Department of Energy
Technical Support Document
Notice of Final Rulemaking
National Environmental Policy Act Implementing Procedures
(10 CFR part 1021)
April 2024

Note: This file will be updated after the final rule is published in the Federal Register.

This Technical Support Document supplements the Department of Energy's (DOE's) Notice of Final Rulemaking (89 FR XXXX) for DOE National Environmental Policy Act (NEPA) Implementing Procedures (RIN 1990-AA48). The Notice of Final Rulemaking, this Technical Support Document, and related documents are available at www.regulations.gov, under Docket ID DOE-HQ-2023-0063, and at www.energy.gov/nepa/doe-nepa-categorical-exclusion-rulemaking-2024.

In this Technical Support Document, DOE presents each of the changes to its NEPA implementing procedures (10 CFR part 1021, subpart D, appendices B, C, and D) and provides information that supplements the preamble's discussion of the supporting basis for the changes.

Many of the documents summarized in this Technical Support Document are environmental assessments (EAs) for the types of projects addressed in this rulemaking. DOE and other federal agencies prepared these environmental assessments for a variety of projects proposed in different locations (federal and non-federal land, existing land uses, and ecosystems), using different technologies and designs, over many years. These EAs resulted in findings of no significant impact (FONSIs). This demonstrates that these types of projects normally do not pose a potential for significant environmental impact and, thus, are appropriate for a categorical exclusion.

Many of the EAs refer to steps to avoid, lessen, or compensate for adverse environmental impacts. In most cases, this is referring to mitigation that is included in the proposed project description, including steps to implement industry standards and best management practices (BMP). Some EAs may refer to changes in project design or mitigation identified during consultation under environmental laws and requirements that occurred in parallel with the NEPA review, such as section 7 of the Endangered Species Act. The categorical exclusions rely on compliance with these requirements and anticipate that they will result in project-specific mitigation. The requirements of such laws, including consultation requirements, would apply to any action subject to the categorical exclusion. Most of these references to mitigation in this Technical Support Document do not mean that the agencies issued a mitigated FONSI. The Council on Environmental Quality (CEQ) NEPA regulations (40 CFR 1501.6(c)) explain that when an "agency finds no significant impacts based on mitigation, the mitigated [FONSI] shall state any enforceable mitigation requirements or commitments that will be undertaken to avoid significant impacts." Where an agency issued a mitigated FONSI for an EA included in this Technical Support Document, that is mentioned in the summary of that document (for example, DOE/EA-1595). Inclusion of these EAs does not mean that the proposed projects would have qualified for a categorical exclusion. That determination would be made on a case-by-case basis. However, inclusion of these EAs is helpful in understanding differences in the types of proposed actions and range of potential environmental impacts.

For assistance in accessing referenced documents, send an email to DOE-NEPA-Rulemaking@hq.doe.gov with "Technical Support Document" in the subject line, or contact Ms. Carrie Abravanel, Deputy Director, Office of NEPA Policy and Compliance, at 202-586-4798.

Changes to 10 CFR part 1021 Relevant to:

A. **Upgrading and Rebuilding Existing Powerlines**
B. **Energy Storage**
C. **Solar Photovoltaic Systems**

A. Upgrading and Rebuilding Existing Powerlines

Change to 10 CFR part 1021:

B4.13 ***Upgrading and rebuilding existing powerlines***

Upgrading or rebuilding ~~approximately 20 miles in length or less of~~ existing electric powerlines, which may involve ~~minor~~ relocations of small segments of the powerlines within an existing powerline right-of-way or within otherwise previously disturbed or developed lands (as discussed at 10 CFR 1021.410(g)(1)). Upgrading or rebuilding existing electric powerlines also may involve widening an existing powerline right-of-way to meet current electrical standards if the widening remains within previously disturbed or developed lands and only extends into a small area beyond such lands as needed to comply with applicable electrical standards. Covered actions would be in accordance with applicable requirements, including the integral elements listed at the start of appendix B of this part; and would incorporate appropriate design and construction standards, control technologies, and best management practices. This categorical exclusion does not apply to underwater powerlines. As used in this categorical exclusion, "small" has the meaning discussed at 10 CFR 1021.410(g)(2).

Supplemental Supporting Basis:

Discussion of the categorical exclusion is provided in Section II.B of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.B of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX). DOE uses the term "powerlines" in the categorical exclusion to be inclusive of both transmission and distribution lines.

DOE reviewed EAs for powerline upgrades and rebuilds of various lengths. Many of these EAs were prepared by Bonneville Power Administration (BPA) and Western Area Power Administration (WAPA), two federal power marketing administrations within the DOE. BPA and WAPA have decades of experience upgrading and rebuilding transmission lines. In addition, DOE reviewed relevant BMPs and construction and design standards that BPA and WAPA implement for each transmission line project they undertake. DOE also reviewed EAs prepared by the U.S. Department of Agriculture Rural Utilities Service (RUS) and the Tennessee Valley Authority (TVA).

As outlined below, BPA's and WAPA's experience in conducting NEPA reviews for upgrading and rebuilding transmission lines demonstrates that both agencies have documented no potential for significant impacts in NEPA reviews for the types of actions that are included in the changes to categorical exclusion B4.13.

BPA owns and operates more than 15,000 circuit miles of high-voltage transmission lines. The transmission lines move most of the Northwest's high-voltage power from facilities that generate the power to users throughout the region. The Federal Columbia River Transmission System Act directs BPA to construct improvements, additions, and replacements to its transmission system that are necessary to maintain electrical stability and reliability, as well as to provide service to BPA's customers (16 United States Code [U.S.C.] § 838b(b-d)). BPA needs to ensure the integrity and reliability of its transmission lines that serves BPA's utility customers and communities in the Northwest.

WAPA's mission is to market and deliver clean, renewable, reliable, cost-based federal hydroelectric power and related services. WAPA provides power marketing and transmission services to WAPA customers, which include Federal and State agencies, cities and towns, rural electric cooperatives, public utility districts, irrigation districts and Native American tribes. They, in turn, provide retail electric service to millions of consumers in the West.

Based on BPA's and WAPA's experience, actions for upgrading and rebuilding existing powerlines follow BMPs, construction/design standards, and any construction/rebuild-specific protocols/procedures. These factors are followed to verify that there would not be a potential for significant environmental impacts by meeting the conditions listed in Appendix B of DOE's NEPA Implementing Procedures.

BPA and WAPA have documented no potential for significant environmental impacts in NEPA reviews for the types of actions covered in B4.13. Thus, BPA and WAPA suggested that DOE remove the mileage limits in B4.13, and instead rely on environmental factors to define the appropriate bounds of the categorical exclusion.

Mileage thresholds are not a reliable factor in determining the potential significance of environmental impacts from upgrading or rebuilding powerlines and the required level of NEPA review. In DOE's experience, factors related to local conditions, such as potential effects to cultural resources, water quality (e.g., associated with runoff during construction), Endangered Species Act (ESA)-listed species; or projects that are proposed within a sensitive area, such as the Columbia River Gorge National Scenic Area or recreationally important areas, are more appropriate indicators of potentially significant impacts.

In addition to the EAs prepared by BPA and WAPA, in response to public comments on the notice of proposed rulemaking, DOE supplemented this Technical Support Document with seven additional EAs from the RUS and the TVA, to cover a broader geographical range of the U.S., including North Dakota, Minnesota, Kentucky, Mississippi, Missouri, and Wisconsin. See the following EAs:

- Environmental Assessment for the Maple River (ND) to Buffalo River (MN) Switch 69kV Line Rebuild (RUS, 2023)
- Environmental Assessment for the Boone-Williamstown 69 kV Transmission Line Rebuild Project (RUS, 2022)
- Environmental Assessment for the Rebuild 69 kV Transmission Lines 71, 72, and 73 Project (RUS, 2022)
- Environmental Assessment for the Kingdom City — Santa Fe Transmission Line (RUS, 2021)
- Environmental Assessment for the McCreary County-Wofford Transmission Line Rebuild Project – Wisconsin (RUS, 2020)
- Environmental Assessment for the Strum to Lublin 69kV Transmission Line Rebuild Project – Wisconsin (RUS, 2013)
- Environmental Assessment for Kirkmansville-Clifty City, Kentucky Power Supply Improvement Project (TVA, 2005)

Additionally, DOE's Loan Programs Office (LPO) has a number of financing programs that may provide a loan or loan guarantee for rebuilding and/or upgrading transmission infrastructure. LPO's experience with monitoring is described further below.

DOE also conducted additional review of the EAs summarized below to determine which projects included widening of the existing right of way. The following four EAs included analysis of widening of the existing right of way to comply with applicable electrical standards. Findings of no significant impact were issued for each of these projects.

- Environmental Assessment for the Walla Walla-Tucannon River Transmission Line Rebuild Project (DOE/EA-1731; BPA, 2011)
- Environmental Assessment for the Cheyenne-Miracle Mile and Ault-Cheyenne Transmission Line Rebuild Project (DOE/EA-1456; WAPA, 2006)
- Environmental Assessment for the Beaver Creek-Hoyt-Erie Transmission Line Rebuild (DOE/EA-1508; WAPA, 2005)
- Environmental Assessment for the Strum to Lublin 69kV Transmission Line Rebuild Project – Wisconsin (RUS, 2013)

DOE's Bonneville Power Administration (BPA) Experience

BPA identifies relevant BMPs and construction/design standards for each transmission line project it undertakes, including all powerline upgrade and rebuild projects. BPA and its contractor are responsible for implementing the BMPs and construction/design standards during various phases of project construction. Relevant BMPs and construction/design standards are included in the construction contract specifications. This obligates the contractor to implement those practices and standards that relate to contractor responsibilities during construction and post-construction. In addition, staff from BPA's Pollution Prevention and Abatement team monitor project implementation for each transmission project, including those projects covered by a categorical exclusion.

For example, BPA's Environmental Mitigation Implementation – Procedures for Development of an Environmental Mitigation Implementation Table (MIT) (ESP#: E-MSC-006, Issued: 6/02/2021) explains that "the environmental mitigation requirements of a project are compiled into an environmental compliance plan that is integrated into the construction specification package and is implemented during construction. BPA utilizes the term mitigation implementation table (MIT) as the environmental compliance plan. The MIT is a document designed to summarize both broad project-wide environmental compliance conditions as well as site-specific mitigation requirements for construction activities near a sensitive area.

A MIT contains broad conditions for environmental compliance, such as cultural resource conditions, erosion and sediment control conditions, spill prevention and response conditions, noxious weed control, wetland and waterway protection, sensitive species conditions, etc. A MIT also includes site-specific mitigation conditions, detailed in a table that lists each sensitive area in the greater project area. A sensitive area is a location with environmentally sensitive or regulated resources that could be impacted by construction activities. These resources may include water bodies, wetlands, riparian areas, fish and wildlife habitats, protected plants, and cultural and historic sites. The MIT details specific requirements for protection of sensitive areas…. Protections can include site marking, avoidance, methods of access, timing restrictions, or site restoration components. It also includes references to any required permits. Both broad conditions and site-specific mitigation requirements may come from, but are not limited to, consultations and permits with the following:

1) Division of State Lands
2) National Marine Fisheries Service
3) State Dept. of Natural Resources
4) State Historic Preservation Office or Dept. of Archaeology & Historic Preservation
5) U.S. Army Corps of Engineers
6) U.S. Bureau of Reclamation
7) U.S. or State Fish & Wildlife Service
8) U.S. Forest Service
9) U.S. Bureau of Land Management"

ESP# E-MSC-006 also notes that "A MIT is not always appropriate or necessary for BPA's construction projects. In many cases, other construction specifications included in the design package, including the BPA transmission line and access roads master specification and the supplemental specification, or the contractor's erosion and sediment control plan, can provide sufficient details regarding the extent of BPA's environmental compliance and mitigation responsibilities."

Below are examples of EAs and FONSIs prepared by BPA for upgrading and rebuilding existing powerlines that are relevant to the changes for this categorical exclusion. For each of these EAs, BPA evaluated the potential environmental impacts for the following resource areas: land use and recreation; transportation; socioeconomics, environmental justice, and public services; noise; public health and safety; geology and soils; vegetation; wildlife and their habitat; water resources and water quality; wetlands and floodplains; visual quality; cultural resources; and air quality and greenhouse gases. For each of these proposed actions, BPA found no potential significant impacts. Some potential impacts that BPA determined would be moderate (not significant) and examples of relevant measures to reduce or avoid potential impacts are described below. For each of these EAs, BPA also prepared a mitigation action plan (MAP). The MAP is for each proposed action and includes all of the measures presented in each final EA to mitigate adverse environmental impacts. A

construction contractor will rebuild and upgrade these transmission lines for BPA. To ensure that the construction contractor would implement the mitigation measures that the construction contractor was responsible for, the relevant portions of each MAP were included in the Mitigation Implementation Table (the directions to the contractor) for each transmission line rebuild and/or upgrade project. BPA explains that "The MAP includes measures to reduce some impacts even when those impacts are not considered significant." To clarify, BMPs and mitigation measures were documented and evaluated as part of the Proposed Action in each final EA and were restated in the MAP to inform the Mitigation Implementation Table. A FONSI for each of these actions was signed based on expected impacts of the Proposed Action. A MAP was prepared for the FONSI per Section 1021.322(b) and as part of BPA's normal practice to ensure that these measures would be properly tracked during project implementation.

Environmental Assessment for the Walla Walla-Tucannon River Transmission Line Rebuild Project (DOE/EA-1731; BPA, 2011): https://www.energy.gov/nepa/ea-1731-walla-walla-tucannon-river-transmission-line-rebuild-project-walla-walla-and-columbia

- Rebuild the 47-mile-long 115-kV transmission line from the existing Walla Walla Substation, located in the city of Walla Walla, Washington, to the existing Tucannon River Substation, located near the town of Dayton, Washington.
- The Proposed Action would entail: widening of the transmission line ROW by 20 feet in both directions from the centerline; removal of existing wood-pole structures and conductors; installation of replacement wood-pole structures and associated components; installation of conductors, ground wire, and counterpoise (counterpoise is a weight that counterbalances the weight of the transmission lines, typically underground wires that extend horizontally from each structure and that connect with ground wire to provide lightning protection); installation of two steel-lattice structures; improvement and reconstruction of some existing access roads (13.57 miles); construction of new access roads (0.46 mile); abandonment of some existing access roads (1.63 miles); establishment of temporary staging areas for storage of materials; accommodation of facilities to allow for the potential future connection of a tap line that would connect the transmission line to the Columbia Rural Electric Association's (CREA's) Dayton Substation; removal of some vegetation, including some danger trees; and revegetation of areas disturbed by construction activities.
- EA: "A total of 317 wood-pole and 2 steel-lattice structures would replace the existing 295 wood-pole structures. In general, the existing structures would be replaced with structures of essentially the same design—two-pole or three-pole—and with similar structural components…. All wood structures would have the same general appearance but would vary in size depending on their function. Two steel-lattice towers would be installed to span a long canyon crossing between Structures 32/3 and 33/1…. The heights of the new wood-pole structures would be similar to the heights of existing structures, ranging from 45 to 105 feet above ground. The two new steel-lattice structures would be approximately 80 feet tall. Structure heights at particular locations would depend on terrain, the length of the span, and other factors."
- EA: "Easements acquired by BPA to allow for widening of the transmission line ROW would occur predominantly in land that is currently in agricultural use. Although the legal rights to the land would be acquired by BPA, it is not anticipated that this would result in significant impacts on existing agricultural land use. Agricultural cultivation would be allowed to continue in these easements so long as they did not interfere with the safe construction, operations, or maintenance of the transmission line."
- The FONSI summarized potential impacts into impact levels based on the EA. The FONSI identified the impacts as low or moderate. Low and moderate impacts are not considered significant.
    - FONSI: "Impacts on land use and recreation would be low, except for low to moderate impacts on residential land uses…."
    - The FONSI also states that impacts on geology and soils; vegetation; wildlife from habitat modification, degradation, or loss and disturbance of wildlife; waterways and water quality; would be low to moderate.
    - FONSI: "Noise impacts from construction and maintenance work would be low to moderate."

- FONSI: "Impacts on cultural resources eligible for the National Register of Historic Places and on socioeconomics and public services are expected to be low or none."
- The FONSI also states that impacts on fish and fish habitat, wetlands, floodplains, temporary and permanent visual impacts, air quality, and public health and safety, and from greenhouse gas emissions would be low.
- FONSI: "Widening of the ROW would have low to no impacts on floodplain storage, water quality functions, and fish and wildlife habitat functions. A total of 217 danger trees would be removed along the 47-mile-long transmission line. Of these, approximately 41 are located within floodplains. Impacts on floodplains from tree and vegetation removal would be low." (A danger tree is a tree located along a transmission line corridor that is a current or future hazard to the transmission line.)

Environmental Assessment for Creston-Bell Transmission Line Rebuild Project (DOE/EA-1855; BPA, 2012): https://www.energy.gov/nepa/ea-1855-creston-bell-rebuild-project-spokane-and-lincoln-counties-wa

- The Proposed Action was to rebuild the 53.8-mile-long 115-kilovolt (kV) Creston-Bell transmission line, conduct work on access roads, and remove danger trees.
- The existing 53.8-mile-long transmission line was built in 1942 and extends east from the existing Creston Substation, located in Lincoln County, Washington, to the existing Bell Substation, located in the city of Spokane, Washington.
- EA: "In general, the existing structures would be replaced with structures of essentially the same design—two-pole or three-pole—and with similar structural components (i.e., structure cross arms, insulators, and dampers). All wood structures would have the same general appearance but would vary in size depending on their function. Two new lattice-steel structures—Structures 48/2 and 48/3—would be installed on either side of the Spokane River. The lattice-steel structures are larger than the existing wood poles and would provide the height necessary for the new conductors to span the river."
- EA: "As indicated in Table 2-1 of the EA, the existing transmission line's wood structures range in height from 55 to 95 feet above ground and the rebuilt transmission line's wood structures would range in height from 43 to 89 feet above ground. The existing transmission line has lattice-steel structures that are 90 feet above ground and the rebuilt transmission line would have lattice steel structures that are 90 to 113 feet above ground."
- EA: "Structure replacement would occur within the existing 100-foot-wide transmission line ROW.… The existing transmission line shares an extended ROW corridor with other larger transmission lines for its entire length between the Creston and Bell substations…. The combined corridor is 400 feet wide, including the 100-foot-wide Creston-Bell ROW."
- For potential impacts, BPA found that these impacts would be low to moderate because the rebuilt transmission line would be within the same transmission line corridor and would not require the acquisition of any new right-of-way and BMPs were identified to substantially reduce and minimize these impacts.
- Examples of these BMPs include measures such as, work area restrictions to avoid disturbance to seven cultural resource sites and employment of an archaeological monitor at four of the sites to further ensure impacts were avoided; and conduct all culvert installation/replacement work in the dry, either when there is no flow or by diverting flow from the stream culvert location during installation/replacement, as necessary, to avoid impacts on fish species. Also, for example, four of the 475 existing pole structures that were replaced were within 100 feet of a fish-bearing stream. Use of BMPs minimize or eliminate the delivery of sediments from pole replacement activities for these structures into nearby streams. All of these BMPs were integrated into the construction contractor's specifications and followed in the implementation phase.
- FONSI: "The Proposed Action would have no significant impacts."

Environmental Assessment for the Alvey-Fairview Transmission Line Rebuild Project (DOE/EA-1891; BPA, 2014): https://www.energy.gov/nepa/ea-1891-alvey-fairview-transmission-line-rebuild-project-oregon

- The Proposed Action is to rebuild the existing 97.5-mile-long Alvey-Fairview 230-kilovolt (kV) transmission line in Oregon. The Proposed Action also includes construction and improvement work on the access road system that allows BPA to get to and from the transmission line.
- EA: "The transmission line would remain in the existing transmission line right-of-way and would continue to be operated at 230-kV. The existing 62 steel-lattice towers that are dispersed throughout the transmission line, ranging in height from 42 to 70 feet, are not in need of replacement, and would remain in their existing locations."
- EA: "The Proposed Action would replace 551 two-pole wood structures and 158 three-pole structures; one existing two-pole structure along the current line would be replaced with a three-pole structure…."
- EA: "The height of the new structures would be similar to the existing structures in most cases, ranging from 40 to 95 feet above ground depending on terrain, requirements for road crossings, and the distance between the top of vegetation and the conductor. Proposed structure heights in some locations would be increased by approximately 5 to 10 feet to provide better conductor clearance."
- EA: "Replacement components would be compliant with the Suggested Practices for Avian Protection on Power Lines prepared by the Avian Power Line Interaction Committee (2006). Bird diverters would be placed on the conductors on spans where an increased risk of bird strikes exists (e.g., wetlands and rivers), and where technically feasible."
- FONSI: "Because most transmission structures would be replaced in the same locations and most road work would be within existing road beds, long-term changes in land use would be minimal and limited to a conversion of about 7 acres of agriculture use to new access road. New road segments would be relatively short (0.2 mile or less) and would not prohibit the remainder of the property from continuing to be used for agriculture."
- FONSI: "In-water work for culvert and stream crossing improvements would be implemented with mitigation measures (construction timing restrictions, fish salvage, diverting stream flow, isolating work areas, on-site biologist, etc.), to minimize short-term turbidity and direct construction-related impacts to Endangered Species Act (ESA)-listed fish species."
- FONSI: "Only about 0.08 acre of wetland distributed across 54 wetlands would be permanently impacted for the wood pole replacements and compensatory mitigation would mitigate for the approximate 6.5 acres of permanent impacts due to access road work where wetlands could not be avoided."
- FONSI: Of the eight archeological sites identified in the project area, access road construction could adversely affect a portion of two of the sites. BPA is continuing to work with the State Historic Preservation Officer and the consulting Tribes to develop a plan to resolve potential adverse effects and implement impact minimization and avoidance measures."
- In the FONSI, BPA concluded that the proposed action would not have significant impacts and summarized low to moderate environmental impacts (not significant) for resource areas evaluated in the EA.

Environmental Assessment for the Midway-Benton No. 1 Rebuild Project (DOE/EA-1912; BPA, 2012): https://www.energy.gov/nepa/ea-1912-midway-benton-no-1-rebuild-project-near-town-desert-aire-benton-county-wa

- The Proposed Action would replace the approximately 28.2-mile-long, 115-kilovolt (kV) Midway-Benton No. 1 transmission line and approximately 11 miles of the 115-kV Benton-Othello No. 1 transmission line between the existing Midway and Benton Substations in Washington. Under the Proposed Action, BPA would rebuild the Midway-Benton No. 1 transmission line within the existing right-of-way (ROW), except for an approximately 14.5-mile-long reroute (using new rights-of-way). The transmission line would be relocated south of the existing line ROW to avoid sensitive cultural resources. BPA would remove the corresponding segment of the existing Midway- Benton No. 1 transmission line. The entire Benton-Othello No. 1 transmission line (11 miles) would be

rebuilt within the existing ROW. The Proposed Action also includes 2.8 miles of new access roads and 30.9 miles of improved access roads.

- EA: "All new wood structures would have the same general appearance but would vary in size depending on their function. The heights of the new structures would be approximately 10 feet taller than existing structures, although structure heights at particular locations would depend on factors such as terrain and the length of the span. This increase in structure height would be required to maintain the minimum conductor to ground clearance standards. Due to the increased conductor size the transmission line would sag more, which would require an increased structure height."
- EA: Figure 2-4 of the EA indicates the existing average height of the wood pole structures is 45 to 90 feet and the proposed average height is 55 to 100 feet.
- EA: "…BPA designed the rebuild project to minimize impacts by following existing utility corridors, minimizing work areas, and using existing access roads (i.e. previously disturbed areas) as much as practical. Work in Segments 1 and 4 would largely occur within the existing, disturbed ROWs. Sections 3.3.4 and 3.4.4 of the EA discuss measures that would mitigate impacts on soils and vegetation, including control of invasive plant species through post-project monitoring and revegetation."
- In the FONSI, BPA concluded that the proposed action would not have significant impacts and summarized low to moderate environmental impacts (not significant) for resource areas evaluated in the EA, except cultural resources.
- FONSI: BPA noted that that the potential impacts for cultural resources would range from low to high (significant). However, BPA explained that "Minimization measures developed in coordination with the Washington State Historic Preservation Office (SHPO) and four American Indian Tribes (Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes and Bands of the Yakama Nation, Nez Perce Tribe, and Wanapum Band) through the National Historic Preservation Act (NHPA) Section 106 consultation process would reduce the moderate and high impacts associated with TCPs [traditional cultural properties] to a moderate level." BPA also noted that "Long-term beneficial impacts would result from removing structures from the topographic highpoints of Gable Butte and Gable Mountain TCPs."
- MAP: "BPA made a finding of adverse effect on cultural properties. BPA, in coordination with Washington State Department of Archaeology and Historic Preservation, Advisory Council on Historic Preservation, consulting tribes, and U.S. Department of Energy-Richland developed a Memorandum of Agreement for project impacts to cultural resources…."
- EA: "Implementation of the mitigation measures described in Section 3.4.4 would reduce construction-related impacts on vegetation resulting from access road improvements to moderate."
- EA: "Several mitigation measures identified in Section 3.4.4 would be implemented to reduce the likely spread of invasive species and measures, specified under BPA's Transmission System Vegetation Management Program FEIS/ROD (BPA 2000) and under DOE-RL's Integrated Vegetation Management EA (DOE-RL 2011), such as conducting invasive weed species surveys before and after construction and treating new infestations identified after construction. Because invasive species would be actively controlled according to established plans, the Proposed Action would be expected to result in a moderate impact from invasive species within areas disturbed by construction and operation and maintenance."
- EA: "The Proposed Action and Rebuild-in-Place Alternative would result in the loss of wildlife habitat, including late-successional shrub-steppe habitat (Levels III and IV). Loss of late-successional shrub-steppe would directly reduce the local carrying capacity for shrub-steppe-dependent species, including sage sparrow and loggerhead shrike. With the implementation of avoidance, minimization, rectification and compensatory mitigation measures (Section 3.5.4) to reduce wildlife habitat impacts, net long-term impacts on special-status wildlife species from long-term habitat loss would be low to moderate."

Environmental Assessment for the Keeler to Tillamook Transmission Line Rebuild Project (DOE/EA-1931; BPA, 2014): https://www.energy.gov/nepa/ea-1931-keeler-tillamook-transmission-line-rebuild-project-washington-and-tillamook-counties

- BPA's Proposed Action is to rebuild 57.8 miles of the existing 59.7-mile Keeler to Tillamook Transmission lines in Tillamook and Washington counties, Oregon. This rebuild would include 10.5 miles of the Keeler-Forest Grove No. 1 transmission line and 47.3 miles of the Forest Grove-Tillamook No. 1 transmission line. The Proposed Action would also involve improvements to existing access roads (~20 miles) and some new access road construction (~1 mile), as well as removal of danger trees (~2,660) outside the existing right-of-way (ROW). (A danger tree is a tree located along a transmission line corridor that is a current or future hazard to the transmission line.)
- EA: The Proposed Action would involve: removal of existing wood-pole structures and conductors; installation of replacement wood-pole structures and associated components; installation of conductors, ground wire, and counterpoise; improvement and reconstruction of some existing access roads; construction of permanent access roads; use of temporary and permanent travel routes; release of some existing access roads; establishment of temporary staging areas for storage of materials; removal of some vegetation, including some danger trees; revegetation of areas disturbed by construction activities.
- EA: "The changes to the line would stay within the existing transmission line corridor and would not require the acquisition of any new land rights. All other replacement poles would be built either on the same footprint as the existing poles, or within a few feet of the existing poles, within BPA's existing ROW easement."
- EA: "Since most of the Proposed Action involves replacing existing wood-pole structures with new, but similar wood-pole structures in generally the same locations, the long-term impacts on visual resources through most of the ROW viewsheds would be low. The height of new poles would increase from a current maximum height of 75 feet to 112 feet, depending on terrain, length of spans, and other factors. This increased height would make the structures more visible on the landscape from specific locations and at specific viewing distances (the change in height would be more pronounced in the foreground, but less perceptible in the background), but would not substantially alter the overall scenic quality of the transmission line ROW viewsheds."
- EA: "Many rebuilt structures would be taller in order to keep the operating temperature of the line to 100 degrees Celsius. Current standards also require larger clearance distances …. There must be at least 9 feet of clearance between the transmission conductor and the distribution line. The proposed new conductor on the line is larger in diameter and is heavier than the existing conductor. The larger conductor has the potential to sag much more than the existing conductor, so pole heights must be increased to meet minimum ground-to-conductor clearance requirements."
- EA: "The EA assessed the project's expected impacts on erosion from danger tree removal (see Section 3.3, Geology and Soils, specifically Section 3.3.2, Environmental Consequences – Proposed Action, Danger Tree Removal). When danger trees and vegetation are removed from a ROW, they are typically cut above-ground, leaving the roots in place. This will help stabilize soils and reduce erosion potential. The EA assessed the project's expected impacts on riparian shading and fish habitat (see Section 3.4, Fish). The EA acknowledges that removing danger trees would decrease cover and shading along portions of some waterways; however, considering the overall danger tree removal plan, including the number of trees, location of trees, and proximity to waterways, the EA concluded that the project would have low impacts on stream temperature. BPA and its contractors will implement a number of mitigation measures designed to reduce or eliminate project impacts on fish and fish habitat (see Fish, Section 3.4.3, Mitigation – Proposed Action)."
- FONSI: "The Proposed Action, with implementation of selected mitigation measures, would have no significant impacts. The following discussion provides a summary of the Proposed Action's potential impacts and the reasons these impacts would not be significant."

Environmental Assessment for the Grand Coulee-Creston Transmission Line Rebuild Project (DOE/EA-1950; BPA, 2014): https://www.energy.gov/nepa/ea-1950-grand-coulee-creston-transmission-line-rebuild-grant-and-lincoln-counties-washington

- The Proposed Action was to rebuild nearly 28 miles of the Grand Coulee-Creston No. 1 115-kilovolt (kV) transmission line between the cities of Grand Coulee in Grant County and Creston in Lincoln County, Washington.
- EA: "The Proposed Action would involve the following activities: removal of existing wood structures and conductors; installation of replacement structures and associated components; installation of conductors, ground wires, and counterpoise; reconstruction of the Grant County PUD and Wilbur taps [taps are where other local utility lines connect to the BPA line]; improvement and reconstruction of some existing access roads, including the installation of one gate and one culvert; establishment of temporary staging areas for storage of materials; establishment of pulling and tensioning sites; removal of some vegetation; and revegetation of areas disturbed by construction activities."
- EA: "The heights of the new wood-pole structures would be about 10 feet taller than existing structures, ranging from 50 to 125 feet above ground. Structure heights at particular locations would depend on the terrain, the length of the span, and other factors."
- EA: "BPA proposes to acquire about 0.1 acre of new right-of-way adjacent to Structures 2/1 and 2/2, and to acquire about 0.5 mile of new easement rights for use of existing access roads."
- For potential impacts, BPA found that these impacts would be low, and low to moderate for wildlife and cultural resources because of timing restrictions and pre-construction field surveys to minimize any impacts to potentially affected wildlife species, and implementation of an Avoidance and Monitoring Plan for cultural resources.
- BMPs were identified to reduce and minimize these impacts. Examples of these BMPs include measures, such as work area restrictions to avoid disturbances to cultural resource sites and the use of an archaeological monitor to oversee construction activities next to known sites; and timing restrictions and pre-construction field surveys for federally- or state-listed threatened and endangered species (i.e., sage grouse, ferruginous hawks, Washington ground squirrels, and gray wolf) to minimize impacts. All of these BMPs were integrated into the construction contractor's specifications and followed in the implementation phase.
- FONSI: "The Proposed Action would have no significant impacts."

Environmental Assessment for the Salem-Albany Transmission Line Rebuild Project (DOE/EA-1946; BPA, 2014): https://www.energy.gov/nepa/ea-1946-salem-albany-transmission-line-rebuild-project-polk-benton-marion-and-linn-counties

- Under the Proposed Action, BPA would replace the transmission lines and all associated components, other than fiber, for the Salem-Albany No. 1 and No. 2 lines, which extend for 24 and 28 miles, respectively. As part of the rebuild, BPA would realign the Salem-Albany No. 1 line to the center of the right-of-way and replace some of its existing wood-pole structures with steel monopoles. In addition, BPA would expand the access road system to both lines by constructing (14 miles), reconstructing (2 miles), and improving (17 miles) roads and would install, improve, or repair culverts. The project would also remove some vegetation along the transmission lines rights-of-way (~1,300 trees) and access roads; establish temporary staging areas and pulling-tensioning sites; and revegetate areas disturbed by construction activities.
- EA: "The heights of the new wood-pole structures would average 10 feet taller than existing structures, ranging from 50 to 100 feet above ground for the two-pole wood structures and 50 to 95 feet above ground for the three-pole or dead-end structures. The 75 steel monopole structures would range from 85 to 115 feet above ground."
- EA: "The transmission lines would remain in the existing transmission line rights-of-way and would continue to be operated at 115 kV."

- FONSI: Several of the resource areas (e.g., visual, wetlands and floodplains) would have the potential for low impacts. The FONSI described the potential for moderate impacts (not significant) for the following resource areas: land use, recreation, habitat conservation, and transportation; vegetation; fish and wildlife, noise. Further, "[i]mpacts would be low-to-moderate for surface water. For example, "Mitigation measures (stormwater pollution prevention plans and use of best management practices [BMPs]) would reduce the potential for erosion and runoff during construction activities, help stabilize disturbed areas, and reduce potential water turbidity impacts."
- FONSI: "The Proposed Action would have no significant impacts."

Environmental Assessment for the Midway-Moxee Rebuild and Midway-Grandview Upgrade Transmission Line Project (DOE/EA-1951; BPA, 2016): https://www.energy.gov/nepa/ea-1951-midway-moxee-rebuild-and-midway-grandview-upgrade-transmission-line-project-benton-and

- The project involves rebuilding the 34-mile-long Midway-Moxee transmission line and rebuilding and upgrading the 26-mile-long Midway-Grandview transmission line. These existing 115-kilovolt (kV) transmission lines run through Benton and Yakima counties, Washington.
- EA: "The rebuilt transmission lines would be similar to the existing transmission lines in design and appearance. They would be along the same alignments and within the same transmission line corridors."
- EA: "The Proposed Action includes…. • Establishment of temporary staging areas for storage of materials • Acquisition of some access road easements • Access road work • Vegetation removal in work areas and some tree removal adjacent to the rights-of-way • Removal of existing structures, associated components, and conductors • Installation of replacement structures and nine new structures and associated components • Installation of conductors, ground wire, and counterpoise • Installation of equipment in the Cold Creek Substation • Replacement of the existing overhead fiber optic cable on the Midway-Moxee transmission line • Removal of some trees scattered along the transmission line that are growing or are expected to grow (in the near future) too close to the conductors for safe operation • Revegetation of areas disturbed by construction activities"
- EA: "Many of the proposed structures would be taller than the structures they are replacing. Along the Midway-Moxee transmission line, 37 structures would be taller to accommodate agricultural production. Given the open nature of the study area, wide views of the transmission lines, and the presence of several other transmission lines in many portions of the study area, it is expected that visual changes associated with increasing structure heights would generally be minimal."
- EA: Table 2-1 indicates the proposed rebuilt transmission line would have structure heights that range from 34 to 113 feet as compared to the existing transmission lines of 43 to 80 feet (Midway-Moxee Transmission Line) and 34 to 75 feet (Midway-Grandview Transmission Line).
- EA: "Nine new structures would be added to the transmission lines in areas where the current conductor can swing outside the existing right-of-way during high winds and where conductor can sag due to ice coating the conductor. New structures were added to shorten the distance between structures, decreasing the span length. Adding structures in these areas means BPA would not have to acquire a wider transmission line right-of-way easement since the conductor needs to remain over the existing transmission line easement."
- FONSI: "Potential impacts on soils from construction activities (topsoil loss, vegetation removal, erosion, soil compaction, decreased soil productivity), would be minimized by managing sediments as specified in the Stormwater Pollution Prevention Plan, using erosion control measures, minimizing the size of disturbance areas and vegetation removal, and reseeding disturbed areas."
- FONSI: "Impacts on special-status species would be limited through minimizing structure construction areas and reducing road widths, conducting construction in winter when species are dormant and pollinators are not present, revegetating disturbed areas with native species, and by coordinating with public land managers to implement mitigation consistent with their policies."

- FONSI: “High impacts are considered to be significant impacts, whereas moderate and low impacts are not. Direct, indirect, and cumulative impacts were evaluated. There were no high impacts associated with the Proposed Action.”

Environmental Assessment for the Lane-Wendson No. 1 Transmission Line Rebuild Project (DOE/EA-1952; BPA, 2016): https://www.energy.gov/nepa/ea-1952-lane-wendson-no-1-transmission-line-rebuild-project-lane-county-oregon

- BPA proposes to rebuild its Lane-Wendson No. 1 transmission line, which runs from Eugene to Florence, Oregon. The aging, 41.3-mile-long 115-kilovolt (kV) line requires replacement of its wood-pole structures and other line components and needs improvements to its access road system, the roads that provide access to the transmission line right-of-way for ongoing operations and maintenance.
- EA: “The Proposed Action would involve the following: • Removal and replacement of all wood-pole transmission line structures (including cross arms, insulators, dampers, and guy wires) • Replacement of existing conductors (electric wires) • Replacement of overhead ground wire • Replacement of five 115-kV disconnect switches • Improvement of the access road system (including upgrading [improving or reconstructing] existing roads [~53 miles], developing new roads [1.0 mile], installing temporary roads, obtaining access rights, and replacing or installing gates) • Installation of new culverts and bridges, replacement of existing culverts, or repair of existing bridges as part of access road improvements • Removal of some trees and other vegetation along the transmission line right-of-way and access roads • Establishment of temporary staging areas and tensioning sites (for pulling and tightening conductors) • Revegetation of areas disturbed by construction activities”
- EA: “The transmission line would remain in the existing transmission line right-of-way and would continue to be operated at 115-kV.”
- EA: “The height of the new structures would be similar to the existing structures in most cases, ranging from 50 feet to 140 feet above ground depending on terrain, requirements for road crossings, and the distance between the top of vegetation and the conductor. Proposed structure heights in some locations would be increased by approximately 5 feet to 10 feet to provide better conductor-to-ground clearance or by 55 feet to 60 feet to accommodate removal of structures 27/4 and 27/5.”
- FONSI: “Erosion control measures would minimize or eliminate the delivery of sediments from construction activities into nearby streams, mitigation measures would reduce the risk and extent of accidental oil or fuel spills, and the project would not be expected to contribute to impaired water quality or inhibit any water quality recovery efforts on streams crossed by the transmission line.”
- FONSI: “New or improved access roads would be constructed with compacted gravel surfaces, drainage dips, culverts, or water bars so the potential for long-term surface erosion to nearby streams would be minimized.”
- FONSI: “In-water work for culvert and stream crossing improvements would be implemented with mitigation measures (construction timing restrictions, fish salvage, diverting stream flow, isolating work areas, on-site biologist, etc.), to minimize short-term turbidity and direct construction-related impacts to Endangered Species Act (ESA)-listed fish species.”
- FONSI: “The improvements would occur in areas where the landscape is largely already altered, replaced structures would appear nearly identical to the existing structures (with some potential increases in height of 5 to 10 feet), and most access road improvements or reconstruction would occur in road corridors that already exist.”
- FONSI: “The Proposed Action would have no significant impacts.”

Environmental Assessment for the Kalispell-Kerr Transmission Line Rebuild Project (DOE/EA-1961; BPA, 2016): https://www.energy.gov/nepa/ea-1961-kalispell-kerr-transmission-line-rebuild-project-kalispell-and-polson-montana

- The project involves rebuilding the Kalispell-Kerr transmission line, which runs from Kalispell to Polson, Montana. The existing 41-mile-long 115- kilovolt (kV) transmission line is aging, and BPA proposes to replace its wood-pole structures and other line components and improve its road system that provides access to the line.

- EA: “The main components of the Proposed Action include the following: • Removal and replacement of all wood-pole transmission line structures (including components such as cross-arms, insulators, dampers, and guy wires). • Replacement of conductors (electric wires). • Installation of a combination fiber optic cable-ground wire (optical ground wire) with counterpoise for the entire length of the transmission line. • Improvements to the access road system, including improving or reconstructing existing roads [31 miles], constructing new roads [4 miles], installing temporary roads, obtaining access rights, and replacing or installing culverts and fords, and entrance gates. • Installation of new, or replacement of existing, roadway culverts. • Removal of trees and other vegetation within [up to 135 trees] and along the right-of-way [up to 165 trees] and along access roads [up to 1,150 trees]. • Establishment of temporary staging areas, material storage sites, and tensioning sites (for pulling and tightening conductors). • Installation of temporary guard structures to protect roads, railroads, and other utilities during conductor stringing. • Revegetation (primarily seeding) of areas disturbed by construction activities. • Updating maintenance road access easements”
- EA: “Current structure height ranges from about 40 feet to over 80 feet, and new structures are expected to be between about 50 and 95 feet, except at the two Flathead River crossings where structures are between 110 and 115 feet. The additional height is needed to increase ground to conductor clearance (Section 2.2.2).”
- FONSI: “All structure replacement activities would occur within the existing transmission line right-of-way.”
- FONSI: “Project activities would occur in areas where the landscape is already altered, replaced structures would appear nearly identical to the existing structures (with some potential increases in height of 10 to 15 feet), and access roads would be short in length (generally ranging from 200–800 feet), narrow in width, and mostly within the existing network of forest roads in the area. … The dispersed removal of trees would not substantially change the existing visual environment.”
- FONSI: “Mitigation measures (e.g., sediment barriers, reseeding disturbed areas, and conducting construction activities during the dry season) would minimize potential erosion and compaction impacts to soils and geology during and following construction.”
- FONSI: “The Proposed Action would have no significant impacts.”

Environmental Assessment for the Hills Creek-Lookout Point Transmission Line Rebuild Project (DOE/EA-1967; BPA, 2017) and Supplemental EA (2021): https://www.energy.gov/nepa/doeea-1967-hills-creek-lookout-point-transmission-line-rebuild-project-lane-county-oregon

- Under the Proposed Action analyzed in the 2017 EA, BPA would rebuild the 26-mile-long transmission line, improve the access road system and foot-trail network, and remove trees and other vegetation that pose a danger to safely and reliably operating the transmission line. BPA would remove and replace 224 wood-pole transmission structures; realign segments of line miles two and three; replace wood pole structures with steel monopole structures in line mile five; replace existing conductors, overhead wire and counterpoise; replace two disconnect switches; establish a temporary material storage yard; helicopter landing pads, and tensioning sites; enhance the access road and trail system; acquire new access road rights along the transmission line and new easements in line miles two and three; and remove trees [up to 4,000 trees] and other vegetation.
- Project implementation was delayed, and, in 2021, BPA prepared a Supplemental EA: “Up to 475 trees would be removed within 150 feet of rivers, and perennial or intermittent streams, which is approximately 150 more trees than were analyzed in the 2017 EA. Most of these tree removals are scattered throughout the 26-mile length of the Project area, except line mile 19 where there is a concentrated area of proposed tree removal. The majority of the tree removal near streams would be along the edges of the ROW, and would not create new large openings in the tree canopy. Most of the tree removal would not be immediately adjacent to streams. In some locations, slight increases in water temperature may occur as a result of tree removal near streams. The majority of the trees would be cut in segments and left on site with the tree stumps and understory left intact. Large machinery would not be used to remove the trees, but rather workers would walk into the locations and cut the trees down with a chainsaw; therefore, decreasing the overall amount of ground disturbance associated with tree removal. The

ground surface would remain largely intact and erosion would be controlled using best management practices (BMPs) identified in the Project Stormwater Pollution Prevention Plan."

