility and cost of what is being proposed. None of that exists. Indeed, none of it is even in the works.

To fully understand the depths of incompetence with which the U.S. government is approaching this energy transition, consider the current effort of the federal Department of Energy called the Energy Storage Grand Challenge. Under this program, the DOE proposes to hand out grants to study the challenges of creating batteries to back up the electricity grid when the grid has gone almost fully wind/solar, and particularly to study the subject of the "long duration" batteries that will clearly be needed to store and then discharge massive amounts of energy over the course of months on end to deal with the issue of seasonality.

According to a piece that [appeared](#) in Energy Storage News in September 2021, here is the status of that effort: "The DOE is also helping to get a US \$75 million long-duration energy storage research centre built at Pacific Northwest National Laboratory, which is expected to open by or during 2025." In other words: we have a hundred-trillion-or-so dollar effort that under presidential directive must be fully up and running by 2035, with everybody's light and heat and everything else dependent on success, and not only don't we have any feasibility study or demonstration project, but we haven't started the basic research yet, and the building where the basic research is to be conducted won't be ready until 2025.

Meanwhile the country heads down a government-directed and coerced path of massively building wind turbines and solar panels, while forcing the closure of fully-functioning power plants burning coal, oil and natural gas. It is only a question of time before somewhere the system ceases to work. It is impossible to predict exactly when and where that will occur. But it is easy to see how the consequences could be dire. Will millions be left without heat in the dead of winter, in which case many will likely die? Will a fully-electrified transportation system get knocked out, stranding millions without ability to get to work? Will our military capabilities get disabled and enable some sort of attack?

No sane, let alone competent, government would ever be headed down this path.

* * *

Francis Menton is the President of the American Friends of the Global Warming Policy Foundation, and blogs at manhattancontrarian.com

👁 17,219 💬 144

DISCRIMINATION NOTICE
PRIVACY POLICY
DISCLAIMER
ADVERTISE WITH ZEROHEDGE

COPYRIGHT ©2009-2022 ZEROHEDGE.COM/ABC MEDIA, LTD

This site may attempt to sell you support for a few days (which I personally will follow up on when I can afford an investment). This discusses health issues with EMF (in solar on homes, in this case) that have been brought up by hospitals and sufferers, mostly ignored by solar installers until they hear anecdotal reports from people who have suffered and incidentally dovetails with the EMF questionnaire included in this packet:

https://www.shieldyourbody.com/solar-panels-emf-radiation/?billing_country=US

3. Environmental impacts. Wait! Didn't I say they were good for the environment? They do help with reducing greenhouse gases, but they are not without their own environmental issues. In order to make the panels, hazardous chemicals are used to clean the semiconductor surfaces. These chemicals may include acetone, hydrogen fluoride, sulfuric acid, trichloroethane and others. In the case of large-scale solar plants, large parcels of land must be cleared and can threaten wildlife habitat. And finally, the manufacturing process itself utilizes significant resources like water, fuel, transportation and chemicals.

4. Health impacts. It will probably come as a surprise to most people that having solar panels on their homes can cause serious health issues. Because the energy created must be converted from DC to AC, dirty electricity can be created and put on the home's electrical wires.

Many of the issues can be debated. Yes, there is an environmental impact in creating the panels, but over the lifespan of the system, the amount of greenhouse gases saved may outweigh the initial impact. The financial cost upfront can be prohibitive for some, but if you live in the home for at least 10-12 years, you will eventually come out ahead.

Many will even debate whether or not the impact on your health is real. Critics will say there is no scientific evidence showing there is a biological impact. For me, understanding if there are health implications is the most important consideration. While I'm a big fan of conserving energy and using more 'earth-friendly' energy sources, it is simply not worth risking the health of my family. So, let's take a deeper dive into what the scientific literature actually says.

Are Solar Panels Bad For Your Health?

In order to answer this question, remember that solar panels create direct current, which must be converted to alternating current in order to power your home's electricity and appliances. The system's inverter takes the low-voltage, high-current signals and converts them to 120-volt or 240-volt alternating current. It's this conversion that creates what we call 'Microsurge Electrical Pollution' or 'Dirty Electricity' (DE).

Dirty electricity is considered one of the four main fields that a Building Biologist or other EMF consultant would be concerned about in your home. In addition to testing your home for radio frequency, electric fields, and magnetic fields, the consultant will spend a significant amount of time measuring your DE fields as they can be among the most biologically harmful.

DE is also referred to as 'hash', 'noise', 'electromagnetic interference', 'dirty power', 'transients', and

other terms. It's essentially an altered sine wave on your 50 or 60Hz AC power line (50Hz in Europe and 60Hz in the US.) Harmonics or frequencies outside of the 50-60Hz standard cycle is considered dirty electricity.

If you're reading this blog, then you've likely heard of electromagnetic fields (EMF) causing health issues for some people. Again, when we talk about EMF radiation, we're talking about electromagnetic fields that come from electric fields, radiofrequency, magnetic fields, and of course, dirty electricity. In my experience, DE has been the most underappreciated and misunderstood of the four main fields. When I'm working with a very sensitive client, it's very often the DE that is causing the most symptoms.

Solar Energy and EHS

People who experience electrohypersensitivity (EHS) report a variety of different symptoms like headaches, tinnitus, insomnia, muscle weakness, anxiety, depression, cramping, irritability, memory issues, cognitive decline, and many others. While these people are often labeled as being 'hyper-sensitive', it does not mean that they are the only ones being affected. The human body is an electric being. It communicates via its own electric signals. When we expose the body to non-native electric signals like EMFs, then that communication can be disrupted.

I don't want to spend too much time here explaining exactly how EMF radiation affects us on a cellular level, but if you want to dig into this a bit deeper, I suggest checking out the work of Dr. Martin Pall. See his YouTube channel [here](#).



From Dr. Pall's work and others, we know that EMF radiation affects our biology acutely.

From Dr. Pall's work and others, we know that EMF radiation affects our biology acutely. Like with many things, some people are more affected by this than others. Those who are 'hyper' sensitive, can feel the effects of EMF immediately, and the symptoms can be debilitating. The interesting thing is that some

sensitive people will react more strongly to radio frequency, while others react the most severely to magnetic fields, still others react to electric fields, and some people will have the most problems with dirty electricity.

We don't really know why people react differently to different fields. Anecdotally, however, the most sensitive people I know react the most severely to DE as I mentioned above. And then there are numerous people who are having EHS symptoms, but they haven't made the connection that their problems are caused by these frequencies!

The Health Effects of Dirty Electricity

While Dr. Pall's work focuses on how EMFs affect the cells on a general level, what about DE specifically? Thanks to the work of Dave Stetzer and Sam Milham, there has been significant research in this area. They have found that DE can increase behavior and attention issues; there is a correlation between DE and cancer diagnosis' as well as with Chronic Fatigue Syndrome; chronic stress and neurotransmitter issues can be influenced by DE; DE can negatively impact blood sugar response, and a lot more. Even without this research, I have witnessed among my clients how much DE can impact a person's health.

I wanted to point this out, because it's an important thing to understand when you're considering bringing new items into your home. Maybe you already have your Internet hardwired and keep your phone on airplane mode. There is a lot of awareness around these issues already, but not so much with things like energy-saving appliances and solar panels.

So the big question is, how much dirty electricity does solar emit, and is it enough to impact my health?

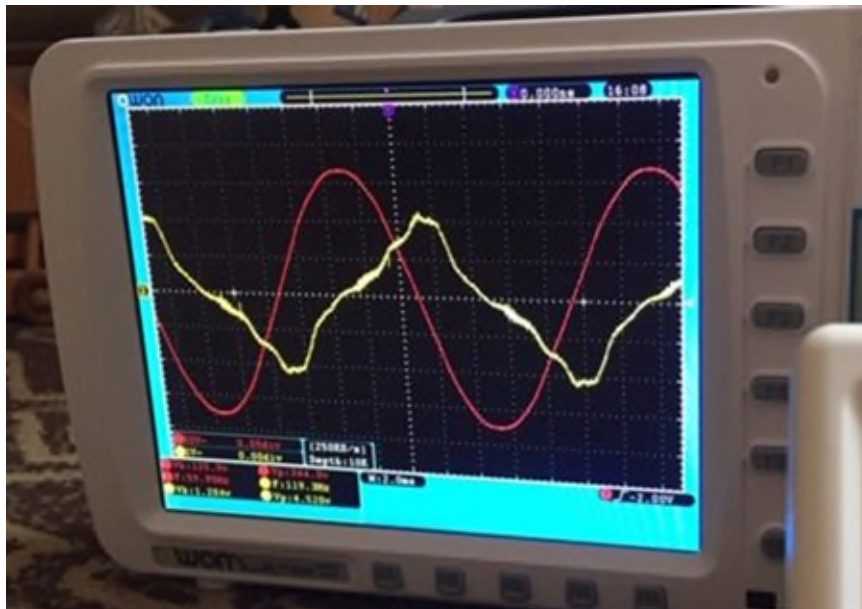
How Much EMF Radiation Do Solar Panels Emit?

How much EMF radiation – in the form of dirty electricity – solar panels emit will vary. There are many considerations like the size of the panel, how many panels there are, how much sun is present, other sources of DE inside the home, how efficient the inverter is, etc. There is no way for anyone to say, solar panels give off xx amount of dirty electricity. You have to account for all the variables, and measure with a variety of DE meters.

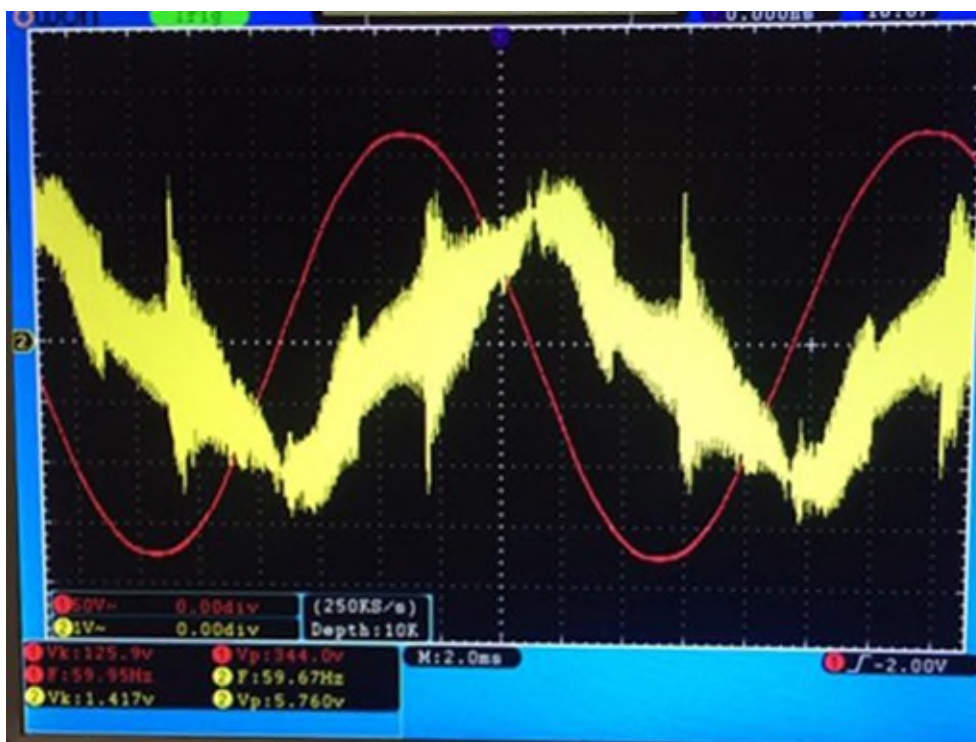
When I measure DE inside a home I use a Graham Stetzer meter, a Greenwave Meter, an Owon Oscilloscope, and Picoscope. This combination of meters will give me measurements in different frequencies and the oscilloscope and Picoscope will show a visual representation of the amount of DE. Measuring is the only way to know how much DE you have in your home.

So then, how can we know if solar panels will cause a problem for us before we ever install them?

Let me offer you a bit of reference here. I almost always see elevated levels of DE in people's homes. Often the source is an LED or CFL lightbulb. Using my oscilloscope, I first like to measure inside the home with everything turned off. Here is a picture of my scope in a recent survey I completed. Note the form of the yellow sine wave. That's more or less how we like it to look. A nice, smooth, thin wave going up and down.

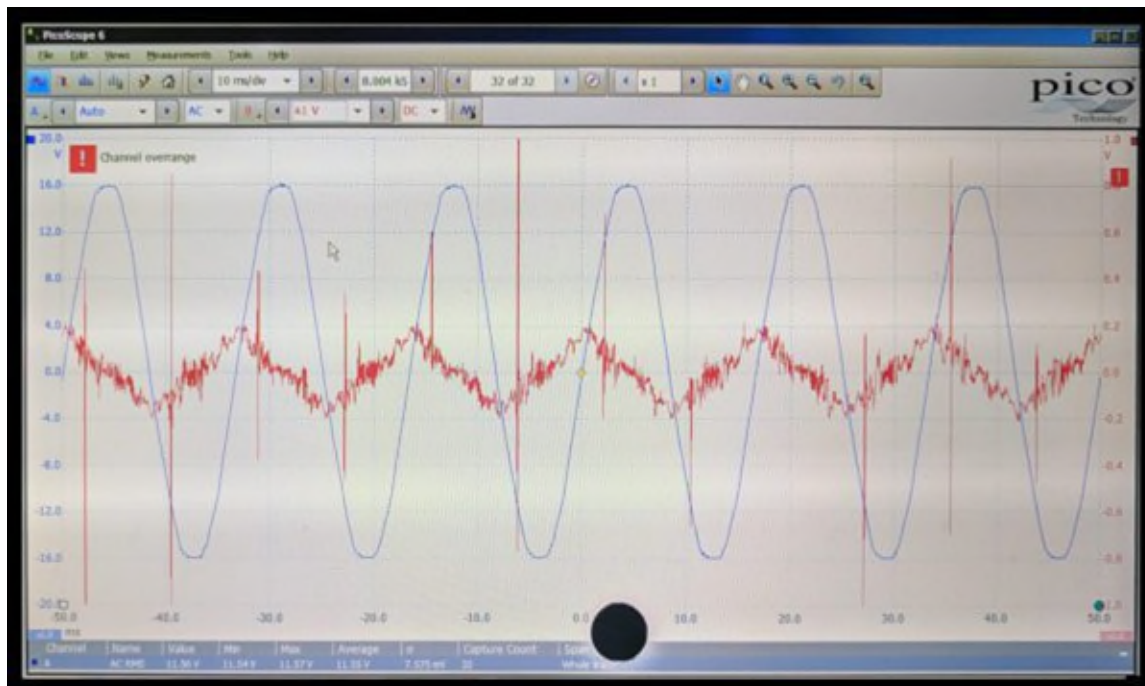


Next I began to turn things on in the house to see if that sine wave changed at all. This is what happened when I turned on one fluorescent lightbulb.

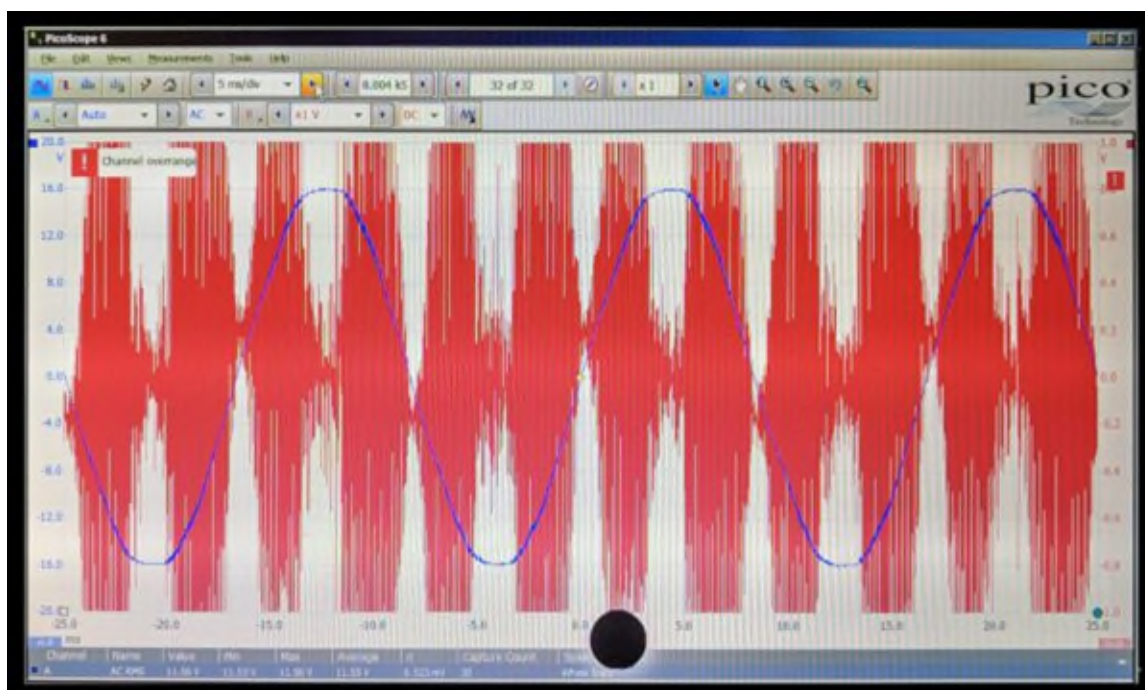


This is quite a significant increase in the dirty electricity. You can definitely expect that to cause health issues. And remember, this was just ONE lightbulb! I see the same thing with computer chargers, LED lights, TVs, and pretty much all energy-saving appliances. If very small devices can contribute so significantly, then I guarantee you that solar panels will have a much more significant impact given the amount of DC to AC conversion they must complete.

In fact, this is exactly what we see when we test solar. A colleague of mine named William Holland (an excellent EMF-aware electrician in Southern California – check out his informative website [here](#)) took these pictures of his Picoscope while testing a home with a Tesla Powerwall (a type of battery storage for solar power) that utilizes solar panels. This is what the home's sine wave looked like with the Powerwall off:



And here is what it looks like with the Powerwall turned on:

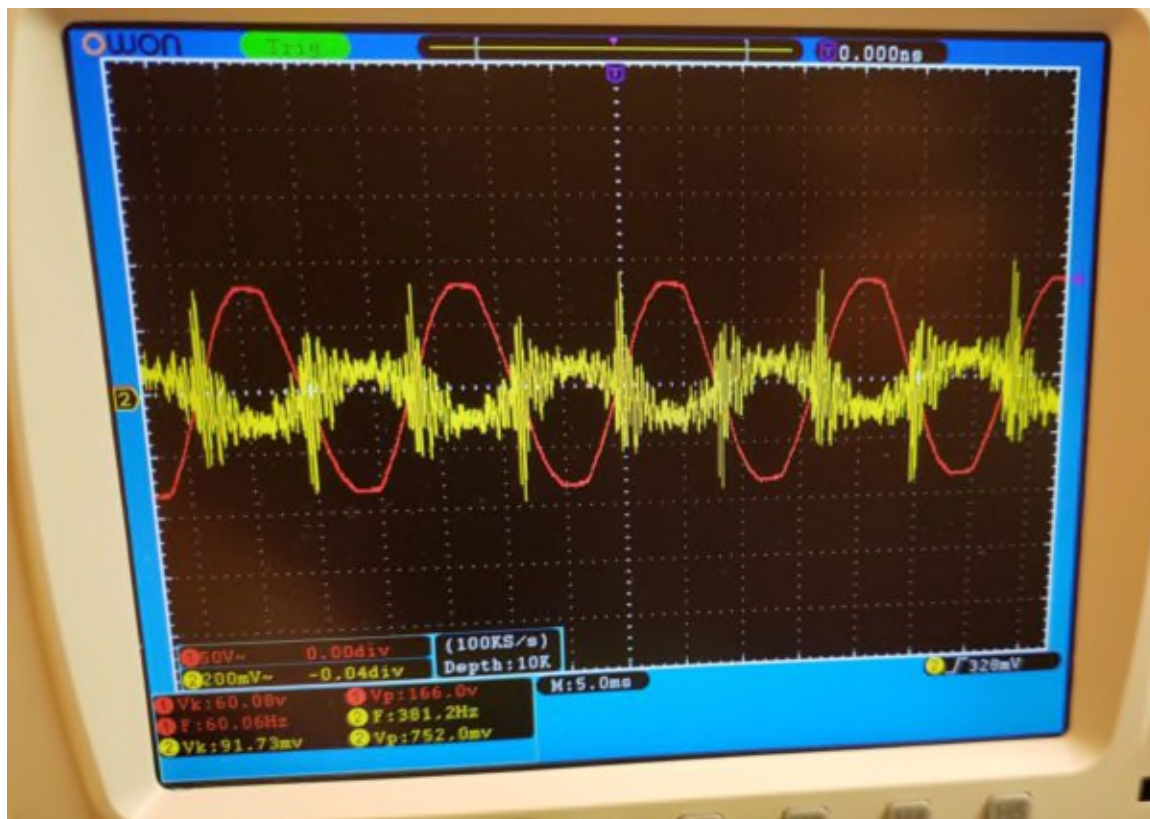


EMF and solar power - dirty electricity reading examples.

Note that on top of the Powerwall, Tesla recently announced the release of their own Tesla brand inverter. A unique feature of the Tesla inverter is over-the-air updates – meaning the device's software can be updated on the fly via Wi-Fi, Ethernet or cellular connectivity – as well as app connectivity for power management. So there's a whole spectrum of EMF being emitted by devices like Tesla's on top of the dirty electricity.

While I don't have any read-outs from the Tesla inverter at this stage, it would be interesting to test.

Another colleague of mine, Dave Green, who lives in Michigan captured this image on his Oscilloscope from his own home's solar panels that use microinverters.



EMF radiation and solar panels - oscilloscope reading.

And finally, if you want to see this in action, I suggest you watch these videos taken by Building Biologist Eric Windheim in Sacramento. [follow link at the top on the internet to see the videos]

Solar Panels & EMF: What Should You Do?

I believe these pictures and videos speak for themselves. There is no doubt that solar panels add an extreme level of DE to your home's wiring. And knowing what we know about the biological impacts of DE, this is simply not a risk I'm willing to take. I have clients that insisted on installing solar even after I explained the concerns to them. For various reasons they thought they could handle the DE, largely

because they didn't feel as though they were sensitive. Sadly, they became sensitive after living with the elevated levels after just a few weeks.

