Programmatic Design Features for Visual Resources

The following design features have been identified to avoid, minimize, and/or mitigate potential impacts on visual resources from solar energy development identified and discussed in Section 5.12.3 of the Draft and Final Solar PEIS.

General

VR1-1 Project developers shall consult with the BLM in the early phases of project planning to help determine the proposed project's potential conformance to VRM class designations and other potential constraints, thus avoiding costly unforeseen planning implications and re-design.

(a) Assessing conformance to VRM class designations and identifying visual resource conflicts shall include, but is not limited to, the following:

- Consulting with the appropriate BLM field office for VRM class designations and associated management objectives during the early phases of project planning, including those related to project site selection, planning, and design. The BLM visual resource inventory (VRI) class values—including those for scenic quality, sensitivity, and distance zones—shall also be factored into the project planning, design, and decision making.

- Analyzing how the visual values influence project design and how the impacts on these values will be minimized through consideration for the proposed project location and its relationship to the surrounding viewshed.

- Including a qualified professional, such as a landscape architect, with demonstrated experience of the BLM's VRM policies and procedures as part of the developer's and the BLM's respective planning teams, to evaluate visual resource issues as project siting options are considered.

- Consulting with the locally based public to provide input on identifying important visual resources in the project area and on the siting and design process. The public shall be involved and informed about the visual site design elements of the proposed solar energy facilities.

- Consulting on viewshed protection objectives and practices with the respective land management for landscapes having special designations, such as Wilderness Areas, National Scenic and Historic Trails, Wild and Scenic Rivers, National Parks, and

National Wildlife Refuges located within the project's viewshed. Developers shall demonstrate a concerted effort to reconcile conflicts while recognizing that the BLM retains authority for final decisions determining project approval and conditions.

- For applications that include artifacts and remnants of a National Historic Trail, are located within the viewshed of a National Historic Trail's designated centerline, or include or are within the viewshed of a trail eligible for listing on the *National Register of Historic Places* (NRHP) by virtue of its important historical or cultural values and integrity of setting, evaluating the potential visual impacts on the trail associated with the proposed project; avoiding, minimizing, and/or mitigating adverse effects through the Section 106 consultation process; and identifying appropriate mitigation measures for inclusion as stipulations in the POD.

- Considering landscape settings observed from a unit of the National Park system, National Historic Sites, National Trails, and cultural resources of tribal concern that may be a part of the historic context contributing to the historic significance of the site or trail.

- Project developers are encouraged to obtain topographical data of engineering-design quality and use digital terrain mapping tools at a landscape-viewshed scale for project location selection, site planning and design, visual impact analysis, and visual impact mitigation planning and design. The digital terrain-mapping tools shall be at a resolution and contour interval suitable for site design and accurate placement of proposed developments into the digital viewshed. Visual simulations shall be prepared and evaluated in accordance with BLM Handbook H-8431-1 and other agency directives, to create spatially accurate and realistic depictions of the appearance of proposed facilities. Simulations shall depict proposed project facilities from key observation points (KOPs) and other visual resource sensitive locations.

- Conducting outreach through public forums as necessary to disseminate visual resource information through methods such as offering organized tours of operating solar energy development projects, and using simulations in public presentations.

- Performing visual mitigation planning and design through field assessments, applied global positioning system (GPS) technology, photo documentation, use of computer-aided design and development software, three-dimensional GIS modeling

software, and imaging software to depict visual simulations to reflect a full range of visual resource mitigation measures.

Site Characterization, Siting Design, and Construction

VR2-1 Solar facilities shall be sited and designed to minimize glint and glare.

(a) Identification of glint and glare effects shall include, but is not limited to, the following:

- Assessing and quantifying potential glint and glare effects and determining the potential safety and visual impacts associated with glint and glare using appropriate and commonly accepted software, procedures, and past project examples.

- Having qualified individuals conduct assessments for glint and glare.

(b) Methods to minimize glint and glare effects may include, but are not limited to, the following:

- Limiting use of signs and project construction signs. Beyond those required for basic facility and company identification for safety, navigation, and delivery purposes, commercial symbols or signs and associated lighting on buildings and other structures should be prohibited.

- Utilizing retro-reflective or luminescent markers in lieu of permanent lighting.