- 2021 Supplemental EA: "Forty-seven trees are proposed to be removed from within 100 feet of streams that are known to have ESA [Endangered Species Act]-listed fish. BPA would mitigate for the loss of those trees by planting native tree saplings or tall native shrubs at a 3:1 ratio for removal of trees with a dbh [diameter at breast height] of 14 inches or more and a 2:1 ratio for removal of trees less than 14 inches dbh. The impacts to fish from improvements to fords and culvert replacement have not changed since the 2017 EA. Impacts to fish would be low."
- 2021 Supplemental EA: "Bird flight diverters would be installed on the conductor and on overhead ground wire (OHG) in the… spans where the transmission line crosses water bodies and bird strikes are more likely to occur…."
- 2017 EA: "The line would be rebuilt with a combination of wood-pole structures similar to the existing structures, several steel monopole structures on a stretch where greater height is needed, and one lattice-steel tower. The two existing lattice-steel towers located at the beginning of the transmission line would not be replaced. The transmission line would remain in the existing right-of-way except in two locations where the line would be moved slightly off the existing right-of-way to avoid rock fall and landslide areas."
- 2017 EA: "To address recent rockfall and documented landslide risks in line miles two and three, minor relocation of approximately 0.3-mile of the transmission line has been proposed. No timber harvest is proposed, however minor tree felling as described in the EA will address danger trees, maintain safe line clearances and address the two re-routes. BPA foresters and project engineers evaluated all danger trees and their condition, prescribing the minimum amount of felling to maintain North American Electric Reliability Corporation… vegetation management standards for safety clearances, address line mile two rockfall concerns, and resolve the active landslide concerns in line mile three (BPA 2010). This action would reduce the potential for large-scale fires from line/tree contact, flashovers, and arcing. Danger tree felling areas also occur in a largely random pattern over the entire 26-mile corridor, and each is within the realm of natural variability associated with a small landslide, windthrow event, and/or insect or disease tree mortality that could result in similar localized impacts. To further reduce environmental impacts, many trees felled on Forest Service property will be left in-situ (as downed wood) or made available for Forest Service upcoming stream restoration projects."
- 2017 EA: "The height of the new wood-pole structures would be similar to the existing structures in most cases, ranging from 50 to 115 feet above ground depending on terrain, requirements for road crossings, and the distance between the top of vegetation and the conductor. Proposed wood-pole structure heights in some locations would be increased by about 5 to 35 feet to provide increased clearance from the conductor to the ground."
- 2017 EA: "Fifteen wood-pole structures (5/2 through 5/16) in line mile five would be replaced with steel monopole structures, as shown in Figure 2-10. Steel monopole structures in line mile five would range from 61 to 106 feet above the ground; an increase of up to 31 feet above the existing woodpole structures. This height increase is needed for some structures in this segment to accommodate the new, heavier conductor and to ensure sufficient clearance over railroad tracks and Lane Electric's local power line."
- 2017 EA: "The realignment of line mile three would result in a low visual impact for this half-mile segment of the transmission line because there is already an existing transmission line corridor in this area. The view would look similar in terms of vegetation removal under the realignment, but the cleared area along the transmission line would be visibly wider. Similar to the realignment of line mile two, the realignment of line mile three would be visible to motorists where the realigned portion of the transmission line crosses LaDuke Road, but there are relatively few sensitive viewers that would be observing the permanent visual changes."
- 2017 EA: "Upon completion of the project, the overall permanent construction impacts on the visual quality of both the forested and urban visual environments would be low. In both environments, the transmission line would be visually similar to the character and dominance of the existing transmission line as a linear visual element through the landscape. Also, in both the forested and urban visual environments, the transmission line right-of-

way would continue to be visible in the foreground or middle ground of the view for a small number of sensitive viewers (residents or park visitors). In the forested visual environment, because of the limited accessibility of the transmission line right-of-way, the topography, and the dense stands of evergreen trees in this area, visibility of the transmission line would remain minimal."

- 2017 FONSI: "To evaluate potential impacts, four impact levels were used—high, moderate, low, and no impact. These impact levels are based on the considerations of context and intensity defined in Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] 1508.27 [1978 version of CEQ regulations]). High impacts could be considered significant impacts, if not mitigated, while moderate and low impacts are not. The Proposed Action would have no significant impacts."
- 2017 FONSI: BPA concluded that potential impacts from the Proposed Action would not be significant and would be low for all resource areas evaluated except the following:
    - Impacts to wildlife from construction noise and activity levels would be moderate.
    - Impacts to wetlands would be low-to-moderate.
- 2021 FONSI: BPA concluded that the potential impacts for each resource area "have not changed substantially since the 2017 EA and FONSI." "The Proposed Action, with implementation of selected mitigation measures, would have no significant impacts." BPA identified no effects that rose to a high level (i.e., significant) without mitigation. Nonetheless, BPA evaluated and incorporated into the EA and FONSI mitigation to reduce non-significant impacts as a good practice to reduce potential adverse impacts as much as practical.

Environmental Assessment for the Bonneville-Hood River Transmission Line Rebuild (DOE/EA-1981; BPA, 2018): https://www.energy.gov/nepa/ea-1981-bonneville-hood-river-transmission-line-rebuild-multnomah-and-hood-river-counties

- BPA proposes to rebuild structures and replace conductor and/or hardware along about 22 miles of its existing 23-mile-long, 115-kV Bonneville-Hood River transmission line and the existing approximately 400-foot-long Cascade Locks Tap, and also to improve the access road and foot trail system that allows BPA to get to and from the Bonneville-Hood River transmission line.
- The Proposed Action would primarily involve removing existing structures, installing replacement structures, installing replacement conductor and associated equipment, and improving [22 miles] and reconstructing [less than a mile] portions of the existing access system. The Proposed Action also includes three options for rebuilding a portion of the existing line at Line Mile 19 [less than a mile]. The main differences between these three options is the configuration for reconstruction of an existing access road to bring it up to current safety standards, the type of transmission structures to be installed, and the construction methods involved to install the transmission structures.
- EA: "The height of the new wood structures would be similar to the existing structures in most cases, ranging from 50 to 90 feet above ground depending on terrain, requirements for road crossings, and the distance between the top of vegetation and the conductor. Steel monopole structures would typically range from 70- to 95- feet above ground, depending on terrain and vegetation. Proposed structure heights in some locations would be increased by about 5 to 15 feet to meet NESC clearance requirements."
- EA: "Under the Proposed Action regardless of Line Mile 19 Option, structure replacement, conductor and hardware replacement, and access road construction would clear up to 380 trees (66 trees for road work, 211 danger trees near the transmission line right-of-way, 7 trees under the Cascade Locks Tap Line, and up to 96 trees for pulling and tensioning sites) . . ."
- EA: "Regardless of which Line Mile 19 Option is selected, the transmission line would remain in the existing transmission line right-of-way and would continue to be operated at 115-kV."
- EA: "As noted in Section 3.3.1 of the EA, the project area crosses extensive landslide deposits in the first 10 miles of the transmission line. While this area is not automatically prone to landslides (DOGAMI 2010), the Eagle Creek Fire has likely increased the risk of landslide by removing moss and other vegetation that help hold the

steep slopes and fractured rock together (USFS 2017a and b). In light of the preexisting landslide hazards, BPA included several mitigation measures in the EA for the proposed project designed to minimize the risk and damage resulting from landslides. These mitigation measures (See Table 2.7-1), which include but are not limited to, preparation of site-specific Public Safety Plans, implementation of slope stabilization measures, and preconstruction geotechnical investigations, are adequate to address the increased landslide risk on the post-fire landscape."

- FONSI: "…the Proposed Action would have no significant impacts." Further, BPA concluded that potential impacts from the Proposed Action would be low for all resource areas evaluated except there would be moderate (not significant) impacts to certain resources areas as indicated below:
    - Impacts would be moderate in the short term to transportation.
    - Impacts would be low to moderate for recreation.
    - Impacts would be moderate in the short term to wildlife.
    - Impacts would be moderate in the short term to visual quality.
    - There would be short term moderate impacts to public services.
    - Impacts would be moderate on built (cultural) resources.
    - Noise impacts would be low to moderate in the short term.

Environmental Assessment for the Holcomb-Naselle Transmission Line Rebuild Project (DOE/EA-2091; BPA, 2020): https://www.energy.gov/nepa/doeea-2091-holcomb-naselle-transmission-line-rebuild-project-pacific-county-washington

- BPA would rebuild the 21-mile-long Holcomb-Naselle No.1 115-kilovolt (kV) transmission line located in Pacific and Wahkiakum counties, Washington. Under the Proposed Action, BPA would replace approximately 111 of the existing wood-pole transmission line structures; replace existing conductors and hardware; replace overhead ground wire and counterpoise in the first 0.5 miles out from Naselle Substation and install overhead ground wire and counterpoise in the first 0.5 miles out from Holcomb Substation; install fiber optic cable on the transmission line; establish a temporary material storage yard, helicopter landing zones, and conductor pulling/tensioning sites; upgrade the access road system; remove danger trees along the transmission line right-of-way edge; and replace equipment within Naselle and Holcomb substations.
- EA: "There would be a total of about 59 miles of access roads used for the project—about 11 miles of access roads would need work (either reconstruction or improvement) and 48 miles of roads that would not require any work (e.g., Green Creek Road, Salmon Creek Road and Deep River Road)."
- EA: "Access road reconstruction – About 90 feet of an existing access road in line mile 6 that has deteriorated to the point of being unusable by construction equipment would be reconstructed (located on WDNR land). This includes vegetation removal, road prism reconstruction, grading, widening, gravelling, and installing drainage features or culverts. … Access road improvements – About 11 miles of existing access roads would be improved with minor adjustments, including cleaning, shaping, and compacting the existing road surface, gravelling, or installing drainage features."
- EA: "The height of the replaced wood-pole structures would be similar to the existing structures in most cases, ranging from 45 to 95 feet above ground depending on terrain, requirements for road crossings, and the distance between the top of low-growing vegetation and the conductor (Figure 2-3). Proposed wood-pole structure heights in some locations would be increased by about 5 to 35 feet to provide increased clearance from the conductor to the ground."
- EA: "Replacement structures would be the same type and the transmission line would retain its current alignment; the line's visual uniformity would remain and its integrity would remain intact."
- EA: "Existing views of the project corridor would not change because wood poles would be replaced in kind and existing access roads would be improved. Views of construction work areas would be temporary with all equipment and materials removed after construction and thus, would not result in significant impacts."

- EA: “Since no trees would be removed and no new structures or roads would be constructed in floodplains, floodway storage capabilities would be unchanged, resulting in none-to-low impacts.”
- EA: “Because the existing transmission line would be rebuilt or repaired (depending on the alternative) in the same location, existing and future land uses would not change in the project corridor.”
- EA: “Culvert replacement or installation would occur in 15 streams. Replacement would occur in already disturbed areas so there would be no new permanent disturbance areas near these streams. Three new culverts would be installed in intermittent, non-fish bearing streams. All but two of the 12 culvert replacements also would be in intermittent, non-fish bearing streams. The remaining two culvert replacements would occur in fish-bearing streams (in unnamed tributaries to Trap Creek) in line mile 4. One culvert replacement would occur in the headwaters of O’Connor Creek. Replacement and installation work would occur within the in-stream work window [seasonal construction restrictions would be implemented per construction schedule described in Section 2.3 of the EA] if water is present and BMPs would be used to prevent sediment movement downstream (Table 2-3). Because erosion and sediment control BMPs would be used during all road work including near or in streams and disturbed areas would be mulched and seeded to facilitate restoration, impacts on water resources including Naselle’s community drinking water protection area would be low.”
- EA: “Overall, because the two culvert replacements in fish-bearing streams would not permanently remove or degrade fish habitat and would not harm any fish present with BMPs and mitigation measures implemented, impacts would be low.”
- FONSI: “…the Proposed Action would have no significant impacts.” Further, BPA concluded that potential impacts from the Proposed Action would be low for all resource areas evaluated except there would be moderate (not significant) impacts to certain resources areas (e.g., “Impacts on marbled murrelet would be low-to-moderate but temporary”).

Below are several categorical exclusion determinations that BPA prepared for powerline rebuilds or upgrades using categorical exclusion B4.13 as it existed prior to this final rule. These examples illustrate that categorical exclusion B4.13 has been applied in the past to projects that included widening ROWs to meet electrical standards and design requirements, or activities such as access road construction and improvement associated with the powerline rebuild or upgrade. DOE expects that the revised categorical exclusion B4.13 would be used for these types of projects in the future.

Categorical Exclusion Determination for the Red Mountain-Horn Rapids Rebuild (DOE/CX-027462; BPA, 2023): https://www.energy.gov/sites/default/files/2023-02/CX-027462.pdf

- CX determination: “Bonneville Power Administration (BPA) proposes to rebuild the first 4 miles of its Red Mountain-White Bluffs 115-kV transmission line from Red Mountain Substation to structure 4/15, located just outside of Horn Rapids Substation (owned by Benton Public Utility District (PUD)).”
- CX determination: “Sixty of the existing 66 single wood-pole structures would be replaced with wood pole H-frame structures at an average height of 70 feet; about 10 feet higher, on average, than the existing single wood-pole structures.”
- CX determination: “At 10 structure sites, guy wires/anchors would extend outside of the existing right-of-way. Required new right-of-way for the guy wires/anchors and two identified areas where the conductor could swing outside the right-of-way under certain conditions would be obtained from the underlying landowner.”
- CX determination: “Eight pulling sites within the existing right-of-way would be used where the transmission line makes a turn. A temporary 5-acre material yard is proposed just west of structure 4/5 in a previously disturbed area adjacent to the existing access road and between 2 existing crop circles. The area would be rocked and fenced. Two temporary helicopter landing zones are proposed at either end of the project at the substations. Existing access roads would be used.”
- CX determination: “…BPA has determined that the proposed action: 1) fits within a class of actions listed in Appendix B of 10 CFR 1021, Subpart D (see attached Environmental Checklist); 2) does not present any

extraordinary circumstances that may affect the significance of the environmental effects of the proposal; and 3) has not been segmented to meet the definition of a categorical exclusion. Based on these determinations, BPA finds that the proposed action is categorically excluded from further NEPA review."

Categorical Exclusion Determination for the Palisades-Swan Valley Transmission Line Rebuild (DOE/CX-012404; BPA, 2014): https://www.energy.gov/sites/default/files/2014/10/f18/CX-012404.pdf

- CX determination: "BPA proposes to rebuild the existing Palisades-Swan Valley 115- kilovolt (kV) transmission line. The 12.5 mile long transmission line begins at the U. S. Bureau of Reclamation (BOR) Substation at Palisades Dam and ends at BPA's Swan Valley Substation, in Swan Valley, Idaho. The line parallels U.S. Highway 26 and crosses predominately fields used for hay production and pasture, in addition to rangeland."
- CX determination: "The proposed project would include replacing transmission line components including wood-pole transmission structures, associated structural components, and conductors. Wood poles would be removed and replaced with structural components of similar design within or near their existing locations. In each case, an additional earthen landing, approximately 50 feet by 50 feet may be constructed or improved adjacent to each tower to safely support equipment."
- CX determination: "Some existing access roads would need to be improved to provide access for construction equipment and some new access roads may need to be constructed to reach structures for which BPA does not presently have adequate access."
- CX determination: "…BPA's current right-of-way is not uniform in width throughout the extent of the transmission line, varying in width from zero to 150 feet. New uniform right-of-way to a width of 125 feet will be acquired for this project."
- CX determination: "No designated critical habitat or essential fish habitat (EFH) occurs in the project area. A determination of "No Effect" was made for all ESA listed species and designated critical habitat, and EFH. Also, BPA has developed recommended conservation measures that will be included in the plans and contract specifications for the project to protect other managed species and habitat."
- CX determination: "Wetlands occur sporadically throughout the project area; however, no new structures or access would be placed in wetlands. Wetlands and surface waters will be protected from stormwater related impacts by implementation of Best Management Practices (BMPs) to prevent erosion and control surface runoff."
- CX determination: "A cultural resources survey and inventory of the project area was completed and on May 30, 2014, the Idaho State Historic Preservation Office (SHPO) concurred that the proposed action would have no adverse effect on historic properties. The Shoshone Bannock Tribes of the Fort Hall Indian Reservation Tribes were also consulted and had no comment on the project."
- CX determination: "The proposed action does not present any extraordinary circumstances that may affect the significance of the environmental effects of the proposal."
- CX determination: "With the actions identified on the attachment, this proposed action meets the requirements for the Categorical Exclusion referenced above. Therefore, BPA has determined that the proposed action may be categorically excluded from further NEPA review and documentation."

Categorical Exclusion Determination for the North Bonneville-Ross #1 230-kV, North Bonneville-Troutdale #2 230-kV Transmission Line Maintenance (DOE/CX-006253; BPA, 2011): https://www.energy.gov/sites/default/files/CX-006253.pdf

- CX determination: "BPA proposes to conduct transmission line maintenance along a portion of the North Bonneville-Ross #1 and North Bonneville-Troutdale #2 230-kV transmission lines. The maintenance activities will take place within the existing transmission line and access road right-of-way easements and includes upgrading existing roads, developing new roads, installing two new wood pole structures and two new steel tower structures."

- CX determination: “Access road maintenance will involve clearing vegetation from existing road surfaces, grading and shaping existing road surfaces, installing water bars and drain dips where needed. All road maintenance will take place within the existing road prism and the existing road easement width of 15 feet.”
- CX determination: “New access road construction will involve removing vegetation, blading, grading, rocking of proposed vehicle travel routes to the North Bonneville-Troutdale steel lattice structure 23/1 and the Bonneville-Ross #1 21/5 wood pole. If deemed necessary to protect new roads from water erosion, culverts, drainage ditches, water bars and drain dips may be constructed. The finished road width will be 15 feet.”
- CX determination: “The proposed action does not present any extraordinary circumstances that may affect the significance of the environmental effects of the proposal.”
- CX determination: “With the actions identified on the attachment, this proposed action meets the requirements for the Categorical Exclusion referenced above. We therefore determine that the proposed action may be categorically excluded from further NEPA review and documentation.”

DOE’s Western Area Power Administration (WAPA) Experience

WAPA’s construction and procurement specifications require routine environmental review of contractor activities. WAPA Construction Standards include Environmental Quality Protection (Standard 13) (https://www.wapa.gov/wp-content/uploads/2023/04/ConstructionStandards2021_Combined.pdf), which details contractor requirements and BMP addressing:

- Landscape Preservation
- Preservation of Cultural and Paleontological Resources
- Noxious Weed Control
- Spill Prevention
- Recycled, Recovered, and Biobased Materials Use
- Pollution Prevention
- Hazardous Waste/Regulated Material Management
- Prevention of Air and Water Pollution
- Conservation of Biological Resources

BMPs are implemented regardless of the NEPA class of action or length of transmission line rebuild or upgrade. WAPA also consults and coordinates with landowners and resource management agencies to ensure compliance with site-specific environmental permits and requirements. WAPA NEPA determinations are based on environmental conditions specific to each project and identify potentially impacted sensitive areas through reviews of its transmission system-specific resource data repository and in consultation with involved agencies, tribal nations, and resource managers. Additional resources for guiding WAPA and its contractors in their efforts to avoid or reduce adverse environmental impacts include the Avian Protection Plan (https://www.wapa.gov/wp-content/uploads/2023/04/FINAL_Avian_Protection_Plan_May2016.pdf), Pollution Prevention Program (https://www.wapa.gov/about-wapa/regions/hq/environment/pollution-prevention-program/), and Materials Management Program (https://www.wapa.gov/about-wapa/regions/hq/environment/materials-management/).

Below are examples of EAs and FONSIs prepared by WAPA for upgrading and rebuilding existing powerlines that are relevant to the changes for this categorical exclusion. In all but one of these environmental assessments, except DOE/EA-1595, as explained below, WAPA found no potentially significant impacts. For several of these EAs, WAPA also prepared a mitigation action plan (MAP) that includes all of the measures presented in the final EA to mitigate adverse impacts. For DOE/EA-1595, WAPA identified potentially significant impacts and issued a mitigated FONSI.

Environmental Assessment for the Cheyenne-Miracle Mile and Ault-Cheyenne Transmission Line Rebuild Project (DOE/EA-1456; WAPA, 2006): https://www.energy.gov/nepa/ea-1456-cheyenne-miracle-mile-and-ault-cheyenne-transmission-line-rebuild-project-wy-co

- WAPA proposes to upgrade the existing Cheyenne-Miracle Mile (CH-MM) and Ault-Cheyenne (AU-CH) 115-kilovolt (kV) transmission lines to 230 kV. The proposed project consists of rebuilding these transmission lines and making modifications to WAPA's existing Miracle Mile, Cheyenne, and Ault Substations to accommodate the 230-kV circuits. A new Snowy Range Substation would also be built near Laramie, Wyoming.
- EA: "The existing CH-MM 115-kV transmission line is 146 miles in length, and crosses Carbon, Albany, and Laramie Counties in Wyoming. The Cheyenne-Ault 115-kV transmission line is 35 miles in length and crosses portions of Laramie County, Wyoming and Weld County, Colorado. Western proposes to upgrade the existing transmission lines by removing the existing 115-kV H-frame structures and replacing them with new 230-kV H-frame structures and single pole steel structures. Western also proposes to widen the existing right-of-way (ROW), where necessary to allow adequate electrical clearances."
- EA: "Western is proposing to rebuild the transmission facilities with 230-kV wood H-frame structures and double circuit single pole steel structures.… Wood H-frame structures would be installed along 134.8 miles of the CH-MM transmission line. The 230-kV H-frame structures would average 70 feet in height, and be approximately 18 feet taller than the existing 115-kV wood pole structures that they would replace.… Western is proposing to install double circuit single pole steel structures along 5.0 miles of the CH-MM line and along 32 miles of the AU-CH line. The single pole steel structures would be approximately 115 feet in height, compared to 52 feet for the average height of the existing H-frame structures."
- EA: "Rebuilding and upgrading the CH-MM and AU-CH transmission line would occur within Western's existing right-of-way (ROW), which crosses land owned by the federal government, state government, and private individuals. Western proposes to widen the existing CH-MM and AU-CH 115-kV ROW by 30-35 ft to a typical width of 105 ft for the proposed 230-kV transmission systems."
- EA: "The width of the ROW would increase, on average, from 75 feet to 105 feet. However, near Laramie between MP 91 and MP 100, the ROW would increase from 50 feet to 105 feet for the new 230-kV wood structures. Existing land uses would not change; however, some land use restrictions may result due to the widening of the ROW for electrical clearances and safety standards."
- EA: "Additional ROW would be required along most of the project route. However, additional ROW would not be necessary along the following areas of the CH-MM rebuild segment: 1) the first 6.6 miles of the CH-MM transmission line segment where the existing line and lattice structures would be uprated and no new construction would occur and 2) the last 5 miles of Western's existing combined ROW for the CH-MM segment that are adequate for the proposed double circuit 230/115-kV single-pole steel structures through the city of Cheyenne."
- EA: "Predominant land uses near the proposed transmission line rebuild include agricultural uses such as grazing and some cultivated lands. Other uses along the line include recreational, commercial, industrial, and residential. Over 77% of the land crossed is privately owned. The rebuild of the transmission line would not affect the economic viability of any of the agricultural uses within the project area in the long run or change the land uses along the ROW."
- EA: "No major new access roads would be constructed. Existing access roads would be used and improved where required to control erosion. Some spur roads within the ROW would be constructed where necessary to access new structure sites."
- FONSI: "Western would minimize the potential to impact these species through pre-construction surveys and a variety of avoidance measures. Avoidance and mitigation measures for TEP&C [threatened, endangered, proposed and candidate] species are incorporated in Western's standard construction and mitigation measures."
- FONSI: "In addition to the proposed project, two transmission line routing alternatives are evaluated. Alternatives were identified to minimize impacts to land uses, visual resources, wetlands and soils."

- FONSI: "Large ranches, rangeland, dryland farming and irrigated fields are the predominant uses within and adjacent to the project ROWs. … Due to the open space character of much of the project area, increased land use restrictions, potentially result from the wider ROW are unlikely to affect existing or planned land uses."
- FONSI: "…increases in ROW width in the more developed area around Laramie would not change existing land uses or interfere with current land use activities."
- FONSI: "…the perceived visual changes would be very weak. Visual changes would also be minor and only slightly adverse along the vast majority of the project area, since there are few viewers along much of the project area. … The visual changes brought about by the proposed project would be more noticeable where Western is proposing to install the 115-kV/230-kV single pole steel structures through urbanizing areas of southern Wyoming.… Overall, beneficial visual impacts would result since there would be fewer structures and the single pole steel design is visually more compatible with urban design features…. While the structure heights would be noticeably taller than the 115-kV wood H-frame structures, the spacing of the 230-kV structures would be great, thus resulting in a reduction in the total number of structures seen."
- FONSI: "Visual impacts from the increased height of the single pole steel structures would be mitigated or offset by both the single pole design and reduction in the total number of structures. Consequently, on balance, this alternative would result in similar or less visual effects than currently occur from the existing 115-kV structures and lines."
- FONSI: "The proposed project and alternatives would have minor, and less than significant impacts on water and water quality since all surface waters would be spanned, and no surface water use is proposed."
- FONSI: "The proposed project would cross or intersect floodplains at 16 locations on the CH-MM transmission line ROW and at two locations on the AU-CH transmission line ROW.… The proposed project would also intersect or cross an estimated 54 potential wetlands.… The impacts of the proposed project would be low, and less than significant where floodplains and wetlands would be spanned. Disturbances would be limited to the installation of up to two structures (approximately 0.3 acre during construction). Long-term disturbance would be limited to the footprint of up to two structures (less than 0.001 acre).… The alternatives would have similar potential impacts to wetlands and floodplains."
- FONSI: "Based on the EA, Western has concluded that, with the environmental protection measures proposed for the project, the construction and operation of the CH-MM and AU-CH Transmission Line Rebuilt Project would not require mitigation beyond that already proposed by Western. Western prepared a Mitigation Action Plan, which will be made available upon written request."

Environmental Assessment for the Beaver Creek-Hoyt-Erie Transmission Line Rebuild (DOE/EA-1508; WAPA, 2005): https://www.energy.gov/nepa/ea-1508-beaver-creek-hoyt-erie-transmission-line-rebuild-co

- WAPA proposes to upgrade approximately 78 miles of 115-kV transmission line between the Beaver Creek Substation, east of Brush, Colorado; the Hoyt Substation, west of Hoyt, Colorado; and the Erie Substation, near Brighton, Colorado. The line is proposed to be rebuilt as a double-circuit 230-kV transmission line. Two routing alternatives are examined in the EA. One reroute would place the line on approximately 7 miles of new ROW. This alternative places the new line in an established utility corridor, reduces impacts to irrigated agriculture and other land uses, improves visual impacts; avoids wetlands, reduces the likelihood of impacts to waterfowl, avoids impacts to most recreation uses on the Brush Prairie Ponds State Wildlife Area [SWA], and improves WAPA's capability to maintain the line. The second reroute (Bijou Creek Crossing alternative) was developed in cooperation with landowners who wanted to improve their ability to use center pivot irrigation and to provide for expansion of their use of their property. This reroute also reduces the number of turning structures in the line. Western adopted the alternative routes as part of the proposed constructed project.
- EA: "The existing Beaver Creek-Hoyt-Erie ROW would be widened as necessary to meet National Electrical Safety Code (NESC) standards and provide increased flexibility for maintenance activities for the proposed 230-kV transmission line. The existing ROW is typically 75 feet wide, and would be increased to widths ranging from

85 feet to 125 feet. ROW expansion requirements would vary depending on the width of the existing ROW, structure designs, and whether the existing ROW overlaps with adjacent transmission line ROWs. The ROW would be expanded to 125 feet in width at the four undercrossing where multiple H-frame structures would route the line under existing transmission lines."

- EA: "The width of the ROW for the proposed 230-kV transmission line would be determined based on final engineering and design. For purposes of the EA, it is assumed that the existing ROWs would be widened from 75 feet (average) to 85 feet to 110 feet for the single pole steel structures. ROWs would be widened to 125 feet for the H-frame structures where they are installed: (1) near substations, (2) at four transmission line undercrossings, and (3) at locations where long spans between structures are designed to avoid or minimize impacts to floodplains and riparian woodlands. During final engineering and design, the width requirements for the ROW may be reduced to 85 feet in most locations."
- EA: "The project crosses portions of Morgan and Weld Counties that are primarily in agriculture related land uses. The proposed project also crosses the Brush Prairie Ponds SWA [State Wildlife Area], managed by the [Colorado Division of Wildlife] CDOW. Several communities and a number of dispersed rural residences are located within two miles of the proposed project including the City of Brush, in Morgan County, and the communities of Lochbuie, Wattenberg and Brighton in Weld County. Several utility corridors occur in the project area. These corridors contain pipelines, transmission lines and communication facilities. Western's existing transmission lines and ROWs have been established land uses since the 1950's."
- EA: "All current uses within and adjacent to the existing ROW are allowable uses according to Attachment 80-LM-04A, Allowable Uses Under Western ROW. Consequently, there would be no direct land use impacts to land uses from the proposed action. The extent of land use restrictions would increase somewhat, however, due to the widening of the ROW for electrical clearances and safety standards. There are no existing residential homes or related structures that would need to be removed for the proposed rebuild project."
- EA: "Visual changes would result from the replacement of the existing transmission line with larger structures and conductors. The single pole steel structures would be almost twice as tall as the existing H-frame structures (average 100 feet in height, compared to the existing H-frame structures that average 50 to 55 feet); consequently, the visibility of the proposed transmission line rebuild would be noticeably increased. The proposed project would result in fewer structures compared to the current conditions due to the increased span length between the proposed structures (1,000 ft. average) compared to the existing H-frame structures (700 ft. average). The visual changes caused by the increased height of the single pole structure design would be partially offset by the reduced number of structures as well as the more streamlined design of the single pole compared to the existing H-frame structures. Visual contrasts created by the increased number and diameter of the conductors, and 230-kV insulator hardware would also be incremental to the existing visual conditions of the 115-kV system. On balance, the increased visual contrasts of the proposed project would be moderate compared to the existing impacts of the H-frame structures and conductors. The proposed project would have adverse, but less than significant visual impacts on the Brush Prairie Ponds SWA."
- FONSI: "Impacts to groundwater could occur during construction of foundations for structures near the Brush Prairie Ponds Recharge Area.… Impacts to groundwater could occur and would be potentially significant if construction of the project impacted the protective clay layer that lies approximately 40 to 60 feet below the surface. Direct impacts to the protective clay layer are considered unlikely since the proposed structures would require foundations from 10 to 30 feet deep. In order to ensure that impacts to groundwater resources does not occur, Western would conduct geological investigations at each proposed structure site within the Brush [Brush, Colorado, municipal] well field and/or Brush Prairie Ponds Recharge Area…. Borings would extend 5 feet beyond the depth of the structure foundations to determine if the clay layer would be encountered during project construction. Alternative structure designs would be used that would allow for shallower foundations in the unlikely event that the standard foundations would reach the clay layer. In the event that water is encountered during construction of foundations, Western would obtain a Permit for Construction Dewatering Wastewater Discharge."

- FONSI: "The existing alignment crosses floodplains at 12 locations…. Seven of the 12 floodplains would be spanned, thus, there would be no direct impact to these floodplains. The remaining floodplain crossings are too wide to be spanned. Since the spacing of the proposed structures would be greater than the spacing of the existing structures, actual numbers of structures located within floodplains would be reduced over the existing conditions. … Western would cross the floodplains in compliance with Permit 12 (utilities) of the Army Corps of Engineers Nationwide Permit. Western would not propose to fill or dredge in floodplains."
- FONSI: "Potential direct impacts to wetlands would be avoided through structure placement that would allow spanning of all wetlands.… indirect impacts would be minimized through implementation of Western's standard practices that provide for erosion control and avoidance of wetlands during construction and maintenance operations."
- FONSI: "All impacts have been determined to be less than significant with implementation of Western's standard practices and project-specific mitigation measures."
- FONSI: "Based on the analysis in the EA, Western has determined that mitigation measures would reduce the potential for significant environmental impacts. The implementation of these measures is addressed in a Mitigation Action Plan (MAP) issued concurrently with the EA. The analyses contained in the EA, along with the mitigation commitments in the MAP, indicate that the proposed action and alternative routes are not a major Federal action significantly affecting the quality of the human environment."

Environmental Assessment for the Mead/Davis 230-kV Transmission Line Reconductor (DOE/EA-1595; WAPA, 2007): https://www.energy.gov/nepa/ea-1595-meaddavis-230-kv-transmission-line-reconductor

- WAPA proposed to reconductor the existing 61-mile long 230-kilovolt (kV) Davis-Mead Transmission Line located in Clark County, Nevada and Mohave County, Arizona. Reconductoring the 61-mile long transmission line would involve replacement of the existing conductor and insulator assemblies. Existing lattice steel transmission line structures and overhead ground wire are proposed to be utilized and remain intact. The steps involved in reconductoring are unclipping, pulling, splicing, tensioning, and clipping conductor. Western's existing right-of-way (ROW) would be used for the Proposed Action; therefore, no new ROW would need to be obtained and no new easements are anticipated. All disturbances are expected to occur within existing transmission line and access road ROWs.
- EA: "…the new conductor can be installed on existing structures, thus eliminating the need to acquire new right-of-way (ROW)."
- EA: "Western proposes to utilize their standard reconductoring process detailed in their Construction Standards (Standard 10-Transmission Line Electrical) (Western 2005a). Western also proposes to employ their Standard Mitigative Practices developed from their Annual Site Environmental Report and Construction Standards (Standard 13-Environmental Quality Protection) (Western 2005b)." Table 2.3 of the EA lists environmental protection measures, including but not limited to the following topics: access road rehabilitation, water bars, erosion control, access road requirements, landscape preservation, revegetation, resource protection, visual resources, tree clearing, invasive weeks, dust control, exhaust emissions, cultural resources (such as unanticipated discovery, site avoidance monitoring, site vandalism), water protection, stream crossings, special status wildlife species (such as pre-construction surveys, bird collisions), hazardous materials and solid waste, and noise.
- EA: "The proposed project normally would fall under a Categorical Exclusion according to Appendix B of [10] CFR 1021 Subpart D…whereby an action may be categorically excluded if, although sensitive resources are present on a site, the action would not adversely affect those resources. However, the proposed project does not meet the 'Integral Element Clause' described above due to the following reasons. Project-related, environmentally sensitive resources include federally-listed threatened or endangered species or their habitat (including Critical Habitat), federally proposed or candidate species or their habitat, or State-listed endangered or threated species or their habitat, and areas having a special designation such as Federally- and State-designated wilderness areas or national parks."

- EA: "Western determined the Proposed Action will have no adverse effect on historic properties provided Special Conditions of Compliance established for resources determined eligible to the NRHP were followed.… Concurrence on the no adverse effect determination was received from the Arizona SHPO… and from the Nevada SHPO…."
- EA: "…construction and operation of the Proposed Action would not result in substantial dominant changes in the landscape."
- Construction activities would modify approximately 114 acres of designated Critical Habitat for the Mojave Desert tortoise. The Mitigated FONSI explained "The modification would be temporary as evidenced by the return of the habitat since the line was constructed.… By abiding with the terms and conditions of the [Biological Opinion issued by the U.S. Fish and Wildlife Service], the Proposed Action would not jeopardize the continued existence of a federally-listed species, cause the loss of individuals of a population of species that would result in a change in species status, or adversely modify Critical Habitat to the degree it would no longer support the species for which it was designated.… The terms and conditions of the [Biological Opinion] will be implemented to avoid a significant impact and is addressed in the MAP [Mitigation Action Plan], issued concurrently with this determination."
- Mitigated FONSI: "Western determined that the Proposed Action would have no adverse effect on historic properties provided Western complies with the Special Conditions of Compliance.… Western concluded that no direct, indirect or cumulative significant impacts to cultural resources would occur from the Proposed Action. The Special Conditions of Compliance will be implemented to avoid a significant impact addressed in the MAP, issued concurrently with this determination."
- Mitigated FONSI: "No fill materials would be placed within the 100-year floodplains in Arizona. The minimal quantities of native materials placed within the two [100-year] floodplains in Nevada would not impede or redirect flood flows, alter existing drainage patterns or modify a floodplain."
- Mitigated FONSI: "Based on the analysis in the EA, Western has determined that the terms and conditions of the BO and the Special Conditions of Compliance are needed to reduce the potential for significant environmental impacts. These measures will be implemented as addressed in the MAP issued concurrently with this determination. The analyses contained in the EA, along with the mitigation commitments in the MAP, indicate that the Proposed Action is not a major Federal action significantly affecting the quality of the human environment."

Environmental Assessment for the Lovell-Yellowtail and Basin-Lovell Transmission Line Rebuild Project (DOE/EA-1617; WAPA, 2011): https://www.energy.gov/nepa/ea-1617-lovell-yellowtail-and-basin-lovell-transmission-line-rebuild-project-big-horn-county

- WAPA proposed to rebuild Lovell-Yellowtail No. 1 and No. 2 115-kV transmission lines located in Big Horn County, Wyoming, and in Big Horn and Carbon Counties, Montana, and the Basin-Lovell 115-kV transmission line in Big Horn County, Wyoming. The Lovell-Yellowtail No. 1 and No. 2 transmission lines parallel each other and are approximately 47 miles long. The Basin-Lovell transmission line is approximately 39 miles long. The transmission lines would be upgraded with larger conduction and would continue to operate at 115 kV.
- EA: "Western is proposing to use wood pole H-frame structures for the rebuild project as well. The majority of the new 115-kV structures would be up to 10 feet taller than the existing 115-kV structures in order to accommodate the larger conductor. Different structure types may be used in challenging terrain or environmentally sensitive areas. … The ROW would not be expanded for the rebuild project."
- EA: "Double-circuit single-pole steel structures would be used if the terrain or other factors do not provide enough room within the ROW for two wood pole H-frame structures adjacent to each other. This may occur in several locations near the Wyoming — Montana border. Single pole steel structures would replace the lattice structures where the line crosses the Bighorn River near Yellowtail Substation. Other areas may require single pole steel structures as well."

- EA: “For the most part, existing access roads would be used and improved if necessary to control erosion. One-half mile of new access roads would be constructed within the Bighorn Canyon NRA to avoid cultural sites.”
- EA: “The upgraded 115-kV H-frame structure poles would have an average height of 70 feet, compared to 60 feet for the existing 115-kV structures.”
- EA: “All surface waters would be spanned and no surface water use is proposed. The project would not impact municipal or private drinking water or ground water. Surface water quality within the project area typically meets water quality standards. Standard construction measures, including erosion control and spill prevention, would be implemented to reduce the potential for sedimentation and water quality impacts. The Proposed Project and all alternatives would have minor to moderate short-term, adverse, indirect impacts from sedimentation due to construction of the transmission lines and improvement of access roads. Along the BA-LV [Basin-Lovell] line, short-term, adverse, indirect impacts from the construction of the transmission line and improvement of access roads would be moderate because of the greater number of unimproved crossings along this transmission line.”
- EA: “The Proposed Project would result in minor, short-term adverse impacts to the quality of recreational experiences at the Bighorn Canyon NRA and WSAs [Wilderness Study Areas].”
- EA: “The Proposed Project would not disrupt access to public lands in the area. The lines would be rebuilt within the existing ROW, which currently crosses the Bighorn Canyon NRA and is located adjacent to the Bighorn Tack-On and Pryor Mountain WSAs.”
- EA: “Due to the relatively small degree of change and weak visual contrasts that would occur to the existing 115-kV system, the visual impacts to highways and residential areas would be minor to negligible. The adverse visual impacts to Bighorn Canyon NRA would range from minor to moderate depending on viewing location and type of structure installed. Impacts to visual quality would be minor in most instances, due to the slight change in the structure size and design. Some moderate impacts to visual quality may occur where steel pole structures are installed near the Montana-Wyoming border.”
- EA: “Some of the structures may be located within floodplain zones and would not be placed within designated flood hazard zones unless necessary. Some access roads currently cross designated flood hazard zones. The structures and access roads located within the floodplains do not impede the natural action or function of the floodplains. The installation of culverts and other stream crossing improvements to access roads would be designed to avoid adverse impacts to floodplains. Long-term disturbance within the flood hazard zones from the Proposed Project and action alternatives would be limited to the footprint of the structures.”
- FONSI: “…Western would minimize potential harm to or within floodplains through the standard construction practices listed in Chapter 2 of the EA and other mitigating actions described in the Chapter 3. These include minimizing the amount of grading in floodplains, appropriate design and placement of culverts, locating transmission line structures to minimize floodplain impacts, and appropriate design of structures and incorporating the requirements of the Nationwide Permit for utility crossings.”
- FONSI: “Based on the analysis of the impacts, adoption of identified measures that would reduce impacts, and use of Western’s standard practices described in Chapter 2, no significant environmental impacts were identified. Western prepared a Mitigation Action Plan to address site-specific measures that would be implemented during construction or operation to control environmental impacts.”

Environmental Assessment for the Charlie Creek to Garrison Transmission Line Rebuild Project (DOE/EA-2093; WAPA, 2020): https://www.energy.gov/nepa/doeea-2093-charlie-creek-garrison-transmission-line-rebuild-project

- WAPA proposed to rebuild 95 miles of the Charlie Creek to Garrison (CCR-GA) 115-kilovolt (kV) transmission line, located in Mercer, Dunn, and McKenzie Counties, North Dakota. The work would be segmented into 4 (or more) phases and would entail: • Upgrading the line capacity by replacing the existing conductors with larger conductors, • Replacing the existing wooden structures with new taller wooden structures to accommodate the larger conductor, and • Installing fiber optic communication capability to one of the overhead ground wires.

- EA: “At roughly 95 miles in length and 75 feet in width, WAPA’s current easement footprint is approximately 865 acres. WAPA expects that additional ROW and easements will be necessary but the extent of easement acquisition is currently unknown. A breakdown of each activity and the anticipated disturbance area is presented below.” For example, Table 2-2 explains that WAPA estimates the size of the disturbance area: permanent disturbance for new access roads: “Currently unknown, but estimated at less than 5 miles of new access roads and 12 feet wide = 7 acres; temporary disturbance for structure assembly: “Less than 0.5 acres per structure and roughly 747 structures = 374 acres.”
- EA: “WAPA proposes to remove the existing wooden H-frame pole structures and replace them with new H-frame wooden pole structures. The new poles would be 10 to 15 feet taller than the existing structures. The existing 747 wood pole structures would be replaced with approximately the same number of structures.”
- EA: “WAPA’s standard construction procedures for transmission lines require the movement of vehicles and equipment within the existing 75 foot ROW. For the most part, the transmission line would stay within the existing ROW and pole structures would be replaced in the existing holes. Some structures may shift in location but would remain within the existing ROW. For example, structures may be moved away from fence lines, protected natural resources (wetlands or cultural sites), cliffs, or other obstacles in order to protect resources and to make construction and access easier. WAPA would need to acquire additional access easements in the following situations: • Where rough terrain makes existing access roads impassable. • Where longer spans (spans over 960 feet) require 80 feet ROW. • Where guy wires (wires used to anchor the pole into the ground for additional support) on deadend structures (structures where the transmission line makes a turn or ends) require “guy pockets” beyond the existing ROW.”
- EA: “Where installation of new structures within floodplains is unavoidable, proposed structures would be designed to withstand 100 year flood events. Structure placement would not alter surface water flow characteristics of a floodplain, change drainage patterns, or impede or redirect flood flows.”
- EA: “The types of vegetation that would be impacted are primarily pre-disturbed communities, such as cropped areas, previously cropped areas, non-native haylands, pasture or other grassland with majority non-native species. An estimated six-mile segment of the transmission line would continue to impact grasslands that have a higher likelihood to contain native species…. The State of North Dakota’s native grassland composition model map indicates there are six miles of existing transmission line that traverse areas that could contain 60% or greater native grasses. This six-mile segment involves approximately 43 structures across 52 acres of right-of-way…. In order to minimize vegetation impacts, WAPA would adopt the following environmental commitments… • Reseed disturbed areas with regionally native grass mixture.”
- EA: “New habitat fragmentation is not expected beyond the short term construction impacts to vegetation. It is unknown how much ROW or easement would be needed, and WAPA cannot estimate the current wildlife habitat value of any new ROW or easement areas. Conservatively, WAPA anticipates less than 10 acres of new disturbance to wildlife habitat as a result of new ROW and easements. Most impacts to wildlife individuals would be short term and intermittent in nature.”
- FONSI: “There are a handful of unique vegetation sites in the Project footprint: the westernmost 2.5 miles of the existing transmission line is in the Little Missouri National Grassland; six miles of existing transmission line (43 structures across 52 acres of right-of-way) cross areas that could contain 60% or greater native grasses, and; the existing transmission line also crosses 3 miles of the Lake Ilo National Wildlife Refuge.”
- FONSI: “Visual Resources: Because both alternatives would occur within the existing alignment, no new impacts to the view shed are expected. The Proposed Action would result in poles that are roughly 10-15 feet taller than the existing poles. The new poles would be more visible than the existing poles. Construction and O&M activities would cause short-term visual impacts due to the presence of vehicles, vegetation removal, and general human activity.”
- FONSI: “Regardless of the alternative, impacts to all resources would be reduced by the use of WAPA’s Standard Mitigation Measures for Construction, Operation, and Maintenance of Transmission Lines and Construction

Standard 13, Environmental Quality Protection. These environmental commitments have been embedded as a required component of both alternatives and are listed in Appendices B and C of the EA."

- FONSI: "The principal reason for the lack of significant environmental impacts is the presence of the existing transmission line and the use of avoidance measures and environmental commitments as a required component of the project."