Now, I should say that this hasn't happened with everyone. Certainly there are people that have solar panels on their homes and they are seemingly quite healthy and don't exhibit any EHS symptoms. That's obviously a very good thing. I just hope they don't develop symptoms or health problems at some point in the future.

I should also note that there are some companies out there that claim to do solar the 'right way' to minimize this DE issue. So far I haven't seen this to be true. I personally have not tested homes with these filters, but I have colleagues that have. They have reported the same levels of DE and associated health symptoms as other solar systems.

In conclusion, it's an unfortunate fact that solar panel systems do create extreme levels of EMF in the form of dirty electricity. While you may not feel the health effects from it directly, it doesn't mean that it's not impacting you. While I personally try to practice energy-saving behaviors as much as possible, I do so by reducing my consumption of electricity, rather than using energy-saving devices. The risks simply are not worth it.

With the increasing awareness of EMFs and the health implications involved, it is my hope that manufacturers of 'green' technology will begin to account for this issue in the near future. Meanwhile, I will continue to turn off breakers at night, use electricity sparingly, and enjoy the ambience of reading by candlelight.

<https://sign.moveon.org/petitions/industrial-solar-dirty-electricity>

INDUSTRIAL SOLAR = NOT CLEAN ENERGY

This is an urgent and unprecedented matter that needs your full attention at this very moment. A Boston Globe article published at the end of December 2021 highlights that New England is heating up faster than anywhere else on the planet. Industrial solar facilities are adding heat into our atmosphere and disrupting the climate. Studies in many deserts have proven that large industrial solar arrays heat up the air around them. I will cite those articles shortly. I have reached out to professors from Boston University, Yale, Salem State, Harvard, Maryland University, and Lancaster to request immediate testing on industrial solar facilities in New England, because no studies have been released documenting what industrial solar companies are doing to our climate here, in our backyards.

I live in Conway, Ma, with my husband and two children, and we as well as our neighbors have been directly affected by one of these large industrial solar arrays installed by the company NeXamp. My neighbors and I urge you to take away subsidy benefits for solar companies such as NeXamp that clear-cut forests while touting they are promoting "clean energy." What they are doing is the exact opposite of clean energy.

We have been exposed to a thing called "dirty electricity" from their solar array, and this is extremely harmful to human health, mentally and physically! Their solar array has been shut down by Eversource until they "figure out" the problem! The high-frequency electrical noise is awful, and it comes out of our light-bulbs, outlets, and many other electrical devices.

Why is this important?

We need people to understand what Nexamp has done to us and our small community! Other large industrial solar companies are also doing this to other communities:

LAWSUIT THREAT. Nexamp threatened to take the town to court because we were concerned about native wildlife and requested a larger buffer between the clear-cutting of the forest and wetland. Nexamp wanted to clear-cut 10 feet away from a wetland.

ENVIRONMENTAL POLLUTION AND EROSION. Nexamp promised no noise or environmental disruption, but they lied.

We endured the stressful deforestation of 30 acres in our backyards.

A diesel generator ran 24/7 for 8 months for "climate control" of batteries on site, which caused noise and air pollution.

Lots of litter blew onto our land and into wetland streams. We documented the litter, picked it up, and notified the DEP.

Heavy, loud freight trucks used Conway's small town roads and exceeded bridge weight limits to make

large deliveries constantly at early hours during construction, stressing road surfaces and disrupting our rural neighborhood's quality of life.

Erosion took place in numerous areas around the site, some going into neighboring wetlands (still not remediated), abutters' properties, and a public road..

Nexamp allowed rock dust from drilling and dirt dust from fill brought on site created storms of dust that blew around our homes during the hottest days from failure to have water trucks on site. This caused air pollution affecting our families and native wildlife.

VIOLATION OF ABUTTERS' BOUNDARIES. Nexamp went over the property lines of abutting neighbors with silt fencing, using inadequate data to accurately make site plans realistic for visibility from abutting neighbors due to tree cover and topography of land

PANEL VISIBILITY. Nexamp promised the array would not be visible because it is situated on a high ledge, but we can see the panels from our home windows and from the public road. This eyesore has taken away beauty from our small rural town and disgusted many residents.

POWER SURGES AND OUTAGES. When the array went "live" the neighborhood experienced random power surges and outages due to Nexamp's faulty equipment.. This affected many people working from home and the performance of appliances and electronic systems.

HARMFUL EXPOSURE TO "DIRTY ELECTRICITY." After the array went live, harmful high-frequency dirty electricity (confirmed by Eversource) was broadcast into our homes for 7 months, affecting our children's mental health, as well as the adults. Because of this urgent problem, Eversource shut down Nexamp's solar array on 1/14/22. Subsequently most of the children's aggressive, angry behaviors have changed; their demeanor is back to normal being happier and sleeping better. (Teachers and doctors are documenting this.) Also, my neighbor and I have developed tinnitus from exposure, all due to Nexamp's faulty equipment.

NO CLIMATE STUDIES. There have been NO studies done in New England on how these arrays are affecting the climate. One panel can get to 149 degrees Fahrenheit on a summer day! If there are 18,000 panels, it doesn't take a rocket scientist to figure out that these arrays are giant ovens heating up New England's landscape. We need to stop allowing industrial solar to prey on small rural communities with inadequate bylaws, put people's health in jeopardy, and wipe out native wildlife, many of which are in steep decline and becoming endangered. Temperature monitors need to be in place in and around every array built, and the public needs access to these numbers. We have every right to know how hot these industrial solar parks can become and how they affect the climate around them, and have resources for people to report dirty electricity!

Please see these links for more information:

<https://www.bostonglobe.com/2021/12/30/science/new-england-is-warming-faster-than-rest-planet-new-study-finds/>

<https://phys.org/news/2016-11-solar-island-effect-large-scale-power.html>

<https://www.techtimes.com/articles/257268/20210221/sahara-desert-solar-panels-are-contributing-to-global-warming-scientists-find-out.htm>

<https://www.dirtyelectricity.org/adhd>

<https://pubmed.ncbi.nlm.nih.gov/18556048/>

<https://www.bostonsolar.us/solar-blog-resource-center/blog/how-do-temperature-and-shade-affect-solar-panel-efficiency/#:~:text=Solar%20panels%20are%20generally%20tested,%C2%B0F%20during%20the%20summer.>



OVERSENSITIVE

HOW THE IPCC HID THE GOOD NEWS ON GLOBAL WARMING

Nicholas Lewis and Marcel Crok

Foreword by Professor Judith Curry

The Global Warming Policy Foundation
GWPF Report 12

OVERSENSITIVE

How the IPCC hid the good news on global warming

Nicholas Lewis and Marcel Crok

Foreword by Professor Judith Curry

ISBN 978-0-9573880-1-9

©Copyright 2014 The Global Warming Policy Foundation

Contents

Contents	1
Foreword	3
About the authors	5
Executive summary	7
Introduction	9
Unexpected decision in the Fifth Assessment	10
History of climate sensitivity estimates	11
Observations indicate a low climate sensitivity	12
Evidence for low climate sensitivity piling up	17
Poor estimates obscure the issue	19
What will the future bring?	26
Conclusions	30
Notes	32
References	35

Foreword

The sensitivity of our climate to increasing concentrations of carbon dioxide is at the heart of the scientific debate on anthropogenic climate change, and also the public debate on the appropriate policy response to increasing carbon dioxide in the atmosphere. Climate sensitivity and estimates of its uncertainty are key inputs into the economic models that drive cost-benefit analyses and estimates of the social cost of carbon.

The complexity and nuances of the issue of climate sensitivity to increasing carbon dioxide are not easily discerned from reading the Summary for Policy Makers of the Assessment Reports undertaken by the Intergovernmental Panel on Climate Change (IPCC). Further, the more detailed discussion of climate sensitivity in the text of the full Working Group I Reports lacks context or an explanation that is easily understood by anyone not actively reading the published literature.

This report by Nic Lewis and Marcel Crok addresses this gap between the IPCC assessments and the primary scientific literature by providing an overview of the different methods for estimating climate sensitivity and a historical perspective on IPCC's assessments of climate sensitivity. The report also provides an independent assessment of the different methods for estimating climate sensitivity and a critique of the IPCC AR4 and AR5 assessments of climate sensitivity. This report emphasizes the point that evidence for low climate sensitivity is piling up. I find this report to be a useful contribution to scientific debate on this topic, as well as an important contribution to the public dialogue and debate on the subject of climate change policy.

I agreed to review this report and write this Foreword since I hold both authors of this report in high regard. I have followed with interest Nic Lewis' emergence as an independent climate scientist and his success in publishing papers in major peer reviewed journals on the topic of climate sensitivity, and I have endeavored to support and publicize his research. I have interacted with Marcel Crok over the years and appreciate his insightful analyses, most recently as a participant in climatedialogue.org.

The collaboration of these two authors in writing this report has resulted in a technically sound, well-organized and readily comprehensible report on the scientific issues surrounding climate sensitivity and the deliberations of the IPCC on this topic.

While writing this Foreword, I considered the very few options available for publishing a report such as this paper by Lewis and Crok. I am appreciative of the GWPF for publishing and publicizing this report. Public accountability of governmental and intergovernmental climate science and policy analysis is enhanced by independent assessments of their conclusions and arguments.

Judith Curry
Atlanta, GA, USA
February 2014

Judith Curry is Professor and Chair of the School of Earth and Atmospheric Sciences at the Georgia Institute of Technology. She is a fellow of the American Meteorological Society, the American Association for the Advancement of Science, and the American Geophysical Union.

About the authors

Nic Lewis

Nic Lewis is an independent climate scientist. He studied mathematics and physics at Cambridge University, but until about five years ago worked in other fields. Since then he has been researching in climate science and in areas of statistics of relevance to climate science. Over the last few years he has concentrated mainly on the problem of estimating climate sensitivity and related key climate system properties. He has worked with prominent IPCC lead authors on a key paper in the area. He is also sole author of a recent paper that reassessed a climate sensitivity study featured in the IPCC AR4 report, showing that the subjective statistical method it used greatly overstated the risk of climate sensitivity being very high. Both papers are cited and discussed in the IPCC's recently released Fifth Assessment Report.

Marcel Crok

Marcel Crok is a freelance science writer based in Amsterdam, The Netherlands. He used to work as an editor for *Natuurwetenschap & Techniek*, a Dutch popular science magazine (recently this magazine has become the Dutch edition of *New Scientist*). In 2005 he published a long article about the infamous hockey stick graph, featuring the criticism of Stephen McIntyre and Ross McKittrick. He published a Dutch book about global warming in 2010. After Climategate and the turmoil surrounding the AR4 IPCC report the Dutch government asked him to review the fifth IPCC assessment report as an expert reviewer. With the leading Dutch climate institutes KNMI and PBL, Crok also set up an international discussion platform, climatedialogue.org, which facilitates constructive dialogues between scientists with different views.

Executive summary

Climate sensitivity is an estimate of how much global warming will result from a doubling of carbon dioxide concentrations, and is a key measure in the climate policy debate.

Previously scientists have estimated climate sensitivity mainly from computer model simulations of the climate system. For the last two generations of models, the value for long-term warming has averaged 3.2°C per doubling. Due to the moderating effect of the ocean, such warming takes many centuries to be fully realised. Over a seventy year period – relevant to warming in the second half of this century – during which carbon dioxide concentrations double, computer climate models show an average temperature rise of around 2°C.

With these values the total warming will cross the iconic two degrees limit later this century – perhaps in only about thirty years under the highest emissions scenario.

Only in recent years has it become possible to make good empirical estimates of climate sensitivity from observational data such as temperature and ocean heat records. These estimates, published in leading scientific journals, point to climate sensitivity per doubling most likely being under 2°C for long-term warming, and under 1.5°C over a seventy-year period. This strongly suggests that climate models display too much sensitivity to carbon dioxide concentrations and in almost all cases exaggerate the likely path of global warming.

Although these new results are reported in the body of the recently-published Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), their impact is not made clear and few readers of the report would learn of them.

In the Fourth Assessment Report of the IPCC, the empirical estimates of climate sensitivity were largely based on poor data and used an inappropriate statistical basis, biasing them towards higher values of climate sensitivity and thus making the global warming problem appear 'worse'. In the recent Fifth Assessment Report, many studies still use inappropriate data and/or statistical methodology.

Between the Fourth and Fifth Assessment Reports the best estimate of the cooling effect of aerosol pollution was greatly reduced. That necessarily implies a substantially lower estimate for climate sensitivity than before. But the

new evidence about aerosol cooling is not reflected in the computer climate models. This is one of the reasons that a typical climate model has a substantially higher climate sensitivity than would be expected from observations: if a model didn't have a high climate sensitivity, its excessive aerosol cooling would prevent it matching historical warming.

Good empirical estimates of both long-term warming and that over a seventy-year period now imply very different expectations of future warming than do climate models – some 40% to 50% lower to 2081–2100. This is almost certainly the most important finding of climate science in recent years, particularly since there are good reasons to doubt the reliability of climate model forecasts. However, in its report the IPCC only alludes to this issue in an oblique fashion. Moreover, rather than reducing its best estimate of climate sensitivity in the light of the new empirical estimates, it simply reduced the lower bound of the uncertainty range and omitted to give a best estimate, without adequately explaining why it had been necessary to do so. Only in the final report published in January 2014 was a paragraph added in the Technical Summary giving slightly more explanation.

The new information on climate sensitivity suggests that even with relatively high emissions the government's two-degree limit for global warming is likely to be reached only towards the end of the century.

Introduction

This report is a reaction to the scientific part (WG1) of the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report (AR5). This report focuses on how AR5 dealt with climate sensitivity, a key parameter in global warming policy decisions. Put very simply, if climate sensitivity is high then we can expect substantial warming in the coming century if greenhouse gas emissions are not severely reduced. If climate sensitivity is low, then future warming will be substantially lower, as will the rise in sea level, and the environmental threat posed by carbon dioxide emissions is necessarily smaller.

Climate sensitivity relates changes in surface temperature to changes in the warming influence of greenhouse gases and other agents affecting the Earth's radiation balance. It is defined as the amount of global surface warming that eventually results when the concentration of atmospheric carbon dioxide doubles.¹ The term generally refers to the rise in temperature once the climate system has fully warmed up, a process taking over a thousand years. This long-term measure, termed 'equilibrium climate sensitivity' (ECS), is most widely used. A shorter term measure of sensitivity, transient climate response (TCR), represents the extent of global warming over a 70-year timeframe.

In a very apt 1998 paper Van der Sluijs noted that the concept of climate sensitivity 'acts as an "anchor" that fixes the scientific basis for the climate policy debate'.² Not only is it scientifically important but it drives estimates of the economic harm done by global warming and hence directly affects policy decisions.

In the international policy arena, the ultimate, two-decade-old goal is to limit global warming to a level that prevents 'dangerous anthropogenic interference' with the climate. In recent years this has been somewhat arbitrarily defined as preventing warming more than 2°C above preindustrial temperatures. We are already about 0.8°C on the way to this level of warming and have only 1.2°C to go. With a climate sensitivity of 3°C, consistent with climate models, 2°C of warming will very probably be reached later this century, depending mainly on how quickly emissions of greenhouse gases rise.

However, the scientific validity of the two-degree target has been questioned.³ For example Jaeger (2011) noted that:

The 2° limit has emerged nearly by chance, and it has evolved in a somewhat contradictory fashion: policy makers have treated it as a scientific finding, scientists as a political issue. It has been presented as a threshold separating a domain of safety from one of catastrophe, and as an optimal strategy balancing costs and benefits.

Tol (2007) concluded that ‘this target is supported by rather thin arguments, based on inadequate methods, sloppy reasoning, and selective citation from a very narrow set of studies’.

This report is written for the lay reader, and summarises a longer, more technical document which is available online.⁴

Unexpected decision in the Fifth Assessment

For over thirty years, international assessments of climate science, including those of the IPCC, have presented an uncertainty range and a best estimate of ECS. In most cases, the uncertainty range has been given as 1.5–4.5°C and the best estimate as 3°C. Only the third assessment report, published in 2001, did not give a best estimate. In the last IPCC report, AR4, the authors raised the low-end of the ‘likely’ range – the central two-thirds probability – to 2°C. But the AR5 reduced the lower bound back to 1.5°C, in effect admitting that the assessment in AR4 was suspect.

An unanticipated decision in AR5 was that the report did not provide a best estimate for ECS, an omission that readers might have expected to be fully explained and justified in the Summary for Policymakers (SPM) and the accepted version of the full report released a few days after the SPM. However, this was hardly the case. The interested reader was left with a footnote in the SPM, which merely stated that no best estimate could be given ‘because of a lack of agreement on values across assessed lines of evidence and studies’. (SPM, footnote 16)

The value of ECS is arguably the most important parameter in climate science, and the decision not to offer any guidance as to whether its best estimate lies towards the bottom, in the middle or towards the top of the ‘likely’ range was unexpected. To find only a limited explanation and then only in a footnote is rather surprising.

There was, however, some explanation for the reduction in the lower bound of the ‘likely’ range for climate sensitivity (our emphasis):

The lower temperature limit of the assessed likely range is thus less than the 2°C in the AR4, but the upper limit is the same. *This assessment reflects improved understanding, the extended temperature record in the atmosphere and ocean, and new estimates of radiative forcing.*⁵

We believe that this paragraph, and in particular the highlighted sentence, reveals why no best estimate was given, but we think that few readers will have noted it. Specifically, new evidence as to the level of climate forcing, combined with the stability of global temperature since the AR4 report, has yielded empirical sensitivity estimates noticeably lower than those of the computer models on which so much of the IPCC report is based. (Forcing is the technical term for the influence of greenhouse gases and other agents on the radiation balance of the climate.) In order to identify a 'best' estimate, the IPCC authors would have had to choose between the data or the models, with potentially embarrassing consequences either way. While we agree with the text as such, we believe the consequences of the 'improved understanding' are more far-reaching than the IPCC AR5 report has let on. In this report we will explain why.

History of climate sensitivity estimates

A National Academy of Sciences' report in 1979 (the Charney report) is regarded as the first major assessment of climate sensitivity. For most of the period since that time, ECS has been estimated using complex computer simulations of the climate – so-called 'general circulation models' (GCMs). Both the previous generation (CMIP3) of GCMs used for AR4 and the current (CMIP5) GCMs used for AR5 have an average ECS estimated as 3.2°C. Earlier GCMs also had average ECS values of around 3°C.

The range and the best estimate of ECS in official reports over the same period has fairly closely reflected the range and average for the GCMs (see Table 1).

The table also shows the evolution of the range for TCR since it was first given in 2001. TCR is also estimated from GCM simulations and, although the IPCC has never published a best-estimate figure, the average of their estimates is between 1.8°C and 1.9°C per doubling of carbon dioxide concentration.

Van der Sluijs (1998) looked at the reasons why the range for climate sensitivity has changed so little over time while the science has evolved enormously.⁶ He concluded that the range was only partly determined by the science itself and that lots of other factors played a role. Among them was 'a need to create and maintain a robust scientific basis' to support policy action.

As this report will make clear, the 1998 historical analysis of Van der Sluijs still applies today. However, we will argue that the scientific evidence supporting a substantial change in both the range and the best estimate for climate sensitivity is now so strong that any serious scientific assessment should describe it in detail.

Table 1: Evolution of equilibrium climate sensitivity estimates in the last 35 years and the range for transient climate response since 2001

	ECS Range (°C)	ECS Best estimate (°C)	TCR Range (°C)
Charney Report 1979	1.5–4.5	3.0	
NAS Report 1983	1.5–4.5	3.0	
Villach Conference 1985	1.5–4.5	3.0	
IPCC First Assessment 1990	1.5–4.5	2.5	
IPCC Second Assessment 1995	1.5–4.5	2.5	
IPCC Third Assessment 2001	1.5–4.5	None given	1.1–3.1 ^a
IPCC Fourth Assessment 2007	2.0–4.5	3.0	1.0–3.0
IPCC Fifth Assessment 2013	1.5–4.5	None given	1.0–2.5

^aRange based on models only.

Observations indicate a low climate sensitivity

As noted above, computer simulations of the climate by GCMs have been the main source of estimates of ECS and TCR. Until nearly the end of the twentieth century, records of factors affecting the climate and of changes in the climate itself were too uncertain to quantify any anthropogenic climate ‘signal’ above the ‘noise’ of natural climate variability. However, since that time the signal has become stronger and it has become practicable to derive good estimates of ECS using observational data from the period since 1850, the so-called ‘instrumental’ period.

Energy budget estimates of climate sensitivity

The simplest such approach, first described by the UK scientist Jonathan Gregory and colleagues in 2002,⁷ relied on a basic physical principle: the conservation of energy.⁸ This is a stark contrast to the highly complex and highly uncertain modelling of physics in a GCM, and means that Gregory’s so-called ‘energy budget’ method of estimating climate sensitivity is particularly robust. Energy budget estimates in effect represent a gold standard, provided the observational values and estimates used to construct them are realistic. Note, however, that the Gregory study relied to some extent on computer simulations, mostly because at that time there were no suitable observational estimates of the effects of pollution (‘aerosols’) on climate; the study was therefore not entirely empirical.

The Gregory et al. best estimate⁹ for ECS came out at the very high value of 6.1°C and was presented in a prominent figure in AR4. However, one of this report's authors (Lewis) has since worked his way through the Gregory et al. method and discovered that the ocean heat content (OHC) dataset used was erroneous, and that a surprisingly small change in forcing was used.¹⁰ When suitable corrections and different forcing data were applied, the new ECS estimate was only 1.8°C, and the result was much better constrained.

How the Fourth Assessment got its sensitivity estimate wrong

Before discussing how climate sensitivity was treated in the AR5 report, it is useful first to discuss how the subject was presented in the fourth IPCC report, published in 2007. Figure 9.20 in AR4 WGI described a range of estimates of ECS using so-called probability density functions (PDFs). These PDFs are replicated in Figure 1. Each curve represents a separate estimate, with the position of the peak representing the most likely value¹¹ of ECS and the shape of the curve representing the uncertainty in that estimate. For example, good estimates will have tall, narrow peaks, while uncertain ones will have low wide ones.