- Minimizing off-site visibility of all commercial symbols and signs and associated lighting. Necessary signs should be made of non-glare materials and utilize unobtrusive colors. The reverse sides of signs and mounts should be painted or coated using a suitable color selected from the BLM Standard Environmental Color Chart to reduce contrasts with the existing landscape. However, placement and design of any signs required by safety regulations must conform to regulatory requirements.

- Considering off-site mitigation of visual impacts. In some situations, off-site mitigation may serve as a means to offset and/or recover the loss of visual landscape integrity. For example, off-site mitigation could include reclaiming unnecessary roads, removing abandoned buildings, reclaiming abandoned mine sites, putting utility lines underground, rehabilitating and revegetating existing erosion or disturbed

areas, or establishing scenic conservation easements. Appropriate off-site mitigation will be determined on a project-specific basis in consultation with the BLM.

VR2-2 Solar facilities shall be sited and designed to minimize night-sky effects.

(a) Identification of night-sky effects shall include, but is not limited to, the following:

- Assessing and quantifying potential lighting impacts on the night sky and nocturnal wildlife, while providing lighting for hazard marking, safety, and other necessary site needs.

- Conducting assessments for night-sky effects by qualified individuals using appropriate and commonly accepted procedures and past project examples.

(b) Methods to minimize night-sky effects may include, but are not limited to, the following:

- Using minimum intensity lighting that meets safety criteria. When accurate color rendition is not required (e.g., roadway, basic security), lighting shall be amber in color, using low-pressure sodium lamps, yellow LED lighting, or equivalent. When white light is required for accurate color rendition, it shall be equal to or less than 3500° Kelvin color temperature. Bluish-white lighting is discouraged.

- Prohibiting the use of red or white strobe lighting unless the BLM approves its use because of conflicting mitigation requirements.

- Fully shielding all permanent lighting (e.g., full cut-off), except for collision markers required by the FAA or other emergency lighting triggered by alarms.

- Mount lighting so that no light is emitted above an imaginary horizontal plane through the fixture.

- Considering lighting control through timers, sensors, dimmers, or switches that are available to facility operators.

- Considering vehicle-mounted lights over permanently mounted lighting for nighttime maintenance activities. When possible, such vehicle-mounted lighting shall be aimed toward the ground to avoid causing glare and skyglow.

VR2-3 The siting and design of solar facilities, structures, roads, and other project elements shall explore and document design considerations for reducing visual dominance in the viewshed and shall comply with the VRM class objectives in conformance with VR1-1.

(a) Assessing visual dominance shall include, but is not limited to, the following:

- Conforming with VRM class objectives through the use of the BLM contrast rating procedures defined in BLM Handbook H-8431-1. Visual contrast rating mitigation of visual impacts shall abide by the requirements outlined in the handbook and other BLM directives. Revised project plans and simulations are to be reevaluated by using the contrast rating procedures.

- Selecting KOPs by first determining the extent of the viewshed using the viewshed modeling tools previously cited under VR1-1. The viewshed modeling shall illustrate the areas from which the proposed facilities may be seen out to 25 mi (40 km). From within the areas, KOPs are to be selected at places where people would be expected: scenic overlooks, roads, trails, campgrounds, recreationally active river corridors, residential areas, etc. For the purpose of conducting a visual contrast rating evaluation, the number of KOPs would be reduced to those that serve as the best representations for demonstrating conformance to the respective VRM class objectives. The BLM is consulted on the KOP selections, and reserves the right to require additional KOPs to further determine the extent of visual impacts and conformance to VRM class objectives.

- Integrating visual design elements into the construction plans, details, drawings, and specifications for the project.

- Incorporating facility siting measures to minimize the profile of all facility-related structures to reduce visibility and visual dominance within the viewshed, particularly for facilities proposed within the foreground/middleground distance zone (0–5 mi [0–8 km]) of sensitive viewing locations.

(b) Measures to minimize visual dominance may include, but are not limited to, the following:

- Using existing topography and vegetation as screening or partially screening devices.

- Incorporating visual design elements when planning for grubbing and clearing, vegetation thinning and clearing, grading, revegetation, drainage, and structural measures.

- Minimizing visual dominance of projects by siting projects outside the viewsheds of KOPs or by diminishing dominance through maximizing visible separation with distance.