Environmental Assessment for the Dave Johnston Tap to Sidney Substation Transmission Line Reconductor Project (DOE/EA-2149; WAPA, 2020): https://www.energy.gov/nepa/doeea-2149-dave-johnston-tap-sidney-substation-transmission-line-reconductor-project-wyoming

- WAPA proposes to install new conductor (reconductor) on the Dave Johnston Tap-Sidney (DJT-SD) 115-kilovolt transmission line. The DJT-SD Transmission Line is approximately 210 miles long with termination points at the Dave Johnson Tap near Casper, Wyoming, and the Sidney Substation near Sidney, Nebraska. The transmission line conductors would be replaced with new conductors, the existing overhead ground wires would be replaced, one with a new fiber optic ground wire (OPGW), and the line would continue to be operated at 115 kV. The project would be confined to the existing rights-of-way (ROW).
- WAPA would continue to use current access roads and routes for the project, which would be repaired, if needed, to ensure effective erosion control and access for routine maintenance over the life of the lines. No new access roads or access routes are being proposed.
- EA: "WAPA proposes to remove and replace approximately 30 existing wooden H-frame pole structures and replace them with new H-frame wooden pole structures. The new poles would be 10 to 15 feet taller than the existing structures. No new structures would be added to the line. Only 'in-kind' replacement would occur with failing structures."
- EA: "The Project area was cleared and leveled when the original transmission line was constructed, and routine maintenance has continued to grade the existing access routes or ROW roads and removed vegetation from the ROW. Due to the prairie and farmland landscape in the Project area, minimal clearing or grading is expected. However, all 'Danger Trees' or 'Danger Vegetation' as defined by NERC FAC-003-4 would be removed along the ROW."
- EA: "WAPA's standard construction procedures for transmission lines require the movement of vehicles and equipment within the existing ROW and on designated access routes or roads. The transmission line would stay within the existing ROW and pole structures would be replaced in the existing holes. No additional structures are planned to be installed and, therefore, no new impacts are expected."
- EA: "…any possible impacts to resources would be reduced by the use of WAPA's Standard Mitigation Measures for Construction, Operation and Maintenance of Transmission Lines (Appendix A) and Construction Standard 13, Environmental Quality Protection (Appendix B)." For example, "WAPA requires all construction activities use methods that would prevent entrance, or accidental spillage of fuels, petroleum products, chemicals, solid matter contaminants, debris, and any other pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. WAPA's construction standards also require a Spill Prevention, Notification, and Cleanup Plan to be implemented prior to work."
- EA: "Regardless of the Action, WAPA's standard practice is to span across water resources and flood prone areas whenever possible. WAPA purposefully aims to install structures at least 300 feet from rivers, streams, ephemeral (intermittent) streams, ponds, lakes, and reservoirs. WAPA is not proposing to install any new structures in wetlands or within riparian zones."
- EA: "Best Management Practices (BMPs) for weed control would be used to reduce the spread of noxious weeds and to increase the effectiveness of treatment."
- EA: "[Bird] Collision avoidance devices that are already in place on the existing transmission lines, or similar devices, would be replaced in kind in the same locations the current devises are located."

- FONSI: “WAPA determined that some construction and maintenance actions would occur within 100-year floodplains. These actions would include replacing existing transmission line structures and replacing existing crushed or non-functioning culverts to improve access to the transmission lines, and overland travel across floodplains during construction and maintenance.… However, WAPA would minimize potential harm to or within floodplains through the standard construction practices…. These include minimizing the amount of grading in floodplains, replacement of existing culverts where needed, and appropriate ‘in-kind’ design of replacement structures. Although transmission line structures could collect flood debris around their bases during a flood event, they are far enough apart that there would be no impediment to flood flows, and would not, therefore, increase the risk of flooding through damming flood flows. WAPA also design structures in floodplains to withstand flood flows and debris accumulations, and remove and collected flood debris during normal annual O&M [operation and maintenance]. Only in-kind culvert replacement and crossing maintenance is authorized. There would be no floodplain effects of national or regional concern associated with WAPA's project. The Proposed Action would Not Effect the existing floodplain based on the review conducted.”
- FONSI: “Based on the analysis of the impacts, adoption of identified measures that would reduce impacts, and use of WAPA’s standard practices described in chapter 2, no significant environmental impacts were identified for any of these resources under the Proposed Action. WAPA shall implement specific protective measures during construction and operation to avoid or reduce environmental impacts.”

Below are two categorical exclusion determinations that WAPA prepared for powerline rebuilds or upgrades using existing categorical exclusion B4.13. These examples illustrate that the existing categorical exclusion has been applied in the past to projects that included widening ROWs to meet electrical standards and design requirements, or activities such as access road construction and improvement associated with the powerline rebuild or upgrade. DOE expects that the revised categorical exclusion B4.13 would be used for these types of projects in the future.

Categorical Exclusion Determination for the CCR-WC Structure Modifications to Accommodate US HWY-85 Upgrade (DOE/CX-026131; WAPA, 2022): https://www.energy.gov/nepa/articles/cx-026131-ccr-wc-structure-modifications-accommodate-us-hwy-85-upgrade

- CX determination: “The NDDOT [North Dakota Department of Transportation] & FHWA [Federal Highway Administration] are proposing to upgrade approximately 62 miles of US HWY-85 to accommodate additional lanes of traffic. NDDOT/FHWA’s project is being designed in phases. The current phase will impact WAPA's existing Charlie Creek to Watford City 230kV transmission line & will require structure modifications (raises & relocations). The total length of impact is 0.35 miles, between structures 25/7 to 26/3.”
- CX determination: “The structure modifications will occur outside of existing WAPA right-of-way but in previously-developed land (other utility ROW and roads are present). The NDDOT is responsible for acquiring & transferring all permanent land rights necessary to facilitate WAPA's structure relocations & access for future maintenance.”
- CX determination: “The Project is not located in or near other formally classified lands, nor areas of high scenic beauty, scenic overlooks, scenic highways, wilderness areas, etc. Project work would have limited impacts to wildlife because the project area and surrounding landscape are developed & offer low, if any, wildlife habitat. WAPA has determined No Effect to federally-listed species & critical habitat. Additionally, the project location was analyzed in the FHWA's Programmatic Biological Assessment (PBA), dated May 2017.”
- CX determination: “WAPA is committed to conducting tree removal activities outside of the active season for NLEB [Northern Long-eared Bat] (April 1 - September 30).”
- CX determination: “The HWY-85 Project corridor was surveyed for cultural resources & SHPO concurrence was received during the spring of 2018 on all determinations of effect. WAPA field-verified the prior surveys in May 2022.”
- CX determination: “There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal.”

- CX determination: "…the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review."

Categorical Exclusion Determination for the Flaming Gorge-Vernal No. 3 138-kV Transmission Line Structure Relocation (DOE/CX-023568; WAPA, 2021): https://www.energy.gov/sites/default/files/2021-06/CX-023568.pdf

- CX determination: "Western Area Power Administration (WAPA), Rocky Mountain Region (RMR), proposes to relocate Structures 20/6 through 21/4 on the Flaming Gorge-Vernal No. 3 (FGE-VNL-3) 138-kV Transmission Line in Uintah County, Utah. The purpose of the project is to move this approximately 0.9-mile section of FGE-VNL-3 out of an area the landowner is preparing to mine. The structures will be moved west across U.S. Highway 191 to previously-mined land, and the FGE-VNL-3 highway crossings in this area will be reduced from four to two."
- CX determination: "To facilitate this transmission line relocation, the landowner will construct new access roads and landings that meet WAPA's design standards on the west side of U.S. Highway 191."
- CX determination: "Work will occur within WAPA's existing right-of-way (ROW) on private lands, as well as a new ROW granted by the private landowner."
- CX determination: "There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal."
- CX determination: "…the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review."

DOE's Loan Programs Office (LPO) Experience

DOE's LPO monitors projects for the life of the loan/loan guarantee. Based on the complexity of application and the structure of the loan/loan guarantee agreement, the DOE LPO environmental monitoring process generally involves monitoring of three broad categories of environmental compliance:

(1) Environmental Project Compliance
(2) Environmental Project Changes
(3) Environmental Notices.

Environmental Project Compliance — List and track the federal and state environmental permits/approvals and associated reporting requirements for both construction and operation.

Environmental Project Changes — Identify material project changes over what was presented in the final NEPA Documentation (Categorical Exclusion, Environmental Assessment and Finding of No Significant Impact, or Environmental Impact Statement and Record of Decision). Such changes might include an updated or previously undocumented transmission line route, location of access roads, or other installations.

Environmental Notices – Notification of formal or informal environmental notices submitted to the borrower from a regulatory agency. Such notices may include a notice of non-compliance, nuisance, or violation of any environmental or worker safety law or regulation.

Based on the status of the project (e.g., construction or operation) and complexity, the frequency of the monitoring and reporting can vary from monthly, to quarterly, to semi-annually, or to annually. The specifics of the monitoring approach are documented in the loan agreement documentation, which includes borrower reporting and notification requirements.

LPO's Title 17 Program Guidance (https://www.energy.gov/lpo/articles/program-guidance-title-17-clean-energy-program#page=1) explains that "LPO maintains active project monitoring and communication to collaborate, surveil, and act as needed in the best interest of the U.S. Government and taxpayers. There are mandatory reporting requirements that

the borrower is required to fulfill on an ongoing basis." Further, the servicing and monitoring of a Loan Guarantee Agreement includes the construction, startup, commissioning, shakedown, and operational phases of an Eligible Project.

Other Federal Agency Experience

Other federal agencies have prepared environmental assessments (EAs) and findings of no significant impact (FONSIs) for upgrading and rebuilding existing powerlines that are relevant to DOE's changes for categorical exclusion B4.13. For example:

Environmental Assessment for the Maple River (ND) to Buffalo River (MN) Switch 69kV Line Rebuild (RUS, 2023): https://www.rd.usda.gov/resources/environmental-studies/assessment/maple-river-nd-buffalo-river-mn-switch-69kv-line-rebuild

- Rebuild 25.5 miles of an existing 69 kV transmission line from Cass County, North Dakota, to Clay County, Minnesota.
- "The proposed Federal Action is for RUS to provide a loan to Minnkota [Minnkota Power Cooperative, Inc] to support the construction of the Project."
- "The Project will occur within the existing transmission line right-of-way (ROW), which is 80 feet in width. The replacement structures are planned to be installed as close to the existing structure location as is possible and structurally safe (i.e., pole-to-pole replacement). Existing structures that are currently located within wetlands that are not spannable would be replaced with a structure in the same location as original within the wetland, resulting in temporary wetland impacts from construction access. The Project would not result in permanent wetland impacts."
- FONSI: "Based on its EA, RUS has concluded that the proposed Project would have no significant effects to land use (including important farmland and formally classified lands), floodplains, wetlands, water resources, coastal resources, biological resources (including fish, wildlife, vegetation), federal and state protected species, historic and cultural properties, aesthetics and visual resources, air quality, socioeconomics/environmental justice, noise, transportation, or human health and safety. The proposed Project will have no effects on historic properties listed or eligible for listing on the National Register of Historic Places and no effects to federally listed species or designated critical habitat. The proposed Project would not disproportionately affect minority or low-income populations."

Environmental Assessment for the Boone-Williamstown 69 kV Transmission Line Rebuild Project (RUS, 2022): https://www.rd.usda.gov/resources/environmental-studies/assessment/boone-williamstown-transmission-line-rebuild-project

- Rebuild the 28.4-mile-long 69-kV transmission line within the existing 100-foot right-of-way in portions of Boone, Gallatin, and Grant Counties, Kentucky.
- East Kentucky Power Cooperative, Inc. (EKPC) is "requesting financing and seeking environmental approval from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) to rebuild, operate, and maintain the 69 kV electric transmission line within the existing 100-foot-wide right-of-way (ROW) in portions of Boone, Gallatin, and Grant Counties, Kentucky (proposed action)."
- EA: "The proposed action will consist of removing the existing transmission line and associated wood pole structures and constructing the new line in its place. The new line will be constructed using stronger steel-pole structures, which are approximately 12 feet higher than existing poles. This construction method will require significantly fewer structures than currently present."
- EA: "The existing transmission line is currently comprised of 263 wood-pole structures that have an approximate above ground height of 60 feet and a typical span length of 575 feet. Based on the engineering design, the existing

structures will be replaced with 212 steel-pole structures with an approximate above ground height of 72 feet and a typical span length of 715 feet, resulting in 51 fewer structures."

- EA: "To the maximum extent practicable, EKPC plans to first set the new structures and then use the existing conductor to pull the new conductor into place, which will generally avoid the need to operate equipment between structure locations."
- EA: "No tree clearing is anticipated within the ROW; however, EKPC project engineers utilized Light Detection and Ranging (LIDAR) data to identify trees located along the edges of the existing ROW that could pose a potential threat to the future operation of the transmission line. These hazard trees are typically large, live trees that could fall and contact the conductor due to their height and/or position relative to the line. As part of the action, EKPC proposes to clear up to 44.76 acres of hazard trees."
- FONSI: "As a result of there being an existing transmission line facility and associated maintenance access points, EKPC anticipates using existing roads and the ROW easement to access the existing and new structure locations without having to create new roads. However, some of the existing 4 access points may require improvements to allow for larger construction vehicles to reach the ROW."
- FONSI: "the SHPO… did concur with RUS's official recommendation of no adverse effect to archaeological and cultural historic properties for the proposed project."
- FONSI: "Due to the removal of suitable Indiana bat summer habitat along the edges of the ROW, EKPC proposed mitigation for adverse effects to the species by contributing to the Imperiled Bat Conservation Fund (IBCF), using the process detailed in the USFWS KFO's 2016 Revised Conservation Strategy for Forest-Dwelling Bats.… As a result of the IBCF contribution, adverse effects to the Indiana bat from removal of suitable roost trees have been mitigated through implementation of the USFWS process."
- FONSI: "…EKPC, on behalf of RUS, has fulfilled the requirements of Section 7 of the Endangered Species Act for this project."
- FONSI: "None of the new steel-pole structures will be installed within designated floodplains, and two existing structures will be removed from the floodplains of Mud Lick Creek and Williams Branch."
- FONSI: "Several wetland areas were identified during field surveys of the project footprint; however, due to avoidance and minimization measures that will be implemented during construction, no loss of wetlands are anticipated as a result of the project. Based upon the information gathered, the proposed project will have no significant impacts to wetlands or streams."
- FONSI: "Based on its EA, RUS has concluded that the proposed project would have no significant adverse effects to water quality, wetlands, the 100-year floodplain, land use, aesthetics, transportation, or human health and safety. RUS has concluded that the proposed project would have no adverse effects on historic properties listed or eligible for listing on the National Register of Historic Places and no adverse effects to federally listed threatened and endangered species, candidate species, or federally designated critical habitat. The proposed project would not disproportionately affect minority or low-income populations."

Environmental Assessment for the Rebuild 69 kV Transmission Lines 71, 72, and 73 Project (RUS, 2022): https://www.rd.usda.gov/resources/environmental-studies/assessment/rebuild-69kv-transmission-lines-71-72-73-project

- Rebuild three existing, overhead 69-kV transmission lines within the existing right-of-way in George County, Mississippi.
- EA: "Cooperative Energy is seeking financing assistance from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) to reconstruct 69kV overhead electric transmission lines 71, 72, & 73."
- EA: "Some routine vegetation management may be necessary prior to beginning reconstruction of the project. The existing width of the ROW will remain at the current 100-feet width for each of the three transmission lines. The total linear length of the project will be approximately twenty-nine and one-half (29.45) miles long (155,496

linear feet). No land will be purchased for this project. No new or additional ROW easements will be procured for this project. No grading, paving, or fencing will be necessary for this project."

- EA: "All three transmission line rebuilds will include 161kV insulation. Construction at 161kV insulation provides system flexibility for future projects that could allow Cooperative Energy to assume transmission service for additional neighboring electric power company (Mississippi Power) area load. All three transmission line rebuilds will also utilize 795 Aluminum Conductor Steel Reinforced (ACSR) wire and modern steel and/or concrete poles and cross-arms."
- FONSI: "The analyses in the EA documented that the proposed project would have no adverse effects to land use, floodplains, wetlands, water resources, coastal resources, biological resources, cultural/historic resources, aesthetics, air quality, social impact and environmental justice, noise, transportation, human health and safety, corridors, and soils."
- FONSI: "Consultation and coordination with George County confirmed that the project site does lie within a floodplain, however, no poles will be placed within the floodplain. Best management practices will be utilized and sediment and erosion controls will be implemented to avoid and minimize runoff. Therefore, the proposed action would result in no direct or indirect impacts to any identified floodplains."

Environmental Assessment for the Kingdom City — Santa Fe Transmission Line (RUS, 2021): https://www.rd.usda.gov/resources/environmental-studies/assessment/kingdom-city-santa-fe-transmission-line

- Central Electric Power Cooperative (Central) in Missouri proposed to rebuild the 69KV transmission lines between the Kingdom City, Auxvasse, Salt River, Mexico and Santa Fe Substations, with a total length of approximately 33 miles. Central proposed to replace the existing single-pole wood structures with new H-frame wood structures on the existing right-of-way (ROW) located in Callaway, Audrain and Monroe Counties.
- EA: "The new transmission structures will not be replaced in place; their location will be selected dependent on engineering and environmental factors including soil conditions, slope, maximum span length between transmission structures, and terrain. Central is proposing to replace the existing single-pole wood structures with new H-frame wood structures that would be approximately 52 to 88 feet tall with a span between structures of approximately 700 to 800 feet."
- EA: "The Contractor will limit the movement of its crews and equipment so as to minimize the damage to crops and property along the ROW.… Restoration procedures will be used on the ROW to prevent erosion and to re-establish ground cover. The procedures include cultivating, seeding, mulching and/or fertilizing the disturbed areas as needed to stimulate rapid growth. During construction the vehicle traffic is generally limited to a 15' wide path on the 100' wide ROW and an area of 50' radius at each structure.… Existing creek crossings will be used as they are found, but if none are available, alternative methods will be utilized, usually simply approaching the crossing from access on the opposite side, as the construction process does not require linear movement down the ROW."
- EA: "An alternative to the complete redesign, retirement and rebuilding of this transmission line is the piece by piece change out of all the line material that has been identified as rejects.… The labor cost analysis shows that installing all new H-frames is similar in cost to changing out only the rejected crossarms and poles.… If only the rejected crossarms and poles are changed out then CEPC will be in possession of a line that still contains 60 plus year old conductor, 60 plus year old corroded overhead ground wires, guys, anchors, and metal components with a large percentage of the remaining crossarms and poles having exceeded typical asset life spans.… The increase in the project time line would also increase the cost of the project due to rising labor and material costs. The alternative of rebuilding the transmission line piece by piece is not acceptable and is therefore eliminated from further consideration."
- EA: "U.S. Fish and Wildlife determined these activities 'may affect, but not likely to adversely affect' listed species [Running Buffalo Clover, Gray Bat, Indiana Bat, and Northern Long-Eared Bat] and stated that the listed

species are not likely to be impacted by the proposed Project action due to the facts that the Project ROW is cleared and waterways will be avoided."

- FONSI: "Central coordinated with the USFW to determine and impacts to endangered species or other related impacts. The agency determined the Project activities should have 'no effect'."
- FONSI: "Central contacts the county commissions, regional planning authorities and the NRCS to evaluate the impact to land and land use. Little to no impact was identified by these agencies and no federally Classified Lands are being traversed."
- FONSI: "Central collaborated with the U.S. Army Corp of Engineers (Corp), U.S. Fish and Wildlife and Missouri Department of Natural Resources to identify potentially impacted floodplains, wetlands and navigable waters. Central does not intend to place any structures in any locations identified and so no federal permitting will be required and impacts should be minimal."
- FONSI: "Central consulted with the State Historic Preservation Office and Tribes. A Phase I cultural resource survey was conducted to identify any potentially important sites. Central does not plan any construction activities near any identified culturally important site. If any potentially important materials are discovered during construction, activities will be halted and further consultation will be required."
- FONSI: "Central also considered other factors such as socioeconomic, aesthetics, and human health and safety, among others. Since the project is a replacement of an existing electric transmission line, all potential impacts considered in these areas were found to be minimal."
- FONSI: "RUS has determined that the environmental impacts of the proposed Project have been adequately addressed and that no significant impacts to the quality of the human environment would result from construction and operation of the proposed Project."

Environmental Assessment for the McCreary County-Wofford Transmission Line Rebuild Project (RUS, 2020): https://www.rd.usda.gov/resources/environmental-studies/assessment/mccreary-county-wofford-transmission-line-rebuild-project-ea

- Rebuild 20.7 miles of existing 69-kV transmission line within McCreary and Whitley counties, Kentucky.
- EA: East Kentucky Power Cooperative, Inc. (EKPC) "is requesting approval from the U.S. Department of Agriculture (USDA), Forest Service (USFS) and the USDA Rural Utilities Service (RUS) to rebuild and maintain a 69 kilovolt (kV) electric transmission line within the existing 100-foot wide right-of-way (ROW)…. EKPC also plans to request financing assistance from RUS for the proposed project."
- EA: "Roughly 16.6 miles of access roads, which would be approximately 15 feet in width, would be improved or constructed for the construction and maintenance of the transmission line. These access roads would cross approximately 5.6 miles of private land, involving approximately 11.7 acres, and approximately 11.0 miles of NFS [National Forest Service] land, involving approximately 20.0 acres."
- EA: "Based on the engineering design, 151 steel-pole structures (50 of which would be located on NFS land) with an approximate above ground height of 72 feet and a typical span length of 750 feet would be used to construct the new line. This would replace the existing 200 wood-pole structures (76 of which are located on NFS land) that have an approximate above ground height of 60 feet and a typical span length of 550 feet."
- FONSI: "Based on its EA, RUS has concluded that the proposed Project would have no significant adverse effects to water quality, wetlands, the 100-year floodplain, land use, aesthetics, transportation, or human health and safety. RUS has concluded that the proposed Project would have no adverse effects to federally listed threatened and endangered species, candidate species, or federally designated critical habitat. The proposed Project would not disproportionately affect minority or low-income populations."

Environmental Assessment for the Strum to Lublin 69kV Transmission Line Rebuild Project – Wisconsin (RUS, 2013): https://www.rd.usda.gov/resources/environmental-studies/assessment/strum-lublin-69kv-transmission-line-rebuild-project-wisconsin

- Rebuild 58 miles of existing 69-kV transmission line within Trempealeau, Jackson, Eau Claire, and Clark counties, Wisconsin.
- Dairyland Power Cooperative (DPC) "intends to request financing assistance from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) for the proposed Project."
- EA: "The proposed Project route would make use of the existing 69kV transmission line right-of-way (ROW), which would be widened from 60 feet to 80 feet (10 feet on either side of the existing ROW) in order to comply with DPC's current standard ROW width for 69kV transmission lines. The new transmission structures would not be replaced in place; their location will be selected dependent on engineering and environmental factors including soil conditions, slope, maximum span length between transmission structures, and terrain."
- EA: "Preliminary access for Phase I (Strum Tap to Willard Tap) of the proposed Project has been identified; construction of this phase of the proposed Project will follow approximately 30-miles of existing maintenance routes used by DPCs maintenance crews since the early 1950s and temporary overland access…. Overland access does not require any grading or vegetation clearing and consists of driving equipment across low-lying vegetation along field edges or adjacent to the edge of a road ROW. Access for Phase II (Willard Tap to Lublin Substation) has yet to be identified; it is expected that overland access for Phase II of the proposed Project would be comparable to the length required for Phase I."
- EA: "The proposed Project would cross county forests, and as a result, some vegetation clearing would be required in order to widen the existing 60-foot ROW to 80 feet, which is DPC's current standard ROW width for 69kV transmission lines."
- EA: "The proposed Project crosses Clark, Eau Claire, Jackson, and Trempealeau counties and is surrounded by agricultural land with rural farmsteads, open space, and deciduous forests."
- EA: "The existing 60-foot transmission line ROW would be widened through tree trimming to 80 feet (10 feet on either side) (the Project ROW) to maintain a safe distance between tree branches and the new transmission structures."
- EA: "Permanent impacts are also expected to be less than significant because the proposed Project would be constructed primarily within the existing transmission line ROW. The existing ROW would be widened from 60 feet to 80 feet and result in permanent impacts where brush and tree clearing would be required. However, vegetation clearing would be limited primarily to where the proposed Project is adjacent to or crossing wooded areas."
- EA: "The proposed Project consists of rebuilding an existing transmission line within an existing ROW, and although the existing ROW would be widened, it would not result in a change in land classification."
- EA: "Within county forests, the majority of the proposed transmission line would parallel existing roadways, thereby limiting tree clearing required to one side of the Project ROW."
- EA: "Widening of the existing 60-foot ROW to 80 feet would result in the permanent loss of less than one acre of woody and herbaceous vegetation where the existing ROW is adjacent to or crosses forested areas as identified by NLCD [National Land Cover Database]. Some trimming of forested areas along overland access with overhanging or overgrown woody vegetation would be necessary to permit passage within a cross-sectional area measuring approximately 15 feet in height and width. The long-term effects of the ROW widening and temporary use of overland access are not expected to result in measurable losses, but short-term effects (during construction) would result in areas of bare ground and long-term effects would result from vegetation maintenance within the 80-foot Project ROW."
- FONSI: "The EA determined that the proposed Project would have no significant impact, either directly, indirectly, or cumulatively, on land use, vegetation, floodplains, water quality, wetlands, threatened and

endangered species, fish and wildlife resources, cultural resources and historic properties, air quality, visual resources, transportation, health and safety, corona, audible noise, radio and television interference, socioeconomic and community resources, and environmental justice."

Environmental Assessment for Kirkmansville-Clifty City, Kentucky Power Supply Improvement Project (TVA, 2005): Email DOE-NEPA-Rulemaking@hq.doe.gov for a copy of this EA and FONSI.

- Rebuild a 23-mile portion of the Paradise-Hopkinsville 69-kV Transmission Line in Christian, Muhlenburg, and Todd Counties, Kentucky.
- Final EA: "To improve the power supply for the Clifty, Dunmor, and Ennis delivery points, TVA would retire and rebuild that portion of the Paradise-Hopkinsville 69-kV Transmission Line from the Clifty Substation tap to the PAF [Paradise Fossil Plant] using the existing right-of-way. The portion of the transmission line that would be rebuilt includes the Kirkmansville-Dunmor 69-kV Transmission Line running from the Clifty Substation to the Dunmor Substation and the Dunmor-Paradise 69-kV Transmission Line from the Dunmor Substation to PAF [Paradise Fossil Plant]."
- Final EA: "The new line would be constructed using steel-pole structures on the centerline of the existing 75-foot-wide right-of-way. At places where the line changes direction, TVA may have to acquire additional rights for guys used to support the poles."
- Final EA: "Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, some reclearing of the right-of-way may be required. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote handling equipment, such as a feller-buncher, in order to limit ground disturbance. In clearing rights-of-way, the guidelines stated in TVA's *Right-of-Way Clearing Specifications* (see Appendix B) would be followed. Similarly, TVA's *Environmental Quality Protection Specifications for Transmission Line Construction* (see Appendix C) and the *TVA Transmission Construction Guidelines Near Streams* (Appendix D) would guide transmission line construction activities. Also, any danger trees would be removed."
- Final EA: "Subsequent to clearing and construction, the right-of-way would be restored as much as is possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grasses and other low-growing species. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Appendices B through D."
- Final EA: "Permanent access roads already established for this existing right-of-way would be used for vehicle access to each structure and other points along the right-of-way. Some necessary improvements would be made to these access roads. However, a few temporary access roads would also be needed in some areas to allow equipment access."
- FONSI: "Best Management Practices… outlined in the following TVA documents… will be employed to minimize adverse effects to water quality and aquatic life from construction activities. Thus, potential effects to surface water, groundwater, and aquatic life would be minor and insignificant."
- FONSI: "No threatened or endangered plant or animal species would be affected by the proposed actions. No unique communities were found on the substation construction sites or along the right-of-way of the transmission line to be rebuilt, and the plants and animals in these areas are common. Thus, potential effects to the biological community would be minor and insignificant."
- FONSI: "…the transmission line rebuild is not expected to require excavation of jurisdictional wetlands. Access road upgrades could affect two forested wetland areas. Application of BMPs, such as silt fences, would minimize potential impacts to these two wetlands. Thus, potential effects to wetlands from the proposed actions are expected to be minor and insignificant."

- FONSI: "…location of structures in the floodplain is not expected to increase flood hazard. Use of BMPs would further reduce potential floodplain effects."
- FONSI: "The rebuilt transmission line would be visually similar to other lines and structures in the local areas, as well as similar to the existing line."
- FONSI: "No change in agricultural land use would result from rebuilding the transmission line."

Width of Powerline Rights-of-Way

For determining how much, if any, the width of a right-of-way (ROW) needs to be expanded to meet electrical standards associated with powerline upgrades and rebuilds, powerline ROW refers to the corridor of land underneath a powerline(s) needed to operate the line(s).[1] The ROW is subject to maintenance of vegetation beyond specified parameters and of buildings and other structures not associated with powerline operation, in accordance with relevant standards and established best practices. Trees and other vegetation adjacent to powerlines must be cleared to reduce risk of fires, power outages, and other accidents. The width of a ROW corridor is based on several factors including voltage, type of construction, type of conductor (wires carrying the electrical current), and span length (distance between poles or towers). Typical ROW corridor widths are:

- 69kV lines – minimum 75-feet wide corridor
- 115kV and 161kV lines – minimum 100-feet wide corridor
- 230kV lines – minimum 125-feet wide corridor
- 500kV lines – minimum 150-feet wide corridor

When rebuilding or upgrading a transmission line, the existing ROW may need to be widened to accommodate project elements such as increased line voltage, greater swing of the new transmission line, or new locations of guy wires (cables that help support poles and towers). Widening commonly would expand the existing ROW by up to about 40 feet, i.e., up to about 20 feet on each side of the centerline. For example, an existing ROW might be widened from 100 feet to 125 feet to account for upgrading the line from a wood pole structure to lattice steel structures of a 230kV line and an increase in clearances and insulation level due to the increase in voltage.

ROW width is set principally by the National Electrical Safety Code (NESC) and the North American Electric Reliability Corporation (NERC) standard FAC-003-5 for Transmission Vegetation Management. DOE further ensures that these requirements are followed by issuing its own orders and standards, including WAPA's Order 450.3C and BPA's Transmission System Standard STD-DT-000062 for ROW Width, both described below.

2023 National Electrical Safety Code (Institute of Electrical and Electronics Engineers, 2023): https://standards.ieee.org/products-programs/nesc/

The NESC is a national standard that dictates the minimum distance between the phase conductors of the transmission line themselves and the minimum distance between the energized conductors and the ground or to a building or structure or other objects near transmission lines. The NESC is used to determine the width of the transmission line ROW to ensure that the energized line will not breach minimum electrical clearances and insulation levels with structures built outside of the ROW. The NESC is also used to specify a minimum distance to the ground, to prevent vehicles that drive beneath the line from breaching minimum electrical clearances, and insulation levels.

[1] This definition is consistent with the *Glossary of Terms Used in NERC Reliability Standards*, April 1, 2024, available at https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf.

Reliability Standards for the Bulk Electric Systems of North America, NERC Standard FAC-003-5: Transmission Vegetation Management (North American Electric Reliability Corporation, 2024): https://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf

The purpose of the NERC standard FAC-003-5 for Transmission Vegetation Management is "to maintain a reliable electric transmission system by using a defense-in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation-related outages that could lead to Cascading." The standard states that "each applicable Transmission Owner and applicable Generator Owner shall manage vegetation to prevent encroachments into the Minimum Vegetation Clearance Distance (MVCD) of its applicable line(s)." Keeping vegetation away from high voltage conductors by the MVCD prevents voltage flash-over to the vegetation." These values are provided in Table 2 of the standard and are "based on empirical testing data from EPRI [Electric Power Research Institute] as requested by FERC in Order No. 777….The air gap testing completed by EPRI per FERC Order No. 777 established that trees with large spreading canopies growing directly below energized high voltage conductors create the greatest likelihood of an air gap flash over incident and was a key driver in changing the gap factor to a more conservative value of 1.0 in version 4 of this standard. (North American Electric Reliability Corporation, 2024).

Order 450.3C: Transmission Vegetation Management (Western Area Power Administration, 2017): https://www.wapa.gov/wp-content/uploads/2023/04/WAPA_Order_450.3C.pdf

WAPA's Order 450.3C states that "WAPA's strategies, procedures, processes, and specifications are designed to prevent vegetation from approaching the minimum vegetation clearance distances (MVCD) as defined by NERC standard FAC-003-4 [updated to FAC-003-5]. WAPA's overall program strategy is to manage vegetation at such a large distance away from MVCD so as to avoid the possibility of the MVCD being approached by vegetation…. WAPA's intent is to secure and maintain a manageable and stable ROW that minimizes vegetative threats to transmission system safety, security and reliability, and ultimately does not require frequent re-treatments." The order also describes the desired condition for ROWs, including that "Compatible plant communities will typically be comprised of native plant species, which, at a mature height, will not interfere with the safety, secure and reliability of the transmission system. WAPA's goal is to manage vegetation for the exclusion of incompatible plant species and the retention and recruitment of compatible species…. The density of vegetation after treatment and areas of regeneration will be managed to reduce the overall fire risk. Vegetation debris from intensive or repetitive treatments may also require mitigation to reduce wildfire and enhance the survivability of the transmission facility" (Western Area Power Association, 2017).

Transmission System Standard, Right-of-Way Width, STD-DT-000062 Revision 05 (Bonneville Power Administration, 2022). Email DOE-NEPA-Rulemaking@hq.doe.gov for a copy of this document.

BPA's Transmission System Standard for Right-of-Way Width establishes "the conditions and requirements for the determination [of] right-of-way (ROW) widths for BPA transmission lines. The conditions and requirements for calculating transmission line centerline-to-ROW boundary spacing, centerline-to-centerline spacing, and construction easements are covered in this standard" (Bonneville Power Administration, 2022). This document describes the different considerations for calculating the ROW width, which include type of construction, type of conductor and conductor bundle, and span length.

Effects of Electric and Magnetic Fields

DOE has supplemented this Technical Support Document with additional information regarding the potential health impacts of electromagnetic fields (EMF) produced by transmission lines. This information includes excerpts from two EISs prepared for new transmission lines. Accordingly, the text refers to practices for "new transmission lines." All projects are designed and constructed to meet applicable EMF guidelines.

Environmental Impact Statement for the Boardman to Hemingway Transmission Project (DOE/EIS-0507; BPA, 2019): https://www.bpa.gov/-/media/Aep/efw/nepa/completed/boardman-to-hemingway/boardman-chapter-3.pdf

- EIS: "Research on the potential influence of EMFs on organisms and human health has been conducted over many decades to understand basic interactions of EMF with biological organisms and cells and to investigate potential therapeutic applications. In the 1970s questions arose about potential adverse health effects because of some epidemiology studies that had suggested statistical associations between exposure to EMF and health conditions, including cancer. Over the past 40 years, considerable additional research has been conducted to address uncertainties in those studies and to determine if there was any consistent pattern of results from human, animal, and cell studies that would support such an association. The quantity and complexity of the research has led scientific and government health agencies to assemble multidisciplinary panels of scientists to conduct weight-of evidence reviews and arrive at conclusions about the possible effects associated with EMF."
- EIS: "Overall, the published conclusions of these scientific review panels have been consistent. None of the panels concluded that either electric fields or magnetic fields are a known or likely cause of any adverse health effect at the long-term, low exposure levels found in the environment. As a result, no standards or guidelines have been recommended to prevent this type of exposure; however, from all the research that has been conducted, it was confirmed that short-term exposure to higher intensities of EMF (even above exposure levels of electrical and industrial workers) could produce adverse stimulation of nerves and muscles. Hence, several scientific agencies have recommended health-based guidelines to limit high intensity EMF exposure. These guidelines include exposure limits for the general public recommended by the International Committee on Electromagnetic Safety (ICES) and ICNIRP [International Commission on Non-Ionizing Radiation Protection] to address health and safety issues (ICES 2002; ICNIRP 2010)."
- EIS: "The only confirmed relationship between electric fields or magnetic fields and an adverse biological or health effect is when electric currents, at very high levels of exposure, are experienced in the body as a shock-like effect. The levels at which these short-term effects occur are typically much higher than levels found under transmission lines and higher than levels found in most homes or commercial establishments. Although there are no federal regulations on low-frequency EMFs in the U.S., recommendations and guidelines are provided by international organizations and U.S. nongovernment organizations. As mentioned, ICES and ICNIRP have recommended exposure limits to protect against the occurrence of these acute adverse effects from short-term exposures. BPA follows electric field guidelines for design of new transmission lines. BPA's guidelines include guidelines of 9-kV/m maximum on the right-of-way, 2.5-kV/m maximum at the edge of the right-of-way, 5-kV/m for road crossings, and 2.5- to 3.5-kV/m in parking lots."

Environmental Impact Statement for the I-5 Corridor Reinforcement Project (DOE/EIS-0436; BPA, 2016): https://www.bpa.gov/learn-and-participate/public-involvement-decisions/project-reviews/i-5-corridor-project

- EIS: "Transmission lines, like all electric devices, produce EMF. Current, the flow of electric charge in a wire, produces the magnetic field. Voltage, the force that drives the current, is the source of the electric field. The strength of EMF around existing lines throughout the project area depends on the design of the electrical line and distance from it."
- EIS: "When BPA builds new high-voltage 500-kV transmission lines, the agency designs them using 'EMF mitigation' techniques to keep EMF exposure as low as reasonably achievable, while maintaining system reliability."
- EIS: "Construction standards, grounding requirements and right-of-way restrictions would minimize the potential for electric fields to cause nuisance shocks for anyone near the right-of-way, causing no-to-low impact. Likewise, new transmission lines are configured to reduce EMF and minimize electromagnetic interference that could affect older audio and video equipment. If interference occurs, BPA has a mitigation program to correct it. EMF from the line could, however, affect older models of pacemakers. Pacemaker wearers are advised to limit their exposure to electric fields of 1 kV/m or less and to magnetic fields of 1,000 mG or less. Electric fields from the proposed

500-kV line would generally meet these guidelines beyond about 35 feet from the edge of the rights-of-way. Wearers of pacemakers and similar medical-assist devices are discouraged from unshielded right-of-way use."

- EIS: "Maximum and average [magnetic] fields depend on the number of transmission lines present, the relative electrical phasing of the conductors and the relative direction of power flow in the lines. Beyond the edge of rights-of-way, magnetic fields would decrease quickly with distance, approaching common ambient levels within a few hundred feet. This means that beyond a few hundred feet, transmission line magnetic fields approach common ambient levels and would be far less than those encountered near common household appliances or directly under the line."

Electric and Magnetic Fields Associated with the Use of Electric Power (National Institute of Environmental Health Sciences, 2002):
https://www.niehs.nih.gov/sites/default/files/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

- Report: "Some have wondered whether the electric and magnetic fields (EMF) produced through the generation, transmission, and use of electric power [power-frequency EMF, 50 or 60 hertz (Hz)] might adversely affect our health. Numerous research studies and scientific reviews have been conducted to address this question."
- Report: "Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter (V/m). Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T)."
- Report: "Electric fields are shielded or weakened by materials that conduct electricity— even materials that conduct poorly, including trees, buildings, and human skin. Magnetic fields, however, pass through most materials and are therefore more difficult to shield. Both electric fields and magnetic fields decrease rapidly as the distance from the source increases."
- Report: "The term 'EMF' usually refers to electric and magnetic fields at extremely low frequencies such as those associated with the use of electric power. The term EMF can be used in a much broader sense as well, encompassing electromagnetic fields with low or high frequencies."
- Report: "Although the earliest studies suggested an association between EMF exposure and all forms of childhood cancer, those initial findings have not been confirmed by other studies. At present, the available series of studies indicates no association between EMF exposure and childhood cancers other than leukemia. Far fewer of these studies have been conducted than studies of childhood leukemia."
- Report: "The few studies that have been conducted to address EMF and adult cancer do not provide strong evidence for an association. Thus, a link has not been established between residential EMF exposure and adult cancers, including leukemia, brain cancer, and breast cancer."
- Report: "Electricity is a beneficial part of our daily lives, but whenever electricity is generated, transmitted, or used, electric and magnetic fields are created. Over the past 25 years, research has addressed the question of whether exposure to power frequency EMF might adversely affect human health. For most health outcomes, there is no evidence that EMF exposures have adverse effects. There is some evidence from epidemiology studies that exposure to power-frequency EMF is associated with an increased risk for childhood leukemia. This association is difficult to interpret in the absence of reproducible laboratory evidence or a scientific explanation that links magnetic fields with childhood leukemia."
- Report: "At a distance of 300 feet and at times of average electricity demand, the magnetic fields from many [power] lines can be similar to typical background levels found in most homes. The distance at which the magnetic field from the [power] line becomes indistinguishable from typical background levels differs for different types of [power] lines."

Sulfur Hexafluoride Management and Reduction

DOE has supplemented this Technical Support Document with information regarding sulfur hexafluoride (SF_6), a potent greenhouse gas that has a high global warming potential. Sulfur hexafluoride is used in gas-insulated switchgears, breakers, and lines in the transmission sector. Transmission operators follow manufacturer guidelines, state requirements, and federal handling and reporting requirements, including the Greenhouse Gas Reporting Program under the Clean Air Act, as applicable, for use and handling of sulfur hexafluoride. Improved engineering and equipment design, advances in leak detection and repair, and alternative insulating gases with lower global warming potentials have resulted in the reduction of sulfur hexafluoride emissions from the electric power sector over time. Further, upgrading and rebuilding powerlines with newer equipment that requires less or no sulfur hexafluoride or has reduced leakage rates and improved monitoring further contribute to a reduction in sulfur hexafluoride emissions across the electric transmission sector.

Overview of SF_6 Emissions Sources and Reduction Options in Electric Power Systems (Environmental Protection Agency, 2018): https://www.epa.gov/sites/default/files/2018-08/documents/12183_sf6_partnership_overview_v20_release_508.pdf

- Report: "Because of its high electronegativity and density, SF_6 has excellent dielectric (insulating electricity) and arc-quenching (extinguishing an electric arc) properties. The high density of SF_6 has also enabled the redesign of electrical equipment, making it smaller, easier to maintain, and safer for higher-voltage loads."
- Report: "In electric power systems, SF_6 gas is used in medium voltage and high voltage switchgear for insulation (such as in gas-insulated switchgear and ring main units) and breaking (in circuit breakers and load break switches). Additionally, less common uses of SF_6 in electric power systems include high voltage gas-insulated lines, outdoor gas-insulated instrument transformers, and other equipment."
- Report: "Potential sources of SF_6 emissions occur from 1) losses through poor gas handling practices during equipment installation, maintenance, and decommissioning and 2) leakage from SF_6-containing GIE [gas insulated equipment]."
- Report: "Over the last two decades, the industry has made significant progress in reducing SF_6 leakage rates and handling losses, based on improved understanding of practices and technologies for managing SF_6. This overview of approaches for reducing SF_6 losses is based on experiences shared by participants in EPA's SF_6 Emission Reduction Partnership for Electric Power Systems. For a number of these approaches, several utilities are also able to work with their service providers to improve practices for handling gas and reducing emissions related to gas handling."
- The report also summarizes industry reduction strategies in the following categories: "Companies' policies, protocols, and standard operating procedures…. Gas inventory, accounting, and tracking procedures and systems…. Management of SF_6 acquisitions and gas inventory…. Training…. Recycling of SF_6 gas…. Leak detection and repair (LDAR)…. Equipment upgrade and replacement…. [and] Proper decommissioning".
    - Report: "…company documents can establish a lifecycle approach to SF_6 management, which can help ensure that employees track inventories of SF_6, detect and repair leaks, properly recover SF_6 from circuit breakers, recycle SF_6, and dispose of equipment and gas, as well as take advantage of other options for reducing SF_6 emissions."
    - Report: "Procedures and systems for gas accounting, tracking, and management can monitor all SF_6 activities, such as purchases, cylinder rentals, recycling, and disbursals…. Tracking leak history of GIE also creates awareness and allows for the preparation of prioritization plans for equipment repair and/or replacement."
    - Report: "Utilities that consolidate their storage inventory and/or select a single vendor have found that it simplifies the tracking of their gas flows, increases transparency of costs, and offers other benefits such as cylinder inventory support from the vendor. Vendors can also support practices such as using the correct cylinder size and customizing the cylinder delivery system to minimize handling, limit cylinder inventories, and maximize gas utilization from each cylinder."