The graph shows eight observationally-based ECS studies (one of these was based on palaeoclimate data – see below – rather than instrumental observations). The dotted black line is our addition to those appearing in the original Figure 9.20. We will comment briefly on the various studies to which these PDFs relate.

Most of the studies have identifiable methodological and/or data shortcomings. The shortcomings in the Gregory et al. (2002) estimate have already been discussed. The PDF of Hegerl et al. (2006), a palaeoclimate study, is so broad as to provide almost no useful information about the value of ECS. Likewise Knutti et al. (2002) did not provide any useful constraint and the results were also biased upwards by use of the same erroneous OHC dataset as Gregory et al. (2002).

Most of the studies adopted a Bayesian statistical approach. In Bayesian analysis, rather than simply calculating a result, a starting position (the 'prior') is updated based on new data. The Bayesian approach is well suited to dealing with uncertain parameters and its use is not particularly controversial. But readers

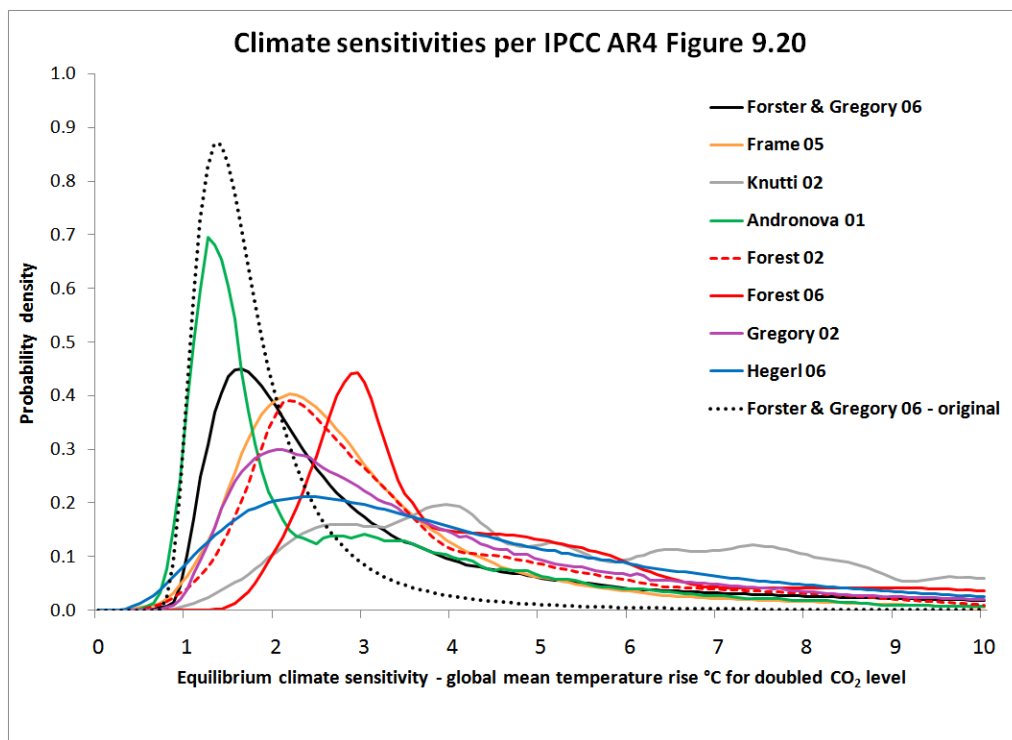


Figure 1: Replication of PDFs from Figure 9.20 in AR4 WGI

The dotted black line is an addition to those appearing in Figure 9.20 and shows the original results of Forster/Gregory (2006). All PDFs were scaled in AR4 to allocate all probability (one in total) between 0°C and 10°C.

of scientific reports based on Bayesian analysis can easily overlook the fact that the choice of prior can significantly affect the result. If the chosen prior is itself controversial, this sharply downgrades the robustness of any findings.

Although the design of scientific studies may be informed by existing knowledge, once designed it is normal for their results only to reflect knowledge gained from the data used. Therefore, it is necessary for the prior estimate properly to represent, in mathematical terms, ignorance about climate sensitivity, not what the researcher believes about it before seeing the new data. In other words, the prior should be chosen to have minimal influence on the resulting ECS estimate: it should let the data 'speak for themselves'. Hardly any of the priors used in AR4 and AR5 satisfied this requirement.

Of the studies underlying the PDFs in Figure 1, five (Knutti et al., Hegerl et al. and three others) used priors that were scientifically controversial and strongly

Oversensitive

biased their ECS estimates upwards. In addition, one of these other studies¹² was affected by statistical errors and poor experimental design, another¹³ used erroneous OHC change data, and a third was affected by both these errors.¹⁴ Still another study¹⁵ had unrealistic input assumptions and also appears to have been affected by an error in its computer code that substantially biased upwards its estimate for ECS.¹⁶

Only one ECS study featured in AR4 stands out as being free of these defects: Forster and Gregory (2006). Unlike all the other instrumental studies, it derived an estimate that was almost fully based on observations, and it did not have evident flaws such as faulty data or methodology. The authors did not use the energy budget approach, but instead used satellite measurements of changes in radiation at the top of the atmosphere and related those to changes in the global temperature. This gave them a direct estimate of climate sensitivity, with little dependence on changes in aerosols, the most important source of uncertainty in energy budget and computer simulation estimates. In their original paper their results were fairly tightly constrained, meaning that the range of possible values for climate sensitivity was limited. Their best estimate was 1.6°C.

However, in AR4 the IPCC misrepresented the Forster and Gregory results by restating them on the same inappropriate Bayesian statistical basis that had biased most of the other studies.¹⁷ The IPCC's version of the Forster and Gregory curve (the solid black line in Figure 1) has a peak skewed substantially to higher climate sensitivities and also the tail is much 'fatter' – in other words the probabilities of high sensitivities are relatively greater – than in the original results, which are shown in Figure 1 by the dotted black line. This misrepresentation¹⁸ was highly consequential, since it involved the only good-quality evidence that was nearly independent of the GCMs, and the alteration substantially increased the apparent risk of high future warming.

The message here is clear. AR4, published in 2007, could already have concluded from the instrumental data that climate sensitivity might well be lower than the 2°C lower limit that GCMs continued to suggest. But instead the IPCC AR4 authors actually *raised* the lower bound of the likely range for climate sensitivity from 1.5°C to 2°C, while retaining a best estimate of 3°C. Note that the best estimate from the Forster and Gregory (2006) paper (1.6°C) fell outside this likely range.

The good news in the Fifth Assessment

Aerosols are – by their cooling effect on the climate – thought to have counteracted some of the warming from greenhouse gases. The effect of aerosols is the biggest uncertainty in estimates of total anthropogenic forcing. Knowledge about aerosols is therefore of crucial importance for estimates of climate sensitivity.

And this is where the AR5 report has some excellent news. AR5 revises downwards the estimated cooling effect (forcing) of aerosols markedly compared to AR4. This is, perhaps counterintuitively, good news. The observed temperature increase to date could result from a high climate sensitivity combined with a large aerosol cooling effect or a low sensitivity combined with a small aerosol cooling effect (or combinations in between these extremes). Therefore, to the extent that aerosol forcing is small, sensitivity to carbon dioxide concentrations must also be relatively low.

Since AR4 the best estimate of aerosol forcing has come down substantially. This is purely a matter of what the IPCC has called ‘improved understanding’. In addition, greenhouse gas concentrations have increased, but global temperatures have hardly changed. The effect on climate sensitivity is that estimates of TCR should now be approaching 30% lower.

If we dig a little deeper into the full AR5 report the news gets even better. The best estimate the IPCC gives for total aerosol forcing is not fully based on observations. It is a composite of estimates derived from simulations by global climate models and from satellite observations. On their own, the satellite observation estimates are lower, suggesting that observationally-based TCR estimates should arguably be lower still.

When all this new data is put together, it is possible to prepare new estimates for ECS and TCR using the robust energy budget method of Gregory et al. with AR5 forcing and OHC data. The details of this calculation are given in the technical version of this report.⁴ The ECS best estimate is 1.7°C, which is very close to the IPCC’s lower bound of 1.5°C, and much lower than per the GCMs (average 3.2°C, best estimate 2.9°C). The TCR best estimate is 1.3°C which is likewise close to the IPCC’s lower bound of 1°C, and much lower than the average GCM estimate of between 1.8°C and 1.9°C.

Evidence for low climate sensitivity piling up

Recently several studies estimating ECS have been published in the peer reviewed literature based on data from the instrumental period and methodology that appears satisfactory, and which in particular incorporate observationally based aerosol forcing estimates.¹⁹ One of us (Lewis) was sole author of one of those studies, which is cited in several places in AR5 WGI. He is also a co-author of the Otto et al. (2013) study. That study is notable because almost all of its other fifteen co-authors are also lead or coordinating lead authors of those chapters of the AR5 WGI report that are relevant to the question of climate sensitivity.

In his own study Lewis comes up with a best estimate for climate sensitivity of 1.6°C, with a 'likely' range of 1.3–2.2°C.²⁰ The Otto et al. study reaches a slightly higher sensitivity of 2.0°C,²¹ with a 'likely' range of 1.5–2.8°C.

These four studies were published in time to be included in AR5. All of them find best estimates for climate sensitivity of between 1.6°C and 2°C. See Table 2 for these best estimates and likely ranges. The table also shows the corresponding estimates and ranges given as the overall assessments both in AR4 and AR5, and for the sets of climate models used in AR4 and AR5.

Otto et al. provided two main estimates. Their primary estimate used data from 2000–2009, while the main alternative set of results used data over the 40-year period 1970–2009. In fact, the best estimates based on data for just the 1980s and just the 1990s are very similar to those based on data for 1970–2009, which demonstrates the robustness of the energy budget method.

All these observational studies, except Aldrin et al. (2012), used objective statistical methods, avoiding the problems of inappropriate Bayesian methodology and the resulting bias that afflicted many of the observational studies featured in AR4 and AR5. Aldrin et al. (2012) also gave alternative results using what appears to be a more objective Bayesian 'prior' for ECS: that best estimate for ECS was 1.53°C, with a likely range of 1.2–2.0°C.

Heat going into the oceans

Around the initial publication of the AR5 report in late September, media attention focused on what has been dubbed the 'hiatus' in global warming: the

Table 2: Recent empirical estimates for ECS that incorporate observationally-based aerosol forcing estimates, compared with those from models and in IPCC reports

Study	Best estimate (°C)	Likely range (°C)
Ring et al. 2012 (using 4 surface temperature datasets)	1.80	1.4–2.0
Aldrin et al. 2012 (main results)	1.76	1.3–2.5
Lewis 2013 (preferred main results ²⁰)	1.64	1.3–2.2
Otto et al. 2013 (2000s data)	2.00	1.5–2.8
Otto et al. 2013 (1970–2009 data)	1.91	1.3–3.0
Average of the above ^a	1.79	1.3–2.4
CMIP3 models (per AR4 Table 8.2)	3.20	2.1–4.4
CMIP5 models (per AR5 Table 9.5)	2.89	1.9–4.5
IPCC AR4 2007	3	2.0–4.5
IPCC AR5	None given	1.5–4.5

^aGiving a 50% weight to each of the two Otto 2013 estimates.

fact that the global temperature has barely risen for 15 years. Several explanations have been put forward, a favourite one being that heat accumulation has continued in the ocean – indeed that it has accelerated since about 2000 – and that you cannot say therefore that the warming of the climate has stopped.

However, recent studies like Otto et al. (2013) take a higher recent heat inflow into the oceans into account. So although more heat going into the oceans – which is contradicted by some datasets – might be an explanation for the slowdown of the warming at the surface, it does not materially change our recent estimates for ECS. They are still far lower than the best estimate of 3°C that has been around for thirty years. The hiatus does, however, decrease estimates for TCR, which is thought to be more policy relevant.

A new ‘best observational’ estimate of climate sensitivity

A new ‘best observational’ estimate of ECS can now be calculated by taking a simple average of the different observationally-based estimates in Table 2. This gives²² a best estimate for ECS of 1.75°C and a likely range of about 1.3–2.4°C. However, recognising that error and uncertainty may be greater than

Oversensitive

allowed for in the underlying studies, and will predominantly affect the upper bound of the range, we conservatively assess the likely range as 1.25–3.0°C.

Now compare these figures with those in AR4 and AR5 (see also Table 1 for the longer historical evolution of the range). Our new 'best observational' ECS estimate of 1.75°C is more than 40% lower than both the best estimate in AR4 of 3°C and the 3.2°C average of GCMs used in AR5. At least as importantly, the top of the likely range for ECS of 3.0°C is a third lower than that given in AR5 (4.5°C) – even after making it much more conservative than is implied by averaging the ranges for each of the observational estimates. Note also that the best observational estimate is close to the value of 1.7°C we gave above using the most up-to-date data and the method of Gregory et al.

Poor estimates obscure the issue

Of course, the four studies included in Table 2 represent only a part of one line of evidence cited in AR5 as to the value of ECS. In AR5, the IPCC showed ranges from many sources, categorised by line of evidence (reproduced below as Figure 2). Examination of this figure shows the 'lack of agreement' between lines of evidence that was mentioned in a footnote in the Summary for Policymakers.

The AR5 authors might not have wanted to declare that some studies are better than others or to adjudicate between observational and model-based lines of evidence, but we believe that this is exactly what an assessment is all about: using expert knowledge to weigh different sources of evidence. In this section we present reasoned arguments for a different assessment to that in AR5.

We will therefore discuss the estimates in Figure 2 in some detail, showing why little weight should be put on the estimates that conflict with the 'likely' ranges for the best observational studies in our Table 2, either because of some identified serious shortcoming in their derivation or on the basis that they use a method upon which AR5 itself casts doubt.

Instrumental estimates

The unlabelled ranges in Figure 2 are for studies cited in AR4. As explained above, these are all, with one exception, unsatisfactory. The exception is the original Forster and Gregory (2006) range (the unlabelled solid mauve bar,

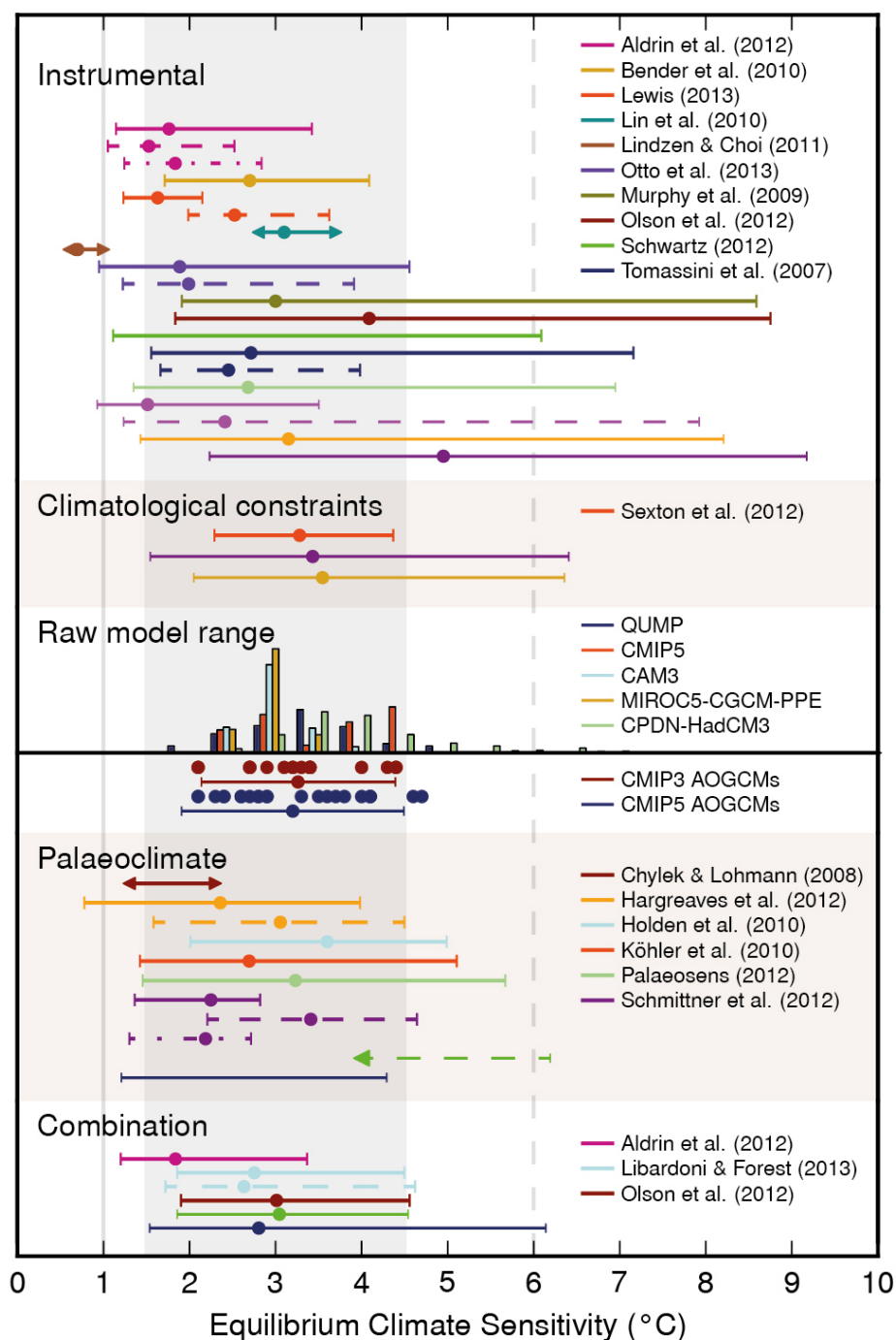


Figure 2: ECS estimates categorised by line of evidence

The figure is a reproduction of Box 12.2, Figure 1 from AR5. Bars show 5–95% uncertainty ranges for ECS, with the best estimates marked by dots. Actual ECS values are given for CMIP3 and CMIP5 AOGCMs. Unlabelled ranges relate to studies cited in AR4.

Oversensitive

fourth up from the bottom of the Instrumental section in Figure 2), which is closely consistent with the 'Average' range in Table 2.

The labelled ranges in Figure 2 are the studies that were new in AR5. Some have already been discussed in relation to our Table 2 above. The other AR5 studies are all unsatisfactory. Some are based on methods that the IPCC itself suggests are unsatisfactory:²³ climate response to volcanic eruptions²⁴ or short-term measurements from satellites.²⁵ The remaining studies²⁶ also have identified shortcomings that we believe make their estimates of ECS unsatisfactory (see Appendix to the technical version of this report).

Climatological constraints

Climatological constraint studies combine computer simulations and instrumental data. However, the estimates shown in Figure 2 are all based on the Met Office's HadCM3 climate model, which is known to be inappropriate for use in this kind of study.^{27,28} Moreover, the instrumental data used provides no information about climate change. The climatological constraint studies shown are therefore of little or no value as estimates of ECS.

Conflict between models and observations: raw model range

As the conflict between observational and GCM estimates of ECS is a central issue, and AR5 also cites a related line of evidence referred to as feedback analysis (the analysis of feedbacks simulated by GCMs), it is appropriate to discuss in some detail feedbacks and ECS in climate models.

It is almost universally accepted that by itself the equilibrium warming effect of a doubling of the carbon dioxide concentration is slightly more than 1°C. Why then do models have an average ECS of 3°C? This is due to the knock-on effects of the initial warming: so-called 'positive feedbacks'. Combined with the initial warming, three feedbacks – water vapour, lapse rate and albedo – can together explain an ECS value of 2°C. The remaining 1°C required to explain the GCM average of 3°C is accounted for primarily by cloud feedback and related adjustments.

But clouds are a big headache for the modellers. It is very difficult to simulate them at all, let alone to predict how they will change in the future. Observational evidence for a positive cloud feedback is weak, at best,²⁹ so on these grounds, GCM estimates of climate sensitivity are highly questionable.

A second concern is that there is no knob for climate sensitivity as such in global climate models. Instead there are many adjustable parameters affecting the treatment of processes (such as those involving clouds) that GCMs do not calculate from basic physics. Whether these parameterisations are sufficiently accurate, and include all important processes, is very much open to question.

Climate scientists tend to assume that their models produce realistic estimates of climate sensitivity if they produce simulated climates that match observations over the instrumental period. However, there is no scientific basis for this assumption. An experienced team of climate modellers has written that models can be made to match observations in many different ways, each with substantially different climate sensitivities.³⁰ They also say that good matching between GCM simulations and observations of global temperatures – a very common test, cited approvingly in the AR4 report as proving model skill – actually proves little.

A lot of the recent public attention has been focussed on the slowdown of global warming in the last 15 years, which the climate models failed to predict. Defenders of the models tend to admit that models have difficulties with natural fluctuations in the climate that last for 10 to 15 years. However, the situation is much worse. Virtually all the models that the IPCC uses in its report have been running too hot over the last 35 years as well, long enough to judge them on a climatic time scale:³¹ see Figure 3 below.

If there were broad agreement between GCMs as to the sign and – within, say, a factor of two – the magnitude of all significant feedbacks and other factors of relevance, then it would be reasonable to place significant weight on GCM-based evidence about climate sensitivity. However, despite model development being closely informed by diverse observations, that is not the case. So we think one should disregard GCM-based evidence about climate sensitivity – everything shown in the ‘Raw model range’ section of Figure 2. This is not only because of the uncertainties over how the models represent the climate, but also because, being only tenuously grounded in observations, it is unclear to what extent raw model ECS values qualify as scientific evidence at all.