- Avoiding, when feasible, locating facilities near visually prominent landscape features (e.g., knobs and waterfalls) that naturally draw an observer's attention.

- Avoiding visual "skylining" by placing structures, transmission lines, and other facilities away from ridgelines, summits, or other locations where they would silhouette against the sky from important viewing locations; however, consideration should be given to the potential for increased ground disturbance and other resource impacts.

- Designing linear features (e.g., ROWs and roads) to follow natural land contours rather than straight lines; however, consideration should be given to the potential for increased ground disturbance and other resource impacts.

- Locating linear developments (e.g., transmission lines, pipelines, roads) at the edges of natural clearings or natural lines of transition between vegetation type and topography.

- Considering alternative means of access in visually sensitive areas, to preserve the natural landscape conditions between tower locations.

- Minimizing vegetation and ground disturbance, and taking advantage of existing clearings where feasible.

- Reducing cut and fill for structures and roads by design and location. Retaining walls, binwalls, half bridges, etc., can be used to reduce cut and fill.

- Considering rounded and varied road-cut slopes and the cut-and-fill pitches to reduce contrasts in form and line; encouraging slope cuts to preserve specimen trees and nonhazardous rock outcroppings.

- Considering sculpting and shaping natural or previously excavated bedrock landforms when excavation of these

landforms is required. For example, percent backslope, benches, and vertical variations may be integrated into a final landform that repeats the natural shapes, forms, textures, and lines of the surrounding landscape. The earthen landform may be integrated and transitioned into the excavated bedrock landform. Sculpted rock face angles, bench formations, and backslope could adhere to the natural bedding planes of the natural bedrock geology. The color contrast from the excavated rock faces may be removed by color treating with a rock stain. Native vegetation or a mix of native and non-native species (if necessary to ensure successful revegetation) could be reestablished with the benches and cavities created within the created bedrock formation.

- Designing and installing natural-looking earthwork landforms, or vegetative or architectural screening to minimize visual impacts. Considering shape and height of earthwork landforms for adaptation to the surrounding landscape.

- Repeating the size, shape, and characteristics of naturally occurring openings in vegetation for facilities, structures, roads, etc.

- Burying electrical collector lines, pipelines, and communication and local utility lines to minimize additional surface disturbance where feasible (e.g., along roads or other paths of surface disturbance).

- Minimizing visual impacts associated with solar energy and electricity transmission projects by choosing appropriate building and structural materials and surface treatments (i.e., paints or coatings designed to reduce contrast and reflectivity). A careful study of the site should be performed to identify appropriate colors and textures for materials; both summer and winter appearance shall be considered, as well as seasons of peak visitor use. Materials and surface treatments shall repeat and/or blend with the existing form, line, color, and texture of the landscape.

- Considering the typical viewing distances and landscape when choosing colors. Appropriate colors for smooth surfaces often need to be two to three shades darker than the background color to compensate for shadows that darken most textured natural surfaces. The BLM Standard Environmental Color Chart CC-001 and guidance shall be referenced when selecting colors.

- Selecting appropriately colored materials for structures, or stains/coatings to blend with the project's backdrop. Materials, coatings, or paints having little or no reflectivity shall be used whenever possible.

- Color treating solar panel/mirror/heliostat backs/supports to reduce visual contrast with the landscape setting.

- Color treating solar towers to reduce visual contrast.

- Considering multiple-color camouflage technology application projects within sensitive viewsheds and with a visibility distance that is between 0.25 and 2 mi (0.40 and 3.20 km).

- Matching aboveground pipelines' paint or coating to their surroundings.

- Considering the appropriate choice of monopoles versus lattice towers for a given landscape setting to further reduce visual impacts.

- Utilizing nonspecular conductors and nonreflective coatings on insulators for electricity transmission/distribution projects.

- Minimizing the use of signs. Where signs are necessary, they shall be made of non-glare materials and utilize unobtrusive colors. The reverse sides of signs and mounts shall be painted or coated by using the most suitable color selected from the BLM Standard Environmental Color Chart; however, placement and design of any signs required by safety regulations must conform to regulatory requirements.

- Clearly delineating construction boundaries and minimizing areas of surface disturbance; preserving vegetation to the greatest extent possible; utilizing undulating surface disturbance edges; stripping, salvaging, and replacing topsoil; using contoured grading; controlling erosion; using dust suppression techniques; and stabilizing exposed soils.