- Report: "Employees involved in handling gas should be specifically trained in SF_6 handling and using equipment for performing this task on a routine basis (e.g., annual refresher trainings)."
- Report: "Commonly practiced in the United States, recycling of SF_6 gas allows utilities to capture used gas that otherwise would be vented to the atmosphere…. Utilities can reduce emissions further by ensuring that they use and maintain recovery equipment, or gas service carts, properly."
- Report: "Leak detection methods vary from simple techniques such as soap and water solutions to more sophisticated techniques such as thermal imaging cameras that visualize the source of SF_6 leaks. Such cameras exploit the strong infrared absorption of SF_6 to detect it."
- Report: "Technologies are available to provide real-time monitoring of SF_6 leaks and to identify and prioritize leaking components that require the most immediate repair."
- Report: "Leak repair on identified leaks is typically handled by applying a sealing material to the component that is leaking. Leak repair should be done using new gaskets and desiccant, as well as lubricant for flanges and o-rings."
- Report: "Upgrading and replacing equipment is a successful strategy that can significantly reduce emissions. Over time, engineering design changes have reduced the amount of SF_6 necessary for the operation of switchgear and increased the tightness of equipment, resulting in smaller leakage amounts and less frequent leakage over time."
- Report: "At the end of life, all SF_6 equipment, including hermetically sealed-pressure switchgear, should be properly decommissioned to avoid emissions. Any remaining gas should be fully extracted using recovery systems that achieve acceptable blank-off pressure (i.e., vacuum generated during the recovery process to levels of 35 Torr and lower depending on the size of the GIE). Used SF_6 should be purified either on-site or off-site. Heavily arced, contaminated gas that is non-reusable can be sent to specialized incineration plants for destruction."

2011–2017 Greenhouse Gas Reporting Program Industrial Profile: Electrical Equipment Production and Use (Environmental Protection Agency, 2018): https://www.epa.gov/sites/default/files/2018-10/documents/electrical_equipment_2017_industrial_profile.pdf

- Report: "The Electrical Equipment Production and Use sector comprises (1) facilities that manufacture or refurbish electrical equipment, and (2) electric power systems that use and maintain electrical equipment to deliver power to customers."
- Report: "The emissions reported to the Greenhouse Gas Reporting Program (GHGRP) by this sector decreased by 37% between 2011 and 2017, from 4.27 million metric tons of carbon dioxide equivalent (MMT CO_2e) to 2.67 MMT CO_2e."
- Report: "The electrical equipment production subsector had a net emissions decrease of approximately 54% between 2011 and 2017. These reductions reflect declines in both process emissions and combustion emissions. The electrical equipment use subsector had a net sulfur hexafluoride (SF_6) emissions decrease of approximately 36% between 2011 and 2017. The total number of reporters for this subsector decreased by 38 facilities (31%) between 2011 and 2017."
- Report: "SF_6 emissions from the use of electrical transmission and distribution equipment occur from equipment leaks and losses through poor gas handling practices during equipment installation, maintenance, and decommissioning. SF_6 emissions reduction can be achieved through a number of means that target these sources, including leak detection and repair (LDAR), equipment refurbishment, the retirement of old leak-prone equipment, SF_6 recycling, and improved SF_6 handling. LDAR includes various monitoring and repair methods that target equipment leaks and reduce gas leakage from gaskets and faulty seals in electrical equipment. Equipment refurbishment serves to reduce longer-term leakage problems that cannot be addressed sufficiently by LDAR. Equipment replacement may provide the more attractive SF_6 mitigation strategy for equipment with major leaks, particularly electrical equipment that is closer to the end of its operational service life. SF_6 recycling involves technicians properly transferring SF_6 to special gas carts prior to equipment maintenance or disposal,

reducing emissions that would otherwise result from venting of SF_6 to the atmosphere. Finally, routine training of personnel on proper handling techniques of SF_6 gas during equipment installation, servicing, and disposal can reduce inadvertent handling-related losses."

Change to 10 CFR part 1021, Appendix C, Classes of Actions that Normally Require EAs but not Necessarily EISs:

C4 ***Upgrading, Rebuilding, or Construction of Powerlines***

(a) Upgrading or rebuilding ~~more than approximately 20 miles in length of~~ existing powerlines when the action does not qualify for categorical exclusion B4.13; or construction of powerlines:
(1) More than approximately 10 miles in length outside previously disturbed or developed powerline or pipeline rights-of-way; or
(2) more than approximately 20 miles in length within previously disturbed or developed powerline or pipeline rights-of-way.

Supplemental Supporting Basis:

Discussion of the class of action is provided in Section II.B of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.B of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

B. Energy Storage

New Categorical Exclusion:

B4.14 ***Construction and operation of electrochemical-battery or flywheel energy storage systems***

Construction, operation, upgrade, or decommissioning of an electrochemical-battery or flywheel energy storage system within a previously disturbed or developed area or within a small (as discussed at 10 CFR 1021.410(g)(2)) area contiguous to a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as land use and zoning requirements) in the proposed project area and the integral elements listed at the start of appendix B of this part, and would incorporate appropriate safety standards (including the current National Fire Protection Association 855, Standard for the Installation of Energy Storage Systems), design and construction standards, control technologies, and best management practices.

Supplemental Supporting Basis:

Discussion of the categorical exclusion is provided in Section II.B of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.C of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

The U.S. Energy Information Administration (EIA) reports that "Battery storage capacity in the United States was negligible prior to 2020, when electricity storage capacity began growing rapidly." (https://www.eia.gov/todayinenergy/detail.php?id=54939) EIA expects "U.S. battery storage capacity to nearly double in 2024 as developers report plans to add 14.3 GW [gigawatts] of battery storage to the existing 15.5 GW [in 2024]. In 2023, 6.4 GW of new battery storage capacity was added to the U.S. grid, a 70% annual increase." (https://www.eia.gov/todayinenergy/detail.php?id=61424)

U.S. battery storage capacity expected to nearly double in 2024 (U.S. Energy Information Administration, 2024): https://www.eia.gov/todayinenergy/detail.php?id=61202

- EIA: "U.S. battery storage capacity has been growing since 2021 and could increase by 89% by the end of 2024 if developers bring all of the energy storage systems they have planned on line by their intended commercial operation dates. Developers currently plan to expand U.S. battery capacity to more than 30 gigawatts (GW) by the end of 2024, a capacity that would exceed those of petroleum liquids, geothermal, wood and wood waste, or landfill gas…. Planned and currently operational U.S. utility-scale battery capacity totaled around 16 GW at the end of 2023. Developers plan to add another 15 GW in 2024 and around 9 GW in 2025, according to our latest Preliminary Monthly Electric Generator Inventory."
- EIA: "Battery storage projects are getting larger in the United States. The battery storage facility owned by Vistra and located at Moss Landing in California is currently the largest in operation in the country, with 750 megawatts (MW). Developers expect to bring more than 300 utility-scale battery storage projects on line in the United States by 2025, and around 50% of the planned capacity installations will be in Texas."

Electricity explained: Energy storage for electricity generation (U.S. Energy Information Administration, 2023): https://www.eia.gov/energyexplained/electricity/energy-storage-for-electricity-generation.php

- EIA: "As of the end of 2022, the total nameplate power capacity of operational utility-scale battery energy storage systems (BESSs) in the United States was 8,842 MW and the total energy capacity was 11,105 MWh. Most of the BESS power capacity that was operational in 2022 was installed after 2014, and about 4,807 MW was installed in 2022 alone. Power capacity ratings for individual batteries of operating BESSs range from less than 1 MW to the 409 MW Manatee Solar Energy Center in Florida, which began operating in November 2021."

- EIA: “Most utility-scale BESSs perform multiple roles, depending on revenue opportunities or grid support requirements. BESSs are usually designed to maximize either their power or energy capacity. In 2021, frequency regulation of electric power supply was the largest reported application of utility-scale BESSs in terms of the share of total battery power capacity.”
- EIA: “Pairing or co-locating batteries with renewable energy generators is increasingly common and is expected to continue. In 2011, two BESSs were co-located with renewable energy power plants—one with a solar photovoltaic plant and one with a wind power plant. In 2022, 207 BESS plants were co-located with renewable-energy generators, nearly all of which were co-located with solar photovoltaic plants. Fourteen BESSs were co-located with wind energy projects.”
- EIA: “Planned energy storage projects reported to EIA in various stages of development are BESS projects and have a combined total nameplate power capacity additions of 22,255 MW planned for installation in 2023 through 2026. About 13,881 MW of that planned capacity is co-located with solar photovoltaic generators.”

DOE and Other Federal Agency Experience

DOE and other federal agencies have prepared environmental assessments (EAs) and findings of no significant impact (FONSIs) for energy storage projects that support the new categorical exclusion B4.14. DOE did not identify any EA for an energy storage system that found significant effects requiring an EIS.

Three of the EAs and FONSIs summarized in this section represent projects with proposed battery energy storage systems ranging in size up to 225MW located on sites contiguous to previously disturbed and developed areas, while the others represent projects within previously disturbed and developed areas. The projects on sites contiguous to previously disturbed and developed areas are:

- Environmental Assessment for Sterling Solar 2 Interconnection Project (DOE/EA-2141; WAPA, 2021)
- Environmental Assessment for the Arizona (AZ) 1 Solar Interconnection Project (DOE/EA-2098; WAPA, 2019)
- Environmental Assessment for Construction and Operation of a Solar Photovoltaic and/or Battery Energy Storage System at Naval Air Station, Fallon, Nevada (Department of the Navy, 2016)

For the final rulemaking, DOE added additional information to the following EA summaries regarding safety standards, risk to human health, spill control measures, and emergency response plans.

- Environmental Assessment for the Arizona Peaking Capacity Energy Storage Project (DOE/EA-2123; WAPA, 2021)
- Environmental Assessment for the Beacon Power Corporation Flywheel Frequency Regulation Plant (DOE/EA-1753; DOE, 2011)
- Environmental Assessment for Sterling Solar 2 Interconnection Project (DOE/EA-2141; WAPA, 2021)
- Environmental Assessment for the Arizona (AZ) 1 Solar Interconnection Project (DOE/EA-2098; WAPA, 2019)
- Environmental Assessment for Construction and Operation of a Solar Photovoltaic and/or Battery Energy Storage System at Naval Air Station, Fallon, Nevada (Department of the Navy, 2016)
- Environmental Assessment for the Vonore Battery Energy Storage System and Associated Subsystem (Tennessee Valley Authority, 2022)
- Environmental Assessment for the Optimist Solar and BESS Project (Tennessee Valley Authority, 2022)
- Environmental Assessment for the Golden Triangle I Solar and Battery Energy Storage Project (Tennessee Valley Authority, 2022)
- Environmental Assessment for the Golden Triangle II Solar and Battery Energy Storage Project (Tennessee Valley Authority, 2022)

Also, DOE added a summary of an EA for the Weld Solar Project issued by WAPA in 2024. This EA was not included in the Technical Support Document for the notice of proposed rulemaking.

Environmental Assessment for the Weld Solar Project (DOE/EA-2178; WAPA, 2024): https://www.energy.gov/nepa/doeea-2178-weld-solar-project-weld-county-co

- Proposed construction, operation, maintenance, and decommissioning of up to 150-MW nameplate capacity solar photovoltaic facility and a 100-MW battery energy storage system on approximately 1,028 acres of private land and 472 acres of state land approximately 4 miles northwest of Ault in Weld County, Colorado.
- EA: "The approximately 0.2-mile-long 345-kilovolt (kV) gen-tie line would extend south from an on-site Project substation, across Weld County Road (CR) 86 to the existing Ault Substation. Weld Solar is requesting interconnection of the Project to the WAPA transmission system at the Ault Substation. This interconnection would consist of an interconnection switchyard and substation located on approximately 12 acres directly adjacent to the north side of the existing substation."
- EA: "Weld Solar's project is primarily within areas of cultivated cropland and grassland, including native shortgrass prairie and disturbed rangeland. Up to 31 acres of temporary disturbance and 1,218 acres of permanent disturbance would occur as a result of Weld Solar's planned solar energy project."
- EA: "Low-elevation motion controlled lighting would be installed at primary access gates, substation, and entrance to energy storage facility. These security lights would be shielded to protect dark skies and only used in areas where it is required for safety."
- EA: "The solar facility and BESS (including structure) would be recycled when the Project's effective operating life is over. Decommissioning would be completed by licensed subcontractors who would use similar methods as those used in construction of the Project. Most parts of the proposed system are recyclable…. Batteries include lithium-ion, which degrades but can be recycled and/or repurposed. The substation transformer and equipment would be transported offsite for re-use or disposal at an approved facility."
- EA: "Hazardous materials from construction and operations activities will not be drained onto the ground or into streams or drainage areas and will be handled in accordance with industry standard best practices. Totally enclosed containment will be provided for trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, will be collected/contained and removed to a disposal facility authorized to accept such materials. No hazardous materials are expected to be produced or stored on the Project site."
- EA: "Additionally, a fire protection and emergency response plan will be developed for the Project."
- FONSI: "The EA analyzed and disclosed the potential environmental impacts of Weld Solar's planned project to fully inform its interconnection decision. The EA identified no significant impacts resulting from either WAPA's Federal action or Weld Solar's planned project."

Environmental Assessment for the Arizona Peaking Capacity Energy Storage Project (DOE/EA-2123; WAPA, 2021): https://www.energy.gov/nepa/doeea-2123-arizona-peaking-capacity-energy-storage-project-maricopa-county-arizona

- DOE's Western Area Power Administration (WAPA) prepared an EA on the potential environmental impacts of a proposed 100-MW battery energy storage system facility to be developed on private, previously disturbed land approximately 25 miles northwest of Phoenix, Arizona. WAPA's proposed action is to provide funding for the project.
- EA: "AES [Arizona Energy Storage, LLC or the Applicant] proposes to build, operate and maintain, and decommission an approximately 100-megawatt (MW) battery energy storage system (BESS) facility on approximately 6 acres of a 10-acre parcel of private land."
- EA: "After completion of 25 years of operations, most of the Project's electrical equipment (breakers, transformers, inverters) would be removed and recycled. Project batteries would be returned to the battery

manufacturer for recycling. Equipment foundations and pads would be demolished and removed. Following decommissioning, the interconnection infrastructure would remain in place as it would continue to serve transmission from other area energy facilities."

- EA: "The Project is located in a previously disturbed area in the Lower Colorado River Valley subdivision of the Sonoran Desert biome…."
- EA: "The proposed battery storage facility would consist of thirty-seven (37) battery storage 'cores.' The initial installation would include thirty-one (31) cores and an additional six (6) cores would be added over the life of the proposed facility to maintain the required capacity."
- EA: "Proposed battery storage facility design would include fire and gas detection and fire suppression systems in each individual battery storage cube. Each cube would be equipped with a three-zone fire detection and suppression system, incorporating photoelectric smoke detectors which would be monitored remotely 24/7. The system would utilize aerosol suppressant supplied via two canisters. The fire suppression system may also be manually activated via pull stations. Combination horn/ strobe devices would indicate that the system has been deployed. Each non-entry cube is designed to be electrically isolated to contain potential fire inside and prevent propagation to battery modules in adjacent cubes."
- EA: "Proposed battery storage facility design would include an 8-foot-tall solid masonry wall, plus intrusion detection system on top, to ensure secure access along all facility boundaries."
- EA: "Proposed battery storage facility design would include a First Responder Station at the emergency access entrance, and a fire water loop with five fire hydrants and requisite isolation valves."
- EA: "The Project would be designed in accordance with all applicable Federal and industrial standards including the American Society of Mechanical Engineers, NESC, International Energy Conservation Code, International Building Code, Uniform Plumbing Code, Uniform Mechanical Code, National Fire Protection Association standards, and Occupational Safety and Health Administration regulations."
- EA: "AES would develop and maintain a Spill Prevention and Emergency Response Plan in coordination with the Fire Marshall. The Emergency Response Plan would include description of the BESS, operational states, emergency scenarios, system actions, recommendations for extinguishing, site access, and control and roles of stakeholders. A copy of the plan would be kept onsite at all times, and facility staff, First Responders, and fire personnel would be trained annually and as needed on the procedures outlined in the plan."
- EA: "During construction and decommissioning, hazardous waste (e.g., motor oil, antifreeze, hydraulic fluid, and grease) could be generated at the site. Exposure to hazardous waste could be a direct source of wildlife mortality and/or injury through the poisoning of individuals. Spills of hazardous material could also indirectly adversely impact wildlife if the spill of the hazardous material results in the loss of natural vegetation community. The containment and disposal of hazardous waste as outlined in a Spill Prevention and Emergency Response Plan developed by the construction contractor for the Project would reduce the likelihood that substantial spills would adversely affect wildlife species or habitat."
- EA: "A Spill Prevention and Emergency Response Plan would be developed and implemented during construction and the operations/maintenance phases of the Project. Adequately sized secondary spill containment would be incorporated around transformers to ensure proper capture and control measures for potential spills. The Spill Prevention and Emergency Response Plan would also provide for hazardous material spill prevention and cleanup measures, were a spill to occur."
- EA: "AES Energy Storage, LLC would be required to comply with all applicable design codes and implement a range of plans to minimize risks to workers and public alike, such as spill prevention and emergency response plans, hazardous materials management plans, fire management plans, and health and safety programs. Further, the proposed battery storage facility design includes fire and gas detection and fire suppression systems in each individual battery storage cube. Therefore, the potential risk to worker and public health during construction, O&M, and decommissioning would be negligible."

- FONSI: "Based on the analysis contained in DOE/EA-2123, WAPA finds that the evaluation of potential environmental impacts will help inform WAPA's consideration of project financing. WAPA has determined that its Proposed Action does not constitute a major Federal Action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, preparation of an environmental impact statement is not required, and WAPA issues this Finding of No Significant Impact (FONSI)."

Environmental Assessment for the Beacon Power Corporation Flywheel Frequency Regulation Plant (DOE/EA-1753; DOE, 2011): https://www.energy.gov/nepa/doeea-1753-beacon-power-corporation-flywheel-frequency-regulation-plant-chicago-heights

- DOE analyzed the potential environmental impacts of awarding a federal grant to Beacon Power Corporation for a utility-scale 20-megawatt flywheel energy storage and frequency regulation plant in either Chicago Heights, Illinois, or Hazle Township, Pennsylvania. A flywheel system stores energy from the grid at times when supply exceeds demand and thus alleviates the need to burn fuel (e.g., natural gas) to generate additional electric power at times when demand exceeds supply. A flywheel is a mechanical device that consists of a large, heavy cylinder that spins inside a vacuum-sealed housing. The flywheel is a kinetic energy storage device that rotates at high speeds. The proposed plant would consist of 20 frequency regulation pods, each containing 10 individual flywheels and the associated energy conversion, electrical control, and power distribution equipment. There would be 200 flywheels in all.
- EA: "The proposed plant would consist of 20 frequency regulation pods, each containing 10 individual flywheels, and the associated energy conversion, electrical control, and power distribution equipment."
- EA: "Beacon Power would operate of the facility almost entirely by remote control with limited onsite personnel. Therefore, there would be limited exposure of workers to hazardous situations at the facility. The installed equipment would have monitors and sensors to alert responders to any accident that might occur, and Beacon Power would brief and train local first responders."
- EA: "Beacon Power would use its existing spill prevention plan to manage the use and storage of oil, gas, and other liquids for the proposed project."
- FONSI: "Based on the analyses in the environmental assessment (EA), DOE determined that its proposed action – awarding a federal grant to Beacon Power Corporation…to facilitate installation and operation of a 20-megawatt flywheel frequency regulation plant – would result in no significant adverse impacts. DOE further determined that the proposed project could result in beneficial impacts to the nation's energy efficiency and air quality. Operating the flywheel plant could result in a decrease in carbon dioxide emissions from regional power plants."
- Beacon Power would use about 3.5 acres for the proposed project in either of the two locations evaluated. The proposed site in Pennsylvania was an undeveloped industrial site within a 3,000-acre industrial park complex. The proposed site in Illinois was an unutilized industrial site that previously hosted a 60-megawatt oil-fired generator at the site (generator and associated structures no longer exist at the site).

Environmental Assessment for Sterling Solar 2 Interconnection Project (DOE/EA-2141; WAPA, 2021): https://www.energy.gov/nepa/doeea-2141-sterling-solar-2-interconnection-project-mohave-county-arizona

- This EA was prepared by DOE's WAPA to consider the potential environmental effects of the proposed Sterling 2 Solar Project, an approximately 225-megawatt (MW) photovoltaic (PV) solar energy generation facility on private land, adjacent to, and west of, the existing Sterling Solar 1 facility, in Arizona. Construction of the facility would include installation of solar panels, underground collection lines, access roads, and up to 225 MW of battery storage. This project area is undeveloped, private land that consists of predominantly Mohave Desertscrub vegetation.
- EA: "The up-to 225 MW battery energy storage system, if installed, would consist of approximately 288 units of 40-foot International Standard Organization shipping containers, and would occupy less than 9 acres of land. The battery storage development would be within the area of disturbance of the solar facility and is not anticipated to

generate additional permanent disturbance. The battery containers would be located next to the solar inverter sites throughout the solar facility. Power would be stored before conversion to AC in the inverter systems. Concrete foundations for each battery unit would measure approximately 41 feet long by 9 feet wide by 2 feet deep. The battery containers would come installed with a fire protection system approved through the National Fire Protection Association (NFPA). Fans and/or air conditioning equipment within the battery storage units would be used to maintain the manufacturer's required temperature within the containers."

- EA: "The security fences around Sterling Solar 2 would be 6-foot-tall chain-link metal with outward-facing 2-foot barbed wire strands on top and would be designed to meet the Arizona Game and Fish Department's (AGFD) Guidelines for Wildlife-Compatible Fencing and Guidelines for Solar Development in Arizona…." "During [operations and maintenance], fencing with a minimum of 8 inches of clearance from the bottom of the fence to the ground surface would be used to allow passage of desert tortoise and small mammals."
- EA: "The project would not generate hazardous wastes during construction; however, small quantities of hazardous materials are contained within the solar panels and the self-contained battery storage units. The Proponent would inspect solar panels and battery storage units prior to installation. Any damaged materials would be handled in accordance with the manufacturer's specifications, including applicable recycling."
- EA: "…the vegetation within the Sterling Solar 2 Proposed Project area is common in the region, and the area does not contain any sensitive, unique, or notable areas of ecological importance to terrestrial species."
- EA: "Prior to submitting the large generator interconnection request, Sterling Solar 2, LLC considered multiple factors in the evaluation of potential project locations, including proximity to the Topock-Black Mesa 230 kV transmission line, contiguous parcel(s) of private lands suitable for solar resource development and with low resource value, proximity to existing transportation and utility infrastructure, and proximity to developed areas to minimize materials transportation and workforce commute. Based on these and other development factors, Sterling Solar 2, LLC optioned the proposed 2,219-acre parcel for development."
- EA: Regarding decommissioning, "If the Proponent determines that the facilities are no longer needed, all structures and facilities, including foundations, would be removed and vegetation would be allowed to re-establish. Property boundary fencing would remain, as well as internal roads to allow continued access through the site."
- EA: "The project would be designed in accordance with all applicable Federal and industrial standards including the American Society of Mechanical Engineers, NESC, International Energy Conservation Code, International Building Code, Uniform Plumbing Code, Uniform Mechanical Code, NFPA standards, and Occupational Safety and Health Administration regulations."
- EA: "Therefore, the potential risk to worker and public health during construction, O&M, and decommissioning would be negligible for the WAPA Proposed Action and Sterling Solar 2 Proposed Project. No additional detailed analysis in the EA is warranted."
- EA: "During construction and decommissioning, hazardous waste (solid and liquid) could be generated at the site. Exposure to hazardous waste could be a direct source of wildlife mortality and/or injury through the poisoning of individuals. Spills of hazardous material could also indirectly adversely impact wildlife if the spill of the hazardous material results in loss of the natural vegetation community. The containment and disposal of hazardous waste as outlined in a Spill Prevention and Emergency Response Plan developed by the construction contractor for the project would reduce the likelihood that substantial spills would adversely affect wildlife…."
- EA: "A Spill Prevention and Emergency Response Plan would be developed and implemented during construction and the O&M phases of the proposed project. Adequately sized secondary spill containment would be incorporated around the transformers at the on-site substation to ensure proper capture and control measures for potential spills. The Plan would also provide for hazardous material spill prevention and cleanup measures, were a spill to occur."
- EA: "A minimal amount (less than 1 cubic yard) of solid wastes would be generated each year during O&M. Good housekeeping procedures would be developed and implemented during O&M to ensure that the site is kept

clear of debris, garbage, fugitive trash, or waste, and the use of scrap heaps and dumps would be prohibited. All solid wastes generated on-site would be transported off-site for disposal at approved waste handling facilities. As part of routine O&M, solar panels would be routinely inspected for damage and replaced, as needed. Damaged solar panels would be recycled in accordance with the manufacturer's guidance. Additionally, the Proponent would develop a Spill Prevention and Emergency Response Plan for O&M of the facility."

- EA: "The solar facility has an estimated lifespan of 30 years. At the end of the facility lifespan, The Proponent may choose to seek to update the solar facility under a new power purchase agreement. If the Proponent determines that the facilities are no longer needed, all structures and facilities, including foundations, would be removed and vegetation would be allowed to re-establish. Property boundary fencing would remain, as well as internal roads to allow continued access through the site."
- FONSI: "Based on the analysis contained in DOE/EA-2141, WAPA finds that the Proposed Action to approve Sterling Solar LLC's application and enter into an interconnection agreement does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA)."

Environmental Assessment for the Arizona (AZ) 1 Solar Interconnection Project (DOE/EA-2098; WAPA, 2019): https://www.energy.gov/nepa/ea-2098-arizona-solar-1-interconnection-project-la-paz-county-az

- This EA was prepared by DOE's WAPA to consider the potential environmental effects of the proposed AZ Solar 1 Project in Arizona. AZ Solar 1 proposes to build, operate, maintain, and decommission an approximately 32.5-megawatt (MW) PV solar energy generation facility (Solar Field 1) on an approximately 480-acre private parcel of land. An optional 27.5 MW of PV solar energy generation and 20 MW of battery storage may be added to the parcel based on market considerations (Solar Field 2).
- EA: "A Phase I Environmental Site Assessment was prepared for the privately owned AZ Solar 1 property. The Phase 1 Environmental Site Assessment determined that the project area has been an undeveloped vacant desert land with no known prior uses." "Low-density residential areas are located east and south of the project area."
- EA: "The battery energy storage systems include self-contained design features; therefore, no leakage or hazardous waste exposure from battery storage systems are anticipated to occur. AZ Solar 1 would inspect battery storage systems for damage prior to installation and during routine maintenance and operations. Damaged systems would be handled in accordance with manufacturer specifications, including those for recycling. Additionally, AZ Solar 1 would develop an emergency response plan for operations and maintenance of the facility."
- EA: "In total, the construction work area for the Solar Field 1 (32.5 MW), including the facilities described below, would permanently disturb approximately 252.5 acres. AZ Solar 1 or its construction contractor may install an additional Solar Field 2 (27.5 MW) and/or battery storage system (20 MW) at the site in the future. An additional 211 acres would be permanently disturbed for Solar Field 2, and 1 acre (spread out across the 480-acre parcel) would be disturbed for the battery storage (20-MW) development."
- EA: "A 20-MW battery storage system would fit in less than 1 acre of land and would consist of approximately 10, 40-foot International Standard Organization shipping containers. The battery containers would be located next to the PCS inverter sites located throughout the solar fields. Power would be stored before conversion to AC in the inverter systems (Figure 2-4). Foundations for these systems would be concrete and measure approximately 24 feet long × 12 feet wide × 2 feet deep. The battery containers would come installed with a fire protection system approved through the National Fire Protection Association. Fans and/or air conditioning equipment within the battery storage units would be used to maintain the manufacturer's required temperature within containers."
- EA: "All potential sources of hazardous materials would be removed from the site during decommissioning (i.e., solar panels, battery storage systems, and transformers and inverters) and AZ Solar 1 would dispose of these materials in accordance with manufacturer specifications, including those for recycling; therefore, decommission would have no long-term impacts to public health and safety."

- EA: “As part of the Proposed Action, WAPA and AZ Solar 1 would implement conservation measures for biological resources (see Appendix B)—which include conducting protocol surveys (for Sonoran desert tortoise, burrowing owl, and migratory bird nests) prior to surface disturbance, relocation of any tortoises within the project area, following Arizona Game and Fish Department guidelines for monitoring and handling of tortoises, establishment of avoidance areas, and restricting vegetation clearing to non-breeding seasons for birds. With the implementation of these measures, it is unlikely that the Proposed Action would result in direct mortality of individual species during construction.”
- EA: “AZ Solar 1 facility’s glare potential was analyzed using the ForgeSolar Solar Glare Hazard Analysis Tool (SWCA 2018a). The tool meets Federal Aviation Administration glare analysis requirements (49 USC 471) and was developed in cooperation with the DOE.… The project would not have any visual impact associated with sunlight reflecting off the panels. According to the glare analysis, there is no anticipated potential for glare to occur on the identified route receptors and flight approach paths analyzed (SWCA 2018a).”
- EA: “The Proposed Action would not impact historic properties in the project area (see Section 3.7.2.2) or elsewhere in the analysis area. The development of the proposed action would not impact the overall visual landscape of the analysis area, which is primarily rural and undeveloped. The Proposed Action’s ground disturbance would create a scar on the landscape (i.e., visual disturbance); however, this disturbance would occur directly adjacent to the existing developed area of Salome. The Proposed Action would result in the direct loss of 465 acres of vegetation and wildlife habitat during construction. The Proposed Action’s disturbance represents less than 0.01% of the identified vegetation communities in the analysis area and similar vegetation communities and habitat types occur in abundance on the undeveloped public lands to the north and west of the project area and throughout the analysis area.”
- *Note: The excerpt from the EA below cites text from the Draft Solar PEIS. BLM and DOE issued a condensed Final Solar PEIS. To clarify, that text from the Draft Solar PEIS remains valid. The Final Solar PEIS stated: “Section 3.5 of the Draft Solar PEIS discussed the types and estimated the quantities of hazardous materials and wastes associated with the construction, operation, and decommissioning of a solar energy facility. The information presented in Section 3.5 of the Draft Solar PEIS remains valid; there are no updates for this section.”*
  EA: “Hazardous materials contained in the solar panels, battery storage systems, and transformers and inverters are unlikely to impact public health and safety. A comprehensive analysis of hazardous materials and environmental exposure was completed for the Draft Solar Energy Development Programmatic Environmental Impact Statement (Draft Solar PEIS]) developed by the BLM and DOE (BLM and DOE 2010). As described in the Draft Solar PEIS, solar panels for utility-scale facilities would likely use nonhazardous silicon-based semiconductor material in the near term. However, semiconductors containing cadmium, copper, gallium, indium, and/or arsenic compounds could be used in the future. Of these, cadmium is the metal with the highest potential for use in utility-scale systems and also has high toxicity. Cadmium-based semiconductor modules contain about 7 g of cadmium per square meter (Fthenakis and Zweible 2003). Consequently, substantial quantities of cadmium or other semiconductor metals may be present at utility-scale PV facilities. The release of cadmium and other heavy metals under normal operations could occur through leaching from broken or cracked modules. In general, researchers have concluded that such releases would result in a negligible potential for human exposures, including leaching into groundwater (EPRI and PIER 2003; Fthenakis and Zweible 2003).
- EA: “As one paper has noted: The only pathways by which people might be exposed to PV compounds from a finished module are by accidentally ingesting flakes or dust particles, or inhaling dust and fumes. The thin CdTe/CdS layers are stable and solid and are encapsulated between thick layers of glass. Unless the module is purposely ground to a fine dust, dust particles cannot be generated. The vapor pressure of CdTe at ambient conditions is zero. Therefore, it is impossible for any vapors or dust to be generated when using PV modules. (Fthenakis and Zweible 2003:2). AZ Solar 1 facility operations would include the use of small quantities of potentially hazardous materials within the solar panel arrays, battery storage systems, and the transformers and inverters as described in Section 2.6. The routine maintenance operations of the solar panels (such as washing) under normal operations would not cause harmful exposure of solar panel hazardous materials. Human exposure to hazardous materials can be averted through appropriate waste management strategies, properly

designed storage areas, and worker training. AZ Solar 1 would service any broken or damaged solar modules or transformers and inverters and any associated released chemicals would be appropriately cleaned. AZ Solar 1 would recycle PV panels if damaged or at the end of their useful life per the manufacturer's warranty. The battery energy storage systems include self-contained design features; therefore, no leakage or hazardous waste exposure from battery storage systems are anticipated to occur. AZ Solar 1 would inspect battery storage systems for damage prior to installation and during routine maintenance and operations. Damaged systems would be handled in accordance with manufacturers specifications, including those for recycling. Additionally, AZ Solar 1 would develop an emergency response plan for operations and maintenance of the facility. All potential sources of hazardous materials would be removed from the site during decommissioning (i.e., solar panels, battery storage systems, and transformers and inverters) and AZ Solar 1 would dispose of these materials in accordance with manufacturers specifications, including those for recycling; therefore, decommission would have no long-term impacts to public health and safety."

- EA: "It is unlikely that accidental spills or leaks of materials during construction, operation, and decommissioning would result in water quality impacts. In the event of a leak or spill, AZ Solar 1 would quickly contain and remove all spilled material so none would enter the groundwater. No hazardous materials would be generated during construction; however, during operations small quantities of hazardous materials would be stored in the solar panels and the battery storage system. Protective measures would be taken to prevent toxins from entering groundwater or waterways, including routine site inspections, timely repairs, and cleaning of all leaks or spills. If any damaged materials are discovered, they would be handled in accordance with the specifications provided by the manufacturer. Because of these protective measures, construction and operation of the AZ Solar 1 facility would not impact groundwater quality."
- FONSI: "Based on the analysis contained in DOE/EA-2098, WAPA finds that the Proposed Action to approve AZ Solar 1 LLC's application and enter into an interconnection agreement does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA)."

Environmental Assessment for Construction and Operation of a Solar Photovoltaic and/or Battery Energy Storage System at Naval Air Station, Fallon, Nevada (Department of the Navy, 2016): Email DOE-NEPA-Rulemaking@hq.doe.gov for a copy of this EA and FONSI.

- Under the Proposed Action, the United States Department of the Navy (Navy) and a private partner would enter into an agreement to allow the private partner to use Navy land to construct, operate, and own a solar photovoltaic (PV) and/or battery energy storage system at Naval Air Station (NAS) Fallon, Nevada. Once the solar PV and/or battery energy storage system is operational, the private partner would be responsible for maintenance and operation. The energy generated and/or stored would be used by the local community, NAS Fallon, or a combination of both.
- Navy evaluated two action alternatives. Alternative 1 (Preferred Alternative) would consist of construction and operation of an up to 20 megawatt (MW) solar PV and/or 150 MW hour battery energy storage system at Sites A and B (in total covering approximately 230 acres). Alternative 2 would consist of construction and operation of an up to 15 MW solar PV and/or 150 MW hour battery energy storage system at Site A (covering approximately 126 acres).
- Final EA: "The battery energy storage system would be comprised of large batteries likely consisting of lithium-ion cell chemistries and/or flow battery chemistries utilizing proprietary solutions based on vanadium sulfate-chloride, zinc-bromine, zinc-chloride, or other electrolytes. Acid based batteries would not be utilized. An energy inverter may also be constructed. The batteries would provide up to 150 MW hours of energy storage capacity. The batteries would be mounted using containment-style mounting to contain any accidental spills of fluids and rated for fire, electrical, and chemical spill safety through international certification programs (e.g., International Electrotechnical Commission Standards, Underwriters Laboratories Standards, Institute of Electrical and

Electronics Engineers Standards). The battery containers would be painted "earth-tone" colors to blend in with the surrounding environment."

- Final EA: "Under the Proposed Action, the land would be converted from native vegetation and dunes to a solar PV and/or battery energy storage system. No change in land use designation would occur. The site would be fenced to minimize the potential for unauthorized access. The Proposed Action would not impact the current use of adjacent land parcels…. Under Alternative 1, construction activities at Sites A and B would result in the removal of up to 230 acres of black greasewood vegetation…. Greasewood habitat is regionally abundant and is a common habitat type on NAS Fallon. Removal of 230 acres of greasewood vegetation would represent 0.03 percent of the total greasewood habitat on the 241,126 acres of lands that NAS Fallon administers in the high desert region of northern Nevada (approximately 88,000 acres total) (NAS Fallon, 2014a). No tree removal would be required for construction of the solar PV and/or battery energy storage system."
- Final EA: "The energy storage system would be comprised of large batteries likely consisting of lithium-ion cell chemistries and/or flow battery chemistries utilizing proprietary solutions based on vanadium sulfatechloride, zinc-bromine, zinc-chloride, or other electrolytes. Acid based batteries would not be utilized. The batteries would be housed in large containers to protect them from the elements. The batteries would be composed of materials typically used in large-scale battery systems, and have been proven via testing to not present a hazard when operated in accordance with manufacturer specifications (Fire Protection Research Foundation, 2016). Under Alternative 1, the battery storage system would be installed, operated, and maintained in accordance with manufacturer specifications, thus presenting no hazard to public health and safety."
- Final EA: "Under the Proposed Action, the battery storage system would be installed, operated, and maintained in accordance with manufacturer specifications, thus presenting negligible impacts to hazardous materials and wastes. Hazardous materials and wastes used and/or generated as part of the construction/operation of the solar PV and/or battery energy storage system would be handled and disposed of in accordance with the NAS Fallon Hazardous Waste Management Plan and all applicable federal, military, state, and local laws and regulations. Therefore, implementation of the alternatives would result in negligible impacts to hazardous materials and wastes."
- Final EA: "The project area is not identified as an agriculture lease area, irrigated pasture and croplands, or pasture area. A land parcel identified as 4AO2, directly north of Site B, is part of the Navy's Agricultural Outlease Program. Land use of leased land under this program include cattle grazing, farming of alfalfa, corn, sundangrass, hay, and combinations of these uses (NAS Fallon, 2002). Pedestrian and vehicle trespassing has been noted at the project area."
- FONSI: "The Proposed Action would occur within a 230-acre project area (Sites A and B) at NAS Fallon. The project area was formerly Bureau of Land Management Land that was recently transferred to the Navy. The project area is undeveloped and is not being leased or parceled out for leasing. Sixteen archaeological sites and three architectural resources are located within the project area. No federally listed plant or animal species are known to occur in the project area."
- FONSI: "Based on the analysis presented in this EA, the Navy finds that implementation of Alternative 1 would not significantly impact the quality of the human or natural environment."

Environmental Assessment for the Vonore Battery Energy Storage System and Associated Subsystem (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/vonore-battery-energy-storage-system-and-associated-subsystem

- Proposed construction, operation, and maintenance of a 15-acre Battery Energy Storage System pilot study project, which would be comprised of twelve containers housing lithium-ion batteries, and capable of generating 20 megawatts with a storage capacity of 40 MW hours.
- The project would require a 10-acre slab-on-grade pad, include an onsite 69-kV substation, roughly 0.4-mile of new all dielectric self-supporting (ADSS) fiber cable, and new poles to accommodate the cables.

- The EA describes measures which would be applied to avoid, minimize or reduce the potential for adverse environmental effects, including: the implementation of various standard BMPs, as described in TVA's 2017 BMP manual; salvaging timber "during vegetation clearing activities"; installing fences, gates, and drainage devices during construction of access roads; and road construction or improvements "done in such a manner that upstream flood elevations would not be increased by more than one foot."
- EA: "Land use on the project site would change from undeveloped, agricultural land to industrial. The land use in the surrounding area is largely agricultural, undeveloped, and residential, which would not change. TVA would implement the commitments and appropriate BMPs identified in this EA during construction, operation, and maintenance activities thus minimizing and/or avoiding impacts on the natural and physical environment to the extent practicable."
- EA: "Based on the USDA-NRCS soil mapping, there are approximately 1.1 acres of prime farmland soils within the BESS and associated substation project area limits of disturbance, and approximately 1.7 acres within the ADSS fiber line installation corridor, that have the potential to be permanently converted."
- EA: "Under the Action Alternative, the two wetlands located within the existing transmission line ROW where the ADSS fiber cable would be installed would be avoided. BMPs, including erosion control measures, would be installed to ensure sedimentation or other indirect wetland impacts do not affect these wetland features or other wetland features downstream of the construction sites. Therefore, with wetland avoidance and BMPs in place, no significant wetland impacts are anticipated to result from the proposed project activities."
- EA: "[W]ith proper implementation of BMPs, no long-term impacts from the associated action are anticipated to water flow, stream channels, or stream banks. With the implementation of BMPs, effects to aquatic life in the local surface waters are expected to be temporary and insignificant."
- The EA states that construction would result in the generation of hazardous and solid waste. "Under the proposed Action Alternative, the replacement of the batteries and ultimate decommissioning of the site would produce solid and hazardous waste in need of disposal. With the implementation of BMP[s] and compliance with the Solid and Hazardous Waste Rules and Regulations of the State… as well as the appropriate waste disposal requirements, no significant impacts associated with solid and/or hazardous waste are anticipated."
- FONSI: "The minor loss of prime farmland within the BESS and new substation footprint (less than one acre) is negligible when compared to the amount of land designated as prime farmland within the surrounding region. Therefore, impacts to prime farmland would be minor.… Although prime farmland soils were documented within the ADSS fiber line installation corridor, these areas would not be considered as prime farmland due to their location within a maintained TVA transmission right-of-way."
- FONSI: "Construction-related activities would result in minor and short-term impacts to air quality and climate change. With the use of [BMPs] impacts would be minimal, temporary, and localized; and would not be anticipated to result in any violation of applicable ambient air quality standards or impact regional air quality. Once operational, the BESS would allow for storage of green energy production for long-term use, which would result in a beneficial effect on climate change."
- FONSI: "A minor permanent impact would occur due to tree removal, and construction of the BESS and associated substation. To minimize the visual effect, TVA would plant a vegetative screen that would not impact security and operational requirements along the perimeter of the BESS and associated substation facility that is visual to the public. Therefore, implementation of the proposed Action Alternative would result in only a minor overall change in visual quality."
- FONSI: "The following non-routine measures would be applied during the construction, operation, and maintenance of the proposed Vonore BESS, transmission lines, and access roads to reduce the potential for adverse environmental effects. Monroe County, Tennessee is currently under APHIS quarantine. As such, any soil, baled hay or straw, plants and sod with roots and soil attached, soil-moving equipment or other 'Regulated Articles' as defined by USDA should be in compliance with APHIS Quarantine Regulations. To offset the

adverse visual effect, TVA would plant a vegetative screen that would not impact security and operational requirements along the perimeter of the BESS and associated substation facility that is visual to the public."

- FONSI: "Based on the findings listed above and the analyses in the EA, we conclude that the proposed action of constructing, operating, and maintaining the BESS facility, associated substation, and ADSS fiber line upgrade would not be a major federal action significantly affecting the environment. This finding of no significant impacts is contingent upon adherence to the mitigation measures described above. Accordingly, an environmental impact statement is not required." TVA did not identify significant effects associated with proposed action and so this is not a mitigated FONSI. The mitigation measures referred to in the FONSI are to reduce the potential for adverse (but not significant) effects associated with fire ants and visual effects.

Environmental Assessment for the Optimist Solar and BESS Project (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/optimist-solar-and-bess-project

- Proposed construction and operation by MS Solar 7 of a an up to 200 MW AC single-axis tracking photovoltaic solar facility with a 50 MW AC – 200 MWh battery energy storage system (BESS) (referred to as the "solar facility"), and purchase by TVA of the renewable energy from the solar facility under a 20-year Power Purchase Agreement (PPA). The Project would connect to the existing TVA electrical network via TVA's West Point Substation.
- The Solar Facility would encompass about 2,952 acres of primarily cultivated agricultural fields and pastureland in Mississippi, of which about 1,540 acres would be used for the ground-mounted PV arrays (standing five to eight feet tall, depending on time of day), BESS, inverters, transformers, internal site access roads, Project substation, ancillary infrastructure, and construction laydown and parking areas.
- EA: "The BESS would be collocated with the Project substation and occupy approximately three acres either adjacent to Barton Ferry Road near the PV arrays or at one the parcels adjacent to the West Point Substation."
- EA: "…the Substation/BESS and the gen-tie/collector lines require a small land commitment. Most of the land in that portion of the Project Site would continue to be used for agriculture."
- EA: "MS Solar 7 is proposing using a pre-engineered metal structure enclosure on a concrete foundation to house the BESS. The exact size and specifications of the enclosure would be contingent on the battery chemistry and other parameters, although the enclosure is anticipated to be similar to a shipping container, measuring approximately 8 feet wide by 40 feet long. The enclosure would be furnished with a fire suppression system, ventilation and air conditioning system, and supporting electrical equipment. The BESS enclosure would be designed and installed in conformance with all applicable standards and electrical codes. Chemical fire suppression systems are typically utilized for BESS installations. The BESS would be collocated with the Project substation and occupy approximately three acres either adjacent to Barton Ferry Road near the PV arrays or at one the parcels adjacent to the West Point Substation. Lithium ion (Li–ion) batteries are most commonly used for utility-scale energy storage, accounting for more than 90 percent of such installations. Li-ion batteries use the exchange of lithium ions between electrodes to charge and discharge the battery. Li-ion batteries are typically characterized as power devices capable of short durations or stacked to form longer durations of power. It should be noted that the battery component of the BESS has not yet been finalized, and MS Solar 7 is also considering battery technology other than Li-ion batteries."
- EA: "If operations cease, the facility would be decommissioned and dismantled, and the Project Site would be restored. In general, most decommissioned equipment and materials would be recycled. Materials that could not be recycled would be disposed of at an approved facility in accordance with federal, state, and local laws and regulations."
- EA: "No public health or safety hazards would be anticipated as a result of operations. Public health and safety hazards could result from a fire during the construction or operation of the BESS. If a fire were to occur, flammable and toxic gases could be released. The BESS building would be furnished with a fire suppression

system. Design of the BESS in order to minimize the potential for thermal runaway (i.e., overheating of the batteries) along with proper storage, handling and ventilation would be employed to reduce the risk of potential hazards. Overall, impacts to public health and safety in association with implementation of the Proposed Action would be considered temporary and minor."