Oversensitive

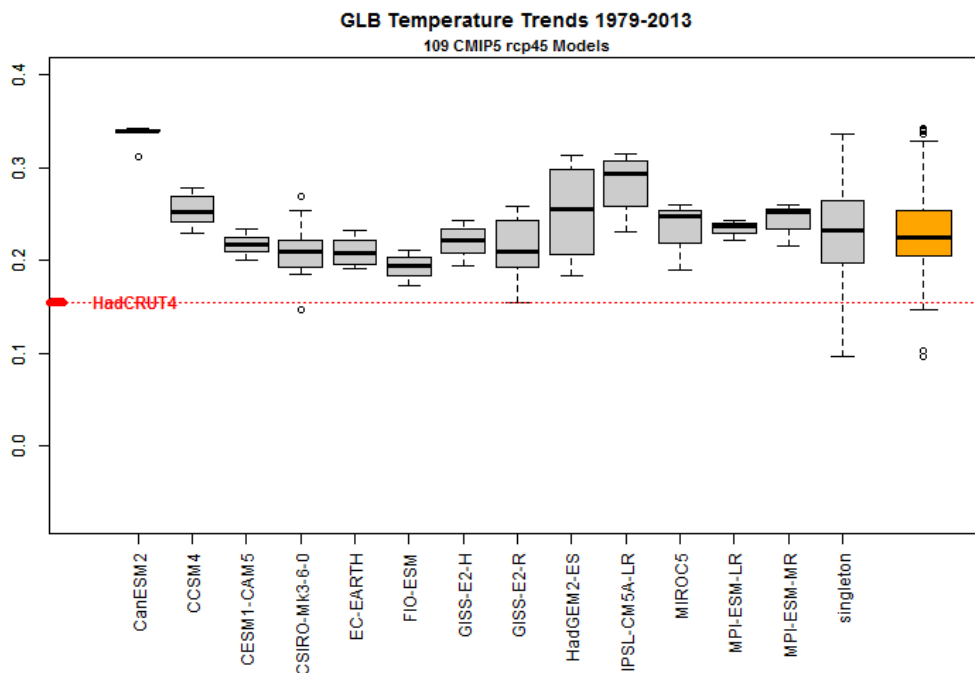


Figure 3: Modelled versus observed decadal global surface temperature trend 1979–2013

Temperature trends in $^{\circ}\text{C}/\text{decade}$. Virtually all model climates warmed much faster than the real climate over the last 35 years. Source: <http://climateaudit.org/2013/09/24/two-minutes-to-midnight/>. Models with multiple runs have separate boxplots; models with single runs are grouped together in the boxplot marked 'singleton'. The orange boxplot at the right combines all model runs together. The default settings in the R boxplot function have been used; the end of the boxes represent the 25th and 75th percentiles. The red dotted line shows the actual trend in global surface temperature over the same period per the HadCRUT4 observational dataset.

Palaeoclimate

Palaeoclimate studies estimate climate sensitivity by using the proxy climate records of the more distant past (for example, the last millennium, the last ice age, or even longer periods). However, in 2007 the AR4 report concluded that uncertainties in studies based on changes in climate since the last glacial maximum were large. Whilst AR4 did include a range from a last-millennium palaeoclimate study, it only constrained ECS very weakly.³²

AR5 also discussed palaeoclimate estimates, noting that the results were still only weakly constrained, and suggesting that true uncertainties were likely larger still.³³ With such wide uncertainty ranges, palaeoclimate ECS estimates

contain little information. Moreover, AR5 concluded that palaeoclimate ECS estimates based on past climate states very different from today may not be representative of the current state of the climate system. That applies to all the palaeoclimate estimates in Figure 2.

Accordingly, little weight can be put on the palaeoclimate estimates.

Combination

These are studies based on combining estimates based on different methods. Of the studies cited by the IPCC, the Libardoni and Forest (2013) and Olson et al. (2012) papers, and the unlabelled AR4 studies, have serious shortcomings and their combination estimates of ECS are unsatisfactory (see Appendix to the technical version of this report).⁴

Instrumental estimates are superior

So, to conclude, we think that of the three main approaches for estimating ECS available today (instrumental observations, palaeoclimate observations, GCM simulations), instrumental estimates – in particular those based on warming over an extended period – are superior by far. Our view as to which type of observational estimates are best is strongly supported by Chapter 12 of AR5 itself.³⁴

Among the instrumental period warming based estimates cited in AR5, we have identified several that have substantial shortcomings. This leaves as satisfactory only the ones cited in Table 2 above, which imply a best estimate for ECS of 1.6–2.0°C. That is consistent with our calculations of what AR5's own best estimates for changes in forcing and OHC imply about ECS. On our reading of AR5, the IPCC scientists largely agreed with our analysis of the observational evidence about ECS.

The conflict between the best observational estimates of ECS and the values derived from computer models must have presented the IPCC authors with a dilemma. Large parts of the IPCC reports are built around the computer simulations. Almost all the projections of future climate change are based on them, and a complete chapter is devoted to the performance of the GCMs. Stating that the best observational estimates of ECS now indicate a value for ECS of only 1.5–2°C would come very close to an admission that most of the global

Oversensitive

climate models substantially overestimate ECS and, by implication, that policymakers should not place reliance on GCM-based projections of our future climate.³⁵

It appears that the IPCC authors may have decided to resolve this dilemma by reducing the lower bound of ECS to 1.5°C and not giving a best estimate for ECS. By doing this they went some way to reflect the new, lower estimates that have been published recently in the literature. Now of course the IPCC scientists are quite entitled to reach a different conclusion from us as to how much weight should be placed on GCM-based estimates. However, they failed to discuss this issue clearly in the Summary for Policymakers or in the version of the full WGI report released when the SPM was approved in September 2013.

In the final report published in January 2014 a paragraph was inserted into the Technical Summary discussing the fact that no best estimate for ECS can now be given.³⁶ This is quite surprising. Edits at this very late stage are meant to correct errors,³⁷ but the new wording about ECS did not represent the correction of an error; it was just new text. The new paragraph, revealed long after governments approved the SPM, says this:

In contrast to AR4, no best estimate for ECS is given because of a lack of agreement on the best estimate across lines of evidence and studies and an improved understanding of the uncertainties in estimates based on the observed warming. Climate models with ECS values in the upper part of the likely range show very good agreement with observed climatology, whereas estimates derived from observed climate change tend to best fit the observed surface and ocean warming for ECS values in the lower part of the likely range. In estimates based on the observed warming the most likely value is sensitive to observational and model uncertainties, internal climate variability and to assumptions about the prior distribution of ECS. In addition, 'best estimate' and 'most likely value' are defined in various ways in different studies.

So here AR5 finally gives some additional explanations. The reader could, however, be wrong-footed by the remark that climate models (GCMs) with high ECS values are in good agreement with 'observed climatology'. This simply means they simulate certain properties of the current climate quite well; it does not mean they simulate global warming well. The authors then caveat the observational estimates by mentioning various issues that, where significant, are normally taken account of in sound studies.

A better approach would have been to give two ‘best’ estimates and ranges for ECS: one derived from the observational studies and one based on the GCMs. This would have alerted policymakers to the divergence between the two and the necessity for, in effect, placing one’s bets on the models or the data. We recommended such an approach in our comments in the official review of the draft report but the IPCC did not take up our suggestion.

What will the future bring?

Transient climate response in the Fifth Assessment

We now consider what effect the changes in greenhouse gas concentrations might have on global temperatures over the rest of the century. In order to do this, we need first to discuss the IPCC’s scenarios for greenhouse gas emissions and then consider how it represented TCR in AR5.

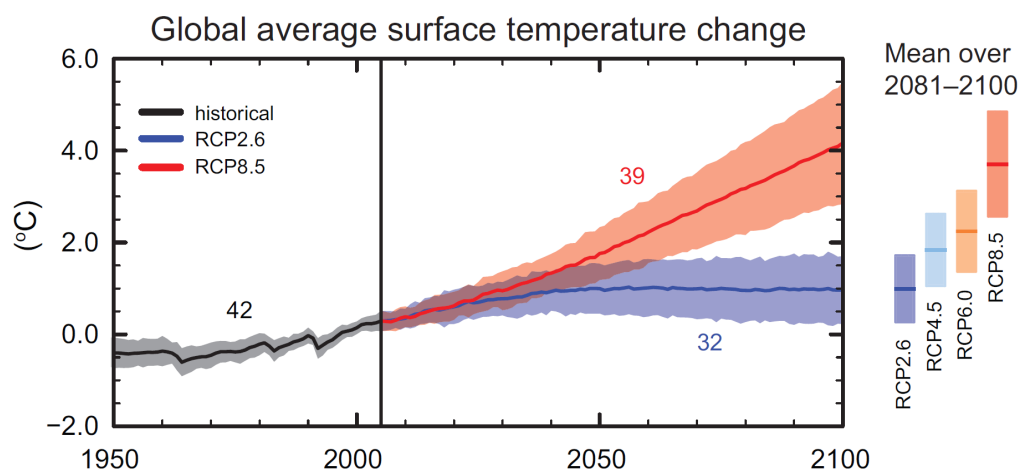


Figure 4: Projected global temperature changes over the rest of the century

Reproduced from AR5, Figure SPM.7. Temperature changes are from the 1986–2005 mean, which was 0.6°C above preindustrial (taken as the 1850–1900 mean global surface temperature). The figures denote the number of models involved.

The AR5 report presented, in the Summary for Policymakers, projections for global surface temperature increase through to 2100 based on four scenarios of future greenhouse gas emissions and hence concentrations. These projections are based on simulations by the GCMs. Figure 4 shows (reproduced from

Oversensitive

Figure SPM.7) the projections for two of the scenarios. RCP8.5 has the highest greenhouse gas concentrations and consequent warming and RCP2.6 the lowest. Recent increases in greenhouse gas concentrations have been close to those in the middle two scenarios, RCP4.5 and RCP6.0,³⁸ although emissions appear to have been increasing at a rate at or above that per the RCP8.5 scenario.

So far we have discussed mainly the scientific evidence for estimates of ECS. However, over the next century, TCR is a more relevant measure (except for sea level rise).

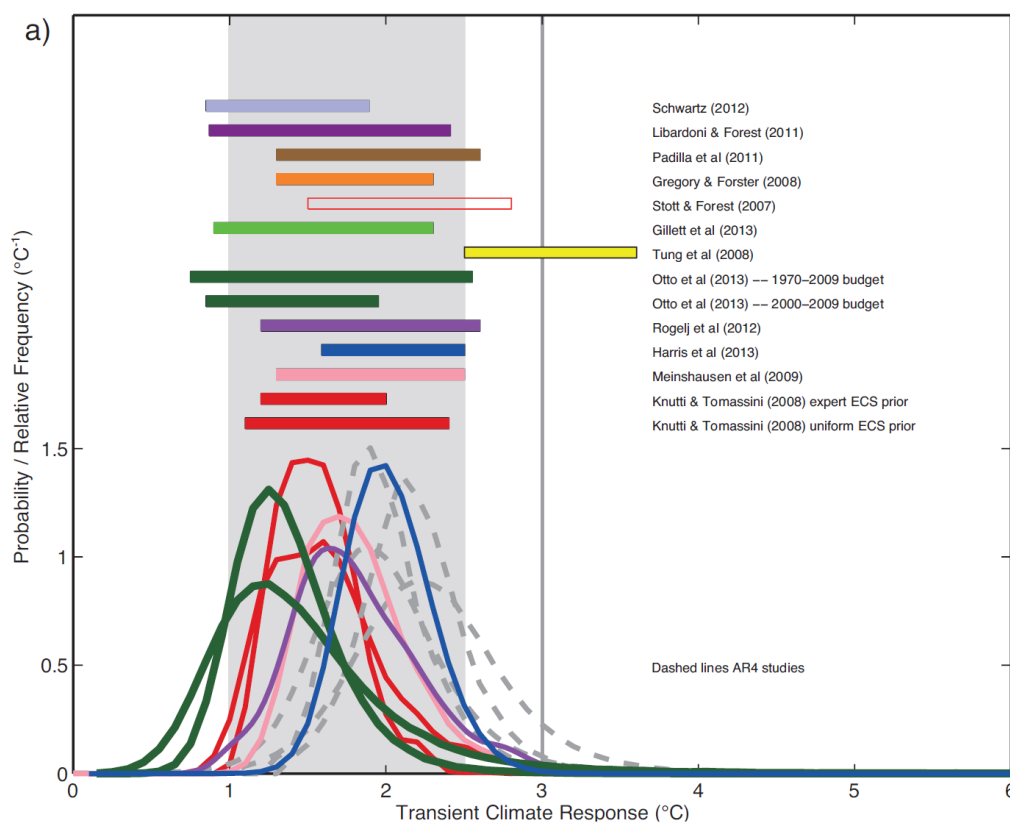


Figure 5: Transient climate response distributions estimated from observational constraints

Reproduced from AR5, Figure 10.20(a). Bars show 5–95% uncertainty ranges for TCR.

AR5 showed in its Figure 10.20(a), reproduced here as Figure 5, a range of observationally based TCR estimates. One of us (Lewis) has written a critical analysis of many of these TCR studies.³⁹ It finds serious fault with most of them. The exceptions – Gillett et al. (2013), Otto et al. (2013) and Schwartz (2012)

– all had relatively low TCRs, the best estimates from each being in the range 1.3–1.4°C.⁴⁰ As mentioned earlier in this report, an observationally-based best estimate for TCR of 1.3°C can also be derived from data in AR5 (see page 16). There is a detailed discussion of that estimate and of the observational TCR estimates cited in Figure 10.20(a) of AR5 in a blog post at *Climate Audit*.⁴¹

In AR5 the IPCC gave the ‘likely’ range for TCR as 1–2.5°C, and said that it was ‘extremely unlikely’ to exceed 3°C. This assessment represented only a marginal reduction compared with AR4. No best estimate for TCR was given in either report, but a best observational estimate of 1.4°C can be derived from information in the Summary for Policymakers about anthropogenic changes over 1950–2011, a well-observed period (see the technical version of this report for details⁴).

All the good-quality observational evidence cited supports a best estimate for TCR of between 1.3 and 1.4°C,⁴² and we suggest that the most appropriate figure is therefore 1.35°C, with a conservative ‘likely’ range being 1–2°C. By contrast, GCM estimates of TCR are on average 35% higher at 1.8°C or so, with the TCR for particularly sensitive models substantially higher even than that. For example the UK Met Office HadGEM2-ES model has a TCR of 2.5°C. Figure 6 compares the best empirical estimate for TCR with the TCR values of the 30 climate models covered in AR5.

Figure 6 below shows an evident mismatch between the observational best estimate and the model range. Nevertheless, AR5 states (Box 12.2) that:

...the ranges of TCR estimated from the observed warming and from AOGCMs agree well, increasing our confidence in the assessment of uncertainties in projections over the 21st century.

How can this be a fair conclusion, when the average model TCR is 35% higher than an observationally-based best estimate of 1.35°C, and almost half the models have TCRs 50% or more above that level? The IPCC obscured this large discrepancy between ‘models’ and ‘observations’ by not showing a graph like our Figure 6 and by a misleading statement in the full report.⁴¹

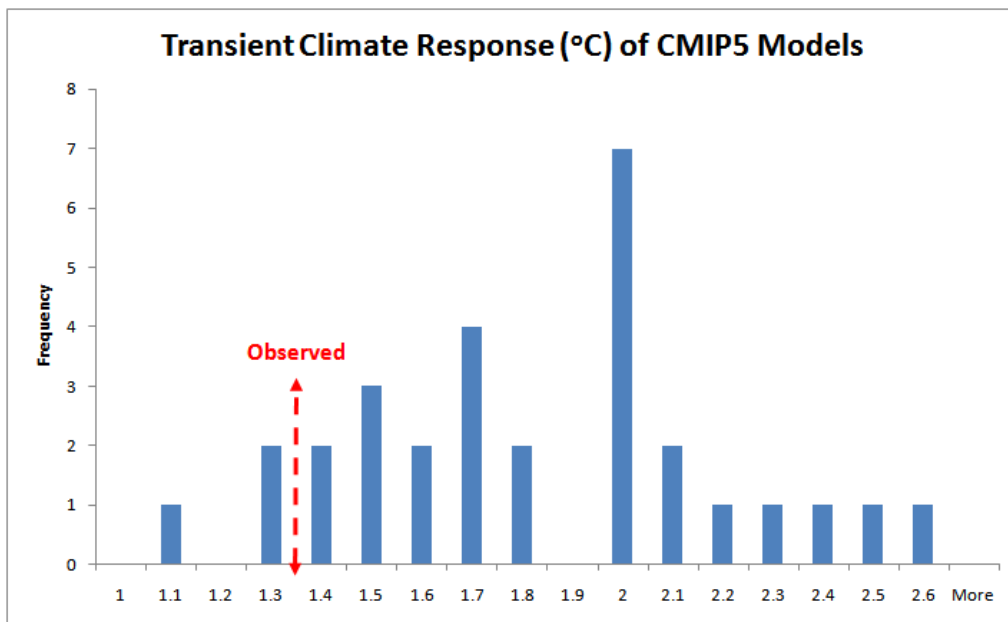


Figure 6: Transient climate response distribution for CMIP5 models

Models per AR5 Table 9.5. The bar heights show how many models in Table 9.5 exhibit each level of TCR.

Warming at the end of the century

As we will show, the mean CMIP5 projected warming to 2081–2100 is far above warming projected using the ‘best observational’ estimate for TCR we derived earlier.⁴³ In Table 3 we show for each scenario the amount of warming projected in AR5 up to 2081–2100, based on the different scenarios that the IPCC uses, from a baseline of 1850–1900 and also from 2012 (after deducting actual warming from 1850–1900 to 2012). The first two columns show the average warming projected by the CMIP5 climate models. The next two columns show the warming based on the best observational estimate for TCR of 1.35°C. These numbers scale the TCR estimate pro rata to the projected increase in total forcing from 2012 until 2081–2100 on each scenario and then add an allowance for currently unrealised warming from past greenhouse gas increases, plus where relevant the amount of warming up to 2012. The rightmost column shows the ratio of CMIP5-model to observational-TCR based warming from 2012.

The GCMs overestimate future warming by 1.7–2 times relative to an estimate based on the best observational evidence.⁴⁴ On the RCP6.0 scenario and using the observational TCR-based method, total warming in 2081–2100 would

Table 3: Global warming up to the late twenty-first century

Scenario	Warming in 2081–2100 based on:		TCR of 1.35°C		CMIP5/TCR warming from
	CMIP5 models °C	°C	°C	°C	
Baseline	1850–1900	2012*	1850–1900*	2012	2012
RCP2.6	1.6	0.8	1.0	0.2	3.4×
RCP4.5	2.4	1.6	1.6	0.8	2.0×
RCP6.0	2.8	2.0	2.0	1.2	1.7×
RCP8.5	4.3	3.5	2.9	2.1	1.7×

*To minimise rounding discrepancies, 0.8°C has been deducted from the CMIP5 global mean surface temperature projected warming from 1850–1900 (taken as representing preindustrial conditions) to obtain warming from 2012, and 0.8°C added to the warming based on TCR from 2012 to obtain warming from 1850–1900. But the unrounded 0.76°C temperature rise from 1850–1900 to 2012 per HadCRUT4 has been used to compute the ratios of CMIP5 model to TCR-based warming.

still be around the international target of 2°C, with a rise of 1.2°C from 2012 rather than the 2°C rise projected by the GCMs. With nearly a century before the target is likely to be breached, policymakers might well conclude that a different policy response was warranted.

Conclusions

In this report we have shown that the AR4 report in 2007 misrepresented an important observational estimate for climate sensitivity, suggesting a higher value than the original research indicated and thus making the climate change problem seem ‘worse’. Perhaps more importantly, it suggests that IPCC authors did not have an adequate grasp of the Bayesian statistical methods used in estimating climate sensitivity.

In the recently released AR5 report the IPCC had the chance to bring readers some good news: the highest quality observational evidence, directly reflecting or consistent with the substantially lower estimate of cooling by aerosol pollution in AR5 than that in AR4, indicates that climate sensitivity is probably below the lower bound set in the AR4 report. However, as we have shown, the IPCC did not explain this fact in clear terms.

We believe that, due largely to the constraints the climate model-orientated IPCC process imposed, the Fifth Assessment Report failed to provide an adequate assessment of climate sensitivity – either ECS or TCR – arguably the most

Oversensitive

important parameters in the climate discussion. In particular, it did not draw out the divergence that has emerged between ECS and TCR estimates based on the best observational evidence and those embodied in GCMs. Policymakers have thus been inadequately informed about the state of the science.

Acknowledgements

The authors are very grateful for the help and comments they have received from Dr James Annan, Professor Judith Curry, Professor David Henderson, Professor Ross McKittrick and Andrew Montford.

Notes

¹The warming effect of atmospheric carbon dioxide is logarithmic, so each doubling in concentration causes the same temperature increase whatever the starting level.

²Van der Sluijs et al. (1998).

³Jaeger and Jaeger (2010); Tol (2007).

⁴<http://www.thegwpf.org/?p=18296>.

⁵AR5, SPM, D.2.

⁶Van der Sluijs et al. (1998).

⁷Gregory et al. (2002).

⁸For further details and discussion see the technical version of the report.

⁹Median: the value at which the estimate is equally likely to be too low or too high. All the best estimates given for ECS and TCR are medians.

¹⁰<http://judithcurry.com/2011/07/07/climate-sensitivity-follow-up/>.

¹¹The mode: for a skewed PDF this differs from the median, particularly when the peak is wide, and should not be regarded as the best estimate.

¹²Forest et al. (2006).

¹³Frame et al. (2005).

¹⁴Forest et al. (2002).

¹⁵Andronova and Schlesinger (2001).

¹⁶See Ring et al. (2012).

¹⁷A uniform prior in ECS.

¹⁸The IPCC does not accept that the restatement amounts to an 'error', on the grounds that the alteration of the Forster and Gregory (2006) PDF (although not its effect) was disclosed and is permissible under a subjective Bayesian philosophy (under which probability has no objective meaning). However, from a scientific viewpoint the altered statistical basis is indefensible.

¹⁹Aldrin et al. (2012), Ring et al. (2012), Lewis (2013) and Otto et al. (2013).

²⁰With non-aerosol forcing and observational surface temperature uncertainties incorporated.

²¹Using data from the most recent decade considered, 2000–09, which arguably should provide the most reliable results. The Otto et al. study could have obtained a lower climate sensitivity best estimate had it used a different source of recent heat uptake data. See <http://bishophill.squarespace.com/blog/2013/5/19/new-energy-budget-derived-estimates-of-climate-sensitivity-a.html>. Using the heat uptake estimate from Loeb et al. (2012) would have resulted in a best estimate for ECS of 1.7°C, reducing to 1.6°C if the 2000–09 period were extended to 2012.

Oversensitive

²²Based on the estimate for Aldrin et al. (2012) using the more objective prior, marginally rounding up the resulting average best estimate, and excluding the non-probabilistic Ring et al. (2012) range (being the lowest and highest of its four best estimates).

²³Sections 10.8.2.2 and 10.8.2.3 of AR5 give detailed reasons for doubting the usefulness of ECS estimates based on these methods.

²⁴Bender et al. (2010).