- Preserving existing rocks, vegetation, and drainage patterns to the maximum extent possible.

- Employing brush-beating, mowing, or the use of protective surface matting rather than removing vegetation.

- Considering mulching and spreading slash from vegetation removal over fresh soil disturbances.
- Avoiding leaving slash piles in sensitive viewing areas.
- Considering restoration of disturbed soils by use of weed-free native grasses, forbs, and shrubs representative of the surrounding and intact native vegetation composition and/or using non-native species, if necessary, to ensure successful revegetation.
- Reducing the visual color contrast of graveled surfaces with approved color treatment practices.
- Considering segregating and spreading topsoil from cut-and-fill activities on freshly disturbed areas to reduce color contrast.
- Avoiding leaving topsoil piles in sensitive viewing areas.
- Spreading excess cut and fill material within project disturbance area and vegetate per approved restoration plan requirements while maintaining natural drainage pathways. Where soil cannot reasonably be spread within project disturbance areas, excess cut-and-fill materials should be hauled out to minimize ground disturbance and impacts from piles.
- Removing stakes and flagging from the construction area after completion of construction.

VR2-4 Project developer shall perform a pre-construction meeting with BLM or their designated visual/scenic resource specialists, such as a landscape architect, to coordinate the project construction VRM mitigation strategy. Final design and construction documents will be reviewed with regard to the visual mitigation elements, assuring that requirements and commitments are adequately addressed. The review of construction documents will include, but not be limited to, grading, drainage, revegetation, vegetation clearing, and feathering.

Operations and Maintenance

VR3-1 Compliance with the terms and conditions for VRM mitigation shall be monitored by the project developer. Consultation with the BLM shall be maintained through operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Maintaining the visual resource design elements during operations and maintenance shall include, but is not limited to, the following:

- Maintaining revegetated surfaces until a self-sustaining stand of vegetation is reestablished and visually adapted to the undisturbed surrounding vegetation. No new disturbance shall be created during operations without completion of a VRM analysis and approval by the BLM authorized officer.

- Keeping painted and color-treated facilities in good repair and repainting when the color fades or flakes.

- Using interim restoration during the operating life of the project as soon as possible after land disturbances.

- Including dust abatement and noxious weed control in maintenance activities.

- Deploying and operating mirrors/heliostats to avoid high-intensity light (glare) reflected off-site. Where off-site glare is unavoidable and project site/off-site spatial relationships favor effective results, fencing with privacy slats or similar screening materials should be considered.

Reclamation and Decommissioning

VR4-1 Reclamation of the construction site shall begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of temporarily disturbed areas as quickly as possible. Developers shall coordinate with BLM in advance of interim/final reclamation to have BLM or other designated visual/scenic resource specialists, such as a landscape architect, on-site during reclamation to work on implementing visual resource requirements and BMPs.

(a) Methods for minimizing visual contrast associated with reclamation and decommissioning of the project may include, but are not limited to, the following:

- Including treatments, such as thinning and feathering vegetation along project edges, enhanced contour grading, salvaging landscape materials from within construction areas, special revegetation requirements (e.g., use of mix of native and non-native species).

- Designing and implementing restoration of the project area to predevelopment visual conditions and the inventoried visual quality rating, or to that of the surrounding landscape setting conditions to the best extent possible or to conditions agreed upon by the BLM.

- Removing aboveground and near-ground-level structures. Some structures may need to be removed to a level below the ground surface to allow reclamation/restoration.

- Considering contouring soil borrow areas, cut-and-fill slopes, berms, water bars, and other disturbed areas to approximate naturally occurring slopes. Contouring to a rough texture would trap seeds and discourage off-road travel, thereby reducing associated visual impacts. Cut slopes can be randomly scarified and roughened to reduce texture contrasts with existing landscapes and aid in revegetation.

- Utilizing native vegetation to establish a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape.

- Reapplying stockpiled topsoil to disturbed areas, where applicable, or using a mix of native and non-native species if necessary to ensure successful revegetation.

- Removing or burying gravel and other surface treatments.

- Restoring rocks, brush, and forest to approximate pre-existing visual conditions.

- Integrating feathering edges of vegetation to reduce form and line contrasts with the existing landscapes.