- FONSI: "Based on the findings listed above and the analyses in the EA, we conclude that the proposed action of constructing, operating, and maintaining the Optimist Solar and BESS facility, and gen-tie line upgrade would not be a major federal action significantly affecting the environment. This finding of no significant impacts is contingent upon adherence to the mitigation measures described above. Accordingly, an environmental impact statement is not required."

Environmental Assessment for the Golden Triangle I Solar and Battery Energy Storage Project (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/golden-triangle-solar-project

- Proposed construction and operation — on approximately 4,150 acres of predominantly agricultural land — by MS Solar 5 of a an up to 200 MW AC single-axis tracking photovoltaic (PV) solar facility with a 50 MW BESS (referred to as the "solar facility"), and purchase by TVA of the renewable energy from the solar facility under a 20-year Power Purchase Agreement (PPA).
- The solar facility would generate up to 200 MW AC output for transmission to TVA's electrical network via an approximate 1,665-foot-long gen-tie line to a new 0.85-acre Artesia 161-kV Switching Station within the existing Artesia Substation.
- The solar facility would consist of multiple parallel rows of PV panels on single-axis tracking structures, along with DC and AC inverters and transformers. The perimeter of the developed facilities would be enclosed with security fencing. Within the limits of the fenced facility would be the arrays of solar panels, inverters, battery storage, electrical cabling, and other related infrastructure such as the Project substation and access roads. The remaining portions of the Project Site would be undeveloped.
- If operations cease at the end of the 20-year PPA, the solar facility would be decommissioned and dismantled, and the Project Site would be restored.
- EA: "…within the Golden Triangle I Substation would be MS Solar 5's BESS Facility. There are numerous components that make up the BESS." Section 2.2.2 of the EA describes the BESS components. For example: "BESS Containers: The Containers, which are typically made of steel or concrete, house the batteries as well as other system components such as battery cabinets, battery management system (BMS), heating, ventilation, and air conditioning (HVAC) system, system controller, and electrical distribution panel. The BESS Containers are considered unoccupied structures, with access only granted to approved personnel for maintenance or repair activities. MS Solar 5 estimates there would be 34 BESS containers within the facility boundaries. Another option for the containment of batteries and other BESS components is the "Building Solution" which is described further below. Batteries: Although the batteries have not yet been selected for this Project, Lithium ion (Li-ion) batteries are the most common batteries by installation, accounting for more than 90% of energy storage installations. Li-ion batteries use the exchange of lithium ions between electrodes to charge and discharge the battery. Li-ion batteries are typically characterized as power devices capable of short durations or stacked to form longer durations of power. This Project would be considered a long duration system. Li-ion energy storage systems are generally appropriate for serving energy applications, moderate power applications, and applications requiring a short response time (i.e., back-up power or supporting a black start). The three most common Li-ion chemistries are lithium nickel cobalt manganese oxide (NCM), lithium iron phosphate (LFP), and lithium titanate oxide (LTO). It should be noted that the battery component of the BESS has not yet been finalized and MS Solar 5 is also considering battery technology other than Li-ion batteries. Pad-Mounted Inverter: These transformers are used to interface the underground medium voltage collection cables at points in which the BESS service drops are connected to step down the primary voltage on the collection system to a lower voltage that is supplied by the BESS inverters. MS Solar 5 estimates there would be 17 pad-mounted inverters within the boundaries of this

facility.… Fire Suppression Tank: The fire suppression tank provides a source of water that is dedicated to the fire suppression system and for use by first responders in case of a fire. The design of the fire suppression system is not yet finalized, but will be designed in accordance with federal, state, and local regulations."

- EA: TVA would utilize standard BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities – Revision 3*, TVA's BMP manual (TVA 2017b), to minimize erosion during construction, operation, and maintenance activities.
- EA: "A majority of the Project Site is either disturbed, maintained, or actively cultivated cropland. There is potential to remove a minor amount of forested area within the Project Site (<6.5 percent) during clearing and grading activities. Additionally, the surrounding areas consist of similar vegetation communities and have also been mostly converted to cropland. Adverse impacts associated with vegetation removal resulting from implementation of the Proposed Action would be minor but permanent."
- EA: "A water source would be required for the operations and maintenance building, which would be located within the Golden Triangle I Substation and BESS Facility boundaries. Water also would be required for the fire suppression system as part of the BESS Facility. Groundwater withdrawal volumes are expected to be less than the existing volume needed for agricultural irrigation, thus resulting in a net positive impact on groundwater resources."
- EA: "At the end of its useful life, the Project facilities would be decommissioned and dismantled, restoring the site. During decommissioning, above ground equipment and below ground electrical connections would be removed from the Project Site. In addition, concrete pads and foundations would be broken and removed, underground utilities would be abandoned, compacted areas would be scarified, and soils would be stabilized. The majority of decommissioned materials and equipment would be recycled.… Materials that cannot be recycled would be disposed at approved facilities in accordance with applicable local, state, and federal laws and regulations."
- Regarding "spent batteries," Table 3-13 of the EA describes the origin and composition as "lead acid/lithium ion"; identifies the waste management method as "recycle"; and describes the estimated volume as "1,000."
- FONSI: "Based upon the analyses documented in the EA, TVA concludes that its proposed action of executing the PPA with MS Solar 5, LLC, and the subsequent construction and operation of the Solar Facility and BESS by MS Solar 5, would not be a major federal action significantly affecting the environment. Accordingly, an environmental impact statement is not required."

Environmental Assessment for the Golden Triangle II Solar and Battery Energy Storage Project (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/golden-triangle-ii-solar-project

- Proposed construction and operation — on approximately 1,500 acres of predominantly agricultural fields and pastureland — by MS Solar 6 of a an up to 150 MW AC photovoltaic (PV) solar facility with a 50 MW AC – 200-megawatt hour (MWh) BESS (referred to as the "solar facility"), and purchase by TVA of the renewable energy from the solar facility under a 20-year Power Purchase Agreement (PPA). The "GT2" Project would connect to the existing TVA electrical network via the existing Golden Triangle gen-tie line to TVA's proposed Artesia Switching Station within the existing Artesia Substation.
- If operations cease at the end of the 20-year PPA, the solar facility would be decommissioned and dismantled, and the Project Site would be restored.
- The EA assesses (1) the impact of TVA's action to enter into the PPA with MS Solar 6, (2) the associated impacts of the construction and operation of the solar facility, and (3) interconnection components by TVA.
- Regarding "spent batteries," Table 3-14 of the EA describes the origin and composition as "lead acid/lithium ion"; identifies the waste management method as "recycle"; and describes the estimated volume as "1,000."

- EA: "No public health or safety hazards would be anticipated from operation of the Solar Facility. Impacts to public health and safety associated with implementation of the Proposed Action would be temporary and minor."
- The FONSI, issued in May 2022, stated, "Based upon the analyses documented in the EA, TVA concludes that the proposed action alternative of constructing and operating the Golden Triangle II Solar and BESS Facility by MS Solar 6, as well as the new gen-tie, and TVA's purchase of the electric output pursuant to the PPA with MS Solar 6 would not be a major federal action significantly affecting the environment. Accordingly, an environmental impact statement is not required."
- After issuance of the May 2022 FONSI and EA, although the overall project site area did not change, a revised site layout indicated that additional tree clearing — beyond what was originally expected — would be necessary for installation of the solar arrays. Based on the revised site plan, it is anticipated that up to 493 acres of forested land could be cleared during initial site construction, versus the "up to 270 acres of forested upland areas" listed in the EA and FONSI. Thus, a revised consultation letter was submitted to the U.S. Fish and Wildlife Service on June 17, 2022.
- Based upon the analyses documented in the EA, and the June 2022 update described above, a Revised FONSI was issued in July 2022.

Below are examples of categorical exclusion determinations that DOE has prepared for energy storage systems using DOE's existing categorical exclusions (e.g., B5.1, *Actions to conserve energy or water*, which includes energy storage (generally less than 10 MW)). DOE expects that the new categorical exclusion B4.14 would be used for these types of projects in the future and, because the categorical exclusion would not be limited to 10 MW, would also be used for larger projects.

Categorical Exclusion Determination for the Kauai North Shore Energy Resiliency Project (CX-026542; DOE, 2022): https://www.energy.gov/sites/default/files/2022-09/CX-026542.pdf

- Kauai Island Utility Cooperative proposes to purchase, install, operate, and maintain a lithium-ion battery energy storage system (BESS) at its Princeville and/or Wainiha substations. The storage capacity of the proposed BESS was 4 megawatts. Categorical exclusion determination covers activities to be conducted within previously disturbed areas and existing substations.

Categorical Exclusion Determination for the Chefornak Battery Energy Storage Project (CX-024366; DOE, 2021): https://www.energy.gov/nepa/articles/cx-024366-chefornak-battery-energy-storage-project

- The U.S. Department of Energy (DOE) is proposing to provide funding to the Chefornak Traditional Council (Chefornak) to install and commission a battery energy storage system (BESS) module and auxiliary equipment at an existing wind-diesel power plant in the Village of Chefornak, AK. The BESS would be interconnected to the wind-diesel power plant and would serve to augment diesel-off operations and consequently reduce diesel usage.
- BESS installation would require the construction of a deck and metal shelter. Construction would occur in a previously disturbed area adjacent to the existing wind-diesel power plant and within 50 ft of an existing power line.

Categorical Exclusion Determination for the Kipnuk Light Plant Battery Energy Storage Project (CX-024372; DOE, 2021): https://www.energy.gov/nepa/articles/cx-024372-kipnuk-light-plant-battery-energy-storage-project

- The U.S. Department of Energy (DOE) is proposing to provide funding to the Kipnuk Tribal Utility (Kipnuk) to install and commission a battery energy storage system (BESS) module and auxiliary equipment at an existing wind-diesel power plant in the Village of Kipnuk, AK. The BESS would be interconnected to the wind-diesel power plant and would serve to augment diesel-off operations and consequently reduce diesel usage.
- BESS installation would require the construction of a deck and metal shelter. Construction would occur in a previously disturbed area adjacent to the existing wind-diesel power plant. The deck would be constructed from

lumber and would measure approximately 24' x 36.' Ground piles would be installed to a depth of 12' and would be utilized to secure the deck in place. Approximately 40 ground piles would be installed when the ground is frozen, resulting in minimal ground disturbance. The metal shelter would consist of a prefabricated structure 12' x 24,' (i.e., a Quonset hut) to be installed on top of the deck to house the lithium-ion batteries.

Categorical Exclusion Determination for the Nuvista Kwethluk Energy Storage — Battery Storage Resiliency Project (CX-101546; DOE, 2019): https://www.energy.gov/nepa/articles/cx-101546-nuvista-kwethluk-energy-storage-battery-storage-resiliency-project

- The U.S. Department of Energy (DOE) is proposing to provide funding to Nuvista Light & Electric Cooperative (Nuvista) to install an ABB E-Mesh PowerStore battery energy storage system (BESS) module at an existing wind-diesel power plant in Kwethluk, AK. The BESS would have a power conversion capacity of 500 kW and an electrical energy storage capacity of 670 kWh.
- Installation activities would require the construction of a deck adjacent to the existing power plant in order to house the BESS module. The deck would measure approximately 12' x 20' and would be built on a post-and-pad foundation, with no associated ground disturbance.

Categorical Exclusion Determination for the Hawaii Energy Sustainability Program (Subtask: 2.2: Kauai BESS Deployment) (CX-003934; DOE, 2010): https://www.energy.gov/sites/default/files/CX-003934.pdf

- Recipient proposes to deploy a 1 MW battery energy storage system at the Kauai Independent Utility Cooperative onto a concrete pad near an existing substation.

Categorical Exclusion Determination for the Advanced Implementation of A123's Community Energy Storage System for Grid Support (CX-002794; DOE, 2010): https://www.energy.gov/sites/default/files/CX-002794.pdf

- Install 20 community energy storage units into an electric utility system that includes a 1 MW storage device integrated into a solar-power system. The units will be coupled with the utility scale device for demonstration.
- The construction will be performed at existing utility easements/substations.

Categorical Exclusion Determination for the Tehachapi Wind Energy Storage (CX-001206; DOE, 2010): https://www.energy.gov/sites/default/files/CX-001206.pdf

- The construction and operation of a 9,000 sq ft battery storage facility inside the boundary of the Southern California Edison Monolith Substation.

Standards, Control Technologies, and Best Management Practices

The new categorical exclusion B4.14 requires that a proposed project "incorporate appropriate safety standards (including the current National Fire Protection Association 855, Standard for the Installation of Stationary Energy Storage Systems), design and construction standards, control technologies, and best management practices." The sources below are examples of standards, control technologies, and BMPs that help ensure safety and that lessen environmental impacts of construction and operation of energy storage systems. These change over time to reflect new developments and lessons learned. Which of these are relevant to a particular proposed action is dependent on the technology and location. This is not an exhaustive list.

National Fire Protection Association (NFPA) 855, Standard for the Installation of Energy Storage Systems (https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=855), applies to the design, construction, install, commissioning, operation, maintenance, and decommissioning of stationary energy storage systems (ESS), including mobile and portable ESS installed in a stationary situation (e.g., batteries and flywheels) and the storage of lithium metal or lithium-ion batteries. DOE has provided additional information summarizing NFPA 855 (2023 edition). Revisions and updates to all NFPA standards occur on a regular three to five year cycle and

incorporate public review and comment (https://www.nfpa.org/For-Professionals/Codes-and-Standards/Standards-Development). NFPA plans to issue the next edition of NFPA 855 in 2026.

NFPA 855 covers a broad range of safety measures and safeguards and contains a variety of provisions related to fire control and suppression, such as requirements related to the storage of combustible materials; repairs, retrofits and replacements of ESS; prohibitions on toxic gases; construction of enclosures; electrical installation; design load; signage; impact protection; elevation; system interconnections; smoke and fire detection; fire suppression systems; fire and explosion testing; spill control emergency response plans, and decommissioning plans. The 2023 edition of NFPA 855 addresses preventing explosions and safely containing fires and mandates fire suppression for all ESS, including requirements for installation of smoke detectors, sprinkler systems, and fire barriers. Additionally, NFPA 855 mandates initial and annual refresher training for facility staff and recommends inclusion of first responders in the trainings. NFPA 855 requires submittals to the authority having jurisdiction (AHJ), which include the results of fire and explosion testing conducted in accordance with UL 9540A, details of all safety systems, and hazard mitigation analysis. Hazard mitigation analysis is a method to evaluate potential failure modes (including thermal runaway conditions) and their cause and effects, in order to develop mitigation solutions to prevent failure during system operation). The hazard mitigation analysis should demonstrate that mitigation solutions provide fire containment, explosion control, safe egress, and toxic and flammable gas management.

Generally speaking, NFPA 855 application is based on size and capacity of the ESS. For example, NFPA 855 applies to lithium-ion battery ESS with a capacity of at least 20 kWh and flywheel ESS with a capacity of at least 70 kWh. NFPA 855 also accounts for different hazards related to location of the ESS, including consideration of whether the installation location for the ESS is indoors or outdoors. For example, for outdoor installations, NFPA 855 considers whether the ESS will be installed in a remote location or near other exposures, and provides for minimum installation distances from exposures, such as combustible materials.

In order to establish a variety of installation requirements, NFPA 855 references other NFPA codes, including NFPA 1, Fire Code, NFPA 13, Standard on the Installation of Sprinkler Systems, NFPA 68, Standard on Explosion Protection by Deflagration Venting, NFPA 69, Standard of Explosion Prevention Systems, and NFPA 70, National Electrical Code. In addition, NFPA 855 references UL 9540 and 9540A. Notably, NFPA 855 states that any lithium-ion battery system over 20 kWh shall be certified to UL 9540, Standard for Safety of Energy Storage Systems and Equipment (https://shopulstandards.com/ProductDetail.aspx?productId=UL9540), and tested to UL 9540A Test Method.

UL 9540 is a consensus safety standard for energy storage systems in the United States and Canada. For energy storage systems connected to a utility grid, the UL 9540 standard extends to the equipment used to make that connection. This standard pertains to fire and explosion safety concerns associated with ESS, including fire detection, fire mitigation, and suppression. This standard focuses on mechanical testing, electrical testing, and environmental testing of the complete, packaged energy storage system.

UL 9540A is a test method for evaluating thermal runaway propagation for battery energy storage systems and includes ventilation requirements, fire protection facilities, fire protection strategies, and countermeasures. In addition to reference by UL 9540 and NFPA 855, UL 9540A is referenced within the International Code Council (ICC) International Fire Code (IFC), as well as various local, state, and international building and fire codes.

UL 1973 certification requires that energy storage lithium battery packs undergo various tests to ensure that the packs can operate safely in various extreme environments.

The International Electrotechnical Commission (IEC) developed IEC 62619 as a test method that specifies requirements of battery management systems, including testing requirements for voltage and controls to prevent overcharging and overheating. Additionally, standard IEC 62477 applies to power electronic converter systems and power switching.

In addition to the above referenced codes and standards, the International Code Council (ICC) International Fire Code (IFC), is a model code that is largely in use throughout the United States. Chapter 12 of the current edition of the IFC applies to the installation, operation, maintenance, repair, retrofitting, testing, commissioning, and decommissioning of energy systems used for generating or storing energy.

DOE reviewed other information in support of its new categorical exclusion B4.14 as summarized below:

U.S. Codes and Standards for Battery Energy Storage Systems (The American Clean Power Association, 2023): https://cleanpower.org/resources/energy-storage-codes-standards/

- "This document provides an overview of current codes and standards (C+S) applicable to U.S. installations of utility-scale battery energy storage systems."
- "A variety of nationally and internationally recognized model codes apply to energy storage systems. The main fire and electrical codes are developed by the International Code Council (ICC) and the National Fire Protection Association (NFPA), which work in conjunction with expert organizations to develop standards and regulations through consensus processes approved by the American National Standards Institute. For these model codes to be enforceable, they must be adopted, in whole or in part, by states or local jurisdictions. This process generally results in a lag in adoption. Below are the most relevant codes that apply to stationary energy storage systems:
    - NFPA 1 Fire Code[B7]. Covers the hazards of fire and explosion, life safety and property protection, and safety of firefighters. Chapter 52 provides high-level requirements for energy storage, mandating compliance with NFPA 855 for detailed requirements, effectively elevating the latter to the status of a code.
    - NFPA 70 National Electrical Code (NEC) [B10]. Covers practical safeguarding of persons and property from hazards arising from the use of electricity. Since 2017, Article 706 has provided specific requirements for Energy Storage Systems, applying to all ESS over 1 kWh.
    - NFPA 855 Standard for the Installation of Stationary Energy Storage Systems [B11]. Provides minimum requirements for mitigating the hazards associated with energy storage systems. NFPA 855 requirements apply to the design, construction, installation, commissioning, operation, maintenance, and decommissioning of energy storage systems.
    - International Fire Code (IFC) [B6]. With a similar scope to NFPA 1, the IFC includes ESS-related content in Section 1207 that is largely harmonized with NFPA 855."

First Responders Guide to Lithium-Ion Battery Energy Storage System Incidents (The American Clean Power Association, 2023): https://cleanpower.org/wp-content/uploads/2023/07/ACP-ES-Product-7-First-Responders-Guide-to-BESS-Incidents-6.28.23.pdf

- "This document provides guidance to first responders for incidents involving energy storage systems (ESS). Hazards addressed include fire, explosion, arc flash, shock, and toxic chemicals. For the purposes of this guide, a facility is assumed to be subject to the 2023 revision of NFPA 855 and to have a battery housed in a number of outdoor enclosures with total energy exceeding 600 kWh, thus triggering requirements for a hazard mitigation analysis (HMA), fire and explosion testing in accordance with UL 9540A, emergency planning, and annual training."
- "This guide provides recommendations for pre-incident planning and incident response. Additional tutorial content is provided for each of the hazard categories."
- This document provides recommendations for development of an ERP and recommends inclusion of the following:
    - Site overview and energy storage system nameplate information
    - Potential hazards
    - Fire protection and safety systems
    - Emergency response recommendations
    - Emergency contacts, including subject-matter experts
    - Safety data sheets

    - Personal protective equipment
- This document also recommends that the UL 9540A test results and videos be used in first-responder training to gain insight into system behavior in a thermal runaway event. Additionally, the document recommends a hazard mitigation analysis to addresses larger-scale failures and to determine the maximum temperature rise of cells in adjacent enclosure in order to justify limited spacing between enclosures and for use in determining whether first responders should intervene.

Battery Energy Storage Safety (The American Clean Power Association, 2023): https://cleanpower.org/wp-content/uploads/2023/07/ACP-ES-Product-4-BESS-Safety-FAQs-230724.pdf

- "Do batteries leak or emit pollution? In normal operation, energy storage facilities do not release pollutants to the air or waterways. Like all energy technologies, batteries can present chemistry-specific hazards under fault conditions. Batteries with free-flowing electrolytes could leak or spill chemicals, so these systems are normally equipped with spill containment. Batteries with aqueous electrolytes may emit small quantities of hydrogen gas in normal operation and larger amounts under fault conditions, but these emissions are handled by ventilation systems and are not considered polluting. As discussed previously, all batteries release toxic substances in a fire, and if water is used for firefighting, it can create contaminated runoff – another reason for manufacturers' recommendations to allow fires to burn themselves out."
- "How are battery energy storage systems regulated? Battery energy storage systems must comply with electrical and fire codes adopted at the state and local level. Facility owners must submit documentation on system certification, fire safety test results, hazard mitigation, and emergency response to the local Authority Having Jurisdiction (AHJ) for approval. Before operation, facility staff and emergency responders must be trained in safety procedures and are required to be given annual refresher training."
- "What is the risk of fire or explosion associated with battery storage systems? Safety events that result in fires or explosions are rare. Explosions constitute a greater risk to personnel, so the US energy storage industry has prioritized the deployment of safety measures such as emergency ventilation to reduce the buildup of flammable gases. Such ventilation can reduce the effectiveness of fire suppression, so an increasing number of manufacturers have adopted a strategy of allowing fires in individual battery enclosures to burn out in a controlled manner, while also preventing the propagation of fire between enclosures. The rationale is that fire consumes any flammable gases as they are produced, thus preventing explosions. Additionally, allowing the battery to burn avoids problems with stranded energy and reignition, both of which have been issues with electric vehicle fires. The monitoring systems of energy storage containers include gas detection and monitoring to indicate potential risks. As the energy storage industry reduces risk and continues to enhance safety, industry members are working with first responders to ensure that fire safety training includes protocols that avoid explosion risk."
- "Do battery energy storage systems pose a risk to the broader community? In the rare case where fires do occur, they may be managed without endangering broader communities. A study for the New York State Energy Research & Development Authority states that, while battery fires emit toxic fumes, the average level of toxicity is similar to that of plastics fires involving materials such as sofas, mattresses, or office furniture. Depending on the size of the facility, authorities may close nearby roads and issue shelter-in-place advisories to local residents. The diverse system components that comprise the energy storage facility have chemical and fire smoke data that can be utilized to determine the risks for each facility. The code-required Hazard Mitigation Analysis will summarize how risks beyond the site boundary will be prevented."

Energy Storage in Local Zoning Ordinances (Pacific Northwest National Laboratory, 2023): https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-34462.pdf

- "Because lithium-ion batteries store large amounts of energy within a relatively small space coupled with having a flammable electrolyte, they have the potential to become unstable and enter thermal runaway—a state in which the chemical reactions within the battery release excess energy and gases that cause battery failure and fires."

- "While battery fires tend to be high-profile events, they are relatively rare when compared to the number of installations. The Electric Power Research Institute (EPRI) maintains a database of fires involving grid-connected BESS from media reporting sources. It does not include battery fires in vehicles or consumer mobility products and contains an incomplete record of fires in systems that were owned and installed by individual customers. But the database does contain a thorough accounting of fires involving the type of large, grid-connected BESS that would be subject to review and approval by local planners."
- "EPRI's database identifies 14 such incidents in the U.S. (EPRI 2023).1 To place that number in context, there were 491 large, utility-scale projects in the U.S. as of April 2023, for a fire incidence rate of about 2.9 percent. No BESS fire in the U.S. has resulted in loss of life, and many of the affected facilities were able to resume operation."
- "The most prominent BESS [battery energy storage system] fire in the U.S. happened in April 2019 in Surprise, AZ, when a 2-MW BESS housed within a structure caught fire and exploded. The explosion occurred several hours after the fire was reported, when firefighters opened the door to inspect the facility and the introduction of oxygen caused the flammable gases trapped in the container to ignite. Several firefighters were severely injured. In response to this event, current codes require explosion control systems for BESS. Many BESS developers have also moved to cabinet-based systems, which have limited internal spaces where gases may accumulate and do not allow entrance by first responders."
- "Typically, a code is a document that guides installation requirements, while a standard is a document that describes the safety requirements of a product and how to perform certification testing. In the energy storage industry, an example of this code and standard relationship is the NFPA 1 Fire Code requiring that energy storage systems of certain sizes and in certain environments be 'tested and listed.' This code then references standard UL 9540, "Standard for Safety of Energy Storage Systems and Equipment." UL 9540 is the key product safety standard for energy storage systems, and ESS listed to this standard is a requirement in both the IFC and NFPA 855. This standard addresses the compatibility of all components and systems, functional safety, enclosures, ventilation and cooling, communications, and fire safety. In addition to the requirement for listing to UL 9540, there are requirements for fire testing to UL 9540A. In a UL 9540A test, thermal runaway is intentionally created so that test administrators can understand how the cell performs under failure and observe how fires spread through the unit. This is used to help design fire safety features and establish safe distances between units to limit propagation should a failure occur. A system that is UL 9540 certified, therefore, is a system designed to contain battery failures and prevent them from spreading to adjacent units while ensuring against explosions."
- "This point of failures being contained to the unit of origin is critical in both system design and assessing the project's overall risk profile. The risk of a fire incident at a battery storage project does not increase with project size; the two are decoupled in a well-designed system that prevents a fire in one unit from spreading to neighboring units. Regardless of project size, the fundamental question in assessing a project's risk is what happens if a single unit fails, rather than what happens if every unit fails at once. In determining the risk to neighboring properties, it is recommended that siting consider prevailing winds where projects are located less than 150 feet from occupied structures, with the knowledge that weather conditions and incident specifics will guide any emergency response by the fire service. In general, it is the distance to the closest BESS enclosure more than the total number of BESS on a site that should guide the siting considerations from a fire safety perspective."
- "Some of the requirements in NFPA that have direct relevance to local zoning officials include: an emergency response plan and training for local emergency responders, use of UL 9540-listed equipment, fire control and suppression systems, a decommissioning plan for removing and disposing of the system at the end of its useful life, detailed site/facility construction requirements, and explosion control."
- "NFPA and IFC codes are updated on a 3-year cycle to include new information and requirements. In the case of energy storage codes, this is particularly relevant as lessons learned from system failures and technological innovations are integrated into new versions of the code."

- A battery storage system has three sources of noise: the inverter, which converts the direct current electricity stored in the battery to the alternating current electricity used on the electric grid (and vice versa); the transformer, which increases the voltage of the electricity stored in the batteries to the level used on the utility's transmission or distribution system; and the ventilation and cooling system, which maintains a safe operational temperature for the batteries. Several jurisdictions that have permitted a large energy storage system have required an impact study that included, among other things, sound impacts. Those studies have generally concluded that individual inverters, transformers, and ventilation systems generally have sound levels between 60 and 80 decibels (dB) when measured at close distance (Burns & McDonnell 2019; Louden 2015; Hodgson 2022; Plus Power 2019). 60 dB corresponds to a normal conversation and 80 dB corresponds to the noise level inside a car (Britannica 2022)."
- "The ultimate noise level experienced by neighboring property owners will depend on three factors: the number of noise-producing components in the project (which increases the noise level), the distance between those components and the property line, and physical screening (which both decrease the noise level). One study found that when the collective impact of all inverters, transformers, and ventilation systems in a project is studied, the noise level would be 101 dB at the source, but an unscreened buffer of 400 feet between the nearest component and the property line reduced that level to 59 dB at the property line (Burns & McDonnell 2019). In another analysis for a similarly sized battery storage project, the analysis determined that a buffer of 125 feet coupled with an 8-foot perimeter fence and natural screening provided by large trees would reduce the noise level at the property line to about 55 dB (Plus power 2019). Noise standards will vary by jurisdiction and the specific zone in which a storage project is located. Where a project has the potential to cause noise pollution for surrounding property owners, local planning and zoning officials may consider requiring a noise study to identify the noise impacts and then requiring setbacks and/or screening to mitigate those impacts."
- "Because lithium-ion battery cells and pouches are designed to be self-contained, a lithium-ion BESS will only leak in a failure state. In fact, battery leakage is an early indicator of failure (Lu et al 2020). During normal operations, therefore, a lithium-ion BESS will not leak chemicals that could contaminate local watersheds."
- "The primary risk of local environmental contamination associated with battery storage systems is the use of water in fire suppression. The water will bind with the chemicals released during the fire and carry them into drainage systems, where they could contaminate watersheds. This risk supports an emerging consensus in the firefighting community, outlined above, that water suppression should be used sparingly on battery fires for exposure protection. If the local fire department prefers to use water in its response plan, then planners may want to require a severable storm drain connection to ensure that contaminated water cannot leave the site."

Battery Energy Storage System Emergency Response Plan Guide (New York Battery and Energy Storage Technology Consortium and Fire and Risk Alliance, 2023): https://cdn.ymaws.com/ny-best.org/resource/resmgr/resource_library/ny-best_fra_erp_guide_final.pdf

- "Fire Risk & Alliance (FRA) developed this emergency response plan (ERP) guide to assist Battery Energy Storage System (BESS) project developers, owners, and operators in preparing for potential emergencies and addressing the concerns of emergency responders and members of the fire services."
- "If there is an option to dispense water within the battery enclosure there must be established triggers such as a fully involved container for an extended period of time. The application of water is usually not a first tactic but a last resort. The decision to dispense water should be made jointly between the Chief Officer and Battery SME."

U.S. DOE Energy Storage Handbook (DOE, 2020): https://www.sandia.gov/ess/publications/doe-oe-resources/eshb

- "The 2020 U.S. Department of Energy (DOE) Energy Storage Handbook (ESHB) is for readers interested in the fundamental concepts and applications of grid-level energy storage systems (ESSs). The ESHB provides high-level technical discussions of current technologies, industry standards, processes, best practices, guidance, challenges, lessons learned, and projections about energy storage as an emerging and enabling technology.

Projects and applications span the gamut of the electricity delivery system: generation, transmission, and distribution."

- "The ESHB is a peer-reviewed document, comprising 25 chapters with approximately 60 contributing authors. The ESHB is divided into three distinct sections: Energy Storage Technologies, Engineering Storage Systems, and Applications and Markets."
- For example, Chapter 18, Physical Security and Cybersecurity of Energy Storage Systems, describes transmission-connected ESS cybersecurity standards. "… BES equipment that is >20 MW connected at 100 kV or greater falls within the NERC [North American Electric Reliability Corporation] CIP [Critical Infrastructure Protection] requirements, which include the following: • CIP-002-5.1a: Cyber systems and asset categorization • CIP-003-6: Security management controls • CIP-004-6: Personnel training and security awareness • CIP-005-5: Electronic security perimeters for critical assets and border access point protections • CIP-006-6: Physical security • CIP-007-6: Security system management • CIP-008-5: Incident reporting and response planning CIP-009-6: Recovery plans • CIP-010-2: Configuration change management and vulnerability assessments • CIP-011-2: Information protection. These, along with the forthcoming CIP-013-1 (Supply chain management) and CIP-014-2 (Physical security for transmission stations, substations, and control systems), provide the basis for mandatory power system security requirements. They are monitored and enforced through NERC audits, spot checks, and self-certifications of utilities and power system operators. The operators of large ESSs will be required to adhere to the NERC CIP requirements. These systems generally are connected to grid operators like other large generators and should be protected in the same way."
- Chapter 18 also describes industry best practices to improve cybersecurity: "Principal among them is defense-in-depth approaches, where multiple security features are layered in the asset or network. National Cybersecurity and Communications Integration Center (NCCIC) and Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) outline several defense-in-depth elements including network architecture, network perimeter security, host security, security monitoring, and vendor management…. ESS vendors and network operators should conduct cybersecurity self-evaluations either with an internal team or using an outside contractor…. It is also critical that the ICS/OT/ESS systems are patched from known vulnerabilities…. It is also essential to minimize the risk to ESS equipment through effective supply chain risk management approaches…. ESS vendors and network operators must consider the risk presented by disgruntled or malicious employees…."
- Chapter 14, Integrating Energy Storage, describes the rules that apply to energy storage interconnection, stating "For wholesale interconnection in the United States, the Federal Energy Regulatory Commission (FERC) Small Generator Interconnection Procedures (SGIP) and Large Generator Interconnection Procedures (LGIP) govern. For retail, the jurisdictional entities that govern retail electric service typically approve retail tariff rules for resource interconnection….36 states and the District of Columbia have adopted statewide interconnection standards either in the form of an administrative code or a public utility commission docket/order…. These standards vary widely from state to state but, as noted above, generally consist of: 1) the administrative procedures and technical standards used to evaluate potential impacts associated with interconnecting a generation resource to the electric power system; and 2) contractual agreements stipulating operational and cost responsibilities between the electric utility and the generation resource owner. These standards mainly address interconnection procedural requirements while relying on the technical requirements provided by IEEE standard 1547—Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces and Underwriters Laboratories (UL) standard 1741— Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.

Considerations for ESS Fire Safety (Consolidated Edison and NYSERDA, 2017): https://www.nyserda.ny.gov/-/media/Project/Nyserda/files/Publications/Research/Energy-Storage/20170118-ConEd-NYSERDA-Battery-Testing-Report.pdf

- "This report summarizes the main findings and recommendations from extensive fire and extinguisher testing program that evaluated a broad range of battery chemistries. The testing was conducted through much of 2016 on behalf of the New York State Energy Research & Development Authority (NYSERDA) and Consolidated Edison, as they engaged the New York City Fire Department (FDNY) and the New York City Department of Buildings (NY DOB) to address code and training updates required to accommodate deployment of energy storage in New York City."
- "Residual heat within a battery module was observed in this program, demonstrating that battery modules equipped with cascading protections will have a reducing effect on water flow rate requirements because less water will be needed to cool them."

DOE/EPRI Electricity Storage Handbook in Collaboration with NRECA (DOE/EPRI, 2013): https://www.sandia.gov/ess/publications/doe-oe-resources/eshb/doe-epri-nreca

- The Electricity Storage Handbook (Handbook) was jointly sponsored by the U.S. Department of Energy and the Electric Power Research Institute (EPRI) in collaboration with the National Rural Electric Cooperative Association.
- The Handbook "is a how-to guide for utility and rural cooperative engineers, planners, and decision makers to plan and implement energy storage projects."
- The Handbook provides a review of electricity storage services and benefits, descriptions of stationary electricity storage technologies, a discussion of methods and tools for evaluating electricity storage and an overview of storage systems procurement and installation, including a description of noteworthy past and present storage projects.
- Section 4.6 provides "a guide to addressing overall safety and environmental issues surrounding energy storage systems," including identification of a sampling of relevant codes and standards.

Hazard Consequences Analyses

DOE has further supplemented this Technical Support Document to include three hazard consequences analyses that address toxic gas plume dispersion modeling in the event of a battery energy storage system fire or thermal runaway event. These analyses evaluate toxic gas dispersion using site-specific factors to determine the maximum toxic endpoint distance that may result in a level of concern for nearby residents or first responders.

Hazard Consequences Analysis for the Black Walnut Energy Storage Project (Dudek, 2023): https://d3n9y02raazwpg.cloudfront.net/santa-paula/c054d956-af58-11ee-bb82-0050569183fa-56cacd49-0a22-4a57-b26e-add1b6bd2905-1705710698.pdf

- HCA: "esVolta, LP proposes to install a battery energy storage system (BESS) with a capacity of 30 megawatts (MW) in Santa Paula, California. This study evaluated the project's potential to cause adverse health effects on nearby sensitive receptors in the highly unlikely scenario of a thermal runaway event. As further discussed herein, emissions calculations indicated that for all the modeled scenarios, the public health impacts from toxic pollutants associated with the worst-case battery cell malfunction scenario would be less than significant."
- HCA: "During normal operations, there will be no toxic air emissions from the Facility. The BESS would also be equipped with i) monitoring and control systems, ii) fire detection and protection systems, and iii) gas ventilation systems, among others, to prevent, monitor, and/or control any battery cell malfunctions. However, to determine the worst-case public health impacts for this analysis, it is assumed that these multiple safety and ventilation systems fail and do not control the battery cell malfunction. It is also assumed that the battery cell malfunction

continues until the reaction is sufficiently abated (e.g., via suppression or water cooling) or ceases once stored energy has been expended."

- HCA: "In the event of a battery cell malfunction, such as a thermal runaway event, a fire could occur. While modern-day systems are designed to contain such fires within a single battery module, if a fire does occur, pollutants could be emitted to the atmosphere. Lithium-ion battery system fires are generally considered Class A (plastics fires, from materials such as the separator) and Class B (flammable liquids, from materials such as the electrolyte) but may also have characteristics of Class C (electrical fires) as well. As such, the pollutants generated are not dissimilar from other common residential and commercial fires."
- HCA: "To capture a worst-case scenario, it is assumed that the release of pollutants to the atmosphere would occur within a relatively short and concentrated period of time (i.e., one hour or less). The actual rate of release would be dependent on energy stored within the system and how the local fire department chooses to address the fire (e.g., a passive management approach vs. the application of water). In the unlikely event of a battery cell malfunction, the primary emissions released would be carbon dioxide (CO2) and carbon monoxide (CO), along with lesser amounts of other compounds. The emissions also include the chemicals released by the fire suppression system (for non-water-based systems)."
- HCA: "As mentioned above, as part of UL testing compliance, battery systems must be designed to limit thermal propagation. During UL9540A testing of the proposed project components, no module-to-module propagation was observed (TUVRheinland 2023). Therefore, the thermal runaway was contained within the module."
- HCA: "Based upon the recent testing data for the project components, there are seven hazardous substances that are potentially released during an accidental event within a BESS that may have an impact on nearby receptors. The hazardous substances include propane, hydrogen fluoride (HF), hydrogen cyanide (HCN), methanol, formaldehyde, and carbon monoxide (CO)."
- HCA: "The following describes the potential air toxics, potential effects from acute inhalation exposure, Emergency Response Planning Guidelines (ERPG) values, and Acute Exposure Guideline Levels (AEGLs). The descriptions of health effects are summarized from the National Institute of Health PubChem database. ERPGs are developed by the Emergency Response Planning committee of the American Industrial Hygiene Association (AIHA). AEGLs are developed by the National Academy of Sciences. Both the ERPGs and AEGLs have three levels, categorized by severity of impact. The ERPG values are defined as follows: • ERPG-1 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor. • ERPG-2 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action. • ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing life-threatening health effects. The AEGL values are defined as • AEGL-1 is the airborne concentration (expressed as parts per million (ppm) or milligrams per cubic meter (mg/m3)) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. • AEGL-2 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. • AEGL-3 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death. The distance of toxic endpoints uses the ERPG-2 and AEGL-2 values per EPA guidance to evaluate potential risk to nearby receptors or first responders."
- HCA: "esVolta, LP provided information on primary pollutants from a battery combustion malfunction. Tests were performed at the cell, module, and unit level. Detailed emissions calculations are provided in Attachment A. The compounds and the associated mass emission rates were determined by proprietary testing performed

by esVolta, LP as part of the UL9540A testing protocol. The tests showed that in the event of a single battery cell undergoing thermal runaway, there was little propagation to surrounding cells. In addition, the tests showed that when an entire battery system module was intentionally ignited, there was no propagation to surrounding modules. Because the battery malfunction events discussed above are unlikely to occur, and if such events were to occur, it will occur only within a single battery module. Therefore, this analysis, which assumes one module would be affected, presents a worst-case analysis (i.e., a multi-battery cell malfunction)."

- HCA: "The results of the offsite consequence analysis showed that concentrations at the ERPG-2 or AEGL-2 thresholds may extend to a toxic endpoint of approximately 210 feet from the toxic release. As indicated in Table 3, there are two receptors within that distance. However, those receptors are businesses that are not open at night when the modeled threat was observed. The threat at point analysis showed that none of the sensitive receptors identified would be exposed to concentrations at or above the ERPG-2 or AEGL-2 levels. Therefore, the project would result in a less than significant impact due to thermal runway of battery modules offsite."
- HCA: "This study also evaluated potential for a deflagration event caused by ignition of off-gasses resulting from a thermal-runaway scenario. Results from the analysis indicate that the worst-case battery cell malfunction scenario would result in acute impacts for toxic pollutant exposures below significant thresholds. Additionally, deflagration event emissions were determined to remain onsite and would not impact offsite locations or receptors. Therefore, the maximum potential public health impacts from the Facility are considered less than significant."

Hazard Consequences Analysis Report (HCA) for Valley Center Storage Project (Haley & Aldrich, 2020): https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/STP-20-011/Hazards%20Analysis_VCStorage_2020-07-14.pdf

- HCA: "This Hazard Consequences Analysis (Analysis) presents the results of an offsite consequence analysis associated with the operation of the Valley Center Storage Project; a 140-megawatt (MW) lithium-ion battery energy storage system (BESS) facility proposed by Valley Center ESS, LLC (Developer), in the unincorporated community of Valley Center, San Diego County, California (Project). Under normal operations, BESS do not store or generate hazardous materials in quantities that would represent a risk to offsite receptors. However, this Analysis was conducted to determine potential impacts resulting from the release of toxics from an unlikely but credible fire or thermal runaway event at the Project site. BESS thermal runaway/fire events may generate hazardous substances such as hydrogen chloride, hydrogen fluoride, hydrogen cyanide, and carbon monoxide, which may be released to the environment during such an event."
- HCA: "For the purposes of this Analysis, 'offsite' means any activity or receptors located beyond the boundaries of the Project site. The Project is not subject to 40 Code of Federal Regulations Part 68 (EPA's Chemical Accident Prevention Provisions), as there is no regulated substance present above any threshold quantity as defined in the regulation nor is it subject to California Accidental Release Prevention Program (CalARP) regulations. Nevertheless, this Analysis has been conducted consistent with the U.S. Environmental Protection Agency's (EPA) 2009 "Risk Management Program Guidance for Offsite Consequence Analysis" and guidance from CalARP, as suggested in Section 5.1 of the San Diego County's 2007 "Guidelines for Determining Significance, Hazardous Materials and Existing Contamination."
- HCA: "This Analysis was conducted using EPA's "Areal Location Hazardous Atmospheres" ([ALOHA]; Version 5.4.7, September 2016) hazards modeling program to determine distances to the toxic endpoints for release scenarios. The distance to the toxic endpoint is the distance a toxic vapor cloud, heat from a fire, or blast waves from an explosion will travel before dissipating to the point where serious injuries from short-term exposures will no longer occur."
- HCA: "The Project's preventative measures and state-of-the-art fire and safety systems, as more fully described in Section 2 of this Analysis, make a thermal runaway event very rare. Furthermore, in the unlikely event of thermal runaway, the Project's preventative measures and systems are designed to limit the event to a single battery module as well as reduce the duration and intensity of an event if it occurs. The Project is subject to the

requirements of Chapter 12 of the 2019 California Fire Code and will utilize pre-engineered battery storage systems and equipment certified under UL 9540, the established Standard for Energy Storage Systems and Equipment. The UL 9540 rating establishes the design limit of a thermal runaway events to a single battery module."