²⁵Lindzen and Choi (2011) and Murphy et al. (2009).

²⁶Lin et al. (2010), Olson et al. (2012), Schwartz (2012) and Tomassini et al. (2007). In the case of Schwartz (2012) the criticism relates only to the section of its range for ECS that exceeds 3 °C.

²⁷Due to structural rigidities in the HadCM3 model, no matter what parameter combination is used, when low ECS values are achieved by the model, its aerosol forcing becomes very highly negative – a combination ruled out by the observational data. The Sexton study was unable to investigate the combination of low-to-moderate ECS and low-to-moderately negative aerosol forcing – the region favoured by the observational data. It is thus unsurprising that the study rules out low ECS values. See Box 1 in: http://niclewis.files.wordpress.com/2013/09/metoffice_response2g.pdf. The Sexton et al. (2012) study is identical to the first stages of the Harris et al. (2013) study that it discusses, and the Harris et al. near-final posterior region in the Box 1 Figure B.1 corresponds to the final results of the Sexton et al. (2012) study.

²⁸In addition the two unlabelled AR4 studies both barely sampled ECS values below 2 °C at any level of aerosol forcing.

²⁹Section 7.2.5.7 of AR5.

³⁰Forest et al. (2008).

³¹Several commentators have shown this recently, e.g. <http://climateaudit.org/2013/09/24/two-minutes-to-midnight/>, <http://rankexploits.com/musings/2013/leaked-spm-ar5-multi-decadal-trends/> and <http://rogerpielkejr.blogspot.nl/2013/09/global-temperature-trends-and-ipcc.html>. A recent commentary in *Nature Climate Change* by Fyfe et al. (2013) reached similar conclusions.

³²Hegerl et al. (2006). As discussed above, this study used an inappropriate uniform prior for ECS, biasing its ECS estimate upwards.

³³Discussing the Paleosens Members (2012) review article.

³⁴Section 12.5.3.

³⁵Projected future warming in GCMs is strongly correlated with ECS, although it increases less than proportionally with ECS due to the moderating effect of heat uptake by the ocean. Projected warming in GCMs could conceivably be in line with observational evidence despite their ECS not being so, but it is not.

³⁶The IPCC provided a long list of substantive edits made after the final draft of the report: http://www.ipcc.ch/report/ar5/wg1/docs/review/WG1AR5_SubstantiveEditsList_All_Final.pdf.

³⁷The front sheet to the accepted final draft of the AR5 WGI report published on 30 September 2013 stated: 'Before publication the Report will undergo final copyediting as well as any error correction as necessary, consistent with the IPCC Protocol for Addressing Possible Errors.'

³⁸Emissions, and the resulting greenhouse gas concentrations, do not diverge significantly between the

RCP4.5 and RCP6 scenarios until after 2050.

³⁹Available at http://niclewis.files.wordpress.com/2013/11/ar5_tcr_estimates2.pdf.

⁴⁰For Gillett et al. (2023) this is on a model-by-model regression basis; on the aggregate estimate method used for the range given in Figure 5 its best TCR estimate is 0.1 °C higher.

⁴¹See post at Climate Audit <http://climateaudit.org/2013/12/09/does-the-observational-evidence-in-ar5-support-its-the-cmip5-models-tcr-ranges/>.

⁴²Although not a peer-reviewed result, it is worth noting that the well-respected climate scientist Isaac Held argues that TCR is unlikely to exceed 1.8 °C, and puts forward a best estimate of 1.4 °C. See <http://www.gfdl.noaa.gov/blog/isaac-held/2012/04/30/27-estimating-tcr-from-recent-warming/>.

⁴³The global warming estimates are based on multiplying the TCR estimate of 1.35 °C by the change in total forcing on each scenario between 2012 and 2081–2100 per the RCP forcings dataset, and adding 0.15 °C for unrealised warming attributable to existing forcing, that as at 2012 was heating the ocean, becoming realised by 2081–2100. These TCR-based projections are consistent with more sophisticated calculations using a two-box model. Using the mean temperature for the decade ending in 2012 instead of that for 2012 would make no difference.

⁴⁴Comparing the two sets of projections of future warming (from 2012 to 2081–2100), and excluding the low RCP2.6 scenario (for which the GCM overestimation is even higher). The projections based on TCR allow for warming 'in the pipeline' boosting future temperature rises. Model warming estimates of $1.7 \times$ to $2.0 \times$ observationally-based estimates correspond to observationally-based estimates being 40% to 50% below model estimates.

References

- Aldrin, M., M. Holden, P. Guttorp, R.B. Skeie, G. Myhre and T.K. Berntsen, 2012. Bayesian estimation of climate sensitivity based on a simple climate model fitted to observations of hemispheric temperatures and global ocean heat content. *Environmetrics*, 23: 253–271.
- Andronova, N.G. and M.E. Schlesinger, 2001. Objective estimation of the probability density function for climate sensitivity. *J. Geophys. Res.*, 106 (D19): 22605–22611.
- Forest, C.E., P.H. Stone, A.P. Sokolov, M.R. Allen and M.D. Webster, 2002. Quantifying uncertainties in climate system properties with the use of recent climate observations. *Science*, 295: 113–117
- Forest, C.E., P.H. Stone and A.P. Sokolov, 2006. Estimated PDFs of climate system properties including natural and anthropogenic forcings. *Geophys. Res. Lett.*, 33: L01705
- Forest, C.E., P.H. Stone and A.P. Sokolov, 2008. Constraining climate model parameters from observed twentieth century changes. *Tellus A*.
- Forster, P.M. D. and J.M. Gregory, 2006. The climate sensitivity and its components diagnosed from Earth Radiation Budget data. *J. Clim.*, 19: 39–52.
- Frame D.J., B.B.B. Booth, J.A. Kettleborough, D.A. Stainforth, J.M. Gregory, M. Collins and M.R. Allen, 2005. Constraining climate forecasts: the role of prior assumptions. *Geophys. Res. Lett.*, 32, L09702
- Fyfe, J.C., N.P. Gillett, and F.W. Zwiers, 2013. Overestimated global warming over the past 20 years. *Nature Clim. Ch.*, 3.9: 767–769.
- Gillett, N.P., V.K. Arora, D. Matthews, P.A. Stott and M.R. Allen, 2013. Constraining the ratio of global warming to cumulative CO₂ emissions using CMIP5 simulations. *J. Clim.*, doi:10.1175/JCLI-D-12-00476.1.
- Gregory, J.M., R.J. Stouffer, S.C.B. Raper, P.A. Stott and N.A. Rayner, 2002. An observationally based estimate of the climate sensitivity. *J. Clim.*, 15: 3117–3121.
- Hegerl, G.C., T.J. Crowley, W.T. Hyde and D.J. Frame, 2006. Climate sensitivity constrained by temperature reconstructions over the past seven centuries. *Nature*, 440: 1029–1032.

Jaeger, C.C. and J. Jaeger, 2011. Three views of two degrees. *Reg Env Change*, 11, S15–S26.

Knutti, R., T.F. Stocker, F. Joos and G.-K. Plattner, 2002. Constraints on radiative forcing and future climate change from observations and climate model ensembles. *Nature*, 416: 719–723.

Lewis, N., 2013. An objective Bayesian, improved approach for applying optimal fingerprint techniques to estimate climate sensitivity. *J. Clim.*, 26: 7414–7429.

Libardoni, A.G. and C.E. Forest, 2013. Correction to ‘Sensitivity of distributions of climate system properties to the surface temperature dataset’. *Geophys. Res. Lett.*, doi:10.1002/grl.50480.

Lin, B., et al., 2010. Estimations of climate sensitivity based on top-of-atmosphere radiation imbalance. *Atmos. Chem. Phys.*, 10: 1923–1930.

Lindzen, R.S. and Y.S. Choi, 2011. On the observational determination of climate sensitivity and its implications. *Asia-Pacific J. Atmos. Sci.*, 47: 377–390.

Loeb, N.G. et al.(2012): Observed changes in top-of-the-atmosphere radiation and upper-ocean heating consistent within uncertainty. *Nature Geoscience*, 5: 110–113.

Murphy, D.M., S. Solomon, R.W. Portmann, K.H. Rosenlof, P.M. Forster and T. Wong, 2009. An observationally based energy balance for the Earth since 1950. *J. Geophys. Res. Atmos.*, 114: D17107.

Olson, R., R. Sriver, M. Goes, N.M. Urban, H.D. Matthews, M. Haran and K. Keller, 2012. A climate sensitivity estimate using Bayesian fusion of instrumental observations and an Earth system model. *J. Geophys. Res. Atmos.*, 117, D04103.

Otto, A., et al., 2013. Energy budget constraints on climate response. *Nature Geoscience*, 6: 415–416.

Paleosens members, 2012. Making sense of palaeoclimate sensitivity. *Nature*, 491: 683–691.

Ring, M.J., D. Lindner, E.F. Cross and M.E. Schlesinger, 2012. Causes of the global warming observed since the 19th century. *Atmos. Climate Sci.*, 2: 401–415.

Oversensitive

Schwartz, S.E., 2012. Determination of Earth's transient and equilibrium climate sensitivities from observations over the twentieth century: Strong dependence on assumed forcing. *Surv. Geophys.*, 33: 745–777.

Sexton, D.M.H., J.M. Murphy, M. Collins and M.J. Webb, 2012. Multivariate probabilistic projections using imperfect climate models part I: outline of methodology. *Clim. Dynam.*, 38: 2513–2542.

Tol, R.S.J., 2007. Europe's long-term climate target: A critical evaluation, *Energy Policy*, 35: 424–432.

Tomassini, L., P. Reichert, R. Knutti, T.F. Stocker and M.E. Borsuk, 2007. Robust Bayesian uncertainty analysis of climate system properties using Markov chain Monte Carlo methods. *J. Clim.*, 20: 1239–1254.

Van der Sluijs, J.P., J.C.M. van Eijndhoven, B. Wynne and S. Shackley, 1998. Anchoring devices in science for policy: the case of consensus around climate sensitivity, *Soc. Studies Sci*, 28(2): 291–323.

The Global Warming Policy Foundation is an all-party and non-party think tank and a registered educational charity which, while open-minded on the contested science of global warming, is deeply concerned about the costs and other implications of many of the policies currently being advocated.

Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice.

Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

The key to the success of the GWPF is the trust and credibility that we have earned in the eyes of a growing number of policy makers, journalists and the interested public.

The GWPF is funded overwhelmingly by voluntary donations from a number of private individuals and charitable trusts. In order to make clear its complete independence, it does not accept gifts from either energy companies or anyone with a significant interest in an energy company.

Views expressed in the publications of the Global Warming Policy Foundation are those of the authors, not those of the GWPF, its Trustees, its Academic Advisory Council members or its Directors.

Published by the Global Warming Policy Foundation

For further information about the GWPF or a print copy of this report contact:

The Global Warming Policy Foundation
10 Upper Bank Street, London E14 5NB
T 020 7006 5827
M 07553 361717
www.thegwpf.org

Registered in England, no 6962749
Registered with the Charity Commission, no 1131448



Stetzer Electric, Inc.

520 W. Broadway
P.O. Box 25
Blair, WI 54616
Tel: (608) 989-2571
Fax: (608) 989-2570
<http://www.stetzerelectric.com>

To whom it may concern,

In April 2018 I tested a variety of properties and locations around Niagara and Haldimand Counties (Ontario) for ground current/stray voltage and for high frequency transients and harmonics. The release of the details of each of those reports is at the discretion of the individual property owners in question.

What I can confirm is the following: in each of the properties tested, varying degrees of electrical distortion and contact current were found inside and outside the homes in question, even with the power turned off. A number of these properties had been tested before the coming online of the Niagara Regional Wind farm and at those previous times levels of electrical pollution were much lower. Clear cases of violation of existing lax ground current standards during the April 2018 testing were found with for example 10 volts of current on a downwire being discharged into the earth near the industrial wind turbine installations.

What are the sources?

Both wind and solar have major issues with complying with the Institute of Electrical and Electronic Engineers Standards, specifically the IEEE 519. In most cases the electric utilities are mandated to buy "Green Energy" such as wind and solar power. The inverters on the devices generate harmonic currents and voltages as well as high frequency transients. These harmonic currents, voltages, and transients are coupled to the electrical company's transmission and distribution system that is eventually connected to homes, business, and industry. This distorted power causes appliances to fail, motors, wires, and transformers to overheat, inaccurate watt-hour meter readings, and, according to the published peer-reviewed scientific research papers, a drop in milk production in cows and other health issues associated with exposure to higher frequencies.

The Guide for Applying Harmonic Limits on Power Systems (72) – May 4, 1996 states:

The electric utility is responsible for the quality of the voltage supplied to its customers. This voltage can become distorted due to harmonics introduced by nonlinear loads within customer facilities, due to harmonics introduced by nonlinear devices applied directly on the power system (e.g. static var systems, high voltage dc converters, traction power rectifiers, etc), or due to resonance conditions on the system. IEEE 519-1992 was developed to help with the coordination that is needed to keep voltage distortion levels on the overall system within reasonable limits.

Figure 1 below is copied from the IEEE 519 and shows the harmonic voltage distortion limits.

Table 1—Voltage distortion limits

Bus voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
$V \leq 1.0$ kV	5.0	8.0
$1 \text{ kV} < V \leq 69$ kV	3.0	5.0
$69 \text{ kV} < V \leq 161$ kV	1.5	2.5
$161 \text{ kV} < V$	1.0	1.5 ^a

^aHigh-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

Figure 1

Electrical distortion and contact current found during testing

In each of the properties tested, electrical pollution in the form of varying degrees of distortion was found to be riding on the 60-cycle waveform. Also, with measurement taken between the kitchen sink and floor in the homes, varying degrees of contact current were found. These were highly distorted 60 Hz sine wave that were measured when the power to each home was turned completely off. That indicates that there is nothing in the home causing his reading. Since the power to the home was turned completely off, the sole responsibility for this is the electric utility due to their use of the earth as a return path – a clear violation of electrical codes and rules. The electric utility is responsible for the 60Hz and the issue should be addressed using sound engineering practices.

A scientific report by Kavet published in *Bioelectromagnetics* states, “the absolute (as well as modest) level of contact current modeled (18 μ A) produces average electric fields in human tissue along its path that exceed 1 mV/m. At and above this level, the NIEHS Working Group [1998] accepts that biological effects relevant to cancer have been reported in “numerous well-programmed studies””.

Testing in a range of locations near the Niagara Regional Wind Farm shows high frequency transients riding along ground current measurable on people’s properties. Again, the source of the ground currents is clearly the responsibility of the electric utility once it is their lines. Instead of keeping these electrical currents on their wires, they elect to put them onto the earth where they come in contact with people and animals.

The *National Electrical Safety Code*, Rule 92D states: “Ground connection points shall be arranged so that under normal circumstances there will be no objectionable flow of current over the grounding conductor.”

The *Wiley Encyclopedia of Electrical and Electronics Engineers* states: “It is an unsafe practice to allow current to flow over the earth continuously, uncontrolled. All continuously flowing current must be contained within insulated electrical conductors.”

This is not an impossible task. Electrical Power Research Institute (EPRI) published a document – *Handbook for the Assessment and Management of Magnetic Fields Caused by Distribution Lines*, EPRI TR-106003, Project 3959-07, Final Report, December 1995 – which states: “A

Stetzer Electric, Inc.

520 W. Broadway
P.O. Box 25
Blair, WI 54616
Tel: (608) 989-2571
Fax: (608) 989-2570
<http://www.stetzerelectric.com>

method that practically eliminates ground currents associated with primary distribution lines and still maintains the advantages of a four-wire multi-grounded system, is the five-wire system....

Conclusion

In conclusion, it is my opinion that the electric utility is dumping distorted, high frequency currents into the earth where it flows uncontrolled over the ground back to their sub-stations. The wind turbines are a major source of these high frequency transients that are on the electric utility's electrical grid and end up on the earth. The IEEE Standards Association's NESC Handbook, Seventh Edition, Rule 215B, "prohibits the use of the earth normally as the sole conductor for any part of a supply circuit. ... (Objections to use of the earth as part of a supply circuit are made from both safety and service standpoints.)" These currents destroy the infrastructure by electrolysis. They also affect milk production in dairy cows as shown in published, scientific, peer-reviewed papers. EPRI, the electric utility's own research arm, reports levels as low as 18 μ A cause cancer in humans. Rule 215B in the NESC Handbook also says:

The destructive nature of current flow through the earth endangers other facilities through electrolysis. When earth returns were used in some rural areas before the 1960's, they became notorious offenders in dairy areas because circulating currents often caused both step and touch potentials. In some cases, these have adversely affected milking operations by shocking the cattle when they were connected to the milking machines and have affected feeding (see Rule 92D – Current in Grounding Conductor). The grounding methods required by the NESC, including the use of a metallic neutral throughout each span of a multi-grounded wye system, reduced the opportunity for such occurrences.

It should be noted that the measurements are a mere snapshot in time and will change continuously as electrical loads change on the system. They will only become worse as more non-linear loads are connected to the grid. The so called "Green" loads such as solar and wind generation will only amplify these problems due to their lack of filters and use of switch-mode power supplies and inverters.

David Stetzer
President
Stetzer Consulting, LLC

Garnet Mesa Solar Facility

1 message

Alida Franco <alidafranco@gmail.com>
To: planning@deltacounty.com

Sun, Jul 3, 2022 at 1:30 PM

Comment:

I reviewed the updates to the project description and understand that the project is now an agro voltaic solar farm and will have landscaping surrounding the farm to provide a visual barrier for those living in the area.

I am in approval of both updates and hope the project will go forward in order to implement affordable, local energy for the area.

Alida Franco
20937 Vista Grande Drive
Austin, CO 81410

Reece & Bonnie Eddy

5268 2000 Road • Delta, CO 81416

WagonWheel7@yahoo.com



Delta County Planning & Development

July 5, 2022

Attn: Carl P. Holm, AICP, Director

planning@deltacounty.com

Re: PLN22 – 084/Garnet Mesa Solar LLC Renewable Energy Facility – OPPOSE

Dear Planning Commission Members:

My husband and I live at 5268 2000 Road, in close proximity to the proposed PLN22-084 solar energy plant. I have lived at this property for over twenty years, and my career is supporting agriculture. We are staunch advocates for using livestock as a forage and land management tool. We very much appreciate that Garnet Mesa Solar LLC is considering using sheep grazing as a management tool for the facility; but that does not change the fact that it's a commercial, industrial power generation plant that is supplanting irrigated agricultural land.

There are thousands of acres on non-irrigated land in this region that would be better suited to this application. The loss and diminishment of productive ag land continues to be a significant threat to our nation's food supply. This solar project, while well intended, undermines the optimal productivity of this land.

The proposed project also significantly diminishes available wildlife habitat. It's always exciting when the sandhill cranes, Canada geese, and other migratory birds visit the neighborhood, and land in the fields adjacent to and in the proposed commercial energy generation facility area. Other notable birds that can be seen from my property flying over the proposed project area include golden and bald eagles, and redtail hawks. Our understanding is that solar arrays can be very disruptive and harmful to avian wildlife.

Our property overlooks the proposed project area, so we are very opposed to the industrial blight this project will create. We don't believe the landscaping will do anything to block our view of the project, and were very concerned about reflections and glare from the solar panels. We have additional concerns about the cost, lifespan, and disposal challenges of spent solar panels. We object to the use of irrigated ag land for industrial, commercial purposes.

In June we made a trip to California on I-15 past the Ivanpah solar facility, this massive and inefficient commercial project drove home the fact that we don't want this in our backyard, and how destructive it is to the landscape.

The glare from the solar panels was very disruptive to the surrounding environment, and nothing that you want to live next to. The proposed solar field does not belong on ag land or next to small acreage rural properties. Solar remains an inefficient energy source that will diminish productive ag land and destroy wildlife habitat.

If this project moves forward it needs to be in a different location that is conducive to commercial, industrial development.

Thank you for your time and consideration.

Respectfully,

Bonnie (Brown) Eddy and Reece M. Eddy

July 5, 2022

Project Planner
Carl P. Holm, AICP, Director
295 W. 6th St.
Delta, CO 81416

Mr Holm:

We appreciate receiving a notice of the public meeting scheduled for July 13, 2022 for the Garnet Mesa Solar LLC Renewable Energy Facility. We have in the past voiced our concerns at all the public meetings dealing with this project. We did not receive this notice until July 2nd which leaves little time to respond if it has to be commented on by July 6th. Not good timing with the holiday weekend.

There are a few things that need to be pointed out. Number one is Parcel 345523100001 located on G Road/2100 Road is in fact irrigated farmland. It is not indicated in your notice. This has been pointed out before and not corrected. This needs to be corrected as this is one of the prime reasons that this project should not be pushed through. Commercial/industrial projects that are not agricultural related have no business on irrigated farm land. Their idea to put sheep on the land under the panels is ridiculous. Sheep don't graze down here in the summer. It's too hot and they can get heat-stressed. This is just a way to get the project pushed through as agricultural which it is not. Commercial/industrial projects should not be adjacent to residential subdivisions either. The land use codes for this county need to be revised! Just because you have designated certain parcels by a number does not mean things are compatible. Please use some sense. Guzman should have done some research before spending the millions that they have dished out and the planning department should have had some protective measures in place to prevent projects like this going in on irrigated, agricultural land or adjacent to a residential area. This type of project belongs on non-irrigated land of which Delta County has much available. Many places where it would bother no one. Also, BLM land is available west of Delta off of Highway 50 with an easy connect to the sub-station north of the highway there. As an added benefit the Biden administration is giving special discounts to alternative energy projects on BLM land. Why did they not do their due diligence to figure these things out before spending millions on land that has no business being used for this project? Makes you wonder if there is another motive behind all this. Are they trying to destroy agriculture for their "green" agenda?

The solar panels to the south of Delta on Highway 50 are only a 10 megawatt project. The Garnet Mesa project is 8 times bigger. It doesn't make any sense that only 129 acres will be covered. If that is the case, why did they need to buy so much land? If that is the case, they could have just purchased the 181 acre parcel on 2200 Road and worked with that. It does have some irrigated areas, but as a whole it is just dirt. There would be far less people being impacted.

This will probably fall on deaf ears, but perhaps you might consider for future projects to put some safe-guards in to prevent this problem from arising again. There has to be a limit put on these types of projects for allowable acres within the county. We do not need to lose any of our agricultural land and residential housing deserves to be protected from eye sores and property value loss.