- HCA: "DNV-GL's Report estimated the limit of failure of a BESS as 1.5 battery racks (referred to as modules in their Report) in cases where, like the Project, the system includes adequate separations, cascading protections, and suppression systems to limit failure to a single cell or module or at least a single rack. DNV-GL found that "the probability of failure for multiple racks should be very low for systems with these active and passive barriers to catastrophic failure." The requirements of UL 9540A meets the safety recommendations of DNV GL's Report, making the runaway event of 1.5 racks sufficiently conservative."
- HCA: "UL 9540 contains safety standards for the system's construction (e.g., frame and enclosure, including mounting, supporting materials, barriers and more); the insulation, wiring, switches, transformers, spacing and grounding; safety standards for performance of over twenty different elements, such as tests for temperature, volatility, impact, overload of switches, and an impact drop test; and standards for manufacturing, ratings, markings, and instruction manuals. In addition to the many individual standards referenced, UL 9540 compliance requires a Failure Mode and Effects Analysis (FMEA) be performed and requires a test to ensure safe compatibility of the system's parts. Hence, the standard embodies both a "forest and trees" approach, ensuring that the components are certified, that the system as a whole is certified as safe, and that an FMEA has identified the set of things that might still go wrong, and taken action to mitigate those risks."
- HCA: "UL 9540 incorporates the UL 1973 standard, in which a battery manufacturer must prove that a failed cell inside will not cause a fire outside the system. The Project will meet the UL 9540 and industry standards for adequate separations, cascading protections, and suppression systems to limit failure to a single cell."
- HCA: "UL has also introduced a comprehensive testing method, UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage, designed to subject battery technologies to a variety an adverse conditions in order to determine if a thermal runaway event is achievable at the cell, unit, enclosure, and installation level and the impact of the event and ensuing fire at those levels. The results from the UL 9540A Test Method can also be used to address building code and fire safety concerns involving BESS installation, ventilation requirements, effectiveness of protection, and fire response methods."
- HCA: "Based upon testing data in available publications (the DNV GL Report, National Fire Protection Association studies), there are four hazardous substances that are potentially released during an accidental event within a BESS that may have an impact on nearby receptors. The hazardous substances include hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen cyanide (HCN), and carbon monoxide (CO)."
- HCA: "The offsite consequence analysis was conducted according to EPA's 'Risk Management Program Guidance for Offsite Consequence Analysis' and guidance from the CalARP. Plume analysis and exposure impacts were conducted using USEPA's ALOHA hazards modeling program. Based on information about a chemical release, ALOHA estimates how quickly the chemical will escape from containment and form a hazardous gas cloud, and also how that release rate may change over time. ALOHA can then model how that hazardous gas cloud will travel downwind, including both neutrally buoyant and heavy gas dispersion. Additionally, if the chemical is flammable, ALOHA simulates pool fires, boiling liquid expanding vapor explosions, vapor cloud explosions, jet fires, and flammable gas clouds (where flash fires might occur). ALOHA evaluates different types of hazards (depending on the release scenario); toxicity, flammability, thermal radiation, and overpressure. ALOHA produces a threat zone estimate, which shows the area where a particular hazard (such as toxicity or thermal radiation) is predicted to exceed a specified level of concern at some time after the release begins. ALOHA is able to determine a threat zone under different weather and wind scenarios."
- HCA: "The following describes the potential air toxics, potential effects from acute inhalation exposure, Emergency Response Planning Guidelines (ERPG) values, and Acute Exposure Guideline Levels (AEGLs). The descriptions of health effects are summarized from the National Institute of Health PubChem database. ERPGs

are developed by the Emergency Response Planning committee of the American Industrial Hygiene Association (AIHA). AEGLs are developed by the National Academy of Sciences."

- HCA: "Both the ERPGs and AEGLs have three levels, categorized by severity of impact. The ERPG values are defined as follows: • ERPG-1 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor. • ERPG-2 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action. • ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing life-threatening health effects."
- HCA: "The AEGL values are defined as: • AEGL-1 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. • AEGL-2 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. • AEGL-3 is the airborne concentration, expressed as parts per million (ppm) or milligrams per cubic meter (mg/m3), of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death. The distance of toxic endpoints (See Section 4) uses the ERPG-2 and AEGL-2 values per EPA guidance to evaluate potential risk to nearby receptors or first responders."
- HCA: "The results of the offsite consequence analysis show that potential concentrations at the ERPG-2 or AEGL-2 thresholds may extend to a toxic endpoint distance of approximately 51 feet from the toxic release during the unlikely but credible fire event during the nighttime scenario and may require shelter in place and/or evacuation of receptors within this toxic endpoint distance. The first 30 feet are entirely within the project boundary. No schools or daycares are located within the potential impact area."

Hazard Consequences Analysis Report (HCA) for Fallbrook Battery Energy Storage System (Haley & Aldrich, 2019): https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/FallbrookBatteryEnergyStorage/Hazard%20Consequences%20Analysis%20Report.pdf

- HCA: "This Hazard Consequences Analysis Report presents the results of an offsite consequence analysis associated with the operation of the proposed 40- megawatt (MW) battery energy storage system (BESS) initially proposed by AES Energy Storage in the unincorporated community of Fallbrook, in northern San Diego County. Under normal operations, a BESS does not store or generate hazardous materials in quantities that would represent a risk to offsite receptors. This offsite consequence analysis was therefore conducted to determine the impacts resulting from the release of toxics from a credible fire or thermal runaway event at the project site."
- HCA: "Appropriate preventative measures make a thermal runaway event a very rare event and can reduce the duration and intensity of an event when it may occur. The credible thermal runaway/fire event was determined to involve 1.5 battery racks. Per Consolidated Edison's 2017 "Considerations for ESS Fire Safety," "…the estimations limit of failure of a BESS is 1.5 battery modules [racks], with the presumption that the system should demonstrate adequate separations, cascading protections, and suppression systems to limit failure to a single cell [module] or at least a single module [rack]. The probability of failure for multiple modules [racks] should be very low for systems with these active and passive barriers to catastrophic failure."
- HCA: "The proposed St. Stephan Lutheran Evangelical School is located approximately 0.25 mile northeast of the project site. The Lavender Hill School is a small home school located approximately 700 feet east of the project site on parcel APN 1054210100. The nearest residence is located approximately 150 feet north of the battery storage area."

- HCA: “Based upon testing data in available publications (the Consolidated Edison study, National Fire Protection Association studies), there are four hazardous substances that are potentially released during an accidental event within the BESS that may have an impact on nearby population. The hazardous substances include hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen cyanide (HCN), and carbon monoxide (CO). These air toxics were analyzed using ALOHA to determine the characteristics of emissions, possible smoke or emissions plume under several weather and wind scenarios, and potential exposure impacts to population and animals within the plume area.”
- HCA: “The ALOHA program models dispersion of a release and compares predicted maximum concentrations to a toxic Level of Concern (LOC). The most common public exposure guidelines that are used as LOC’s include Acute Exposure Guideline Levels (AEGLs) Emergency Response Planning Guidelines (ERPGs), and Temporary Emergency Exposure Limits (TEELs). All have three tiers of exposure values for each covered chemical. At a general level, the tiers are similar: the first tier is a mild effects threshold, the second tier is an escape-impairment threshold, and the third tier is a life-threatening effects threshold. Any of these three sources may be appropriate for a LOC comparison. For releases with an impact area extending well beyond the site, AEGLs are often preferentially used, but modeling against AEGLs has been shown to predict lower concentrations at a closer distance than ERPG values (Kelsey, 2012).”
- HCA: “As impacts under the release scenario are close to the project site, ERPG values were selected for the level of concern (LOC) in this analysis. The following describes potential air toxics, potential impacts from acute inhalation exposure and ERPG values. The descriptions of health effects are summarized from the National Institute of Health PubChem database. ERPGs are developed by the Emergency Response Planning committee of the American Industrial Hygiene Association (AIHA). For many substances regulated by 40 CFR Part 68, included those listed above, the toxic endpoints listed in 40 CFR Part 68, Appendix A, are the ERPG-2 values published by AIHA. These are the toxic endpoints, which are airborne concentrations, that would be used if the facility was subject to 40 CFR Part 68 and are considered appropriate for this analysis. The offsite consequences analysis and distance of toxic endpoints used the ERPG-2 value per EPA guidance to assess the hazards impacts on nearby receptors. The ERPG values are defined as follows: • ERPG-1 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odor. • ERPG-2 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual’s ability to take protective action. • ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed to for up to one hour without experiencing or developing life-threatening health effects.”
- HCA: “In ALOHA, you can choose ERPGs as your toxic Levels of Concern when modeling a toxic chemical release if ERPGs have been defined for that chemical. ALOHA allows you to specify up to three toxic Levels of Concern. Modeling was conducted to identify maximum estimated distances to the ERPG-1, ERPG-2, and ERPG-3 values and the ERPG-2 value was used as the toxic endpoint.”
- HCA: “The results of the offsite consequence analysis show that the impacts at the ERPG-2 thresholds may extend to a toxic endpoint distance of approximately 33 feet from the toxic release/credible fire event and may require shelter in place and/or evacuation of receptors within this toxic endpoint distance. The estimated maximum toxic endpoint distance is primarily within the project site’s boundary but does extend to the adjacent undeveloped parcel (APN 1054101100), which is also controlled by Fluence. No schools or residences are located within the estimated maximum toxic endpoint boundary.”

  HCA: “The project will be equipped with the state-of- art Battery Management System (BMS), that monitors cell level voltage, state of health, cell temperature, and cell current in and out. If any of the monitored parameters are above or below pre-determined limits, the BMS will shut down and electrically isolate the affected battery rack from the system. This is designed to happen well before a battery cell overheats to the point that it will enter a thermal runaway state. Air conditioning equipment will be used to maintain safe ambient operating temperature

conditions. An effective method for Li-ion battery storage is to use a fire containment and suppression system that would deal with a battery fire event. Such systems contain the fire event and encourage suppression through cooling, isolation, and containment. It is important when using this approach to ensure batteries are housed in environments that feature fire suppression systems that extinguish through cooling. Suppressing a lithium ion (secondary) battery is best accomplished by cooling the burning material. The proposed project would include a gaseous fire suppressant agent (e.g., 3M™ Novec™ 1230 Fire Protection Fluid or similar) and an automatic fire extinguishing system with sound and light alarms. Water has been historically recommended as fire suppression because of its ability to cool and limited side effects. Novec 1230 evaporates 50 times faster than water, rapidly removing heat. The project will also be developed with an onsite fire hydrant for the fire department to use water to provide additional cooling and to prevent fires from spreading. The Consolidated Edison study found that if a fixed suppression agent is installed within an enclosed environment containing the event, it may suppress flammability in the enclosed space and make the use of water unnecessary. The Consolidated Edison study recommended that the first stage of fire suppression should be a gas-based suppression system to extinguish a single rack fire and prevent flashover in a contained environment. In the event that temperatures continue to rise, the study recommended the second stage of fire suppress be forced ventilation or water to cool the system and prevent further propagation of fire. This is consistent with the fire suppression measures proposed by Fluence. The use of Novec 1230 with an active suppression system is consistent with recommendations of the Consolidated Edison study and supports the determination [sic] adequate separations, cascading protections, and suppression systems would to [sic] limit failure to a single module or at least a single rack and that the credible thermal runaway/fire event involving a maximum of 1.5 battery racks is a conservative assumption."

Mobile Energy Storage Systems

Energy storage systems can be implemented in either stationary or mobile installations.

Application of Mobile Energy Storage for Enhancing Power Grid Resilience: A Review (Dugan, J., Mohagheghi, S., Kroposki, B., 2021) Energies 14, 6476: https://doi.org/10.3390/en14206476

- "Mobile energy storage systems, classified as truck-mounted or towable battery storage systems, have recently been considered to enhance distribution grid resilience by providing localized support to critical loads during an outage. Compared to stationary batteries and other energy storage systems, their mobility provides operational flexibility to support geographically dispersed loads across an outage area."
- "Mobile energy storage systems (MESSs) have recently been considered as an operational resilience enhancement strategy to provide localized emergency power during an outage. A MESS is classified as a truck-mounted or towable battery storage system, typically with utility-scale capacity. Referred to as transportable energy storage systems, MESSs are generally vehicle-mounted container battery systems equipped with standardized physical interfaces to allow for plug-and-play operation. Their transportation could be powered by a diesel engine or the energy from the batteries themselves. MESS containers typically hold batteries in addition to systems for thermal management, power conversion, and power control."
- "The design, operation, and maintenance of a MESS are governed by IEEE Standard 2030.2.1-2019, which stresses the importance of safety measures including anti-vibration, anti-collision, and waterproof capabilities."
- "MESSs also do not produce greenhouse gas emissions or create air pollution during operation and can be deployed to help meet clean energy targets."
- "Unlike conventional emergency response equipment such as diesel generators, MESSs can operate both during normal conditions and during emergency events. During normal operation, they can provide valuable grid services and capabilities including load leveling, peak shaving, spatiotemporal energy arbitrage, reactive power support, renewable energy integration, and transmission deferral."

Mobile Energy Storage System Report (Massachusetts Department of Energy Resources, 2020): https://www.mass.gov/doc/mobile-energy-storage-study/download

- "Mobile ESS can be self-mobile electric vehicles (light-duty vehicles, vans, or buses) or towable (towable or transportable via semi-trailer truck). This study provides a comprehensive assessment of Mobile ESS, their use in emergency relief operations, and their use on typical (non-outage) days. Specifically, this report addresses four fundamental questions; state-of-the-art, usage on typical days, opportunities and challenges to deploy in response to outages, and potential advantages over stationary BESS."
- "Mobile ESS are designed to be plug-and-play solutions requiring minimal reconfiguration once on site. Off-grid mobile ESS provide power without being connected to the grid."
- "The transportation of mobile ESS requires several specific preparations. First, before deployment the systems must undergo necessary testing and receive relevant certifications. The size and configuration of a mobile storage asset will need to be considered during transportation arrangements. This differs from stationary energy storage applications because those battery cells are disconnected and transported separately from the container to meet road weight restrictions. Another key consideration is the state-of-charge (SOC) of the battery energy storage equipment. Typically, energy storage systems are not transported at a fully charged state (SOC of 100 percent) due to safety concerns. For instance, when transported by aircraft, Li-ion cells and batteries must not exceed an SOC of 30 percent. However, in an emergency scenario when the mobile storage asset is needed for immediate use, recommended SOC limits are problematic. (One way around this could be to transport and charge mobile ESS on site ahead of forecasted events.) Authorities with jurisdiction (AHJ) over deployment requirements for mobile energy storage will need to agree on requirements that can address safety and ensures preparedness at the same time."
- "Mobile ESS must be designed and dispatched in a manner that protects the safety of the equipment operators, individuals at the site, utility workers, and the general public. Adherence to the codes, standards, and protocols that exist at the federal, state, and local levels will help prevent safety hazards. Two hazards of concern for mobile ESS are thermal runaway and electrical fire. Thermal runaway occurs when a temperature increase changes the operating conditions in a manner that further increases temperature, which may produce damage. Electrical fires are fires involving electrically energized equipment that can cause harm due to temperature, electrical shock, or both. The potential for thermal runaway can contribute to the electrical fire risk. Battery systems and the equipment to which they connect must be designed to prevent thermal runaway and electrical fires which can be associated with chemical reactions, current flow, and power dissipation."
- Section 3.2 of this study "details the site-relevant constraints and considerations for deploying energy storage systems in a temporary or semi-permanent configuration." The report outlines space requirements to consider when vetting locations for use of mobile energy storage systems including space separation (relative to buildings, equipment), firefighting access, egress routes, among others. For example, "Although mobile ESS should include adequate fire suppression systems, as discussed below, professional firefighters serve as a safety backstop. As such, adequate clearances should be provided to ensure access to the mobiles by firefighting personnel and their equipment."
- "Physical requirements of mobile energy storage are comparable to stationary battery systems. However, due to the physical size and weight of containerized batteries, additional site requirements are needed for emergency operation. If containerized batteries are intended to be used as long-term solutions and would need to be offloaded from the trailer, a platform designed to withstand heavy loads would need to be installed prior to deployment to ensure safe and effective operation in the event of an emergency. Mobile energy storage assets such as passenger vehicles or tow-behind trailers are required to be clear of any obstructions that may interfere with safe operation, display clear signage, and have suitable access."
- "As protocols are still being developed, standards will require further testing and revisions to create a more reliable communication for switching and operating energy storage in an emergency. It is important that all

utilities, owner/operators, and emergency personnel are familiar with existing ERP's so that proper protocols and coordination can be followed."

NFPA Today: Mobile Energy Storage Systems (O'Connor, B., 2023): https://www.nfpa.org/News-and-Research/Publications-and-media/Blogs-Landing-Page/NFPA-Today/Blog-Posts/2023/02/13/Mobile-Energy-Storage-Systems

- "The scope of NFPA 855 states that it applies to "mobile and portable energy storage systems installed in a stationary situation."
- "…when the mobile energy storage system needs to be parked for more than an hour, it needs to be parked more than 100 ft (30.5 m) away from any occupied building, unless the authority having jurisdiction (AHJ) approves an alternative in advance."
- "Before a mobile energy storage system is deployed, it needs to be approved by the AHJ, and a permit must be obtained for the specific use case. The permit application must include the following items: *MOBILE ENERGY STORAGE SYSTEM PERMIT APPLICATION CHECKLIST* • Information for the mobile energy storage system equipment and protection measures in the construction documents • Location and layout diagram of the area in which the mobile energy storage system is to be deployed, including a scale diagram of all nearby exposures • Location and content of signage • Description of fencing to be provided around the energy storage system and locking methods • Details on fire protection systems • The intended duration of operation, including connection and disconnection times and dates • Description of the temporary wiring, including connection methods, conductor type and size, and circuit overcurrent protection to be provided • Description how fire suppression system supply connections (water or another extinguishing agent) • Maintenance, service, and emergency response contact information."

There are existing categorical exclusions from the Department of Homeland Security and the Federal Emergency Management Agency that are relevant to mobile battery energy storage systems.

Department of Homeland Security (DHS), Implementation of the National Environmental Policy Act (Instruction Manual 023-01-001-01, Revision 01), Appendix A: https://www.dhs.gov/sites/default/files/publications/DHS_Instruction%20Manual%20023-01-001-01%20Rev%2001_508%20Admin%20Rev.pdf

"**N18 Federal Assistance for Construction or Installation of Structures, Facilities, or Equipment to Ensure Continuity of Operations.* Federal assistance for the construction or installation of measures for the purpose of ensuring the continuity of operations during incidents such as emergencies, disasters, flooding, and power outages involving less than one acre of ground disturbance. Examples include the installation of generators, installation of storage tanks of up to 10,000 gallons, installation of pumps, construction of structures to house emergency equipment, and utility line installation. This CATEX covers associated ground disturbing activities, such as trenching, excavation, and vegetation removal of less than one acre, as well as modification of existing structures." [NOTE: DHS explains "* Denotes classes of actions that have a higher possibility of involving extraordinary circumstances. A REC [Record of Environmental Consideration] will be prepared to document consideration of extraordinary circumstances whenever a CATEX that is identified by an asterisk is used."]

Federal Emergency Management Agency, Implementation of the National Environmental Policy Act (Instruction Manual 023-01-001-01, Revision 01), Appendix A: https://www.dhs.gov/sites/default/files/publications/DHS_Instruction%20Manual%20023-01-001-01%20Rev%2001_508%20Admin%20Rev.pdf

"*M13 Construction or installation of structures, facilities, or equipment for the purpose of ensuring the continuity of operations during incidents such as emergencies, disasters, flooding, and power outages involving less than one acre of ground disturbance. Examples include the installation of generators, installation of storage tanks of up to 10,000 gallons, installation of pumps, construction of structures to house emergency equipment, and utility line installation. This CATEX

covers associated ground disturbing activities, such as trenching, excavation, and vegetation removal of less than one acre, as well as modification of existing structures." [NOTE: DHS explains "* Denotes classes of actions that have a higher possibility of involving extraordinary circumstances. A REC will be prepared to document consideration of extraordinary circumstances whenever a CATEX that is identified by an asterisk is used."]

Change to 10 CFR part 1021:

B4.4 ***Power marketing services and activities***

Power marketing services and power management activities (including, but not limited to, storage, load shaping and balancing, seasonal exchanges, and other similar activities), provided that the operations of generating projects would remain within normal operating limits. (*See* B4.14 of this appendix for energy storage systems.)

Supplemental Supporting Basis:

This addition would conform to the establishment of a new categorical exclusion, B4.14, for energy storage, which includes flywheels and battery arrays. Discussion of the categorical exclusion is provided in Section II.C of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.C of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

Change to 10 CFR part 1021:

B4.6 ***Additions and modifications to transmission facilities***

Additions or modifications to electric power transmission facilities within a previously disturbed or developed facility area. Covered activities include, but are not limited to, switchyard rock grounding upgrades, secondary containment projects, paving projects, seismic upgrading, tower modifications, load shaping projects (such as reducing energy use during periods of peak demand ~~the installation and use of flywheels and battery arrays~~), changing insulators, and replacement of poles, circuit breakers, conductors, transformers, and crossarms. (*See* B4.14 of this appendix for energy storage systems.)

Supplemental Supporting Basis:

This deletion would conform to the establishment of a new categorical exclusion, B4.14, for energy storage, which includes flywheels and electrochemical-battery arrays. Discussion of the categorical exclusion is provided in Section II.C of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.C of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

Change to 10 CFR part 1021:

B5.1 ***Actions to conserve energy or water***

(a) Actions to conserve energy or water, demonstrate potential energy or water conservation, and promote energy efficiency that would not have the potential to cause significant changes in the indoor or outdoor concentrations of potentially harmful substances. These actions may involve financial and technical assistance to individuals (such as builders, owners, consultants, manufacturers, and designers), organizations (such as utilities), and governments (such as state, local, and tribal). Covered actions include, but are not limited to weatherization (such as insulation and replacing windows and doors); programmed lowering of thermostat settings; placement of timers on hot water heaters; installation or replacement of energy efficient lighting, low-flow plumbing fixtures (such as faucets, toilets, and showerheads), heating, ventilation, and air conditioning systems, and appliances; installation of drip-irrigation systems; improvements in generator efficiency and appliance efficiency ratings; efficiency improvements for vehicles and transportation (such as fleet changeout); ~~power~~

~~storage (such as flywheels and batteries, generally less than 10 megawatt equivalent);~~ transportation management systems (such as traffic signal control systems, car navigation, speed cameras, and automatic plate number recognition); development of energy-efficient manufacturing, industrial, or building practices; and small-scale energy efficiency and conservation research and development and small-scale pilot projects. Covered actions include building renovations or new structures, provided that they occur in a previously disturbed or developed area. Covered actions could involve commercial, residential, agricultural, academic, institutional, or industrial sectors. Covered actions do not include rulemakings, standard-settings, or proposed DOE legislation, except for those actions listed in B5.1(b) of this appendix.

Supplemental Supporting Basis:

This deletion would conform to the establishment of a new categorical exclusion, B4.14, for energy storage, which includes flywheels and electrochemical-battery storage. Discussion of the categorical exclusion is provided in Section II.C of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.C of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

C. Solar Photovoltaic Systems

Change to 10 CFR part 1021:

B5.16 ***Solar photovoltaic systems***

(a) The installation, modification, operation, ~~and~~ or ~~removal~~ decommissioning of commercially available solar photovoltaic systems:
(1) L~~l~~ocated on a building or other structure (such as rooftop, parking lot or facility, or mounted to signage, lighting, gates, or fences)~~,~~; or
(2) ~~or if~~ L~~l~~ocated ~~on land, generally comprising less than 10 acres~~ within a previously disturbed or developed area.
(b) Covered actions would be in accordance with applicable requirements (such as ~~local~~ land use and zoning requirements) in the proposed project area and the integral elements listed at the start of appendix B of this part, and would be consistent with applicable plans for the management of wildlife and habitat, including plans to maintain habitat connectivity, and ~~would~~ incorporate appropriate control technologies and best management practices.

Supplemental Supporting Basis:

Discussion of the categorical exclusion is provided in Section II.D of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.D of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

DOE Experience

Below are summaries of DOE environmental assessments (EAs) and findings of no significant impact (FONSIs) for solar photovoltaic projects. DOE did not identify any EA for solar a photovoltaic project that found significant effects requiring an EIS. DOE has added a summary of an EA for the Weld Solar Project issued by WAPA in 2024.

Environmental Assessment for the Weld Solar Project (DOE/EA-2178; WAPA, 2024):
https://www.energy.gov/nepa/doeea-2178-weld-solar-project-weld-county-co

- Proposed construction, operation, maintenance, and decommissioning of up to 150-MW nameplate capacity solar photovoltaic facility and a 100-MW battery energy storage system on approximately 1,028 acres of private land and 472 acres of state land approximately 4 miles northwest of Ault in Weld County, Colorado.
- EA: "The approximately 0.2-mile-long 345-kilovolt (kV) gen-tie line would extend south from an on-site Project substation, across Weld County Road (CR) 86 to the existing Ault Substation. Weld Solar is requesting interconnection of the Project to the WAPA transmission system at the Ault Substation. This interconnection would consist of an interconnection switchyard and substation located on approximately 12 acres directly adjacent to the north side of the existing substation."
- EA: "Weld Solar's project is primarily within areas of cultivated cropland and grassland, including native shortgrass prairie and disturbed rangeland. Up to 31 acres of temporary disturbance and 1,218 acres of permanent disturbance would occur as a result of Weld Solar's planned solar energy project."
- EA: "The perimeter of the solar facility will be enclosed by a 6-foot-tall chain-link fence topped with 1 foot of three-strand barbed wire…. The perimeter of the proposed substation will be enclosed by a 7-foot-tall chain-link fence topped with 1 foot of three-strand barbed wire. Cattle guards will be installed with gates, as necessary."
- EA: "The solar facility and BESS (including structure) would be recycled when the Project's effective operating life is over. Decommissioning would be completed by licensed subcontractors who would use similar methods as

those used in construction of the Project. Most parts of the proposed system are recyclable. Panels typically consist of silicon, glass, and a metal frame and can sometimes be reused or recycled through the manufacturer."

- EA: "Upon removal of the Project components, the site would be restored to pre-development conditions through revegetation and reclamation implementation. A revegetation plan would be developed for the Project."
- EA: "Current land use within the Project area and surrounding area consists primarily of dryland farming and cattle grazing (SWCA 2022c). The Project area is crossed by multiple transmission lines running generally northwest to southeast through the western portion of the Project area. Additionally, multiple transmission lines run north to south on the adjacent property east of the Project area. The Ault Substation lies immediately south of the Project area across CR 86. The Project area is flanked by CR 90 to the north."
- EA: "Low-elevation motion controlled lighting would be installed at primary access gates, substation, and entrance to energy storage facility. These security lights would be shielded to protect dark skies and only used in areas where it is required for safety."
- EA: "In construction areas where ground disturbance is significant or where recontouring is required, surface restoration will occur as required by the landowner or land management agency. The method of restoration will consist of returning disturbed areas back to their natural contour, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, and filling ditches, as applicable. A revegetation plan for the Project will be developed."
- EA: "Upon removal of the Project components, the site would be restored to pre-development conditions through revegetation and reclamation implementation. A revegetation plan would be developed for the Project."
- EA: "The existing visual character of the analysis area (area of visibility up to 3 miles from the Project area) would be affected during the period of construction by the generation of fugitive dust; movement of equipment and vehicles in and out of the Project area; and the presence and operation of construction cranes and other heavy equipment, transmission line stringing, and material stockpiles. The construction activities would introduce forms, lines, colors, textures, and motion not common in the landscape that would temporarily demand attention and create strong contrast with the existing setting. Removal of vegetation would expose lighter-color soils in the cleared areas for laydown/staging, the solar array electrical collection system, distribution lines, and solar array tracker foundations. Visual effects during Project operations would result from the visibility of the aboveground components associated with the Project, and the magnitude of change to the landscape character would be altered."
- EA: "A glint and glare analysis was conducted using the Sandia National Laboratory's Solar Glare Hazard Analysis Tools by Forge Solar to assess potential glare impacts resulting from the Project. Specifically, this analysis focused on potential glare on aircraft approaching the Northern Colorado Regional Airport, the Greeley-Weld County Airport, the Bellmore Farms Airfield, and the Yankee Airfield. This analysis identified no predicted glare occurrences for approaches for any runways associated with the Northern Colorado Regional Airport, the Greeley-Weld County Airport, the Bellmore Farms Airfield, or the Yankee Airfield (Forge Solar 2022). However, approximately 13 homes that are located in and around the proposed Project are expected to have varying durations of green glare throughout the year. One house located south of KOP 1 on Road 88 is expected to have yellow glare in the late afternoon during June and July. This receptor is expected to have approximately 1 minute of yellow glare and a yearly cumulative total of 49 minutes."
- EA: "Throughout the life of the Project, big game individuals would be able to effectively cross Project roads during times of Project inactivity, reducing potential impacts to big game species; however, in areas where fencing is installed, movement would be restricted. Big game species could be directly impacted by the Project through the potential for collision with vehicles during construction and operations activities. The response of big game to habitat removal, human activity, and vehicle collision would be variable and depend on the individual, species, distance, and the type, intensity, and duration of the disturbance. Disturbance would be restricted to pre-defined areas for construction and vehicular access, which would contribute to mitigating potential impacts to big game individuals and their habitat (Section 3.9.2.1). Considering the relatively minimal impacts to big game

habitat, including seasonal ranges (1% or less of the respective CPW-mapped range in the analysis area [see Table 3-12]), impacts from the construction and operations of the Project on big game species are not anticipated to be significant."

- EA: "Water consumption during construction would be used for dust suppression and earthwork over approximately 12 months. Weld Solar anticipates that between 50 and 75 acre-feet of water will be needed for the construction phase of the Project, primarily for dust abatement; 75 acre-feet is equivalent to the annual water use of approximately 150 households (Colorado State University 2014). Scheduled panel rinsing is not proposed for the Project, which further limits the need for water consumption."
- FONSI: "The EA analyzed and disclosed the potential environmental impacts of Weld Solar's planned project to fully inform its interconnection decision. The EA identified no significant impacts resulting from either WAPA's Federal action or Weld Solar's planned project."

Environmental Assessment for the Wild Springs Solar Project (DOE/EA-2068; WAPA, 2021): https://www.energy.gov/nepa/doeea-2068-wild-springs-solar-project-pennington-county-south-dakota

- Proposed construction and operation of the 128-megawatt (MW) Wild Springs Solar Project (Project) on approximately 1,100 acres within 1,499 acres of privately-owned land in Pennington County, South Dakota, including less than 1 mile of new overhead 115-kilovolt (kV) gen-tie transmission line. (Gen-tie stands for generation intertie, which is a transmission line that connects a generating facility (solar project in this case) with the electric grid.)
- Land within the project site is privately owned (except for WAPA's substation parcel) and predominantly used for livestock grazing and agricultural production
- EA: "The Project would utilize PV panels with tempered glass varying in size between approximately 4 to 7 feet long by 2 to 4 feet wide, and 1 to 2 inches thick. The panels would be installed on a tracking rack system made of galvanized steel and aluminum with a motor that allows the panels to rotate their angle. The panels and tracking rack system would be generally aligned in rows north and south…. Each tracking rack would contain multiple panels. On the tracking rack system, panels would be up to 20 feet in height from the ground to the top of the panels when at a 45-degree angle. Ground clearance to the bottom of the panels when at a 45-degree angle is approximately 32 inches depending on topography and vegetation constraints."
- The EA describes environmental commitments by the project proponent including, for example:
    - EA: "Wild Springs Solar will site the Project so that the perimeter fence excludes the 2019 mapped extent of both prairie dog colonies."
    - EA: "Above-ground Project facilities (solar panels, fencing, access roads, collector substation, and O&M building) would be sited no closer than 65 feet to wetlands within the Project Boundary."
    - EA: "Wild Springs Solar would compare the pre-construction surveys and two years of post-construction breeding bird surveys to determine if any displacement or change in avian use has occurred."
    - EA: "Grading would be minimized as the site conditions allow and all areas of temporary construction disturbance would be revegetated with a native grass mix. This would stabilize the soil and help to recover wildlife habitat."
- EA: "Habitat fragmentation would result from the permanent 7-foot high fence (6-foot chain link topped with one additional foot of barbed wire). The fencing would stretch 17.3 miles along the perimeter of the solar arrays, acting as a barrier to prevent large mammals (i.e., whitetail or mule deer, pronghorn) from using these portions of the Project Footprint. This permanent fencing would enclose blocks of panels, rather than surrounding the entire Project Footprint with a single fence (see Figures 3 and 4a-4d for fencing locations). Therefore, there are corridors through the Project Boundary for ground-based wildlife to move around or between the fenced areas." Further, "Prairie dog exclusionary fencing options may be utilized in portions of the Project such as chicken-wire below the chain link fence extending below grade."

- EA: “After construction of the solar facility is complete, Wild Springs Solar would revegetate the disturbed areas using a seed mix that includes recommendations provided by the NRCS and a cover crop. Approximately 96 percent of the land in the Project Footprint would be restored as open, herbaceous (i.e., within the racking area) rangeland cover (1,060.8 acres). Roughly 4 percent (47.3 acres) would be permanently converted to developed land with impervious surfaces (i.e., the substation and O&M building, inverter skids, parking areas, and access roads).”
- EA: “Field verification efforts noted that dryland cultivated cropland is predominantly used to produce annual crops such as alfalfa, hay crop, and wheat and also includes all land being actively tilled. Cultivated cropland is predominately in the northwestern portion of the Project Boundary. … There are a total of 288.7 acres of cultivated cropland within the Project Footprint and construction and operation of the Project would remove these lands from production for the life of the Project (Table 4) and convert their use to developed land. Areas of cultivated cropland within the Project Footprint would be reseeded with a native seed mix that is similar to the surrounding herbaceous landscape for the life of the Project.… The U.S. Department of Agriculture, Natural Resource Conservation Service requested a Farmland Protection Policy Act review of the Project. Based on this review, the Project would not impact prime or unique farmland.”
- EA: “Based on aerial photography and the wetland delineation data, the Project design avoids three of the five intermittent streams that bisect the Project Boundary…. Of the two intermittent streams that cannot be avoided, one would be crossed by two access roads, and Wild Springs Solar would utilize low water crossings and culverts to reduce impacts. For the second intermittent stream, Wild Springs Solar would either bore collection lines beneath the waterway or utilize a Nationwide Permit, which is necessary for work in streams, wetlands, and other waters of the United States under Section 404 of the CWA.”
- FONSI: “The Project Footprint overlaps with 82 acres of 100-year floodplain. Initial assessments suggest that the floodplain extents are significantly less than indicated by FEMA’s effective mapping, and that adverse upstream impacts are very unlikely.”
- EA: “Wild Springs Solar has coordinated with Pennington County and plans to seek a Letter of Map Revision (LOMR) from FEMA. Wild Springs Solar submitted the LOMR application on November 23, 2020. Wild Springs Solar is currently coordinating with FEMA on the LOMR. Assuming the mapping revision is granted, a Floodplain Permit would not be required. Alternatively, if the mapping revision is not granted, Wild Springs Solar would seek a Floodplain Permit through Pennington County.” (NOTE: Following WAPA’s issuance of the FONSI, the LOMR was approved by FEMA and became effective on January 18, 2022.)
- FONSI: “The combination of topography in the area and low-profile arrays is such that most of the Project would not be seen from long distances. The gen-tie transmission line would be visible from longer distances but would be likely [to] blend with the other existing transmission lines near the New Underwood substation.”
- FONSI: “The principal reason for the lack of significant environmental impacts is the use of avoidance measures and environmental commitments as a required component of the project.”

Environmental Assessment for the Front Range — Midway Solar Interconnection Project (DOE/EA-2018; WAPA, 2016): https://www.energy.gov/nepa/ea-2018-front-range-midway-solar-interconnection-project-el-paso-county-colorado

- This environmental assessment evaluated the potential environmental impacts of proposed construction and operation of a 100-MW PV solar electric generation facility (~911 acres) and the associated gen-tie line (approximately 0.85 miles in length) by Midway Solar to connect the solar facility to WAPA’s Midway Substation. The proposed Project would consist of PV panels, tracking system, and associated electric power collection system, with light-duty gravel covered service roads. In addition, WAPA would be required to build a new 230-kV bay within the Midway Substation, install new communications and protection equipment within the substation’s control building; and install new take-off and gen-tie structures to direct the 230-kV transmission line into the new bay. (A take-off structure is where a transmission line terminates in a substation.)

- EA: “Various types of solar technology could be utilized on the proposed Project. Polycrystalline panels are very common and widely used on solar projects in various geographies. If polycrystalline panels were used for the Project, the proposed solar array would consist of over 300,000 PV panels on a single axis tracking system supported on steel posts. If other technologies such as thin film were incorporated, more panels would be needed; although the panels are smaller, the same overall area would be occupied by the proposed Project. Solar arrays would be positioned nearly three feet above ground level and extend up to 10 ft in height.”
- EA: “The gen-tie line would be located within existing transmission line corridors and in close proximity to existing transmission lines. The inclusion of a new overhead power line near existing transmission lines would have a negligible impact on the visual resources of the Project Study Area.”
- EA: “None of the soils that occur in the Project study area were classified as prime or unique farmland.” (“The land uses within the Project Study Area were described as vacant or undeveloped. Land uses near the Project Study Area included residential developments to the immediate west and northwest of the Project Study Area, with Fort Carson further west. Immediately south of the Project Study Area was a landfill operation and undeveloped lands.”)
- EA: “While these developments, the gen-tie line and solar facility collection substation, represent a substantial visual change over existing undeveloped conditions, these changes would likely be viewed as negligible to minimal compared to the altered state of the existing substations, transmission line corridors, and natural gas fueled electric generation facilities in the area. The overwhelming majority of the proposed Project, however, includes the development of 911 acres of solar field. The solar field would consist of 8-ft high glass PV panels mounted on steel structures and would be enclosed by 6-ft high chain link fencing. The proposed solar field would span over two miles east to west and nearly 1.5 miles north to south. The solar field would not be a homogenous rectangle of panels, but would include a large surface area that would be visible for a considerable distance. The solar field would be located in the vicinity of existing electric utility infrastructure, but the size of the solar field would far exceed the current visual limits of the existing infrastructure. Furthermore, solar panels can have a highly reflective surface depending on the technology used for the system. Based on the size of the proposed solar facility, proximity of residents and passenger traffic, and the potential for solar panels to be highly reflective, Midway Solar’s proposed solar field would have a minor-to-moderate impact on the views and visual resources.”
- EA: “The potential glare hazard of the proposed PV arrays to vehicular traffic in the vicinity was analyzed using Sandia National Laboratories’ (Sandia) Solar Glare Hazard Analysis Tool (SGHAT; Sandia 2015; WEST 2015). … The Sandia SGHAT results suggest glare associated with the proposed solar facility would have a negligible to minor impact on vehicle traffic near Project Study Area.”
- FONSI: “Midway Solar has incorporated WAPA’s Standard Construction Practices and Best Management Practices into the description of its proposed Project. The analysis of environmental impacts identified no potential impacts that would be considered significant and no mitigation measures that should be implemented additional to those already embedded within the proposed project description. The principal reasons for the lack of significant environmental impact was the avoidance of sensitive resources during siting of the solar facility, the minor amount of disturbance at structure locations, and Midway Solar’s efforts to work cooperatively with affected landowners.”

Environmental Assessment for Department of Energy Loan Guarantee for the Agua Caliente Solar Project (DOE/EA-1797; DOE, 2010): https://www.energy.gov/nepa/doeea-1797-agua-caliente-solar-project-yuma-county-arizona

- Proposed construction and operation of a solar energy generating project that would generate approximately 290 megawatts of renewable energy through the use of photovoltaic (PV) technology.
- The project site would occupy approximately 2,400 acres of private, agricultural property.
- EA: “The proposed Project consists of a utility-scale solar photovoltaic facility utilizing cadmium telluride solar panels (PV modules)….”

- EA: “The design calls for fixed tilt PV modules, inverters, and transformers to be combined into approximately 1MW, or larger, blocks that are repeated to reach the full contract capacity. … The PV panels would be mounted on fixed-tilt structures. Using this mounting system, the PV modules would be mounted onto steel frame structures, approximately 6 feet off the ground, facing south and arranged on an east-west axis, angled towards the sun.”
- EA: “The existing land use on the Site is agricultural. The Site has been historically farmed for many decades, and all of the Site has been previously disturbed.”
- EA: “The Agua Caliente Solar Project site does not contain prime or unique farmlands.”
- EA: “Development of the Project would result in a change of land use on the Site from irrigated agriculture to the industrial use associated with the Project. Agriculture and the associated irrigation infrastructure would be removed from the site. If the Project is constructed, the majority of the Site would be covered by solar panels with small areas used for the O&M area, the substation, and site drainage control features. This land use conversion would not be irreversible as the Site could be returned to irrigated agriculture after the Project was removed.”
- EA: “There would be no significant adverse impacts on other land uses in the area as a result of development and operation of the Project. There are no nearby residential areas, existing communities, or other uses. Continuation of the primary local land use – agriculture –on the lands adjacent to or near the Project would not be affected. The northern portion (approximately 1,400 acres) of the Whitewing Ranch north of the Site where the Project is located would continue in irrigated agriculture.”
- EA: “Although these [plant and wildlife] species have the potential to occur in the Project vicinity, due to the highly disturbed nature of the Site, few of these plant and wildlife species are expected to occur on the Site. No native plants or habitats occur on the agricultural lands that will be impacted by development of the Project.”
- EA: “There would be minimal off-site impacts because all transmission interconnections would be located on this already disturbed site. The Project would tie in with the existing Palo Verde — North Gila #1 500kV transmission line located along the southern Project boundary via a short Gen-Tie line and a new utility owned Q43 switchyard – both of which would be located on the Project Site.”
- FONSI: “On the basis of the final EA, DOE has determined that providing a Federal loan guarantee to Agua Caliente for construction and startup of the 290MMW photovoltaic solar power project and its associated connection to the Palo Verde – North Gila transmission line in Yuma County, Arizona, will not have a significant [e]ffect on the human environment.”

Environmental Assessment for Department of Energy Loan Guarantee for the SunPower, Systems California Valley Solar Ranch (CVSR) Project in San Luis Obispo County, California (DOE/EA-1840; DOE, 2011): https://www.energy.gov/nepa/ea-1840-department-energy-loan-guarantee-sunpower-systems-california-valley-solar-ranch

- The proposed action is the design, construction, and startup of a 250-MW solar photovoltaic (PV) electricity generating facility in San Luis Obispo County, CA, on previously disturbed, former agricultural land. The Project also includes construction of a 4-mile 230-kilovolt (kV) interconnection line, which would connect the facility to an existing PG&E transmission line, reconductoring of 35 miles of the existing transmission line, and construction of a new switching station.
    - An existing 10-acre borrow pit near the transmission corridor would be expanded to a 24-acre surface mine to produce an aggregate base for access road construction. Though not a part of the proposed action, establishment of the mine is addressed in the EA as a connected action.
- The proposed site would be primarily located on private property on about 4,700 acres of rural land, with few residences. As planned, 811,000 PV solar panels would be mounted on tracker units and arranged in 10 separate solar panel arrays. The tracker is designed to have a low profile, typically 5 to 6 feet above the ground when oriented in the horizontal position (may be slightly higher in limited areas with steeper slopes). The foundations would be driven directly into the ground without the need for concrete foundations.

- The county prepared an Environmental Impact Report (EIR) for the Project in accordance with the California Environmental Quality Act (CEQA). "In the Final EIR, the County identified significant impacts to several environmental resources based on CEQA significance criteria and analysis methodology. Because of the differences in the proposed project at the DOE stage and between San Luis Obispo County's and DOE's impact evaluation criteria, the impacts of the project are different when evaluated under NEPA."
- The EA lists Project Design Features in Appendix B, which "are defined as those specific means, measures, or practices that have been incorporated into the proposed action to avoid or reduce adverse impacts."
- Habitat occupying approximately 1,684 acres of land would be permanently disturbed by the project. Regarding this matter, the EA notes that "because adverse effects on vegetation and habitat from construction and operation of the proposed action would be avoided or minimized through incorporated project design features (Appendix B), effects would be minor and not significant." Some of the design features include: photovoltaic arrays would use foundations and supporting structures that preserve most of the existing annual grassland ground cover; except where grading is otherwise required, vegetation would not be removed to install the solar trackers; revegetation plans; and biological monitors would be assigned to the site. The monitors would be responsible for ensuring that impacts to special status species, native vegetation, wildlife habitat, or unique resources would be avoided to the fullest extent possible.
- EA: "Fencing would be designed to avoid potential impacts on local wildlife species, including the San Joaquin kit fox (Vulpes macrotis mutica) and pronghorn antelope. There would be about 100,000 linear feet of perimeter fencing on the CVSR site, most of which is already present (an estimated 18,000 linear feet of new fencing may be required). There would be about 116,120 linear feet of fencing around the solar arrays. The Applicant would also remove approximately 52,800 linear feet (about 10 miles) of existing interior fencing and associated wooden posts."
- EA: "Except in selected areas where alternative fencing would be used for safety reasons, perimeter fencing (i.e., both existing and new) would be either repaired and retained or modified to incorporate wildlife movement design features (see Section 3.8, Biological Resources). The existing perimeter fencing is generally traditional four-wire barbed wire ranch fence. The modified perimeter fence segments, which would be a minimum of 300 feet in extent, would be three-strand ranch fencing with a smooth wire on the bottom that would be elevated 18 inches above ground level. The top of the modified segments of fence would be no greater than 42 inches above ground level. In compliance with resource agencies requirements and as part of the biological resources habitat mitigation and monitoring plan, approximately 23,750 linear feet of perimeter fencing is proposed for the area north of SR-58. With this additional fencing, there would be an estimated 60,250 linear feet of modified perimeter fencing."
- EA: "Current National Electrical Safety Code requirements mandate a 7-foot-high fence around electric generating equipment. If 7-foot-tall fencing is required for inverters and/or arrays in addition to the CVSR substation and Caliente switching station, it would be constructed around the arrays only, rather than around the site perimeter. The fencing around the arrays would be constructed using wire mesh with a 6- inch by 6-inch opening. This design would allow San Joaquin kit fox to pass through the fence without risk of entanglement and would prevent coyotes and domestic dogs from entering the array areas. The 7- foot fence would use both wooden uprights, approximately 3 inches in diameter, and steel t-posts. Anti-perch structures would be installed on top of the 7-foot-tall wooden poles."
- EA: "Agricultural use of the CVSR site has been restricted by limited water supply and poor water quality. The site is currently functioning as private grazing land and habitat, but not as farmland. … No Prime or Unique farmland is present within the CVSR site, within the interconnection line route, within the Morro Bay–Midway transmission line reconductoring route…." "The severe water quality and quantity restrictions that prevent the CVSR site from being irrigated have significantly limited its agricultural potential. Water for local agricultural operations for the CVSR site is obtained primarily from the Carrizo Plain Groundwater Basin, and data suggest that groundwater supplies in this basin are inadequate to sustain irrigated use. Therefore, these areas are not considered to have access to adequate water supplies to sustain irrigated use and do not meet the Prime Farmland criteria."

- EA: "…the proposed action would not result in a permanent conversion of NRCS designated Prime Farmland."
- EA: "To further reduce effects on agricultural lands, the Applicant would conserve, in perpetuity, off-site farmland located within San Luis Obispo County at a 1:1 ratio through establishment of an open space easement or other farmland conservation mechanism acceptable to the County. In addition, the Applicant would coordinate construction activities with agricultural land owners to minimize disruption to agricultural operations and restore agricultural areas disturbed by construction to pre-construction conditions. The Applicant would provide compensation to landowners for crop loss and other reasonable and associated costs as soon as practicable after completion of construction. In addition, in order to compensate for potential crop loss due to construction activities associated with reconductoring the Morro Bay–Midway transmission line, the Applicant would coordinate with agricultural landowners and grazing operators to schedule construction activities so as to minimize disruption to agricultural operations."
- EA: "Approximately 3,233 acres of the solar generation facility site would be preserved as open space and wildlife corridors. The Applicant would implement a controlled grazing plan to manage annual grassland fuel load and height for fire deterrence, such as having sheep and/or goats graze in the array area and removing vegetation that would otherwise increase the risk of a grass fire. Implementation of this grazing plan would enable the existing agricultural use of most of the CVSR site to continue."
- Regarding air quality, the EA states that through implementation of design features, other measures, and feasible emission controls, the temporary emissions of NOX, VOCs, and fugitive dust during construction and reconductoring would be reduced and would not be significant. "To further reduce impacts, the Applicant would also implement or fund a program for off-site mitigation of ozone precursors (Nox and VOC) from existing sources in surrounding communities based on final engineering and approval by the [county]."
- The EA explained that consistent with the industry-standard U.S. Department of Transportation Federal Highway Administration methodology, DOE analyzed the visual effects as a combination of the physical changes that would be introduced by a project, and also the anticipated impacts on individual viewers, such as users of the Carrizo Plain National Monument, which is about 2 miles from the site. The EA notes that the monument viewers "would be of a low number, would likely visit the monument infrequently, and, depending on activity, would likely have a short view duration; furthermore, these viewers would be within the middleground or background distance zones."
- The Applicant utilized numerous siting and design features to reduce potential impacts to the visual setting, "such as the preservation of adjacent lands, retaining the natural landscape along the north side of SR-58, use of aesthetic treatments (e.g., landscaping, entrance treatments, and a fencing plan), and use of the minimum necessary nighttime lighting…" Further, "to reduce visual intrusiveness, the Applicant would maintain setbacks from public roads and provide vegetative screening for residences. The Applicant would also implement an exterior and signage lighting plan."
- EA: "Because the Applicant would limit noisy construction activities to the hours exempt from the noise limits specified in [the local] ordinance, monitor noise levels within 3,700 feet of the CVSR site perimeter, and implement noise attenuation measures that meet established limits, temporary increases in noise levels from construction would be minor and not significant."
- FONSI: "On the basis of the Final EA, DOE has determined that providing a Federal loan guarantee to HPR II for construction and start-up of the 250 MW CVSR photovoltaic solar power project and reconductoring of the PG&E 230-kV Morro Bay-Midway transmission line in San Luis Obispo and Kern Counties, California, will not have a significant effect on the human environment."

Environmental Assessment for Department of Energy Loan Guarantee to Cogentrix of Alamosa, LLC for Construction of the Cogentrix Solar Project near Alamosa, Colorado (DOE/EA-1839; DOE, 2011): https://www.energy.gov/nepa/articles/ea-1839-final-environmental-assessment-and-finding-no-significant-impact

- DOE proposes to issue a loan guarantee to Cogentrix of Alamosa, LLC (Cogentrix) to support construction of a 30-megawatt high-concentrating photovoltaic (HCPV) energy facility in Alamosa, Colorado. (DOE's EA evaluates the potential impacts of construction and operation of the facility.)
- The Project site consists of approximately 225 acres, and the HCPV solar power units would use approximately 180 acres of the site.
- Land within the project site is cultivated, private agricultural land. Adjacent land uses include active and inactive agriculture, irrigation, residences, and utility transmission lines.
- EA: "The Project area has been extensively modified by agricultural activities and irrigation projects. Most of the Project area is plowed farm lands that retain limited natural habitat features."
- EA: "Cogentrix would install approximately 500 HCPV solar trackers from the manufacturer Amonix. The solar trackers consist of an HCPV solar cell panel assembly mounted on a support column …. A hydraulic motor is used to rotate and tilt the solar panel assembly throughout the day so the surface of the solar panel always maintains an optimal angle with respect to the sun. Each tracker has an inverter mounted on the support column, which is physically located to minimize the effects of shadows cast by adjacent trackers when the sun is low in the sky (early morning or late afternoon). The tracker minimum height is 27 feet 6 inches; this occurs when the tracker is in the horizontal position. The tracker maximum height is 50 feet 9 inches; which occurs at sunrise and sunset."
- EA: "…the Project area includes approximately 225 acres of irrigated farmland. These 225 irrigated acres would be converted to a solar electrical generation facility, and taken out of agricultural production."
- EA: "Construction of the facility would convert approximately 14 acres of prime or unique farmland. None of the combined ratings resulting from the NRCS evaluation exceeded 160 points. According to the Farmland Protection Policy Act, sites with a rating less than 160 need no further consideration (Appendix B)."
- EA: "A visual analysis was conducted to document the existing visual conditions on the Project site and the surrounding area and assesses the extent to which the proposed Project has the potential to affect the valued qualities of the area's scenic resources. The analysis was conducted using the evaluative process set out by the Federal Highway Administration in Visual Impact Assessment for Highway Projects…."
- EA: "Visual impacts resulting from the Project would consist of the alteration of the presently open farmland to a solar energy facility. While the panels would be noticeable features to those viewers within the immediate Project vicinity, the visual impact of the Project would remain fairly localized, with changes to visual quality diminishing with increasing distance."
- With respect to water use, the EA stated that "the Project area includes approximately 225 acres of irrigated farmland" that would be "taken out of agricultural production. Therefore, the construction and operation of the solar electrical generation would thereby "substantially reduce the current water consumption used for annual agricultural activities, resulting in a net water balance gain."
- EA: "Based on species habitat requirements and distributions and habitats available in the Project site, it is unlikely that federally listed threatened or endangered species would occur in the Project site. In addition, no designated critical habitat occurs within the Project area. Therefore, no federally listed threatened or endangered species or critical habitat would be impacted by the proposed project. [Colorado Division of Wildlife] concurred with the no effect determination for the proposed project, and USFWS also determined that the proposed project would have no effect on federally listed threatened and endangered species or their habitat."
- EA: A Class III cultural resource inventory identified the Central Lateral Canal of the San Luis Valley Canal as a resource eligible for listing on the National Register of Historic Places (NRHP). The Central Lateral Canal runs along the southern and southwestern edge of the project site.

- EA: “The Cogentrix project would not affect the Central Lateral Canal which runs along the boundary of the project site. The Canal would be completely avoided during construction of the proposed project, and a silt fence barrier would be erected between the canal and the construction zone to protect the canal during construction activities. The undertaking would not alter, directly or indirectly, any of the characteristics of the Central Lateral Canal that qualify it for NRHP listing, nor would it diminish the Canal’s integrity.”
- FONSI: “DOE examined potential impacts on the following resources and found none to be significant: land use and visual resources; air quality; noise; geology and soils; water resources; biological resources; cultural resources; socioeconomics and environmental justice; public health and safety, including impacts related to intentionally destructive acts; transportation; waste and hazardous materials management; and cumulative effects, including global climate change.”

Environmental Assessment for Department of Energy Loan Guarantee for the AV Solar Ranch One Project in Los Angeles and Kern Counties, California (DOE/EA-1826; DOE, 2011): https://www.energy.gov/nepa/ea-1826-department-energy-loan-guarantee-first-solar-inc-av-solar-ranch-one-project-los

- Proposed design, construction, and start-up of a 230-megawatt gross output photovoltaic (PV) solar power plant and 230-kV transmission line, in Los Angeles County, California, on approximately 2,100 acres of private land, previously used for agriculture.
- The Project includes an operations and maintenance (O&M) building, an approximately 4.25-mile long 230-kilovolt (kV) transmission line, which will connect the facility substation to Southern California Edison (SCE)’s Whirlwind Substation in Kern County.
- The Project utilizes PV technology using non-reflective, cadmium-telluride (CdTe) solar panels, at least 50 megawatts (MW) of which would be mounted on single-axis trackers. The remainder is mounted on fixed tilt supports. The maximum height of tilted trackers is approximately 14 feet.
- Areas immediately adjacent to the property are either vacant lands or agricultural fields, and the Project site vicinity is an area of low residential density.
- EA: “The majority of the Project site had been historically farmed (primarily dry farming) since the 1950s, and was farmed continuously until 1995. The last irrigated farming activity consisted of an 80-acre crop of onions in 2004.”
- EA: The solar generation site and the 230-kV transmission line route contain soil units that are considered “Prime Farmland if irrigated.”
- EA: “In accordance with the FPPA, the DOE has coordinated with the NRCS, and jointly completed the FPPA Farmland Conversion Impact Rating form (Form 1006) (see Appendix E). Data used to complete the form was obtained from site observations, GIS analysis, and NRCS soils information.” As identified on the Form 1006 in Appendix E, land assessment and site assessment criteria were calculated according to FPPA guidelines, and the solar generation site and the proposed transmission line route would each result in less than 160 total points (threshold). Therefore, under the provisions of 7 CFR 658.4I(2), additional consideration for protection is not necessary.
- EA: “The proposed action would involve covering the majority of the site with solar panels with small areas used for the O&M area, the substation, and site drainage control features. This land use conversion would not be irreversible as the Site could be restored to approximately the current condition at the end of the operational period of the Project.”
- The EA summarizes various measures to be implemented by the Applicant, which “result in the avoidance or minimization of Project impacts to less than significant levels”: Hazardous Material Management Program (HMMP); Recycling and Reuse Plan; Mitigation Monitoring and Reporting Plan (MMRP); Fire Protection and Prevention Plan; Vegetation Management and Fire Control Measures Plan; Plant Operations Fire Protection and Prevention Program, and Dust Control Program.

- An analysis of visual factors was conducted from key observation points (KOPs) that are representative of the visual conditions around the Project area. The EA generally concluded: "Implementation of the proposed action would involve a shift in land use from rural open space to solar energy generation. While the proposed action would cover a relatively large area, the solar generation portion of the proposed action would not be readily visible from middleground or more distant locations, and would only have a moderate effect to foreground views. More specifically:
    - EA: "The potential cumulative impacts to visual resources from the proposed Project when considered together with other proposed projects are minimal since the proposed Project features would generally only be visible from distant elevated vantage points within a maximum of approximately 5 miles and from relatively short segments of SR-138 and 170th Street West."
    - EA: "The only publically accessible elevated vantage points with unobstructed views and within 5 miles of the proposed Project facilities are from the Antelope Valley California Poppy Reserve and to a lesser extent the Arthur B. Ripley Desert Woodland State Park to the southeast and southwest of the proposed Project site, respectively.… the proposed Project facilities are almost indistinguishable from these viewing locations."
- EA: "The majority of the impacts to air quality from the proposed Project would occur during the construction phase and would be temporary and less than significant."
- EA: "The proposed Project alone would be expected to reduce carbon dioxide (CO2) equivalent (CO2e) emissions by approximately 195,000 metric tons per year compared to traditional generation source emissions for an equivalent electrical output."
- EA: "The proposed Project (solar generation site and transmission line) has the potential to result in biological impacts to: natural habitats, sensitive natural communities, special status species, and wildlife movement. However, with implementation of [Applicant Committed Measures], including on-site and off-site mitigation, avoidance of biological resources and habitats, implementation of wildlife-permeable fencing, and revegetation and restoration efforts, as required by the approved Conditional Use Permit (Los Angeles County), the proposed Project would fully mitigate potential biological effects."
- EA: "The Project site perimeter will be secured with a 7-foot-tall chain link fence with 1 foot of 3-strand barbed wire on top; additionally, a "slack wire" would be installed on top of the upper strand of barbed wire as an anti-perch device. Controlled access gates will be located at the main site entrance and at other locations to facilitate access for maintenance and emergency response equipment. Wildlife permeable fencing will be installed at regular intervals around the site perimeter. This fencing would consist of a 1-foot vertical space at ground level to allow for wildlife passage. Other fence designs that will allow as much or greater wildlife movement may be used in certain areas if needed."
- Regarding the construction of the proposed Project solar generation facility involving the permanent and temporary removal of existing vegetation, the EA states: "[The] removal and modification of sensitive habitat would be mitigated through the Applicant-proposed on-site Habitat Enhancement and Vegetation Management Plan (HEVMP) and off-site mitigation (as required by LA County CUP), as these measures would require the preservation and enhancement of wildflower field vegetation within the Project site and vicinity at a ratio of 1.5:1…These measures are required by the approved Los Angeles County CUP for the Project and would be monitored and enforced by the Los Angeles County Department of Regional Planning. These County-required measures would result in a net increase of wildflower field vegetation in the Project vicinity." Further, "The biological monitor will ensure that impacts to biological resources are avoided or minimized to the fullest extent possible. During earth moving activities, the biological monitor will be present to relocate any vertebrate species that may come into harm's way to undisturbed areas of suitable habitat using appropriate methods that would not injure the wildlife."
- FONSI: "DOE examined potential impacts on the following resources and found none to be significant: land use; visual resources; noise; air quality; geology and seismicity; water resources, including floodplains; biological

resources; cultural resources; socioeconomics and environmental justice; public health and safety, including impacts related to intentionally destructive acts; transportation; and cumulative effects, including global climate change."

Environmental Assessment for Department of Energy Loan Guarantee to Sempra Generation for Construction of the Mesquite Solar Project in Maricopa County, AZ (DOE/EA-1796; DOE, 2011): https://www.energy.gov/nepa/doeea-1796-sempra-mesquite-solar-energy-project-maricopa-county-arizona

- DOE proposes to issue a loan guarantee to Sempra Generation (Sempra) to develop a 400-megawatt photovoltaic (PV) solar energy generating facility consisting of a solar field of ground-mounted PV panels, an electrical collection system that converts generated power from direct current to alternating current, a substation, and a generation-tie (gen-tie) power line.
- The project site consists of two adjacent parcels—a 2,480-acre parcel (Part 1), and a 1,280-acre parcel (Part 2); lands within both parcels are owned by Sempra or are controlled through an option to purchase. Project development would occur on approximately 1,530 acres of Part 1 and 980 acres of Part 2.
- The proposed 230-kilovolt (kV) gen-tie line would originate at the project site and terminate at the Mesquite Generating Station switchyard, an existing natural gas-fired generation located approximately two miles east of the proposed project site. The gen-tie line length would be 4.5 miles long and utilize monopole tubular steel transmission structures would be 150 feet high with spans between the structures of 500 to 1,000 feet.
- EA: "The Mesquite Solar Energy project site itself consists primarily of rural undeveloped desert, much of which was formerly used for agriculture." "Vacant desert and grazing lands continue to the north, west, and south of the project site, while the eastern lands are more industrially developed with energy-related land uses." "Most Part 1 lands were used for agriculture in the past and are thus highly disturbed."
- EA: "The proposed project would not affect any lands considered to be prime or unique farmlands."
- EA: "Measures to minimize or avoid impacts have been built into the proposed action and include limiting the project development boundaries to avoid sensitive resources, such as Federal Emergency Management Agency (FEMA)-designated floodplains and a potentially eligible cultural resource site, as well as implementing measures required by state and county agencies during permitting to minimize effects, such as design of a landscaped berm to shield the site from sensitive viewpoints, measures to control drainage as required by the county drainage administration, measures to address wildlife connectivity concerns, pre-construction surveys for sensitive species, and county dust control requirements."
- EA: "While the development represents a substantial visual change, this change is viewed as acceptable given the altered state of the existing landscape, the limited number of sensitive receptors, the support the project has received from surrounding landowners… and an elevated berm and other measures built into the project description to minimize the visual effects of the project as viewed from Elliot Road and the rural residences to the north."
- EA: "Minor impacts on geology and soils during construction activities due to potential for increased erosion. Best management practices would be adapted to site conditions to avoid soil erosion and to prevent construction vehicles from tracking soils from the facility site during construction."
- Storm water drainage channels and retention basins would be the primary erosion-control features during project operations. Erosion associated with off-site flows would be minimized by perimeter drainage channels, which would divert off-site flows around the site. Erosion associated with on-site flows would be minimized by the development of interior drainage channels and retention basins. Site grading would incorporate provisions in the engineering design of the facility to address both on-site and offsite storm water management in accordance with floodplain regulations for Maricopa County.
- EA: "Project lands would be cleared of vegetation and fenced, which would generally prevent wildlife from entering the site. Given the poor condition of the current vegetation on the project site, loss of Part 1 and Part 2

lands to wildlife use would not impact wildlife habitat in the area. Pursuant to consultation with AZGFD, Sempra altered its original project plan to avoid impacts on wildlife by (1) fencing the site to direct wildlife to Centennial Wash, thus encouraging a wildlife connectivity corridor, (2) eliminating one site entrance to further address wildlife connectivity concerns, and (3) leaving the area adjacent to Centennial Wash undisturbed."

- Minor effects on vegetation from clearing and grading the project site. Minor impacts on wildlife from construction, including short-term avoidance of the area by wildlife due to noise generated by construction and low occurrence of crushing of wildlife due to heavy machinery use. Project site would be fenced to prevent wildlife access; wildlife connectivity would be maintained through measures developed in concert with the Arizona Game and Fish Department (AZGFD).
- EA: "Implementation of pre-construction survey requirements and conservation measures developed in concert with AZGFD for wildlife and Arizona Department of Agriculture for straw-top cholla would ensure that construction activities have no adverse impact on special status species and species of local concern."
- EA: "Migratory bird species regulated under the Migratory Bird Treaty Act (MBTA) may use vegetation communities in the project area. Direct impacts on these species would be avoided if construction occurred outside of the breeding season. If construction occurred during the breeding season, impacts would be avoided by conducting pre-construction surveys for occupied nests."
- EA: "Class III cultural surveys were performed for the entire site. One resource potentially eligible for listing was identified on the western portion (Part 2) of the project site. Sempra adjusted the project development boundary to avoid the 100-year floodplain, and no surface disturbance would occur within approximately 200 feet (60 meters) of the eastern edge of the potentially eligible resource."
- FONSI (2011): "All discussion and analysis related to the potential impacts of construction and operation of the proposed Mesquite project is contained in the Final EA (DOE/EA-1796), which is incorporated here by reference. DOE examined potential impacts… and found none to be significant."
- On the basis of the final EA, DOE has determined that providing a Federal loan guarantee to Sempra for construction and startup of the 400-M W photovoltaic solar power project and its associated transmission line in Maricopa County, Arizona, will not have a significant effect on the human environment.
- Western Area Power Administration (Western) conducted a supplement analysis process on the proposed construction of Part 2 of Mesquite Solar as originally analyzed in DOE/EA-1796. Western's NEPA analysis will help determine whether to enter into a Power Purchase Agreement with Sempra and/or its affiliates to purchase, on behalf of the U.S. Department of the Navy (Navy), the renewable energy that would be generated by Part 2 of Mesquite Solar.
- FONSI (2015): "Western has determined that there are no significant new circumstances or information relevant to environmental concerns resulting from the project or its impacts, and a Supplemental EA is therefore not required.

Environmental Assessment for Photovoltaic Solar Project at the Durango, Colorado, Disposal Site (DOE/EA-1770; DOE, 2011): https://www.energy.gov/nepa/downloads/ea-1770-final-environmental-assessment

- Proposed installation, operation, and removal of a ~4.5-megawatt photovoltaic solar energy system
- The Durango Disposal Site contains a partially below-grade uranium and vanadium mill tailings pile that has been encapsulated in an engineered cover system that is designed to isolate the mill tailings from the environment.
- Proposed PV location is on ~21 acres of the Durango Disposal Site, including approximately 18 acres of vegetated surface of a disposal cell and 3 acres of previously disturbed areas adjacent to the disposal cell.
- All of the areas considered for the two action alternatives have been disturbed, either through the installation of the engineered cover or were disturbed by activities related to the construction of the disposal cell. DOE would restrict the location of system components to previously disturbed areas.

- EA: “Solar panel frames are typically anchored in subsurface foundations to secure the panels from wind damage. However, due to the non-penetration restrictions on the engineered cell cover at the disposal site, an alternative design, based on ballasting instead of on anchoring into the cell surface, would be used to secure the panels. Concrete blocks may be used for ballast for the frame panels.”
- EA: “The anticipated height of the [PV] modules is approximately 8 ft above the ground surface at the highest point of the panel.”
- EA: “If fencing is required for site security, CDOW has requested that wildlife-exclusion fencing, or fencing that is wildlife-friendly, be installed. Any site fencing related to wildlife concerns should be minimal.”
- The FONSI stated that the EA identified “only minor and expected impacts (e.g., vehicle emissions related to travel to the site, minor loss of vegetation, minor displacement of wildlife), which will be short-term and related to installation and removal actions. No long-term impacts related to the operation of a PV system were identified.”

Environmental Assessment for Proposed Construction and Operation of a Solar Photovoltaic Array at Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EA-2101; National Nuclear Security Administration, 2019): https://www.energy.gov/nepa/downloads/ea-2101-final-environmental-assessment

- Proposed construction and operation of a 10-megawatt ground-mounted solar photovoltaic system and erection of an associated power transmission line within an existing power transmission line corridor
- Proposed PV location is on approximately 55-plus acres of which around 50 acres are a previously disturbed area that was used as a borrow pit at Los Alamos National Laboratory, on DOE owned property within Los Alamos County, New Mexico.
- There are two power line corridors under consideration, and each follows existing utility rights-of-way. The primary impact from the proposed action would be the result of land conversion resulting in loss of habitat and potential PV array attractiveness to birds. PV arrays have been postulated to attract birds and their insect prey as a result of glare and polarized light reflected off solar panels. However, to date there are relatively few systematic empirical research studies that have analyzed the attraction and impacts of PV facilities on birds.
- EA: “The PV system would include photovoltaic panels, racking, electrical junction boxes, wiring, direct current (DC) to alternating current (AC) inverters, transformers, and associated electrical distribution systems to a substation…. There would be approximately 450 tracking panels about 3 feet x 6.5 feet and 1.5 inches in width, configured to prevent self-shading. Depending upon the most cost-effective option, the panels would be ground-mounted fixed tilt, single axis tracking rotating from east to west, or dual axis tracking from both east to west and north to south.”
- The FONSI states, “In consideration of the lack of data regarding PV structure effects on birds and the potential for development of other PV sites at LANL, a project Mitigation Action Plan has been developed as specified in Section 3.4 of the Final EA. The Mitigation Action Plan consists [solely] of a long-term avian monitoring study at the proposed PV array site and adjacent habitat that will be implemented prior to construction and conducted for a minimum 10 year study period. This study would add to the body of literature on these types of bird effects.” The Mitigation Action Plan in Section 3.4 of the Final EA explains, “The study will include preconstruction standard avian point count methodology field surveys to record species abundance and diversity. Preconstruction surveys are anticipated to include two breeding seasons. Post PV panel installation bird point count surveys will be conducted for a minimum of ten years.”
- All other resource areas, with implementation of BMPs and preparation and adherence to a Storm Water Pollution Prevention Plan, were found to have no or minor environmental impacts associated with the proposed action.
- The FONSI states, “Based on the analysis presented in the EA and public comments, NNSA has determined there would be no significant impact from proceeding with the Proposed Action. The basis of this determination is that there are no identified significant adverse effects likely to result from implementing the Proposed Action.”

Environmental Assessment for the Lookout Solar Park I Project (DOE/EA-2075; WAPA, 2021): https://www.energy.gov/nepa/doeea-2075-lookout-solar-park-i-custer-and-oglala-lakota-counties-south-dakota

- Proposed construction and operation of a Solar Project (Project) on 892-acres in South Dakota, primarily located on the Pine Ridge Indian Reservation (PRIR) and partially located on private off-Reservation lands. The Project also includes an interconnection request to connect the Project to Western Area Power Administration's (WAPA) transmission system. The Project consists of a 110-megawatt (MW) solar generating facility, including 500,000 solar panels fenced for security, 4 miles of access roads, a substation, an operation and maintenance facility, parking area, 11 miles of buried transmission line (including a 72-acre Right-of-Way), a potential energy storage facility, and about 20 acres of laydown area for construction.
- The Bureau of Indian Affairs (BIA) prepared an Environmental Assessment (https://docslib.org/doc/5179253/bureau-of-indian-affairs-solar-farm-environmental-assessment) in 2016 to analyze the parts of the Project within the Reservation and issued a Finding of No Significant Impact (https://puc.sd.gov/commission/dockets/electric/2018/el18-059/biamemo.pdf).
- WAPA prepared this Environmental Assessment "to analyze the impacts of the interconnection, as well as portions of the Project located outside of the PRIR boundary, which were not analyzed in the BIA EA." The Study Area included the 892-acre Project Area buffered by 0.5 miles (for a total of 9,803 acres) to account for indirect impacts to natural resources. The EA indicates that the Project Area is currently managed as rangeland and grazed by livestock.
- EA: "The bottom edge of the PV panels would be three to four feet from the soil surface. The total height of the panels would range from 12 to 13 feet, depending on the terrain…Once the PV panels are installed, underground electrical wiring between each PV array would be connected."
- The EA notes that operation of the facility would have long-term and permanent impacts to about 250 acres of soil. To limit these impacts, the EA describes certain measures will be implemented, including: utilizing the existing landscape to minimize or eliminate grading work and land disturbance; using controls (e.g., silt fences, riprap, etc.) to minimize soil exposure and to prevent eroded soil from leaving the disturbed area; stockpiling the topsoil separately and redistributing it after grading is complete; working during dry conditions, regrading disturbed areas to "approximate original contours" and revegetating with a native plant community; and developing and implementing a Stormwater Pollution Prevention Plan.
- In order to reduce emissions related to construction and operation, the EA describes various measures to be implemented, including: wetting construction areas and access roads to control dust; ensuring that all pieces of heavy equipment and smaller vehicles meet emission standards specified in the applicable state regulations; if possible, leasing or purchasing equipment with more stringent emission controls; and limiting the idling of diesel equipment to no more than 10 minutes, unless necessary for proper operation.
- The EA describes environmental commitments to reduce the impacts to vegetation, including that "vegetation would be maintained (e.g. mowed) to the lowest height tolerable for plant survival, allowing plants to grow without impeding Project function" and "construction equipment would be properly cleaned before entry into the Project area, to reduce the spread of noxious weeds."
- The EA notes that "[a]ll water resources in the area could be impacted by an accidental release of pollutants, such as fuel spills and/or runoff" and that "the PV panels in the solar array would likely contain hazardous materials and/or hazardous substances and, although the panels are sealed under normal operating conditions, there is the potential for environmental contamination if damaged or improperly disposed of during decommissioning." In this regard, in order "[t]o reduce the chance of accidental releases, the Project would develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan, which would contain measures to control runoff and discharge of pollutants."
- The EA describes a variety of wildlife habitat modification and animal disturbance, injury, or mortality. It also notes that a "total of 250 acres of grasslands would be impacted throughout the long-term operational duration of the Project." The EA also describes various impact-reducing measures by the project proponent, including:

- EA: "No construction would occur within a 150-foot buffer of the Angostura Canal, as required by the BOR around wetlands in the Project Area."
- EA: "Ground clearing activities would not occur during the migratory bird nesting season, from May 1 to August 15, unless: 1) surveys are performed prior to construction to identify and mark nests for avoidance or 2) potential nesting habitat is removed outside of the breeding season (i.e. mowing)."
- EA: "No trees would be removed within the Project Area."
- EA: "The solar generating facility and substation would be fenced using wildlife-friendly fencing techniques. Specifically, a barbed wire fence or a woven wire fence would be used with the following specifications that would minimize impacts to mule deer, whitetail deer, and antelope. Where woven fence exclusions are used, they would be 7 feet to 8 feet tall and SDGFP would be contacted to conduct a site visit to assure big game animals are excluded from the fenced-in facility. Where barbed wire fence is used, the height would be 40 inches or less, the top two wires would be no less than 12 inches apart, and the bottom wire or rail would be at least 18 inches from the ground. Barbless wire would be used for the top and bottom strands and the fence would be highly visible through use of location, marking, or materials."
- EA: "Open trenches would be backfilled, covered, or adequate wildlife escape ramps would be installed at the end of each shift to minimize entrapment of wildlife."

- EA: "Potential adverse impacts to cultural resources would be mitigated through the presence of a qualified construction/archaeologist monitor during ground disturbing activities."
- EA: "During the life of the Project, approximately 187 acres of Prime Farmland if [i]rrigated and 178 acres of Farmland of Statewide importance would be unavailable for farming. These lands are not currently irrigated and are not currently used for farming, so there would be no loss of existing farmlands." "During the scoping phase of this EA, the NRCS reviewed the Project and concluded that no impact would occur to prime or important farmland (Appendix A)."
- EA: "Cumulatively, the Project would beneficially contribute to the socioeconomic condition. This Project, along with the Red Cloud Renewable Energy Center, could promote renewable energy facility development elsewhere, increase employment opportunities on the PRIR, increase tourism, and increase revenues for the Tribe, county, and/or state."
- EA: "Overall, potential impacts to visual resources immediately surrounding the Project (whether they are adverse or beneficial) would be limited because of the area's sparse population, low volume of travelers along the roadways, and limited number of visitors (i.e. 9,500) the South Unit receives each year (NPS and Oglala Sioux Tribe 2012)."
- FONSI: "WAPA's Proposed Action is to enter into an Interconnection Agreement with SPP and Lookout Solar to allow the Project to interconnect to WAPA's existing New Underwood to Wayside 230 kV transmission line. Additionally, WAPA would make any necessary design or equipment changes to WAPA-owned facilities, as specified in the Interconnection Agreement, to accommodate the interconnection."
- FONSI: "WAPA identified no significant impacts to environmental resources or the human environment, either individually or cumulatively with other actions in the general area, which would result from the Proposed Action or No Action alternatives. The principal reason for the lack of significant environmental impacts is the use of avoidance measures and environmental commitments as a required component of the project."
- FONSI: "Lookout Solar agreed to implement an additional 37 conditions, called Permit Conditions, as part of the South Dakota Public Utilities Commission (SD PUC) permitting process. The SD PUC published their permit approval on February 14, 2020."

Environmental Assessment for Proposed British Petroleum Solar Photovoltaic Arrays at Brookhaven National Laboratory, Upton, New York (DOE/EA-1663; DOE, 2009): https://www.energy.gov/nepa/ea-1663-proposed-british-petroleum-bp-solar-photovoltaic-arrays-brookhaven-national-laboratory

- The proposed project involves DOE granting an easement to BP Solar to construct a large-scale commercial solar photovoltaic array of approximately 37 MW which would cover approximately 200 acres (80.94 hectares) of the BNL federal site.
- Electricity generated by these arrays would be connected into the regional utility power grid. In addition, a Laboratory dedicated array of 1 to 2 MW may be constructed and connected to the on-site BNL electric grid.
- The arrays would utilize, where possible, areas already cleared (agricultural fields, firebreaks, and brownfields), as well as require clearing of an estimated 153 acres (62 hectares) of trees.
- EA: "The BP solar arrays would be comprised of individual solar modules, such as the BP3220 modules, or a comparable solar module. The module would have dimensions of approximately 5.5 x 3.3 x 0.016 feet (1,667 x 1,000 x 50mm) weigh 43 lbs (19.4kg), and have a standard rating of 220 watts (W). Approximately 167,712 modules would be used to obtain a total project capability of about 37 MW of direct current (dc)."
- EA: "In summary, the analysis of potential environmental effects from the construction and operation of the BP solar array project indicates a net positive benefit to the environment. The key negative environmental impacts to the ecological resources (i.e. trees, endangered species, and migratory birds) are due to the land disturbance. Some of these impacts are minimal and may be reduced with mitigative actions proposed."
- The FONSI states, "Based on the information and analysis in the EA, the DOE has determined that the proposal to construct and operate the BP Solar Array Project at BNL does not constitute a federal action significantly affecting the quality of the human environment…."

Other Federal Agency Experience

Other Federal agencies have prepared environmental assessments (EAs) and findings of no significant impact (FONSIs) for solar photovoltaic projects that are relevant to DOE's changes to categorical exclusion B5.16. For example:

Environmental Assessment for the Arkansas Electric Cooperative Corporation Bailey Solar Project (RUS, 2022): https://www.rd.usda.gov/resources/environmental-studies/assessment/bailey-solar-facility

- Arkansas Electric Cooperative Corporation (AECC), a generation and transmission cooperative, is proposing to construct a new solar photovoltaic (PV) electrical power generation station, known as the Bailey Solar Project (Project) which will be located near the City of Augusta in Woodruff County, Arkansas.
- The Project includes a 100-megawatt (MW) solar PV electrical power generation station, an approximate 0.5 Mile 34.5-kilovolt (kV) transmission line (T-Line), and related interconnection equipment.
- The Project will be on property adjacent to the existing Carl E. Bailey Generating Station (Existing Bailey Generating Station). The output of the Project will connect to the grid at the Existing Bailey Generating Station's switchyard.
- The facility will consist of the following major components, systems, and associated infrastructure: Solar panels and support structures/racking, Electrical collection system, Electrical invertors, Electrical transmission system, Access/internal road system, and Plant monitoring and control system.
- AECC is seeking financial assistance from the Rural Utilities Service (RUS), United States Department of Agriculture. Under the Proposed Action Alternative, RUS would provide financial assistance to AECC to aid in construction of the Bailey Solar Project and associated infrastructure.
- EA: "Mitigation strategies included selecting a flat already cleared site to minimize the need for grading and clearing of forested areas."
- EA: "This activity will not affect Prime Farmland or Farmland of Statewide Importance."

- EA: “Utilization of sediment and erosion control measures will minimize adverse impacts to soils. Following construction, the site will be stabilized year-round with vegetation. This should be an improvement over current conditions of seasonal bare soils during winter months associated with common row crop agricultural practices.”
- EA: “Significant earthwork is not anticipated for the project as the Project Site is already level. Best management practices (BMPs) and a storm water pollution prevention plan (SWPPP) will be utilized to ensure the streams and waterways within the Project Area are not adversely affected by sediment runoff.”
- EA: “Mitigation for land clearing impacts will center around the SWPPP. The SWPPP for the Project will govern how construction activities on the site are conducted and what BMPs are utilized to prevent soil erosion and sedimentation. The SWPPP will include guidelines for: Construction staging, Soil stabilization BMPs, Sediment control BMPs, and Vegetation replanting and mulching.”
- EA: “Water quality impacts will also be mitigated largely by the SWPPP. The soil and erosion control BMPs will be designed for protection of water quality with a focus on reduction and/or elimination of sedimentation into streams and wetlands. In addition, stream side buffer zones will be left intact to a width of at least 25 ft where possible.”
- EA: “Construction and operation of the proposed Project should not result in significant adverse impacts on hydrology. The solar array and supporting infrastructure will be designed to avoid waters and floodplains to the extent practicable. Aside from pilings no fill will be placed in any WOTUS or floodplains. Where encroachment on floodplains is necessary, pilings will be installed, and the actual infrastructure (solar photovoltaic panels, conduit, etc.) will be elevated above the 500-year floodplain elevation.”
- EA: “No fill will be placed in WOTUS [Waters of the United States], and except for pilings, no fill will be placed in floodplains. Indirect impacts will be minimum as the Project will not require significant topography altering earthwork. Drainage pathways and streams will remain intact. The site will benefit from the presence of year-round vegetation to stabilize the soil and reduce the amount of sediment running off the site as is common in row crop agricultural fields that commonly maintain bare soil outside of the active crop production season. Reduction of sediment runoff will reduce potential fill in adjacent waterways and floodplains long term.”
- EA: “Temporary disturbance of vegetation at the solar site is anticipated during the construction phase but will benefit from year-round herbaceous vegetation following completion of construction. There will be a permanent loss of approximately 2.6 acres of forestland for the construction of the T-line. The proposed T-line will be constructed side by side to an existing T-Line which will reduce any further habitat fragmentation. Constructing adjacent to the existing T-Line will also reduce the amount of clearing necessary as a portion of the exiting ROW can be used as part of the new ROW. Trees in the ROW will be cut at ground level, leaving the roots in place for erosion control. Once T-line construction is complete, grasses and low-growth vegetation will be established in the ROW for permanent stabilization.”
- FONSI: “The analyses in the EA documented that the proposed Project would have no significant impacts to the following analyzed resources: topography and climate, soils, water features, vegetation, wildlife, threatened and endangered species, land use, cultural and historic resources, urban, residential and recreation areas, transportation, population, noise, or air quality. A summary of anticipated impacts on the human environment is provided below, including any mitigation measures deemed necessary to avoid or minimize impacts. AECC is responsible for implementing these measures.”
- FONSI: “In accordance with the National Environmental Policy Act, as amended (42 U.S.C. 4321 et seq.), the Council on Environmental Quality Regulations (40 CFR 1500–1508), and RD’s Environmental Policies and Procedures (7 CFR Part 1970), RUS has determined that the environmental impacts of the proposed Project have been adequately addressed and that no significant impacts to the quality of the human environment would result from construction and operation of the proposed Project.”

Environmental Assessment for the Optimist Solar and BESS Project (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/optimist-solar-and-bess-project

- Proposed construction and operation by MS Solar 7 of a an up to 200 MW AC single-axis tracking photovoltaic solar facility with a 50 MW AC – 200 MWh battery energy storage system (BESS) (referred to as the "solar facility"), and purchase by TVA of the renewable energy from the solar facility under a 20-year Power Purchase Agreement (PPA). The Project would connect to the existing TVA electrical network via TVA's West Point Substation.
- The Solar Facility would encompass about 2,952 acres of primarily cultivated agricultural fields and pastureland in Mississippi, of which about 1,540 acres would be used for the ground-mounted PV arrays (standing five to eight feet tall, depending on time of day), BESS, inverters, transformers, internal site access roads, Project substation, ancillary infrastructure, and construction laydown and parking areas.
- MS Solar 7 proposed three easement route options (Options A, B, and C; Option C being the preferred option) for the gen-tie connection to the Project substation and BESS, which would be located adjacent to the West Point Substation. Depending on the route option, about 63 to 83 acres would be used for the installation of the gen-tie, "dead end" pole, and 0.4-mile-long TVA transmission line, in order to facilitate interconnection with TVA at the point of interconnect (POI) within the TVA West Point substation.
- EA: The "easement parcels would be used for installation of an approximately 3- to 4.1-mile-long collector line from the solar arrays to the Project substation, utilizing one of the same easement routes as the gen-tie line, before being delivered to the POI within the TVA West Point substation via an approximately 0.4-mile-long transmission line from the Project substation."
- The EA assesses (1) the impact of TVA's action to enter into the PPA with MS Solar 7, (2) the associated impacts of the construction and operation of the solar facility, and (3) impacts associated with the interconnection by TVA.
- EA: "The development of the Project Site for industrial purposes is compatible with future land use plans for the area adjacent to Yokohama Boulevard as identified in the City of West Point's Comprehensive Plan. There are existing industrial land uses in the area directly north and to the southwest of the Project Site. The addition of the Solar Facility would result in an expansion of industrial land use in Clay County to the northeast of the city of West Point, where agricultural use currently dominates. Undeveloped areas of the Project Site along the gen-tie/collector line route could remain in agricultural use during operation of the Solar Facility. Minor direct impacts are anticipated from the conversion of pasture and actively cultivated crops in agricultural land use to renewable energy production."
- EA: 'The Solar Facility would be compatible with surrounding land use. Development within the Project Site would be consistent with local land use planning and zoning. If operations cease, the facility would be decommissioned and dismantled, and the Project Site restored…."
- Per the EA, MS Solar 7 would implement the various BMPs and mitigation measures in relation to potentially affected resources, including for example: " • Install silt fencing along the perimeter of areas that would be cleared, consistent with local and state stormwater regulations; • Implement other soil stabilization and vegetation management measures to reduce the potential for soil erosion during site operations;… • Avoid direct impacts to the maximum extent practicable on perennial and intermittent streams by maintaining a 25-foot riparian buffer at perennial and intermittent streams and wetlands in accordance with MDEQ NPDES General Construction Permit conditions; • Avoid construction within floodplains;… • Avoid or minimize direct impacts on nesting and migratory birds and bats, as well as federally listed species, by clearing trees outside of the Northern long-eared bat pup season (June 1–July 31);… • Develop and implement a variety of plans and programs to ensure safe handling, storage, and use of hazardous materials"
- The EA noted that 97% of the soil within the Project Site would be considered Prime Farmland or Farmland of Statewide Importance under the FPPA, and that approximately 1,378 acres of prime farmland would be disturbed.

However, the EA also noted that "[i]f operations cease, the facility would be decommissioned and dismantled, and the Project Site restored (see Section 2.2.5). Once restored, the Project Site could be returned to agricultural and pastureland uses with a no loss to soil productivity and potentially an increase in soil productivity after a prolonged rest period."

- EA: "By adhering to the following mitigation measures, the proposed Solar Facility and transmission construction and transmission upgrades would have no significant impact on floodplains and their natural and beneficial values: • Standard BMPs would be used during construction • Construction would adhere to the TVA subclass review criteria for transmission line location in floodplains • Any road improvements done within the floodplain would be done in such a manner that upstream flood elevations would not be increased by more than 1.0 foot."
- EA: "Following the Phase I historic architectural survey of the APE, TVA determined that 025- WPT-5470 (the Gulf, Mobile, and Ohio Railroad) and HS-7 (the Illinois Central Railroad), are eligible for listing on the NRHP. However, TVA also determined the viewshed has already been affected by surrounding modern infrastructure and the undertaking would not diminish the significance of the character-defining elements which contribute to their eligibility and would not result in adverse effects. TVA determined that the Project would not result in an adverse effect on cultural resources; therefore, there would be no direct or indirect impacts to archaeological or historic resources listed eligible, potentially eligible, or undetermined for the NRHP."
- FONSI: "Impacts on residents on adjoining properties and visitors travelling on roadways in the vicinity would be minimized through the presence of existing natural screening buffers including forest areas. If existing buffers are not sufficient in shielding residents from the Solar Facility, MS Solar 7 would install privacy fence or shrubbery along the perimeter of the Project Site on a case-by-case basis."
- FONSI: "Based on the findings listed above and the analyses in the EA, we conclude that the proposed action of constructing, operating, and maintaining the Optimist Solar and BESS facility, and gen-tie line upgrade would not be a major federal action significantly affecting the environment. This finding of no significant impacts is contingent upon adherence to the mitigation measures described above. Accordingly, an environmental impact statement is not required."