Thank you for the opportunity to comment.

Jon and Gayle Montelin

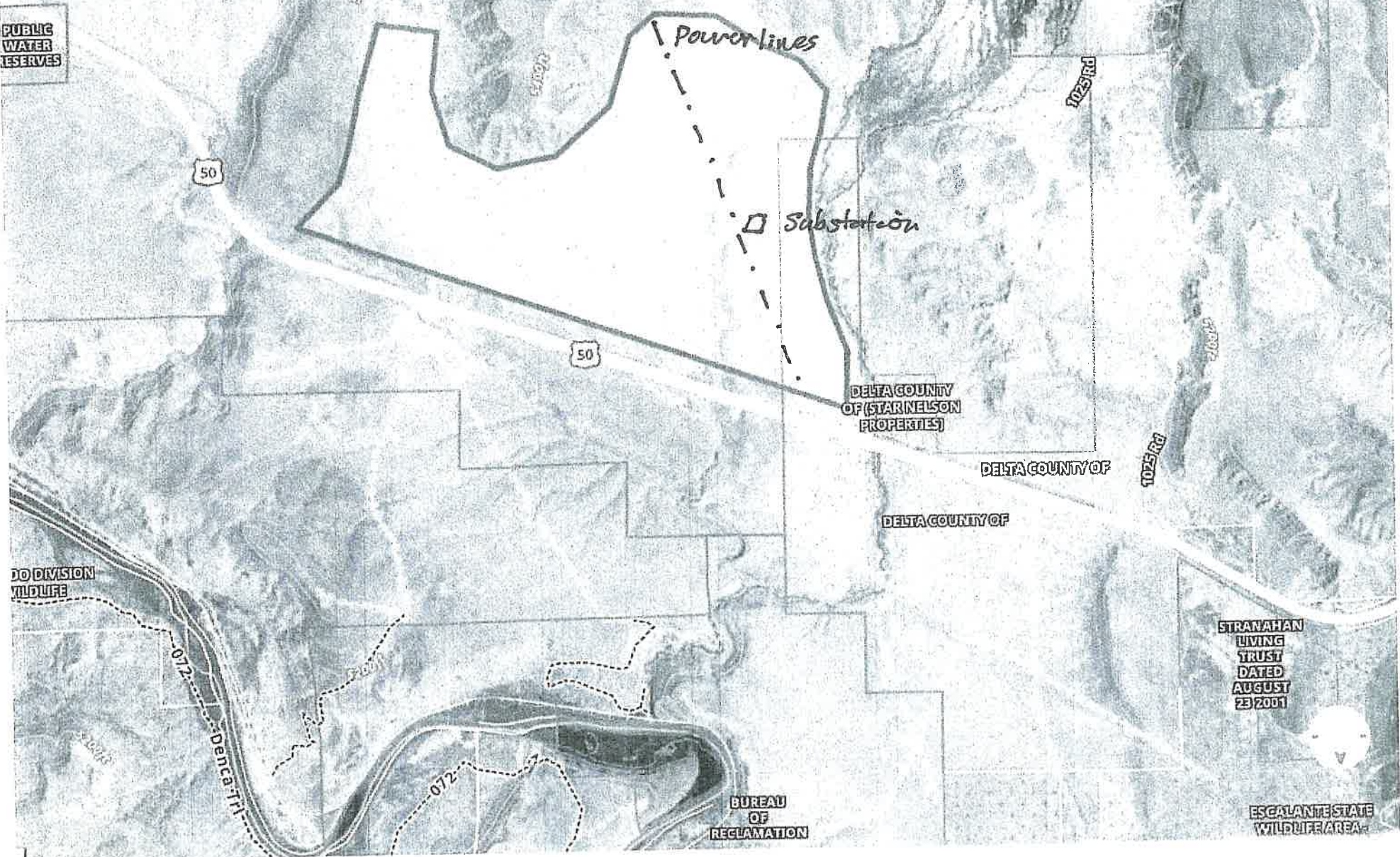
Alternative Solar Project Location - 760 acres

- All BLM land
- no impact on county roads
- no conflicts with residences
- no impact on agriculture

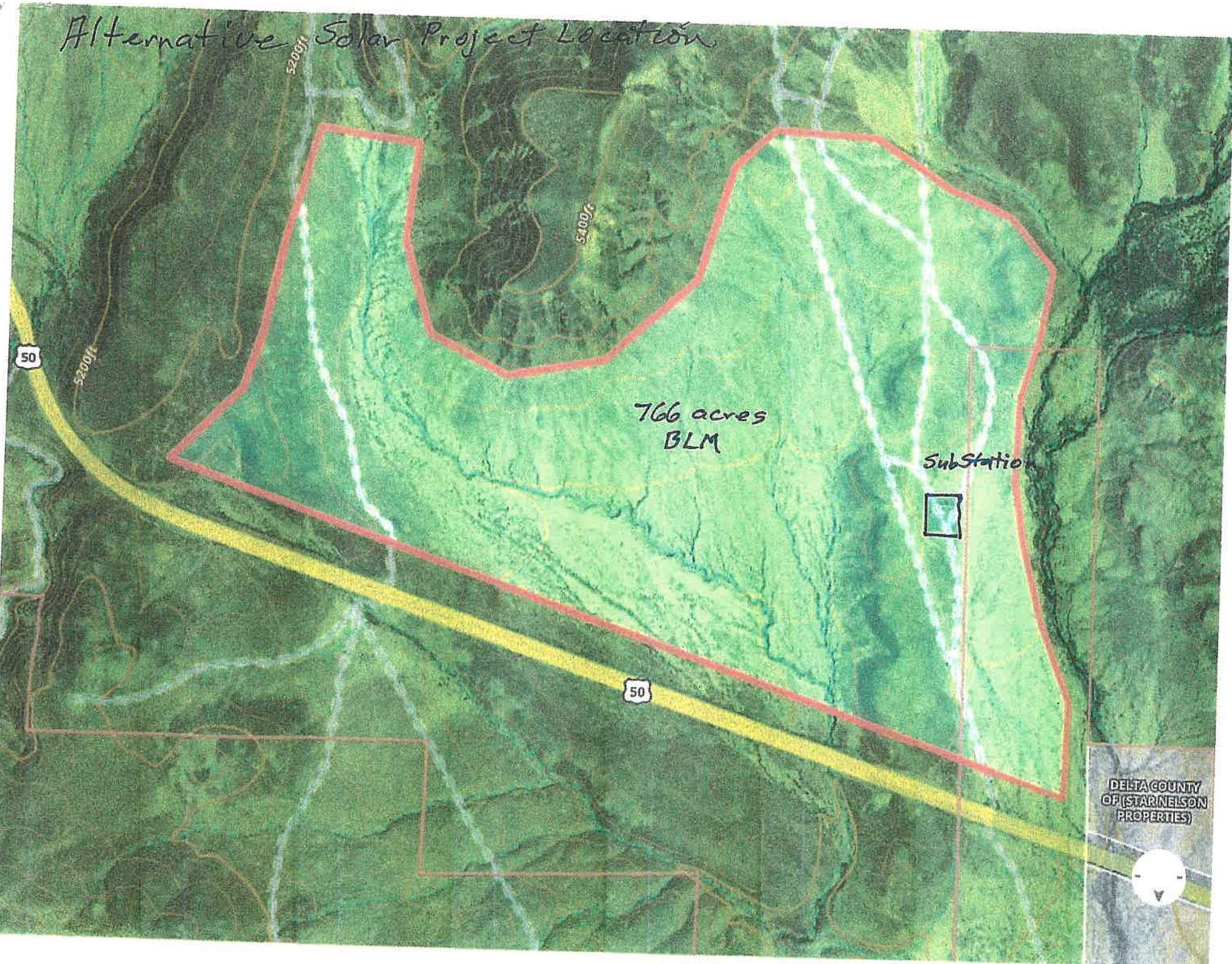
Two major powerline in it
Substation located next to powerlines

PUBLIC
WATER
RESERVES

WHITING
THOMAS
SCOTT



Alternative Solar Project Location



July 6, 2022

To: Delta County Planning Commission and the Delta County Board of Commissioners

Re: Garnet Mesa LLC conditional permit for Garnet Mesa Solar Farm. 2nd Application

From: Charles Cherek and Chase Schofield, 5607 and 5509 2000 Rd., Delta, CO 81416

Notes from questions for Carl Holm, Delta County Colorado, Community Development and Natural Resources Director at a meeting this day, July 6, 2022 10:00 AM.

DMEA has a 22 page Construction Handbook, **New Construction Service and Engineering** (page 6 states the National Electrical Safety Cod (NESC) is used for the design construction, and maintenance and operation of DMEA's electric transmission and distribution system. A new code for NESC will go into effect February 1, 2023 and major updates to this edition will include new rules for Photovoltaic (PV) generating stations. The NESC covers basic provisions and work rules for safeguarding of persons and hazards arising from the installation, operation or maintenance of systems and equipment operated by utilities.

All of these questions have been asked of DMEA representatives in previous meetings or communications and have remained unanswered to date.

When Carl did his research what did he find out about FAA Requirements for Transmission lines in proximity to airports and airstrips adjacent properties? The transmission lines existing on our property are adjacent to the Star Nelson Airport to the west and there is a landing strip on our property and the property adjacent to the south of us.

What authorities and regulations are DMEA and Guzman subject to for the installation of Solar Farm and expansion of transmission lines? Is it Guzman, Citra, or DMEA that will actually come on the property and work on transmission lines? What will be the height of the poles and the altered and expanded transmission lines? The question as to the height of these transmission poles to accommodate the solar farm electric transmission to the substation has been asked numerous times of DMEA and no answer has been given to us to date. The poles are currently 42 feet high. The recorded easement is 40 feet. When Carl was asked today if he knew the proposed pole height he said he was told 90' to 120'. Why couldn't /wouldn't DMEA give us this information. Recommended easement width for an 115KV line is 50-100 feet. Carl was asked if he was aware of a proposal from DMEA to widen the easement by eminent domain. He was not aware of any such proposal.

An increase to the width of the easement and additional height to the poles and lines will seriously impact our ability to live at the home site we have been developing since 2006.

Once permitted, is it possible for DMEA and Guzman to come back to the county to permit further expansion or changes to that which was originally approved. (Raise solar panel height – or increase voltage again on transmission lines, bring additional acreage on line for solar etc.) or will this kind of expansion be permitted in the future by approval given now.

PROPERTY OWNERS NEED TO SEE PLANS AND TIMING! Once approved it seems we are being told they can do whatever they want to. AT THE VERY LEAST property owners impacted should have the opportunity to review GUIDELINES as set forth by the entities regulating the solar farm installation and transmission of the electricity. . These unknowns are essentially infringing on our private property rights for land outside of the DMEA easement, by obstructing us from going forward with plans for enhancement and improvement of our property and these unknowns, by lack of information asked for and not provided, substantially interferes with the right to seek quiet use and enjoyment of the property free from unreasonable interference. "NO PERSONS SHALL BE ARBITRARILY DEPRIVED OF HIS PROPERTY.

Why didn't Guzman have to wait "the one year" between applications? Carl told us Garnet Mesa Solar LLC came back with the same permitting plan with a material change. He told us that it was at his **discretion** to accept the irrigation being on a sprinkler instead of flood irrigation as a material change.

We have been told that the tax benefit to Delta County is 13 million over 15 years. Carl was asked if he could or would extrapolate from that 13 million, the historic taxes for the ranch property Guzman purchased for the Garnet Mesa Solar Farm and the cost of the reduction in property taxes that will occur from loss of property value to area adjacent acreage and home sites in order to get us a real number as to dollar benefit to the county.

We asked for the 700 page Application that had been referenced in the original meetings for consideration of this solar farm. That is now being made available to us by Delta County although it should have been made available the first go round.

Why does Guzman need 473 acres approved for permit of only 129 acres are being used for the Solar Farm installation and electric transmission?

Schofield /Cherek page 3

Carl was asked if he was aware of the advocacy groups helping property owners and communities fight against the installation of Solar Farms in rural residential areas and communities not wanting to live next to a solar farm or suffer the impacts to their way of life and property values. He said that he was. He was told that he and Delta County are on the wrong side of history on this. He was reminded by all in attendance that no one present was against the installation of Solar Farms in Delta County; however this location Guzman and DMEA are pushing is just wrong on so many levels!



Help us protect agricultural-forestry zoned land

Home

About Us

Gallery

Video Hub

Culpeper County's Story

Citizen Groups

Press Room

Resources

Citizens For
Responsible
Solar

Click on the below related articles.

Success Stories Opposing Industrial-Scale Solar On Agricultural-Rural Land

Utility-scale solar belongs on industrial-zoned land, marginal land or commercial rooftops. The destruction of farm and timberland is not green.

Augusta County, Virginia

Augusta Board of Supervisors votes to limit solar to 200 acres.



Augusta County Supervisors pass solar restrictions despite pleas from farmland owners

Policy changes include projects strongly discouraged from covering more than 200 acres with panels, and from close proximity to other solar energy facilities, and discouraged from Urban Service and Community Development areas.

July 28, 2021 - [Augusta County Supervisors pass solar restrictions despite pleas from farmland owners](#)

Axton in Henry County, Virginia

Lee Clark, Henry County's director of planning, zoning and inspections said "For me it's about the appropriateness of land use" and saying that just because a person doesn't own the view doesn't necessarily mean they are not entitled to enjoy it.

Board of Zoning Appeals denies two solar farm requests in Axton

Bill Wyatt Nov 29, 2021 1



Henry County Board of Zoning Appeals prepare to open public hearings on two solar farms in Axton that lasted over four hours.

November 29, 2021 - [Board of Zoning Appeals denies two farm requests in Axton](#)

Bedford, New York

Bedford Town Board voted to reject a petition for proposed solar plant zoning amendment. There will be no industrial-scale plants near residents. The planning board, because it is cheaper to build these facilities on open land, it believes that allowing such developments will serve as a disincentive to putting such facilities on the commercial and municipal sites that are most appropriate for them.

The Record-Lowell Press and Review
RECORD REVIEW

Bedford

No code revision for solar farm projects

By JEFF MORRIS

At its meeting on May 11, the Bedford

amendment would have essentially made it possible to build solar farms

ford Town Board voted to follow the planning board's recommendation and reject a petition for a proposed solar farm zoning code amendment.

throughout the Town of Bedford. In its letter to the town board, the planning board stated it fully supports the development of solar power

May 28, 2021 - [No code revisions for solar farm project](#)

Clark County, Nevada

Clark County courts deny ordinances to expand where solar plants are allowed in the county; Citizens for Responsible Solar provided advisory support for the effort.

EWKYT STANDS FOR KENTUCKY

Clark Co. tables massive solar farm project for now

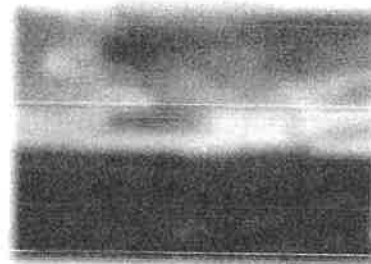


August 26, 2021 - [Clark Co. tables massive solar farm project for now](#)

Culpeper County, Virginia

Since 2010, Culpeper citizens have successfully opposed 4 industrial-scale solar projects on agricultural land: Troilio, Greenwood, Cricket and Maroon. Citizens for Responsible Solar was created by concerned residents who are committed to protecting their community, the land and the environment. Despite these victories, Culpeper's agricultural land remains under threat and Citizens for Responsible Solar continues to work toward an ordinance that restricts utility-scale solar to industrial land.

[Citizens for Responsible Solar](#)
[Greenwood Solar Project](#)
[Cricket Solar Project](#)
[Maroon Solar Project](#)
[Troilio Solar Project](#)



Nov 19, 2021 - [Loud and clear: Culpeper County planners support solar plants on industrial land only.](#) Opposition led by Citizens for Responsible Solar.

May 4, 2021 - [Culpeper County Board denies Maroon Solar project request.](#) Opposition led by Citizens for Responsible Solar.

Nov 22, 2020 - [Strata Solar pulls application for utility scale project in Culpeper.](#) Opposition led by Citizens for Responsible Solar.

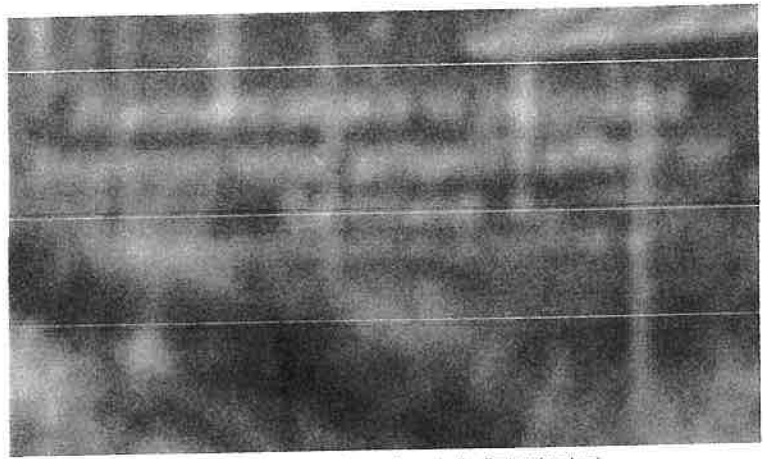
October 4, 2020 - [Permit expires for Culpeper solar-power plant.](#) Greenwood Solar's CUP approved in 2018 expires after citizens successfully delay approval of site plan. Opposition led by Citizens for Responsible Solar.

September 10, 2019 (The Washington Post) - [A company suggested installing solar panels near Virginia Civil War battlefields. Locals raged — and what happened next will happen again, experts say.](#)

Fauquier County, Virginia

County planners reject application for 40-acre solar plant in Bealeton after deciding it was not in accord with the comprehensive plan.





April 21, 2021 - Planners object to proposed Boulton solar project's effect on farmland

Gloucester County, Virginia

Board of Supervisors reject zoning ordinance revision and restricted industrial-scale solar.

Gloucester County, Virginia

Gloucester County Board of Supervisors rejected a proposed zoning ordinance revision that would have restricted industrial-scale solar.

September 8, 2021

The Board of Supervisors rejected a proposed zoning ordinance revision that would have restricted industrial-scale solar.

The Board of Supervisors rejected a proposed zoning ordinance revision that would have restricted industrial-scale solar.

The Board of Supervisors rejected a proposed zoning ordinance revision that would have restricted industrial-scale solar.

The Board of Supervisors rejected a proposed zoning ordinance revision that would have restricted industrial-scale solar.

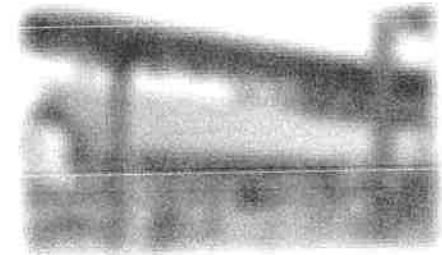
September 8, 2021 - Gloucester board approves limits on solar facilities

Howard County, Indiana

Howard County Board of zoning appeals voted to deny Engie's special exception permit to build 2,000-acre solar plant.

Howard County, Indiana

Howard County Board of zoning appeals voted to deny Engie's special exception permit to build 2,000-acre solar plant.

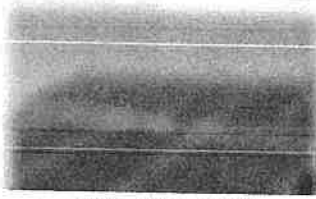


September 8, 2021 - BZA denies special exception for solar farm

Lincoln County, North Carolina

Lincoln City loses appeals court litigation filed by citizens opposing Strata Solar's proposed solar plant. Application originally filed in 2013.

Solar Farm Saga--2019 Chapter

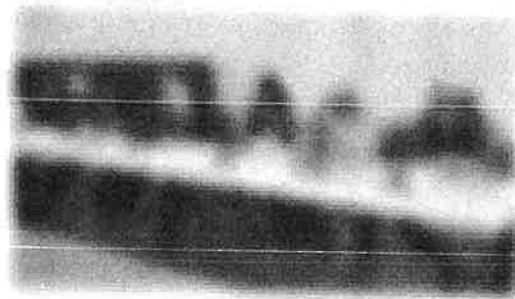


July 16, 2019 - [Solar Farm Saga--2019 Chapter](#)

Linn County, Iowa

The Linn County Planning and Zoning Commission voted 6-1 Nov. 29 to recommend denial of a rezoning request for an industrial-scale solar project in the northwest portion of Linn County.

[Linn County Planning and Zoning Commission](#)
[Recommendation to Deny Rezoning](#)
[Request for Coggon Solar Project](#)



November 30, 2021 - [Linn County commission recommends denial of rezoning request for Coggon Solar project](#)

Madison County, Virginia

Madison County Board of Supervisors approves a zoning ordinance restricting utility-scale solar to industrial-zoned land.

[Madison County Board of Supervisors](#)
[Approves Ordinance Restricting Utility-Scale Solar to Industrial-Zoned Land](#)

Madison County Board of Supervisors approved a zoning ordinance on August 8, 2019, that restricts utility-scale solar to industrial-zoned land. The ordinance also requires that solar projects be sited in areas that are not prime agricultural land.

August 8, 2019 - [Madison requires industrial zoning for utility-scale solar plants](#)

Mecklenburg County, Virginia

Planning commission rejects 800-acre 105 MW Longroad Energy solar plant.

[Mecklenburg County Planning Commission](#)
[Rejects 800-Acre 105 MW Longroad Energy Solar Plant](#)

[Mecklenburg County Planning Commission](#)
[Rejects 800-Acre 105 MW Longroad Energy Solar Plant](#)

[Mecklenburg County Planning Commission](#)
[Rejects 800-Acre 105 MW Longroad Energy Solar Plant](#)

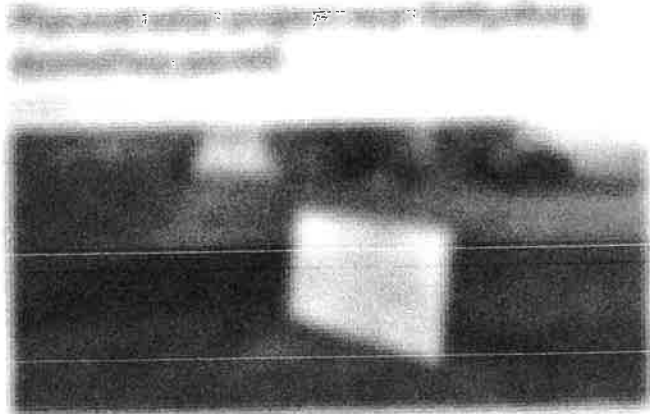
[Mecklenburg County Planning Commission](#)
[Rejects 800-Acre 105 MW Longroad Energy Solar Plant](#)

[Mecklenburg County Planning Commission](#)
[Rejects 800-Acre 105 MW Longroad Energy Solar Plant](#)

October 6, 2021 - [Mecklenburg planners give thumbs down to Longroad solar project](#)

Mt. Joy Township, Pennsylvania

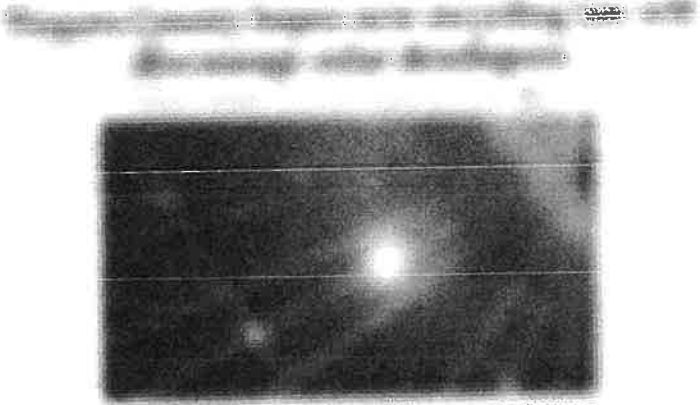
Mt. Joy Township supervisors deny permit for 75 MW solar plant b NextEra; Citizens for Responsible Solar provided advisory support for the effort.



June 5, 2021 - [Planned solar project near Gettysburg denied key permit](#)

Niagara County, Kentucky

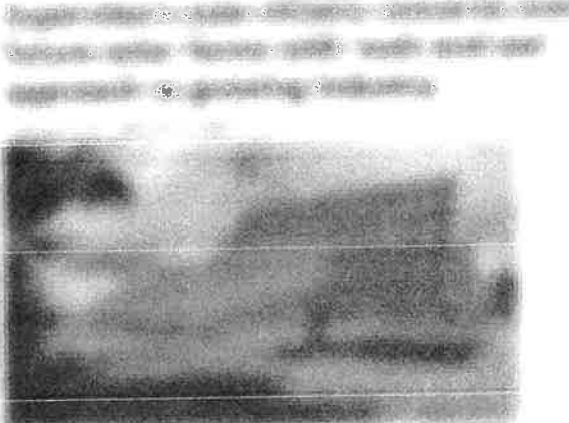
Niagara County passed a new law requiring solar developers submit a detailed recycling plan for solar panels hoping it will discourage developers from pushing large solar projects in the county.



Jun 20, 2021 - [Niagara County hopes new recycling law will discourage solar developers](#)

Page County, Virginia

Citizen opposition successfully prevented the Board of Supervisors from passing a pro-developer ordinance and have also kept a project from proceeding; Citizens for Responsible Solar provided advisory support for their effort.

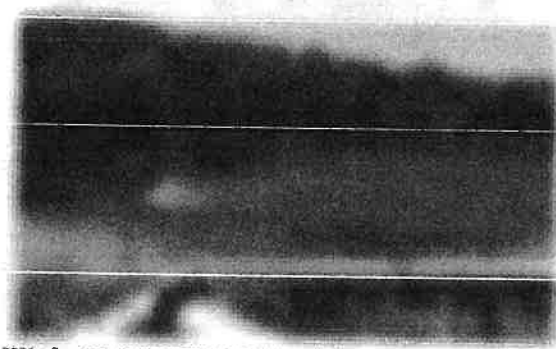


May 20, 2021 - [Supervisors ease citizens concerns over future solar farms with 'wait and see' approach to growing industry](#)

Smith Mtn Lake, Virginia

Energix Solar application withdrawn as a result of citizens opposition. Citizens for Responsible Solar provided advisory support for their effort.

[Energix Solar application withdrawn as a result of citizens opposition](#)



September 10, 2021 - [Company scraps plans for Westlake solar farm](#)



**Citizens For
Responsible
Solar**

PLEASE [CONTACT US HERE TO JOIN OUR EFFORT](#) to protect agricultural-rural land from industrial-scale solar development. We are a grassroots group of concerned citizens organized to promote responsible solar and other forms of renewable energy. Destruction of habitat on an industrial scale is not green.

For our latest updates in your inbox fill in the below.

Full Name*

Email*



I accept terms & conditions

Submit

CITIZENS FOR RESPONSIBLE SOLAR

[Home](#)

[Video Hub](#)

[About Us](#)

[Culpeper's Story](#)

[Press Room](#)

CITIZENS

[Impacted Citizens](#)

[Page County](#)

RESOURCES

[Solar Toolkit for Citizens](#)

[Solar Ordinance](#)

[5 Things to Know About Solar](#)

[American Battlefield Report](#)

[Water- Ecological Concerns](#)

[Solar Times Blog](#)

CONNECT & SUPPORT

[Contact Us](#)

[Donate](#)

Disclaimer: The information contained on the Citizens for Responsible Solar website is for general informational and educational purposes. The decision to use content on the Citizens for Responsible Solar website is the responsibility of the reader. While Citizens for Responsible Solar believes the information on its website is accurate, we encourage the reader to conduct their own research, as

much information is subject to interpretation, and information may be updated, as new research, findings, materials, reports and studies become publicly available.

©2020 Citizens for Responsible Solar | Privacy Policy | Terms of Use | Citizens for Responsible Solar is a 501(c)(4) Non-Profit Headquartered in Culpeper, Virginia

Home

Gallery

Video Hub

Culpeper County's Story

Citizen Groups

Press Room

Resources



Citizens For
Responsible
Solar



Who We Are

We are a nonprofit organization, dedicated to helping rural communities save their community, from energy corporations who want to build large-scale, industrial solar power plants on agricultural- and forestry-zoned land.

We are a 501(c)(4) nonprofit.

Mission

We advocate for responsible solar policies that balance the demand for renewable energy with the interests of counties and their residents. We raise awareness about what is happening in rural communities, and work to save agricultural-forestry zoned land from large, industrial-scale solar developments.

Our Story

Citizens for Responsible Solar was formed by concerned citizens in response to the destruction of the rural landscape in Virginia by industrial-scale solar development. In 2018, three industrial-scale solar projects targeted Culpeper, VA and submitted applications to develop thousands of acres of farmland, woodlands and rural acreage and replace them with hundreds of thousands of solar panels. These projects proposed devastating impact to the environment, threatened historic land, purported questionable economic benefits to the local community and undermined resident property values. Unfortunately, we found that this story was being repeated across the state and all over the U.S. First and foremost, we are working hard to protect Culpeper, VA from the continued onslaught of aggressive solar developers, and we are supporting rural residents across the country in their own challenge to preserve their health, safety, rural lifestyle and property.

Our Core Team



Susan Ralston

Susan is leading the Citizens for Responsible Solar tax-exempt group. Through her own consulting firm, Susan helps organizations with strategic partnership development, public affairs and public relations activities. She was a Special Assistant to President George W.



Bud Hall

Bud is a founding board member of the Chantilly Battlefield Association, the Association for the Preservation of Civil War Sites (now the American Battlefield Trust), the Brandy Station Foundation, and has been active in historic preservation for more than 30 years.



The People of Culpeper, Virginia

There are hundreds of people of Culpeper united to protect our land, history and homes.

Bush and a deputy to Karl Rove, the Deputy Chief of Staff and Senior Advisor at The White House. Susan has lived in Culpeper, Virginia for the last 10 years.

Bud has written and lectured widely on cavalry operations and Culpeper County during the American Civil War, and is acknowledged as Culpeper's Civil War historian. Bud is a Marine combat veteran, who served in Viet Nam. He resides in Culpeper, Virginia.

: Citizens for Responsible Solar



Culpeper: \$37M in violations is a drop in the bucket for these solar companies

Susan raises what is Culpeper's oversight plan, or what is the decommissioning costs? If we allow the destruction of this...



Culpeper: A deep dive into Culpeper's history with Bud Hall

Bud provides a glimpse into the history of Culpeper in Virginia, which was monumental during the Civil War, in...



Culpeper: Elderly lives matter

Don expresses how elderly lives do matter, asks that the so proposals be denied and a solar ordinance be put in place.



Citizens For
Responsible
Solar

PLEASE [CONTACT US HERE](#) TO JOIN OUR EFFORT to protect agricultural-rural land from industrial-scale solar development. We are a grassroots group of concerned citizens organized to promote responsible solar and other forms of renewable energy. Destruction of habitat on an industrial scale is not green.

For our latest updates in your inbox fill in the below.

Full Name *

Email *

☐

I accept terms & conditions

Submit

CITIZENS FOR RESPONSIBLE SOLAR

[Home](#)

[Video Hub](#)

[About Us](#)

[Culpeper's Story](#)

[Press Room](#)

CITIZENS

[Impacted Citizens](#)

[Page County](#)

RESOURCES

[Solar Toolkit for Citizens](#)

[Solar Ordinance](#)

[5 Things to Know About Solar](#)

[American Battlefield Report](#)

[Water- Ecological Concerns](#)

CONNECT & SUPPORT

[Contact Us](#)

[Donate](#)

Disclaimer: The information contained on the Citizens for Responsible Solar website is for general informational and educational purposes. The decision to use content on the Citizens for Responsible Solar website is the responsibility of the reader. While Citizens for Responsible Solar believes the information on its website is accurate, we encourage the reader to conduct their own research, as much information is subject to interpretation, and information may be updated, as new research, findings, materials, reports and studies become publicly available.

©2020 Citizens for Responsible Solar | Privacy Policy | Terms of Use | Citizens for Responsible Solar is a 501(c)(4) Non-Profit Headquartered in Culpeper, Virginia

Columbia Law School
Scholarship Archive

Sabin Center for Climate Change Law

Research Centers & Programs

3-2022

Opposition to Renewable Energy Facilities in the United States: March 2022 Edition

Hillary Aidun

Columbia Law School, Sabin Center for Climate Change Law, hwa2108@columbia.edu

Jacob Elkin

Columbia Law School, Sabin Center for Climate Change Law

Radhika Goyal

Columbia Law School, Sabin Center for Climate Change Law

Kate Marsh

Columbia Law School, Sabin Center for Climate Change Law

Neely McKee

Columbia Law School, Sabin Center for Climate Change Law

See next page for additional authors

Follow this and additional works at: https://scholarship.law.columbia.edu/sabin_climate_change



Part of the Energy and Utilities Law Commons, Environmental Law Commons, and the Land Use Law Commons

Recommended Citation

Hillary Aidun & Jacob Elkin et al., *Opposition to Renewable Energy Facilities in the United States* (Sabin Center for Climate Change Law March 2022 ed.).

This Report is brought to you for free and open access by the Research Centers & Programs at Scholarship Archive. It has been accepted for inclusion in Sabin Center for Climate Change Law by an authorized administrator of Scholarship Archive. For more information, please contact scholarshiparchive@law.columbia.edu, rwitt@law.columbia.edu.

Authors

Hillary Aidun, Jacob Elkin, Radhika Goyal, Kate Marsh, Neely McKee, Maris Welch, Leah Adelman, and Shane Finn

birds in violation of the public trust doctrine. On appeal, the 1st District Court of Appeal of California affirmed that whilst the plaintiffs had standing, the requisite time bringing a petition for a writ of mandate had long passed by the time of the action.²⁵

- **Halus Power:** The Heron Bay Homeowners' Association in San Leandro successfully had approval for a single 100-foot wind turbine set aside and Halus Power did not proceed with the project.²⁶

7. COLORADO

7.1 Local Laws/Ordinances

- **Washington County:** A temporary moratorium on the county's processing of wind and solar farm permits in unincorporated parts of the county came into effect on March 24, 2020.²⁷

7.2 Contested Projects

- **Pueblo:** In December 2018, Pueblo County commissioners denied Invenergy's application to construct a 100-MW solar energy generation facility after local residents expressed fears of fire and property value depreciation. The commissioners encouraged Invenergy to look for another site in the county for potential development.²⁸
- **Tessera:** In 2010, Tessera Solar proposed a 145-MW solar facility in Saguache County, Colorado. Residents organized against the proposed solar plant due to concerns about noise and environmental impact. Ultimately, Tessera Solar withdrew the application because the project failed to meet state noise requirements.²⁹

²⁵ *Center for Biological Diversity, Inc. v. FPL Group, Inc.*, 166 Cal. App. 4th 1349 (Cal. Ct. App. Sept. 18, 2008).

²⁶ *Heron Bay Homeowners Ass'n v. City of San Leandro*, 19 Cal. App. 5th 376 (Cal. Ct. App. Jan. 12, 2018).

²⁷ WASHINGTON COUNTY, CO., Resolution 64 (Mar. 24, 2020).

²⁸ Anthony Mestas, *County denies solar project*, THE PUEBLO CHIEFTAIN, Dec. 12, 2018.

²⁹ Mary and Vince Palermo, *County to hold public hearing on Tessera solar proposal* Dec. 6, THE CRESTON EAGLE (visited Dec. 18, 2020); Megan Verlee, *Residents Fight Over Solar Projects*, COLORADO PUBLIC RADIO, Dec. 21, 2010.



Top Stories

By Scott Harrison ✓

June 6, 2022 6:47 PM Published June 6, 2022 11:30 AM

Two large solar farms, one under construction and one seeking approval, in Pueblo County



PUEBLO COUNTY, Colo. (KRDO) -- KRDO NewsChannel 13 is updating the progress of two significant solar power-generating operations in the area.

One of the projects is currently being built north of the Pueblo Airport, along the road that leads to the Transportation Technology Center; both sides of the road for several miles appear to be full of solar farm infrastructure.

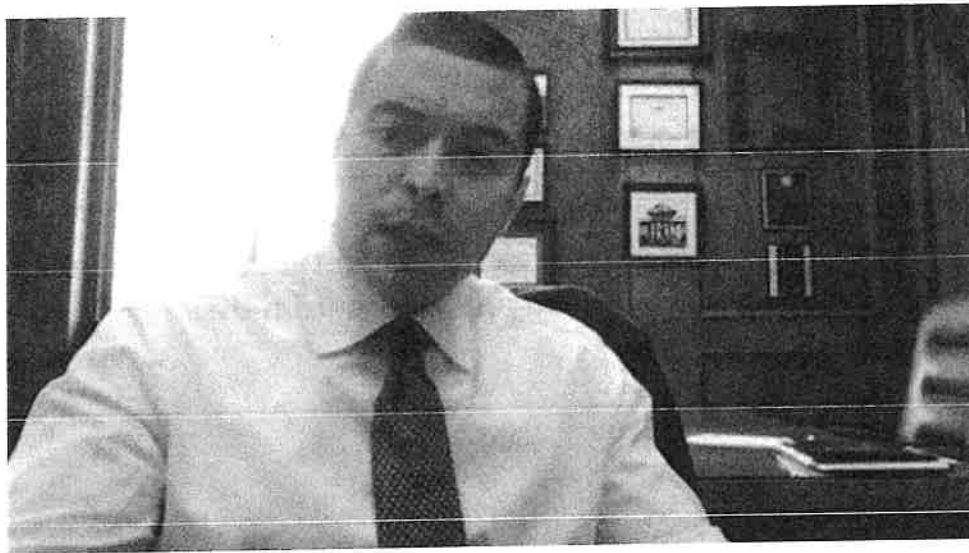


KRDO

Signage on the property indicates that the project is being built by *Moss CM*, a Florida-based construction company that also specializes in solar energy projects; the company's website lists two similar projects in Boulder and 14 others in seven states.

×

4th OF JUL



KRDO

"That's just one of many solar farms we've had come here," said County Commissioner Garrison Ortiz. "The weather is perfect for that industry and our regulations now make it more favorable to have solar farms operating here. We also have plenty of land where they can build without a lot of opposition, and that's hard to find."

But commissioners expect to vote Thursday on whether to approve a proposed solar farm, known as the Pronghorn Solar Park, that would be located along Lime Road near the existing Xcel Energy power plant.

×

MENU

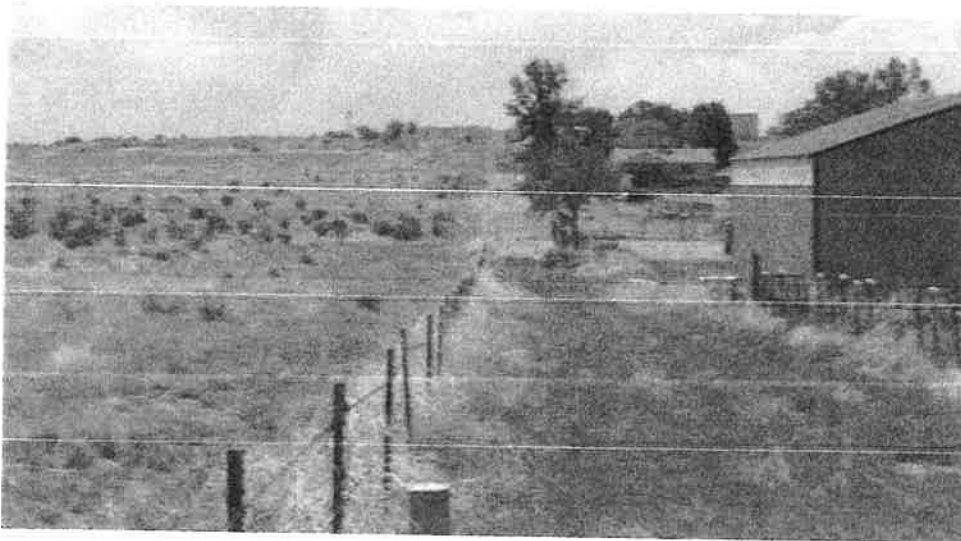


82°

**KRDO**

If approved, construction on that project would begin later this year and start operations late next year.

Many residents of the nearby Lakeside Manor Estates neighborhood oppose the project, saying that thousands of solar arrays would be placed just across from their backyards.

**KRDO**

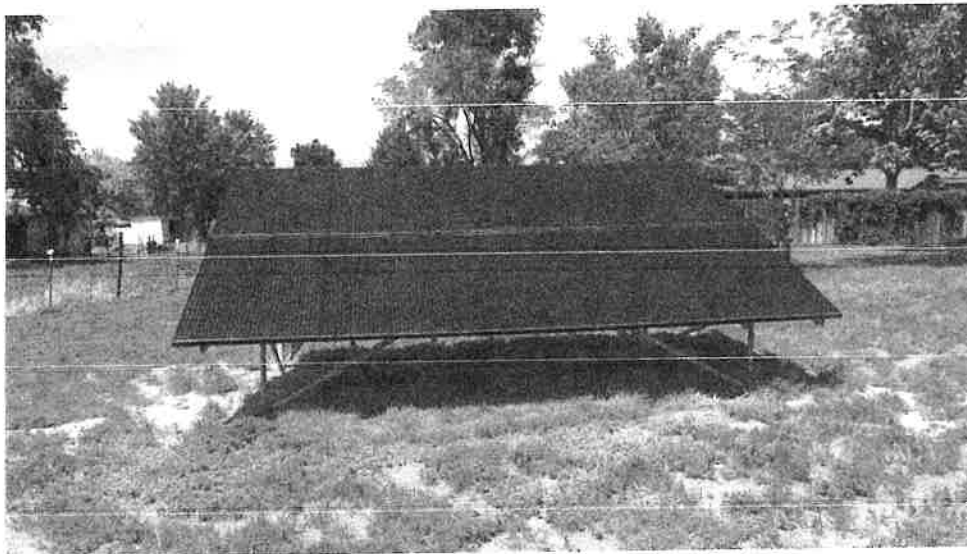
"We don't want the disruption of our views," said Rhonda Pighetti, a resident for 42 years. "We've also talked to realtors in our area, and they said that it would depreciate the value of our homes and property. We are concerned for what it will disrupt behind us. We have wildlife back there."

✕

**KRDO**

She said that some homeowners may move out of the neighborhood if the project is approved.

"It's not that we're against solar power," Pighetti said. "I have solar panels in my yard. This just isn't the right place for that project. And it doesn't benefit anyone here in our county. The landowner who sold for the project lives out of town, and the power from it is going to Denver."

**KRDO**

Representatives of Moss and Pronghorn were unavailable for comment Monday.

Top Stories



WIKIPEDIA

National Electrical Safety Code

The **National Electrical Safety Code (NESC)** or **ANSI Standard C2** is a United States standard of the safe installation, operation, and maintenance of electric power and communication utility systems including power substations, power and communication overhead lines, and power and communication underground lines. It is published by the Institute of Electrical and Electronics Engineers (IEEE). "National Electrical Safety Code" and "NESC" are registered trademarks of the IEEE. The NESC should not be confused with the National Electrical Code (NEC) published by the National Fire Protection Association (NFPA). The NEC is used for residential, commercial, and industrial building wiring.

Contents

General

- [Access to the NESC](#)

- [Format of the NESC](#)

- [NESC Handbooks and Other Resources](#)

Links

References

General

Access to the NESC

The NESC is written as a voluntary standard. It is typically adopted as law by individual states or other governmental authorities. To determine the legal status of the NESC, the state public service commission, public utility commission, or other governmental authority should be contacted. The majority of the states in the United States adopt the NESC in some form or fashion. The state of California is an exception. The state of California writes their own utility codes titled General Order 95 (GO95) for overhead lines and General Order 128 (GO128) for underground lines. The current edition of the NESC (2017) is available as a spiral bound book containing approximately 345 pages. The NESC codebook can be purchased online from the publisher, from IEEE (<http://www.IEEE.org>), or at various third party websites. The 2023 edition of the NESC codebook, handbook and course program will be available in August 2022 and can be preordered beginning in May 2022.

Format of the NESC

The NESC is written by various sub committees. The organizations represented, subcommittees, and committee members are listed in the front of the code book. The NESC contains the procedure and time schedule for revising the NESC, which are described in the back of the code book. The NESC has an interpretation committee that issues formal interpretations. The process for obtaining a formal interpretation is outlined in the front of the code book. The NESC is currently published on a 5-year cycle. Urgent safety matters that require a change in between code editions are handled through a Tentative Interim Amendment (TIA) process. Original work on the NESC began in 1913.



He Set Up a Big Solar Farm. His Neighbors Hated It.

A push toward renewable energy is facing resistance in rural areas where conspicuous panels are affecting vistas and squeezing small farmers.



By Sarah Maslin Nir

March 18, 2020

LEWISTON, N.Y. — Neighbors used to wave to Timothy Masters whenever he stood outside his cherry-red barn, trading hellos across his corn and soybean fields in this small town about 10 miles north of Niagara Falls.

That ended about a year ago, when a field of solar panels was deposited on 18 acres of Mr. Masters's land.

Mr. Masters, the building inspector in Lewiston, is among a growing number of landowners trying to cash in on New York State's push toward renewable energy: The solar company now leasing his land, he said, pays him 20 times more than the soybean farmer who had previously rented it.

But by replacing lush green soybean plants with rows of silicon and metal solar panels, Mr. Masters has found himself the target of a growing backlash against the spread of solar farms in rural areas.

"You'll have people that get up and say, 'I am green,' and 'I'm for the environment,' and 'I'm pro this whole green agenda,' but then all of a sudden whenever one comes in, it changes," Mr. Masters said. "What I notice is people have ideals and values that they will put forth — until it comes maybe around their house."

Opponents in New York cite reasons from practical to the aesthetic: the impact of the solar arrays on pastoral vistas, the hazard of glare for drivers passing by and even concern for endangered short-eared owls that may struggle to find field mice to eat among the panels.

There is also economic opposition from small farmers who lease land parcels from bigger farmers or landowners; they fear that they will be squeezed out by energy companies willing to pay more to use farmland for their solar cells.

Across swaths of western New York, anti-solar sentiment has fomented in heated town hall meetings and has surfaced on lawn signs and in Change.org petitions. The movement has had some effect: At least a dozen towns in New York State have placed moratoriums on new solar projects, and several others are weighing temporary bans. Local officials have said that they need time to study the potential impact of the solar farms.





Farmers who lease small land parcels fear that they will be squeezed out by energy companies willing to pay more. Libby March for The New York Times

The pushback is not unique to New York; in Virginia, the successful quashing of a planned 80-megawatt solar farm near Culpeper last year inspired the launch of a nonprofit with a mission to help communities across the country stop solar farms.

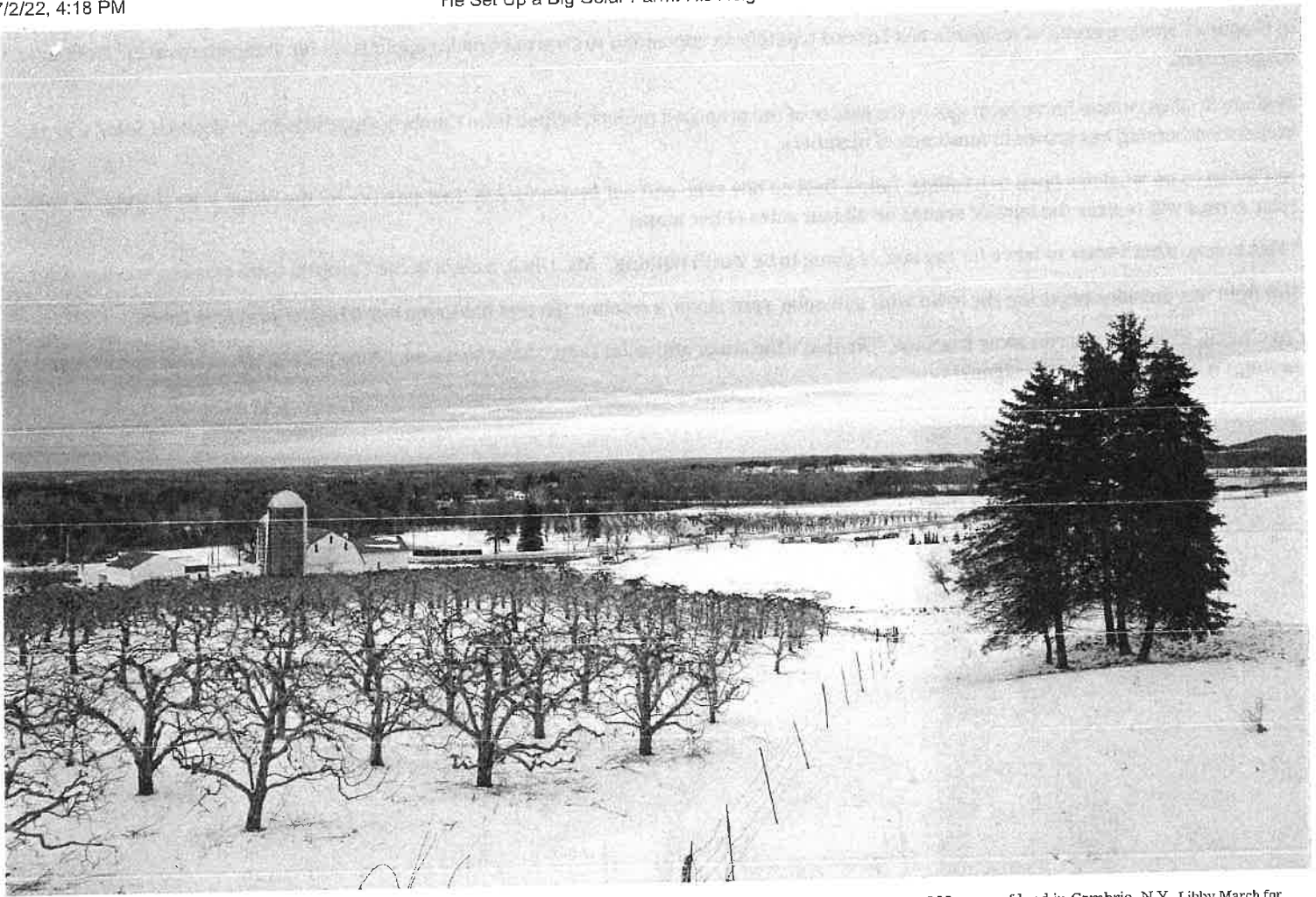
See attached 'Citizens for Responsible Solar'
The grass-roots backlash against large solar farms has become so widespread that the Solar Energy Industries Association last year developed and disseminated a manual that included navigating community sensitivities, in a move to combat mounting negativity.

Abigail Ross Hopper, the president and chief executive of the association, said that many struggling farmers need the income from solar to supplement their traditional businesses; some even use grazing sheep as a way to manage the pastures surrounding the panels.

"If that narrative gains traction, that these are just big developers with little care for the communities they are operating in, that is a problem," Ms. Hopper said. "Because you do lose the reality, which is clean energy, clean air, clean water, good jobs, local tax revenue."

In New York, lawsuits have been traded on both sides of the aisle: One filed late last year in Duanesburg, in Schenectady County, seeks to block a proposed solar farm; another filed last March in Coxsackie, in Greene County, unsuccessfully challenged a new town zoning law that prohibited larger scale solar plants in certain areas.

"I'm not against solar power, that's not my problem. I'm for it, but not to the point of disrupting the whole community that we've got there," said Wright H. Ellis, the longtime town supervisor of Cambria in Niagara County, where a California-based company, Cypress Creek Renewables, is planning to build the Bear Ridge Solar Project. The sprawling proposed plant would total about 900 acres, much of it on prime farmland within the town limits.



Cypress Creek Renewables, a California-based company, is seeking to build the 100-megawatt Bear Ridge Solar Project on 900 acres of land in Cambria, N.Y. Libby March for The New York Times

"This is the wrong place to put it," said Mr. Ellis, a former naval captain whose office inside Cambria Town Hall serves as his anti-solar war room, with petitions to sign and town zoning maps blasted in red where solar may end up. "Don't drop it in the middle of an agricultural, residential community. You're talking about disrupting a way of life," he said.

Sign up for the New York Today Newsletter Each morning, get the latest on New York businesses, arts, sports, dining, style and more. [Get it sent to your inbox.](#)

Part of the impetus behind the solar power push in New York is the state's mandate, under Gov. Andrew M. Cuomo, to shift 70 percent of its electricity to renewable energy sources such as solar, hydroelectric and wind power by 2030.

The move has resulted in a so-called green rush of solar developers, spurred by generous subsidies and tax breaks, to procure flat, vacant land on which to install sun-catching technology. More than 46,000 solar projects of varying sizes have been completed since 2016, according to information collected by the state.

Opposition has largely focused on large-scale solar farms. A state law known as Article 10 empowers the state to approve 25-megawatt plants or larger (a 25-megawatt solar plant generally requires more than 100 acres of land). None have yet been built via this process; 38 are making their way through the approval process, according to the New York State Energy Research and Development Authority.

Governor Cuomo said that the state intends to streamline that process through a new Office of Renewable Energy Permitting, eventually allowing the state to preselect sites for large solar farms and assess their viability, then offer those that pass muster to developers.

"When the private developer advances it, they often generate community opposition, because they don't bring the lens of political feasibility," the governor said in an interview. If the state can "run the traps first on the community opposition," Mr. Cuomo added, then some of the tensions should subside. But critics fear that the new model, if adopted, will render the community powerless to stop a preselected site.

In Niagara County, a group of residents has banded together in opposition to Cypress Creek's application for state approval for its Bear Ridge project.

Melinda S. Olick, whose horse farm sits in the center of the proposed project, helped form Cambria Opposition to Industrial Solar, a group whose membership has grown to hundreds of members.

Her living room windows open to a rolling, fallow field on one side, and her two horses in their pasture on the other. If Bear Ridge is built, solar arrays will replace the bucolic scenes on all four sides of her home.

"This house, what I want to leave for my son, is going to be worth nothing," Ms. Olick, a clerk in the Cambria town assessor's office, said.

Her fight has included papering the town with anti-solar yard signs, a sideline job that has given her a higher profile in town.

"At church, people would run away from me, 'Oh, that's the crazy anti-solar lady,'" Ms. Olick said, "Now people are coming up to me and saying, 'Where do you get the signs?'"



Melinda and Scott Olick, bottom left, oppose the Bear Ridge Solar Project; they own a farm that would be surrounded by solar panels if the project is approved. Libby March for The New York Times



Libby March for The New York Times





Libby March for The New York Times

Cypress Creek officials said they continue to try to work with the community, noting that they had hired a local outreach coordinator, conducted site walks with community members and opened a project office to answer local questions.

"New York's permitting processes create opportunities for the public's questions, concerns, support and opposition to be expressed, addressed and documented," Kevin Kohlstedt, a developer for Cypress Creek, wrote in an email. "We listen, incorporate feedback and adjust the project when possible."

The tension over solar plants often resembles not-in-my-backyard, or Nimby, disputes. In Altamont, about 20 miles northwest of Albany, Laura Shore has spent the last several months fighting a proposed solar farm with petitions, letter-writing campaigns and media interviews.

Ms. Shore, a landscape painter, said one of her favorite scenes to paint was a local orchard with its majestic vista of the Helderberg Escarpment. The 60 plus acres were the planned site of a five-megawatt solar field, adding to two sites already in the town, and more under consideration.

"I think there is an awful lot of pressure for solar, and I think it's really good," said Ms. Shore, whose lobbying recently got the site moved to a less visible field. "I am willing to accept seeing solar in a lot of different settings. I just think that there are certain places that just should be off-limits."





COLORADO
Department of Local Affairs
 Division of Property Taxation

2022 Renewable Template for Estimating Property Taxes for Qualified State Assessed Renewables
FOR PROJECTS PLACED IN SERVICE ON OR AFTER JANUARY 1, 2021

State of Colorado - State Assessed Properties

Instructions: (the form is pre-populated to indicate continued integrity of the formulas)

Please complete what is highlighted in Yellow

Annual Factors

Rated Plant Capacity (incl. storage)	80.0	MW (AC)
Annual Production	210,240	MWh
Annual Capacity Factor	30%	%
Energy Price (PPA)	\$50	\$/MWh
Energy Price Escalation Factor (PPA)	0.00%	% per year
Projected Gross Revenue	\$10,512,000	MWh x price
2021 Mill Levy (decimal)	0.075550	75.5500
Capital Cost Threshold	\$506	\$/kW
Non-renewable Equiv. Capital Cost	\$40,480,000	w/o intertie line
Intertie Line Included in the Unit?	yes	new = yes
Intertie Line	\$70,000	fixed cost

2022 Colorado Capital Cost Thresholds
 The capital cost thresholds are the non-renewable equivalent costs developed each year in accordance with §39-4-102, C.R.S. The cost thresholds are contained in the table to the right. The full history of the cost thresholds is available on the Division's website.

2022 Delivery Capital Cost Threshold
 Intertie lines are not part of the capital cost threshold table. Projects in service after 1/1/2012 have the Division's non-renewable equivalent cost of \$70,000 added to the capital cost threshold each year.

Other Important Information
 The projected property tax is estimated as levelized, but will fluctuate each year with the comparable non-renewable energy cost and other variables.
 The nameplate of on-site battery storage connected to the grid should be added to the total nameplate for the facility and valued together.
 Have questions? Call Michael Krueger at 303-864-7792.
 $Capacity\ Factor = (Annual\ Production) \div (Capacity \times 8,760\ hours\ per\ year)$
 $Annual\ Production = (Capacity\ Factor) \times (Capacity \times 8,760\ hours\ per\ year)$

Unhide the missing rows (25-55) to see the depreciating cost basis annual estimated property tax payments, which are converted into level payments below.

Benchmark Calculations

30 Year Projected Property Tax

Based on Depreciating Non-Renewable Cost Basis:		Total Tax Paid Over		Annual Levelized	
Thirty Year Assessed Value Total Estimate		30-years		Equivalent	
\$36,254,503		\$10,513,806		\$350,460	

Annual Energy Production (MWh)					Energy Price Assumption	Gross Energy Revenue	Tax Factor*	Actual Value	Assessment Rate	Assessed Value	Prior Year's Mill Levy %	Projected Property Tax Payment
Year 1	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	26.40%	\$4,248,286	7.5550%	\$320,958			
Year 2	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	26.40%	\$4,248,286	7.5550%	\$320,958			
Year 3	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 4	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 5	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 6	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 7	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 8	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 9	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 10	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 11	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 12	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 13	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 14	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 15	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 16	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 17	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 18	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 19	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 20	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 21	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 22	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 23	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 24	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 25	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 26	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 27	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 28	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 29	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			
Year 30	210,240	\$50.00	\$10,512,000	1.53	\$16,091,992	29.00%	\$4,666,678	7.5550%	\$352,567			

PROJECTED 30-YEAR PROPERTY TAX REVENUE (income basis) \$10,513,806

** Tax Factor: Equivalent to a gross income multiplier without income from renewable energy income tax credits.*

Colorado Threshold Rate History 2014-2022 For State Assessed Qualified Renewable Energy Facilities										
Nameplate MWac	Nameplate kWac	2014	2015	2016	2017	2018	2019	2020	2021	2022
0.000 - 2.000	0 - 2,000	\$1,089	\$1,098	\$1,128	\$1,182	\$1,227	\$1,248	\$1,267	\$511	\$560
2.001 - 5.000	2,001 - 5,000	\$844	\$845	\$916	\$986	\$1,048	\$1,103	\$1,146	\$511	\$560
5.001 - 10.000	5,001 - 10,000	\$738	\$740	\$799	\$859	\$912	\$964	\$1,001	\$511	\$560
10.001 - 50.000	10,001 - 50,000	\$552	\$553	\$577	\$600	\$621	\$635	\$645	\$638	\$640
50.001 - 100.000	50,001 - 100,000	\$435	\$436	\$547	\$479	\$499	\$511	\$518	\$514	\$506
>100.001	>100,001	\$388	\$376	\$371	\$368	\$354	\$342	\$334	\$328	\$319

Note: For tax years 2022 and 2023, the assessment rate for renewable energy facilities is 26.4% rather than 29%.



**DELTA COUNTY PLANNING COMMISSION MEETING MINUTES
DELTA COUNTY BOARD OF COUNTY COMMISSIONER'S ROOM
560 Dodge St., Delta, CO 81416
June 22, 2022**

Chair Tom Kay called the meeting to order at 5:30 p.m. in the Delta County Board of County Commissioner's Room.

ROLL CALL

Planning Commission Members in Attendance:

Tom Kay	Steve Shea
Tate Locke	Hardy Hutto
Steve Schrock	Cindy Watson
Layne Brones	David Marek (Associate)
Jacob Gray	

Absent Members:

Michelle Roberts (Associate)
Kate Darlington

With member(s) absent from District 3, David Marek is a voting member.

Staff in Attendance:

Delta County Community Development & Natural Resource Director, Carl Holm
Delta County Community Development Planner I, Kate Kelly
Delta County Community Development Planner I, Angie Kemp
Delta County Community Development Administrative Assistant, Kim Henderson
Delta County Community Development Code Compliance Officer, Everett Neil
Delta County Engineer, Tim McCracken
Delta County Administrator, Robbie LeValley

Chair Tom Kay revised the order of business to consider Item B.1 first

Item B.1: Meeting Minutes
a. June 8, 2022
RECOMMENDATION: Approve the action minutes as presented.

Cindy Watson moved to approve the action minutes as presented. Layne Brones seconded the motion.

Motion carried unanimously

A. PUBLIC HEARING ITEMS

Item A.1: PLN22-007/C. Brown Subdivision
Consider a Clustered Subdivision subdividing 19.5 acres in the A-5 zoning district into six (6) lots (Preliminary Plat) ranging in size from 2.3 to 5.3 acres. The property is located to the west of Chantelle Lane and north of LJ Road (Parcel #349323400010), Delta.
RECOMMENDATION: Staff recommends that the Planning Commission (PC) recommend the following action(s) to the Board of County Commissioners (BoCC):

- Find that PLN22-007/C. Brown is consistent with applicable policies of the 2018 Master Plan and complies with requirement of the 2021 Land Use Code (LUC) for a Preliminary Plat (clustered subdivision), including Chapters 3, 4, 5 & 6; and
- Conditionally Approve PLN22-007/C. Brown, Clustered Subdivision subdividing 19.5 acres in the A-5 zoning district into six (6) lots (Preliminary Plat) ranging in size from 2.3 to 5.3 acres located at the west end of Chantelle Lane and north of LJ Road, Delta (Parcel:349323400010).

Cindy Watson recused herself from participating as a Planning Commissioner for this item. She stepped down from the table so she could participate as a member of the public.



Planner I, Kate Kelly presented the project, and answered Commissioner questions.

Cody Brown, the applicant provided additional information about the project, and answered Commissioner questions.

There was public comment from six neighbors who attended the hearing in person.

Issues raised and addressed through the public hearing included: access off of LJ Road, access off Chantelle Lane, emergency access, County Road maintenance, Irrigation plan/operations, stewardship areas as well as Covenants.

Following deliberation by the Commissioners:

Jacob Gray moved to deny the application because of issues and questions with the design. Motion died from lack of second.

Hardy Hutto moved to approve PLN22-007/C. Brown Subdivision alternative design with staff recommended findings and conditions as well as two additional conditions:

- 1) Move the emergency access to the west side of Lot 5; and
- 2) Pave Chantelle Lane to the cul-de-sac and dedicate right-of-way for public use.

David Marek seconded the motion.

Motion carried 5-3.

Ayes – Hardy Hutto, Steve Shea, Layne Brones, David Marek, Tom Kay.

Nays – Stave Schrock, Tate Locke, Jacob Gray

Chair Kay called for a 10-minute break.

Cindy Watson returned to the table as a Planning Commissioner.

B. PUBLIC MEETING ITEMS

Item B.2

Land Use Code Update – Work Session

Work Session to consider redline drafts of the following:

- a. Chapter 2, Section 1.A (Table 2.a) "Zoning Districts" (Continued from June 8th)
- b. Chapter 2, Section 2.A "Land Use by Zoning District"
- c. Chapter 2, Section 4.A "Permitted Use Standards"
- d. Chapter 2, Section 5.A "Limited Use Standards"
- e. Chapter 2, Section 6 "Conditional Use Standards"

RECOMMENDATIONS: Staff recommends that the Planning Commission continue a Work Session from June 8th on the LUC Update and:

- a. Consider draft redline edits to Chapter 2, Section 1.A (Table 2.a) "Zoning Districts"
- b. Consider draft redline edits to Chapter 2, Section 2.A "Land Use by Zoning District"
- c. Consider draft redline edits to Chapter 2, Section 4.A "Permitted Use Standards"
- d. Consider draft redline edits to Chapter 2, Section 5.A "Limited Use Standards"
- e. Consider draft redline edits to Chapter 2, Section 6 "Conditional Use Standards"
- f. Provide Direction on topic(s) and date for next Work Session.

The Planning Commission did not consider this item.

C. DEPARTMENT REPORT

Director Holm provided the following updates:

- a. The BoCC accepted Phase 1 of the Anthony Ranches Preliminary Plat.
- b. Garnet Mesa submitted a material change to the application for the Solar project. It is considered a new application that will be presented to the Planning Commission on July 13, 2022. It was noted that the



applicant announced a neighborhood meeting and open house for the public on Monday, June 27th. Any Commissioners attending will be subject to ex parte.

- c. The BoCC had a work session with County staff on June 16, 2022. Staff presented the Code Compliance Program Standard Operating Procedures. The BoCC supported a shift from strictly reactive (require a signed complaint form) leading to formal action to being somewhat proactive with a more informal approach.
- d. The BoCC will be having a work session on mobile homes in July.
- e. The BoCC will be reviewing the Pre-LUC projects to expire the remaining incomplete applications on July 5, 2022.
- f. Kim Henderson completed review of Specific Development Permit files to follow up with condition compliance and possible expired/obsolete permits.
- g. Planning has worked with the County Treasurer and County Attorney to clear old Escrow accounts. Only a handful remain.

D. COMMISSIONER COMMENTS, REQUESTS AND REFERRALS

Tom Kay noted that discussion during this meeting highlighted the need to include emergency access standards and define clustered subdivision/stewardship area as part of considering amendments to the Land Use Code.

ADJOURNMENT

The next meeting will be held on July 13, 2022 at 5:30pm, Delta County Roubideau Room 320 W. 5th Street, Delta, CO.

Meeting adjourned at 8:01 p.m.

Respectfully submitted by:
Administrative Assistant, Kim Henderson