Environmental Assessment for the Golden Triangle I Solar and Battery Energy Storage Project (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/golden-triangle-solar-project

- Proposed construction and operation - on approximately 4,150 acres of predominantly agricultural land - by MS Solar 5 of a an up to 200 MW AC single-axis tracking photovoltaic (PV) solar facility with a 50 MW BESS (referred to as the "solar facility"), and purchase by TVA of the renewable energy from the solar facility under a 20-year Power Purchase Agreement (PPA).
- The solar facility would generate up to 200 MW AC output for transmission to TVA's electrical network via an approximate 1,665-foot-long gen-tie line to a new 0.85-acre Artesia 161-kV Switching Station within the existing Artesia Substation.
- The solar facility would consist of multiple parallel rows of PV panels on single-axis tracking structures, along with DC and AC inverters and transformers. The perimeter of the developed facilities would be enclosed with security fencing. Within the limits of the fenced facility would be the arrays of solar panels, inverters, battery storage, electrical cabling, and other related infrastructure such as the Project substation and access roads. The remaining portions of the Project Site would be undeveloped.
- If operations cease at the end of the 20-year PPA, the solar facility would be decommissioned and dismantled, and the Project Site would be restored.

- The EA assesses (1) the impact of TVA's action to enter into the PPA with MS Solar 5, (2) the associated impacts of the construction and operation of the solar facility, and (3) impacts associated with the interconnection by TVA.
- In addition to the interconnection, existing TVA transmission lines would be upgraded. However, "[a]dditional details regarding the TVA network upgrades, such as the exact locations of pull points or any potential pole replacements, are still being developed. Supplemental NEPA analysis would be conducted if additional environmental resources are affected."
- Per the EA, MS Solar 5 would implement various BMPs and mitigation measures in relation to potentially affected resources, including for example: " • Install anti-reflective, PV panel surfaces to minimize glare and reflection; • Install silt fence along the perimeter of areas that would be cleared, consistent with local and state stormwater regulations; • Maintain stormwater BMPs in each area until stabilization (adequate vegetation regrowth) has been achieved; • Avoid direct impacts on perennial and intermittent streams by maintaining a riparian buffer at most perennial and intermittent streams and jurisdictional wetlands;… • Utilize vegetation that benefits pollinator species to the extent practicable; • Utilize timer- and/or motion-activated downward facing security lighting to limit attracting wildlife, such as migratory birds and bats…. • Avoid or minimize direct impacts on federally-listed species by clearing trees outside of the northern long-eared bat (NLEB) pup season (June 1 – July 31);… • Where existing natural buffers are not sufficient in shielding residents in Artesia from the Solar Facility, MS Solar 5 would install a privacy fence or shrubbery along the perimeter of the Project Site."
- EA: "TVA would utilize standard BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities – Revision 3*, TVA's BMP manual (TVA 2017b), to minimize erosion during construction, operation, and maintenance activities."
- EA: "A majority of the Project Site is either disturbed, maintained, or actively cultivated cropland. There is potential to remove a minor amount of forested area within the Project Site (<6.5 percent) during clearing and grading activities. Additionally, the surrounding areas consist of similar vegetation communities and have also been mostly converted to cropland. Adverse impacts associated with vegetation removal resulting from implementation of the Proposed Action would be minor but permanent."
- The visual impacts analysis included a Solar Glare Ocular Impact Analysis to determine whether any glare created from the Project would adversely impact surrounding properties, nearby traveling vehicles, or pilots approaching a nearby airport. "Based on the [Solar Glare Hazard Analysis Tool] results, onsite visual observations, a view angle analysis, and reviews of the landscaping, it was found that no observation points have or would have potential glare to adversely impact surrounding properties near the Project Site."
- FONSI: "MS Solar 5 would coordinate with the homeowners, construction contractors, and the array layout designers to determine the most suitable type of buffer to be used in each location where the visual environment for residents has undergone a long-term change due to the Project. For residences that are within 500 feet of an inverter, a pre-construction sound study including an ambient survey would be conducted to quantify the existing ambient environment."
- FONSI: "After the project reaches commercial operation, MS Solar 5 would measure the sound levels at residential property lines and identify any equipment that generates a day-night average (Ldn) sound level that exceeds 55 dBA at the property line. If there are locations where noise levels exceed that threshold, MS Solar 5 would install sound buffers (walls, fences with screening, or vegetation) in order to minimize the noise levels from operating equipment."
- FONSI: "Based upon the analyses documented in the EA, TVA concludes that its proposed action of executing the PPA with MS Solar 5, LLC, and the subsequent construction and operation of the Solar Facility and BESS by

MS Solar 5, would not be a major federal action significantly affecting the environment. Accordingly, an environmental impact statement is not required."

Environmental Assessment for the Golden Triangle II Solar and Battery Energy Storage Project (Tennessee Valley Authority, 2022): https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/golden-triangle-ii-solar-project

- Proposed construction and operation - on approximately 1,500 acres of predominantly agricultural fields and pastureland - by MS Solar 6 of a an up to 150 MW AC photovoltaic (PV) solar facility with a 50 MW AC – 200-megawatt hour (MWh) BESS (referred to as the "solar facility"), and purchase by TVA of the renewable energy from the solar facility under a 20-year Power Purchase Agreement (PPA). The "GT2" Project would connect to the existing TVA electrical network via the existing Golden Triangle gen-tie line to TVA's proposed Artesia Switching Station within the existing Artesia Substation.
- The solar facility would consist of multiple parallel rows of PV panes on single-axis tracking structures, along with DC and AC inverters and transformers. The perimeter of the developed facilities would be enclosed with security fencing. Within the limits of the fenced facility would be the arrays of solar panels, inverters, electrical cabling, and other related infrastructure such as the access roads. The remaining portions of the Project Site would remain undeveloped.
- If operations cease at the end of the 20-year PPA, the solar facility would be decommissioned and dismantled, and the Project Site would be restored.
- The EA assesses (1) the impact of TVA's action to enter into the PPA with MS Solar 6, (2) the associated impacts of the construction and operation of the solar facility, and (3) interconnection components by TVA.
- The proposed solar facility would be monitored remotely from the MS Solar 6 Headquarters Energy Control Center in Austin, TX, 24 hours a day, seven days a week to identify security or operational issues.
- Per the EA, MS Solar 6 would implement various BMPs and mitigation measures in relation to potentially affected resources, including for example:" • Install anti-reflective, PV panel surfaces to minimize glare and reflection; • Install silt fencing along the perimeter of areas that would be cleared, consistent with local and state stormwater regulations; • Maintain stormwater BMPs in each area until stabilization (adequate vegetation regrowth) has been achieved; • Avoid direct impacts on perennial and intermittent streams by maintaining a riparian buffer at most perennial and intermittent streams and jurisdictional wetlands; • Plant or seed with noninvasive vegetation and include native and naturalized plant species to encourage beneficial habitat, reduce erosion, and limit the spread of invasive species;… • There are three residences within visual proximity to GT2. Where existing natural buffers are not sufficient in shielding residents from the Solar Facility, MS Solar 6 would install vegetative screening along the perimeter of the Project Site;… • For residences that are within 500 feet of an inverter, if there are locations where noise levels exceed 55 dBA at the property line, MS Solar 6 would install sound buffers (walls, fences with screening, or vegetation) to minimize the noise levels from operating equipment;… • Interpretive signs would be installed. One interpretive sign would mark the location of the Thomas Wilburn Harness Horse Racing Track, and the second interpretive sign will discuss the Oakland Plantation Historic District."
- EA: "Minor adverse indirect impacts could occur on the agricultural economy of the region due to the loss of up to 495 acres of annual soybean and corn production. …the loss of agricultural land would adversely impact the farmers working the land as well as other services that support agricultural production. These impacts would be minimal, and the economic benefit of the Project would outweigh the adverse impacts substantially."
- At the time of the EA, Golden Triangle I Solar and BESS Project (GT1) was recently approved, and the Infinity Megasite was a pending 1,144-acre industrial development adjacent to the proposed Golden Triangle Solar

Project. The EA concluded that long-term impacts, "such as the clearing of mature trees or the conversion of agricultural land to developed industrial land will inevitably overlap for all three projects, thus resulting in a long-term cumulative impact on those resources." The EA also concluded that short-term cumulative impacts "would occur on noise and local air quality only if two or more of the projects are under construction at the same time."

- The FONSI, issued in May 2022, stated, "Based upon the analyses documented in the EA, TVA concludes that the proposed action alternative of constructing and operating the Golden Triangle II Solar and BESS Facility by MS Solar 6, as well as the new gen-tie, and TVA's purchase of the electric output pursuant to the PPA with MS Solar 6 would not be a major federal action significantly affecting the environment. Accordingly, an environmental impact statement is not required."
- After issuance of the May 2022 FONSI and EA, although the overall project site area did not change, a revised site layout indicated that additional tree clearing - beyond what was originally expected - would be necessary for installation of the solar arrays. Based on the revised site plan, it is anticipated that up to 493 acres of forested land could be cleared during initial site construction, versus the "up to 270 acres of forested upland areas" listed in the EA and FONSI. Thus, a revised consultation letter was submitted to the U.S. Fish and Wildlife Service on June 17, 2022.
- Based upon the analyses documented in the EA, and the June 2022 update described above, a Revised FONSI was issued in July 2022.

Environmental Assessment for Construction of Solar Photovoltaic Facilities at the John F. Kennedy Space Center, Kennedy Space Center, Florida (National Aeronautics and Space Administration, 2018):
https://netspublic.grc.nasa.gov/main/FPL_KSC%20Solar%20Project%20Final%20EA_12.2018.pdf
https://netspublic.grc.nasa.gov/main/FONSI%20for%20EA%20for%20FPL%20Solar%20Photovoltaic%20Facilties%20KSC--original.pdf

- Under the Proposed Action, the National Aeronautics and Space Administration (NASA) Kennedy Space Center (KSC) and Florida Power & Light (FPL) would develop a 74.5 megawatt (MW) solar PV facility on NASA property on Roberts Road on KSC. In addition, NASA proposes to develop a number of smaller solar installations (ground mount and canopies) at up to 12 additional sites on KSC.
- EA: "A 702-acre (284 ha) area (referred to as the Primary site) on NASA-KSC property has been evaluated in this Environmental Assessment (EA) to allow for engineering flexibility." The EA also evaluated the potential impacts to "distributed generation (i.e., In-Kind) solar PV facilities on up to 12 sites [In-Kind sites 1-12] totaling approximately 165.5 acres (67 ha) of the NASA-KSC property."
- EA: "Per the CMP Future Land Use Map (NASA, 2016), the Primary site and In-Kind sites 6, 10, 11 and 12 are proposed to be located in areas designated as Renewable Energy. The other In-Kind sites are located on parking lots or grassy fields in areas with land use designations of Administration, Utility Systems, Assembly Testing and Processing, or Research and Development. The Primary site is located on land designated for Renewable Energy and Operational Buffer/Conservation. Renewable Energy areas are designated to accommodate varying forms of renewable energy, including solar array fields. Operational Buffer areas are submerged areas vulnerable to rising seawater or high value upland habitats. Future development in the Operational Buffer is permitted for low impact or small footprint facilities that may be required for support of space launch or landing operations. The Primary site is undeveloped and consists of abandoned citrus groves, uplands, and wetlands overgrown in invasive exotic species; a complex of unpaved site access roads, and man-made ditches. In-Kind sites 6, 10, 11 and 12 are also located in portions of KSC designated for Renewable Energy; none of these sites are developed. In-Kind sites 6, 10, and 11 are abandoned citrus groves covered in invasive exotic species. Site 10 does not appear to have ever been developed."

- EA: “Vegetation would be removed in order for the solar PV arrays to be mounted; however, the vast majority of the vegetation that would be removed is invasive exotic species (e.g. Brazilian pepper). The construction activity at the Primary site would result in a short-term minor impact to visual resources/aesthetics to visitors at the Visitor complex. Once installed, the solar PV arrays or canopies would be visible from the adjacent roadways. However, these arrays would not be tall (approximately 7 feet) and would have a negligible effect on the surrounding view shed.”
- EA: “Approximately 360 acres of the Primary site would be developed for the Proposed action. The limits of disturbance would be focused towards the lower quality habitats and sensitive habitats such as wetlands would be avoided to the extent possible. Based on a preliminary layout, approximately 94 percent of the impact would occur in disturbed habitats, including former citrus groves that have transitioned to dense thickets of Brazilian pepper, Australian pine, ruderal habitats, and areas of infrastructure. Given the poor quality of these habitats, the effect would be minor, but long-term.”
- EA: “A study prepared for Massachusetts Clean Energy Center (MCEC, 2012) found that, ‘At the utility scale sites, sound levels along the fenced boundary of the PV arrays were generally at background levels, though a faint inverter hum could be heard at some locations along the boundary. Any sound from the PV array and equipment was inaudible and sound levels are at background levels at set back distances of 50 to 150 feet from the boundary.’ Noise impacts resulting from operation of the Proposed Action are likely to be negligible and long-term.”
- EA: “Based on the preliminary layout, 95 percent of the proposed solar facilities would be in uplands and approximately 18 acres of wetlands may be affected. This would account for a 7 percent reduction in wetland area on the Primary site. These numbers are preliminary. A thorough wetland delineation will be conducted on the site prior to developing the final site layout. The final design will further avoid and minimize wetland impacts to the extent possible, with a focus on avoiding isolation of high quality wetlands for adjacent high quality upland habitats. An ERP from the FDEP and a Section 404 permit from the USACE would be obtained to authorize regulated activities in wetlands. Functional losses associated with unavoidable impacts will be compensated for by purchasing wetland mitigation credits from an approved mitigation bank, or by another approved method. Implementation of mitigation measures would ensure long-term impacts remain minor. Wetland impacts on the In-Kind sites would also be avoided, minimized, and mitigated for.”
- EA: “Construction in the 100-year floodplain on the Primary site and In-Kind sites 11 and 12 would be avoided to the extent possible and unavoidable impacts to floodplains would be compensated for in accordance with state and federal regulations to ensure no adverse flooding effects occur to adjacent properties. Groundcover beneath the solar PV arrays would be pervious, which would allow water to infiltrate similar to the pre-construction condition. Overall, effects to the floodplain from the Proposed Action on the Primary site or In-Kind sites 11 and 12 are expected to be long-term and minor. No effects to floodplains would occur to In-Kind sites 1 to 10, as these sites are outside of the 100-year floodplain.”
- FONSI: “Environmental impacts from the Proposed Action construction and associated operations were classified none or minor.” “Where NASA anticipates minimal impacts may occur, FPL would employ various best management practices and other mitigation measures, as defined in the Biological Opinion issued by U.S. Fish and Wildlife Service, during construction and operation of the proposed development.”

Environmental Assessment and Plan of Development for the San Luis Solar Project (DOI/EA-14-059, Bureau of Reclamation, 2018): https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=33221; https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=33222

- Proposed issuance of a 30-year Land Use Authorization to access, install, operate, maintain and remove a 26-megawatt (MW) alternating current (AC) solar photovoltaic (PV) energy generating project in and adjacent to San Luis Reservoir, on up to 237 acres of land.
- The Project would consist of the three separate solar PV systems (Sites 1, 2, and 3), including approximately 102,360 high-efficiency solar PV panels, racks, cabling, direct current (DC) to AC power conversion units with medium voltage transformers, and medium voltage underground lines. The Project includes access roads, fencing, lighting, and security systems.
- "Other Project components include combining switchgear, control buildings, meteorological stations, and substations (34.5 kV / 70 kV), depending on the site. Gen-tie lines (70 kV) would connect each site to the existing O'Neill Substation. In addition, a battery energy storage system (BESS) would be included as part of the Project to help the Applicant better deliver energy at a controlled and more constant level."
- At each site, the solar PV panels would be mounted on steel brackets to a horizontal single-axis tracking system. "Each tracker unit would consist of 16 rows with 40 solar PV panels each, which would be mechanically connected by a common rod. The rod would be moved by a single electric motor and gear train. The maximum height of the solar PV panels when mounted on the tracking system would be less than 7.5 feet."
- The gen-tie lines "will be suspended from wooden and/or steel poles, similar to telephone poles, that would be approximately 70 feet high and 50 inches in circumference…Approximately 200 poles would be installed over the 6.2-mile corridor."
- EA: "The Project would not affect any agricultural land or forest resources because none are present in the Project area."
- The EA states that in addition to terms and conditions of a Biological Opinion issued by the U.S. Fish and Wildlife Service for the Project, the applicant should implement certain environmental protection measures, including, for example:
    - "Each battery container will contain a fire suppression system that is designed to contain any fire within the container itself…. The fire suppression system will include a gaseous fire suppressant agent and an automatic fire extinguishing system designed according to National Fire Protection Association safety standards, further preventing any spill that would impact the surface streams."
    - Fencing "would be constructed to screen views of construction activities from visitors."
    - "Vertical tubes and poles will be capped to prevent entrapment of birds and small mammals."
    - "All construction equipment powered by gasoline or diesel engines will have sound control devices that are at least as effective as those originally provided by the manufacturer. All equipment will be operated and maintained to minimize noise generation."
- Per the EA, the Project design also includes several protective erosion and drainage control measures including: silt fences, stabilized construction entrances at each site, designated vehicle and equipment cleaning/concrete washout areas at each site, and dust control and hydroseeding or other reseeding within each site.
- EA: "A Revegetation Plan will be prepared for the Project. Upon Project completion, all areas temporarily subject to ground disturbance, including staging areas, will be revegetated according to the Revegetation Plan."
- The EA describes "best management practices" (BMPs) that would be employed in the use and storage of all hazardous materials within the Project area, including the use of containment systems in appropriate locations; keeping materials in their original containers with the original manufacturer's label and resealed when possible;

avoiding excessive on-site inventories of chemicals; and performing fueling of vehicles and equipment in locations that are protected from spillage onto exposed ground surface.

- EA: "The preparation and implementation of an approved [Storm Water Pollution Prevention Plan] and implementation of Project design measures and BMPs would avoid and/or minimize major adverse surface water quality effects…as well as groundwater effects during Project construction."
- EA: "The Proposed Action would not cause dislocation, changes in employment, or increase flood, drought, or disease; nor would it disproportionately impact economically disadvantaged or minority populations."
- The EA describes detention basins at each site to minimize effects to surface water quantity and drainage. "Basins would be placed strategically at low points for each site…Runoff in excess of the first-flush volume would overtop the basins and discharge to the historical outfall for each site…As Site 3 does not have an existing outfall, a float will be installed in the detention basin to monitor the water levels. Once a predetermined water level is reached, a pump will be activated to discharge additional runoff through a pipe to the O'Neill Pumping-Generating Plant intake channel…. The BESS would have a separate runoff collection system to contain all runoff and prevent it from entering any surface waters as well as groundwater or soils. As a result of these design measures, effects on surface water and drainage from Project operation would be minor."
- Visual resources were assessed in the EA based on potential change in landscape character experienced from identified viewing areas of recreationists, residents, and roadway travelers. "Impacts were assessed based on the magnitude and duration of anticipated impacts as well as the context of the affected resource. This assessment was implemented at [key observation points] representing typical landscape features, common or sensitive view areas, significant viewpoints, and important landmark features."
- FONSI: "Reclamation and the Applicant shall comply with the terms and conditions of the Biological Opinion issued by the U.S. Fish and Wildlife Service for the Project (Appendix B of EA-14- 059)."
- FONSI: "In accordance with NEPA, Reclamation has determined that the approval of the Proposed Action is not a major federal action that will significantly affect the quality of the human environment; consequently, an environmental impact statement is not required."

Environmental Assessment for Construction and Operation of a Solar Photovoltaic and/or Battery Energy Storage System at Naval Air Station, Fallon, Nevada (Department of the Navy, 2016): Email DOE-NEPA-Rulemaking@hq.doe.gov for a copy of this EA and FONSI.

- Under the Proposed Action, the United States Department of the Navy (Navy) and a private partner would enter into an agreement to allow the private partner to use Navy land to construct, operate, and own a solar photovoltaic (PV) and/or battery energy storage system at Naval Air Station (NAS) Fallon, Nevada. Once the solar PV and/or battery energy storage system is operational, the private partner would be responsible for maintenance and operation. The energy generated and/or stored would be used by the local community, NAS Fallon, or a combination of both.
- Navy evaluated two action alternatives. Alternative 1 (Preferred Alternative) would consist of construction and operation of an up to 20 megawatt (MW) solar PV and/or 150 MW hour battery energy storage system at Sites A and B (in total covering approximately 230 acres). Alternative 2 would consist of construction and operation of an up to 15 MW solar PV and/or 150 MW hour battery energy storage system at Site A (covering approximately 126 acres).
- The Final EA states, "Under Alternative 1, construction activities at Sites A and B would result in the removal of up to 230 acres of black greasewood vegetation.... Greasewood habitat is regionally abundant and is a common habitat type on NAS Fallon. Removal of 230 acres of greasewood vegetation would represent 0.03 percent of the total greasewood habitat on the 241,126 acres of lands that NAS Fallon administers in the high desert region of

northern Nevada (approximately 88,000 acres total) (NAS Fallon, 2014a). No tree removal would be required for construction of the solar PV and/or battery energy storage system."

- FONSI states, "Based on the analysis presented in this EA, the Navy finds that implementation of Alternative 1 would not significantly impact the quality of the human or natural environment."

Environmental Assessment for Blythe Mesa Solar Power Project (Bureau of Land Management, 2015): https://eplanning.blm.gov/eplanning-ui/project/66074/510

- This EA evaluates the potential environmental impacts of the Blythe Mesa Solar Project, a solar photovoltaic (PV) electrical generating facility of up to 485 megawatt (MW) and 8.4-mile generation interconnection (gen-tie) line that would together occupy a total of 3,660 acres; 3,587 acres for the solar facility component and 73 acres for the 230 kilovolt (kV) gen-tie line.
- EA: "The Applicant does not propose to pave, remove, or significantly alter the agricultural soil that currently exists at the Project area. Rather, the solar panels would be built atop the relatively flat soil lots, leaving the farming soil relatively undisturbed and available for crop cultivation at the end of the Project's life, should the parcels revert to agricultural land. Implementation of Mitigation Measure Agriculture-1 would provide various options for the Applicant to reduce the severity of the impact of the temporary loss of Important Farmland, resulting in a less than significant impact. Project operation would not add to the impacts to agricultural resources."
- EA: "The conversion of Farmland to non-agricultural use in the unincorporated area of Riverside County over the life of the Project, and the cancellation of a Williamson Act contract, would be offset by conservation on other off-site lands; purchase of credits from an established agricultural land mitigation bank; contribution of agricultural land or equivalent funding to an organization that provides for the preservation of farmland in California; or participation in any agricultural land mitigation program adopted by Riverside County that provides equal or more effective mitigation than the measures listed in Mitigation Measure Agriculture-1. Implementation of Mitigation Measure Agriculture-1 would result in a less than significant impact."
- EA: "The solar facility would be in a seismically active region, and people and structures could be exposed to seismic ground shaking. Implementation of Mitigation Measure Geology-1 requires subsequent geotechnical work to determine site specific parameters for foundation design and engineering. Implementation of Mitigation Measure Geology-3 would require the removal of loose soil layers and replacement with compacted fill or specialized foundation design, including the use of deep foundation systems, if appropriate, to help support structures. With implementation of Mitigation Measures Geology-1 and Geology-3, impacts would be reduced to less than significant levels."
- FONSI: "No environmental effects associated with the Blythe Mesa Solar Project meet the definition of significance in context or intensity as defined in 40 CFR 1508.27."
- FONSI: "…the context of Alternative 3 points to no significant unmitigated environmental impact considering the following: 1. The Alternative 3 solar generation facility is proposed on land already disturbed by past activities including agriculture. The gen-tie line will result in some, but not substantial amounts, of new areas of disturbance. As discussed in the EIR/EA, the extent of new areas of disturbance will be minimized through project design features and mitigation measures provided in the EIR/EA. 2. Alternative 3 is a site-specific action directly involving a total gen-tie length of 8.8 miles (including federal and non-federal land); 3 .6 miles would be located on private lands within the array site boundary and 5.2 miles would be located outside the solar plant site boundary on BLM-managed lands. The BLM portion of the ROW would contain 78 acres."
- FONSI: "Although the Project would convert approximately 1,700 acres of Prime Farmland to non-agricultural use, the Project's conversion of farmland to non-agricultural use would not result in conversion of other adjacent

Farmland to non-agricultural use. The Selected Alternative would not introduce a non-agricultural use that is sensitive to or incompatible with agricultural operations that would occur nearby. Additionally, Mitigation Measure Agriculture-I will mitigate for land converted from Farmland to non-agricultural uses."

- FONSI: "The Selected Alternative is located in an area identified in the BLM Solar Energy Program Western Solar Plan (the "Western Solar Plan", 2012) as a priority area for utility-scale solar energy and associated transmission infrastructure development. In addition, the proposed solar facility would be located on previously disturbed agricultural land as opposed to undisturbed land. The gen-tie line and other federal actions included in the Selected Alternative will be constructed within a previously established transmission corridor (Corridor K) as identified in the CDCA plan. Therefore, the Project is not likely to be highly controversial."

Environmental Assessment for Construction, Operation, and Decommissioning of a Solar Photovoltaic System at Marine Air Ground Task Force Training Command Marine Corps Air Ground Combat Center Twentynine Palms, California (Department of the Navy and United States Marine Corps, 2015): https://www.29palms.marines.mil/Portals/56/Docs/Environmental-Affairs/Final-EA-and-FONSI-for-Solar-PV-System-2015.pdf

- This EA evaluates the potential environmental impacts resulting from the construction, operation, and decommissioning of a solar photovoltaic system in the Mainside area at Marine Air Ground Task Force Training Command (MAGTFTC), Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California.
- The EA analyzes three action alternatives: up to 57 megawatts (MW) on 241 acres for each (differences among the alternatives relate to the proposed location and length of the new transmission line).
- The proposed action would be located within the Mainside area, which is located in the southernmost portion of the installation (MCAGCC) and is the primary developed area on the installation, providing an array of maintenance, storage, administrative, commercial, and housing facilities.
- EA: "A decommissioning plan would be prepared in accordance with DoN [Department of the Navy] requirements. The plan would ensure that the project facilities would be decommissioned and removed and that the site would be restored to pre-construction conditions. Soils and impacted areas would be reclaimed to a level that would, at a minimum, support uses for the land consistent with pre-construction activities. The decommissioning and restoration process would likely involve the removal of above ground structures, possible grading, and restoration of topsoil. A revegetation and seeding plan approved by the Combat Center's Natural Resources and Environmental Affairs (NREA) office would be implemented following decommissioning activities to restore the site to pre-project conditions for specific areas within, or adjacent to, the Mesquite Dry Lake or along the transmission line corridor. Temporary erosion and sedimentation control best management practices would be used during the decommissioning phase of the project."
- EA: "All hazardous materials would be disposed of in accordance with applicable regulations at an appropriately accredited facility for the hazardous material(s). A decommissioning staging area would be delineated within the overall project area and all work would be done on-site. Following decommissioning activities, the DoN would certify that the land condition has been returned to its pre-project condition. All decommissioning activities would be conducted in compliance with all regulations applicable to conducting work activities at the Combat Center"
- FONSI: "Implementation of the selected alternative (Alternative 3) will not result in significant environmental impacts. The proposed action will have negligible direct, indirect, or cumulative impacts on the quality of the local environment and will comply with all regulatory requirements. … Cumulative effects of the proposed action in combination with other past, present, or reasonably foreseeable future actions would not be significant."

Environmental Assessment of a Photovoltaic Development for Holloman Air Force Base (U.S. Air Force, 2015): https://www.holloman.af.mil/Portals/101/documents/Environmental_Info/EA%20of%20Photovoltaic%20development%2

0for%20HAFB%202015.pdf?ver=2016-02-23-110850-320; https://media.defense.gov/2020/Feb/03/2002243097/-1/-1/1/FONSI%20-%202016%20PHOTOVOLTAIC%20DEVELOPMENT%20EA.PDF

- The proposed action is to develop a photovoltaic (PV) energy production facility on Holloman Air Force Base (HAFB) by means of a Power Purchase Agreement between the AF, a public utility and/or a private power producer to develop, operate and maintain the electrical generation facility with HAFB as the customer.
- The Preferred Alternative Site for the construction of the PV array is 400 acres including the Atlas Power Substation.
- The EA explained, "The HAFB solar PV array project area is currently an open, undeveloped parcel dominated by native vegetation, containing several power lines with associated unimproved service roads and an electric substation. Current aerial views of the parcel and vegetation surveys demonstrate an essential similarity to naturally vegetated basin areas throughout the region. Power lines and the substation, Holloman mission buildings a mile south and southwest, WSMR instrument stations, old Balloon facilities and the La Luz Gate to the north, and embankments of a construction debris landfill a mile northeast, are the man-made visual elements within the immediate vicinity. The area is remote from any residential area, visible only to traffic on Vandergrift Road and is not in any sensitive view-shed."
- The EA states, "Implementation of the action would not significantly impact geology, seismicity, ground water, land use, socioeconomic and environmental justice concerns, human health and safety, nor would there be hazardous or toxic waste or materials concerns. Negligible or brief transient impacts would occur in the local air quality, soils, aesthetics, noise, wildlife and solid waste categories. Construction and operation of the proposed facility would have some potential to cause adverse impacts to surface water resources, vegetation, species of concern and cultural resources (archaeological sites). The proposed action is sited to avoid major impacts to vegetation and species of concern, design measures will prevent surface water impacts, and measures to mitigate adverse effects on historic properties are being addressed…."
- The USAF FONSI states "none of [the] alternatives or the proposed action will have significant direct, indirect or cumulative impacts upon the environment."

Environmental Assessment for Outgrant for Construction and Operation of a Solar Photovoltaic System in Area I, Nellis Air Force Base, Clark County, Nevada (U.S. Air Force, 2011): https://www.nellis.af.mil/Portals/104/Documents/Environmental%20Assessments/Final%20Solar%20PSII%20EA%20Nellis%20March%202011.pdf?ver=2016-04-25-160259-820

- The U.S. Air Force (USAF) proposes to initiate a renewable outgrant to Nevada Power Company (NV Energy) for approximately 160 acres of USAF property located at the southwest corner of Nellis Air Force Base (Nellis). NV Energy proposes to construct, operate, and eventually decommission a solar photovoltaic system on the property proposed for the outgrant by Nellis.
- The solar photovoltaic system would generate 10 to 15 megawatts alternating current or up to 18 megawatts direct current. NV Energy could construct either fixed or one-axis type solar panels. The solar panels would be ballasted to minimize excavation.
- Nellis would be the primary recipient of power generated, but some excess power may go to the electric grid when energy demand at Nellis is low.
- The USAF FONSI concludes that, "implementation of the Proposed Action or the Alternative Actions would result in no significant impacts on the quality of the human or natural environments."

Effects on Birds and Insects

DOE reviewed and considered literature on the risk that solar photovoltaic facilities pose to aquatic bird species. Research is ongoing into the risk of avian mortality at solar photovoltaic facilities, in particular the "lake effect hypothesis" (LEH) which posits that aquatic birds are attracted to arrays of reflective solar panels, mistaking them for open water. However, recent studies by Kosciuch et al. (summarized below) have found no evidence of flocks of aquatic birds landing at solar PV facilities, and often the bird mortality observed at solar sites does not have a clear cause.

A 2021 study by Kosciuch et al. monitored aquatic habitat bird presence and mortality at five solar PV facilities in southern California and compared the findings to reference sites and to a nearby lake. The researchers found live aquatic birds at the PV sites, and not at the desert/scrub and grassland reference areas. However, they did not observe flocks approaching the solar sites exhibiting landing behavior. The researchers also stated that "aquatic habitat bird use was higher in an irrigated landscape compared with a grassland and desert/scrub habitat; however, the mortality patterns at PV solar facilities in agricultural landscapes are poorly studied." They concluded that some species could be attracted to PV facilities but stated "we cannot readily generalize the LEH to all aquatic habitat birds, and fatality risk could be species specific and context dependent." For the full study, please refer to *Aquatic Habitat Bird Occurrences at Photovoltaic Solar Energy Development in Southern California, USA* (Kosciuch, K., et al., 2021) Diversity 13(11):524 (https://doi.org/10.3390/d13110524).

A 2020 paper by Kosciuch et al. summarized bird mortality monitoring at ten solar PV facilities in California and Nevada over 13 years and identified potential patterns among the sites. Aquatic birds were detected at all sites and across 90% of the site-years, but they found that the monitoring indicated "no evidence of a comparatively large-scale fatality events of nocturnal migrating passerines or migrating water associates or water obligates" and noted that most of the mortality was of unknown cause. They also noted that proximity to stopover sites, such as the Salton Sea, was associated with higher percentages of aquatic birds. However, they caution that "our statements should not be interpreted as evidence there will be water-obligate bird mortality at PV USSE [utility scale solar energy] facilities developed in areas with concentrations of migrating or overwintering water obligates because the causal mechanism for fatality risk is unknown." For the full study, please refer to *A Summary of Bird Mortality at Photovoltaic Utility Scale Solar Facilities in the Southwestern U.S.* (Kosciuch K., et al., 2020) PLoS ONE 15(4):e0232034 (https://doi.org/10.1371/journal.pone.0232034).

Other studies reviewed by DOE presented different methods of extrapolating monitoring data to annual avian mortality rates resulting in a range of estimates and indicating the need for continued monitoring. Two such studies are *A Preliminary Assessment of Avian Mortality at Utility-Scale Solar Energy Facilities in the United States* (Walston, L., et al., 2016) Renewable Energy 92(1):405-414 (https://doi.org/10.1016/j.renene.2016.02.041) and *Utility-Scale Solar Impacts to Volant Wildlife* (Smallwood, K., 2022) The Journal of Wildlife Management 86:e22216 (https://doi.org/10.1002/jwmg.22216). These papers also point to the difficulty in distinguishing exact cause of mortality in many cases and suggest methods for improving future monitoring.

DOE also reviewed and considered literature on the effects of solar photovoltaic facilities on insect populations, and BMPs and design considerations to reduce potential adverse impacts. Several relevant studies are summarized below.

How to disguise evolutionary traps created by solar panels (Black, T.V., Robertson, B.A., 2020) Journal of Insect Conservation 24: https://doi.org/10.1007/s10841-019-00191-5

- "Photovoltaic panels are the most rapidly growing source of sustainable energy, but are also sources of polarized light pollution that can mislead aquatic insects into thinking they represent natural waterbodies. Aquatic insects are commonly attracted away from natural water bodies to lay their eggs upon solar panels where they fail to hatch, a phenomenon called an evolutionary trap."
- "This study demonstrates that interruption of attraction through the addition of non-polarizing surface patterns is a fundamental aspect of aquatic insect interpretation of environmental polarized light signals that can be used to disguise environmental cues that normally trigger evolutionary traps."

- "Extant and commercially available PV panel designs represent an incredibly diverse array of configurations of solar-active (light polarizing) and white (non-polarizing) surfaces. Our results indicate significant flexibility exists in the placement and width of non-polarizing stripping on solar panels that disguise evolutionary traps, though no research investigates a potential role for pattern in the efficacy of disguising these traps."
- "Further development of our approach is necessary before it can be applicable as a mitigation strategy in a commercial setting, but our study contributes significantly to the growing breadth of work which suggests that the interplay between polarized and non-polarized light is an essential part of many insect behaviors."

Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem (Graham, M., et al., 2021) Scientific Reports 11, 7452: https://doi.org/10.1038/s41598-021-86756-4

- "We documented the species abundance, richness, and diversity of flowers and pollinators at a PV solar plant designed to provide habitat for pollinating insects and native plants."
- "Our results show that (1) pollinating insects visited flowers regardless of the presence of solar panels, and (2) that shading from solar panels altered the abundance and timing of floral blooms visited by pollinators, and influenced the abundance, richness and diversity of the pollinator community. Thus, planting solar arrays with pollen and nectar producing plants (flowers) creates habitat for pollinating insects, and "pollinator-friendly" solar installations should include multiple plant species that are shade-tolerant or thrive in full sun to maximize the niche-partitioning inherent in insect pollinator communities."
- "Microclimates with partial shading may provide additional benefits in drylands during hot, dry summers. Unused or underutilized lands below solar panels represent an opportunity to augment current paucity and expected decline of pollinator habitat. Near agricultural lands, this also has the potential to benefit the surrounding agricultural community."

Solar energy development impacts flower-visiting beetles and flies in the Mojave Desert (Grodsky, S., et al., 2021) Biological Conservation 263, 109336: https://doi.org/10.1016/j.biocon.2021.109336

- "Our objective was to elucidate relationships between solar energy development decisions, including site preparation practices and retention of undisturbed habitat patches in solar fields, and non-bee insect flower visitors at Ivanpah Solar Electric Generating System (ISEGS)."
- "Our results are applicable to PV solar energy development in deserts. Historically, most PV facilities in deserts have been prepared by blading and mowing to heights lower than at CSP [concentrated solar power] facilities like ISEGS, and they typically are devoid of habitat patches."
- "Our empirical results indicate that displacement of non-bee insect flower visitors via indirect effects of habitat loss from solar energy development is a valid conservation concern."
- "Siting solar energy facilities on ecologically marginalized lands like abandoned farmland and contaminated sites and in the built environment (e.g., distributed solar on residential/commercial rooftops) rather than in undeveloped desert environments will sustain non-bee insect flower visiting populations in desert ecosystems while potentially conveying techno-ecological synergies."
- "Solar energy development decisions that may reduce negative effects on non-bee insect flower visitors and warrant investigation include the following: 1) mowing vegetation at heights taller than 0.30 m; 2) site preparation that entails neither blading nor mowing, such as "drive and crush"; and 3) creation of large-scale habitat patches within the footprint of solar facilities where soils and floral resources are left completely undisturbed via avoidance of desert washes and increased PV panel spacing, for example."

If you build it, will they come? Insect community responses to habitat establishment at solar energy facilities in Minnesota, USA (Walston, L., et al., 2023) Environmental Research Letters 19, 014053: https://doi.org/10.1088/1748-9326/ad0f72

- "Our study took place between 2018 and 2022 at two utility-scale solar energy facilities in southern Minnesota, USA…. Prior to solar energy development, both sites were previously used for decades for row crop agricultural production. The solar facilities were constructed with plans to minimize impacts to soils…. After construction, both sites were prepared for restoration with native plantings of grasses and forbs."
- "Our objectives were to address the following three research questions: • Does flowering plant abundance and diversity on solar sites increase over time? • Does insect abundance and diversity within the solar sites increase over time? • Does proximity to solar-pollinator habitat influence bee visitation to croplands near the solar facilities?"
- "By the end of the 5 year study period, we observed a 7-fold increase in flowering plant species richness, on average, within the onsite habitat transects. In that same time, abundance of insect pollinators and beneficial insects tripled, and insect group diversity increased by an average of 13% per year. Remarkably, we observed an exponential increase in the abundance of native bees, which increased over 20-fold during this study, with most observations occurring after Year 2."
- "Along with observed annual increases in insect group abundance and diversity within the solar-pollinator habitat transects, we also found positive effects of proximity to solar-pollinator habitat on bee visitation to nearby soybean fields."
- "…siting future solar energy sites on marginal farmland and pairing these developments with solar-pollinator habitat could preserve prime farmland, improve the productivity of those remaining lands through pollination and pest control services supported by solar-pollinator habitat, and increase the site's ecosystem services potential…."
- "Solar-pollinator habitat is unlikely to completely offset the residual ecological impacts of solar developments poorly sited in areas with high ecological value. In this context, solar-pollinator habitat may have the greatest potential for ecological benefit for solar energy facilities sited in areas that have been previously ecologically compromised, such as marginal farmland, former industrial or mine lands, and other disturbed sites. In these situations, solar-pollinator habitat may be able to provide net biodiversity benefits."
- "Our observations highlight the relatively rapid (<4 year) insect community responses to grassland restoration activities and provide support for solar-pollinator habitat as a feasible conservation practice to safeguard biodiversity and increase food security in agricultural landscapes."

Control Technologies and Best Management Practices

In addition, DOE identified the sources below that include BMPs that lessen environmental impacts of construction and operation of solar facilities. These change over time to reflect new developments and lessons learned. Which of these are relevant to a particular proposed action is dependent on the technology and location. This list of sources is not an exhaustive list. Many states have developed local or state-specific guidance or ordinances, which provide greater detail and considerations of BMPs for solar project implementation by state.

The categorical exclusion B5.16 requires that a proposed project "would be consistent with applicable wildlife management plans and incorporate appropriate control technologies and best management practices (e.g., to maintain habitat connectivity)." DOE has expanded its review of BMPs that address wildlife habitat and connectivity and added additional references on this topic. These practices are often site- or species-specific and developed with input from state or federal wildlife officials. Fence designs may permit or prevent passage of certain species, or encourage wildlife to use certain corridors to move through the area, depending on what is appropriate for the species and the location. Anti-perch designs may be used to deter birds from areas where they may become entrapped or otherwise harmed, or wildlife escape ramps may be used to prevent entrapment of small animals.

The following references also address other BMPs such as soil compaction and erosion prevention, surface water runoff management, weed prevention, native and pollinator-friendly seeding, decommissioning, and other considerations.

Best Practices: Photovoltaic Stormwater Management Research and Testing (PV-SMART) (Great Plains Institute, 2023): https://betterenergy.org/wp-content/uploads/2023/01/PV-SMaRT-Best-Practice.pdf

- The Great Plains Institute PV-SMART project studied stormwater infiltration and runoff at photovoltaic sites and identified four key elements that impact stormwater and water quality: soil compaction, soil depth, ground cover, and disconnection of impervious areas from receiving water bodies. The Best Practices report provides recommended BMPs to address these elements. The following are selected examples; refer to the full report for a more comprehensive list.
    - "Consider modifications to standard site design (array layout, vegetation selection, final stabilization procedures) to reduce bulk density, particularly for sites with finer soils."
    - "Measure soil bulk density before and after construction, both between arrays and under arrays."
    - "Identify compaction or bulk density standards for contractors to allow them to integrate consideration of compaction into construction practices."
    - "Post-construction, if bulk density is high, decompact areas between arrays to a minimum of six inches and under arrays to a minimum of four inches."
    - "Include a post-construction vegetation establishment and maintenance plan in Stormwater Pollution Prevention Plan for implementation by site owners/managers."
    - "Use appropriate deep-rooted vegetative cover between and under the array that lowers bulk density, increases infiltrative capacity, and reduces the need for vegetative maintenance over the life of the project."
    - "Create a plan for the establishment of native or naturalized optimal vegetative cover that allows interim use of an appropriate cover crop."
    - "Minimize or eliminate grading of the site. Grading can significantly affect the infiltrative capacity of the site and result in the need for additional engineered stormwater BMPs."
    - "Prevent soil removal. Topsoil and rooting soils enable infiltration. Removing soils will increase the need for engineered BMPs."

Land Use Considerations for Large-Scale Solar (SolSmart, 2020): https://solsmart.org/wp-content/uploads/imported-files/Solar-Land-Use_03122021.pdf

- The SolSmart program is funded by the U.S. Department of Energy Solar Energy Technologies Office. This SolSmart Issue Brief was written by the Electric Power Research Institute and is intended to educate local governments and community stakeholders by identifying key challenges posed by stormwater runoff and mitigation measures to reduce impacts, as well as vegetation management strategies to avoid soil erosion issues at large-scale solar sites. The following are selected examples; refer to the full report for a more comprehensive list.
    - "Stormwater management provisions vary considerably by state, depending on state-level regulations, legislation, and local government zoning codes and ordinances."
    - "Common design considerations include: • Ensuring that there is an adequate permeable space between rows of solar panels so that runoff from the panels remains hydrologically disconnected. • Selecting a construction site with a slope of less than 5%, or terracing the site to maintain sheet flow conditions. • Minimizing site compaction during construction or tilling and amending soil following construction to maintain the natural infiltration capacity of the soils. • Limiting the vertical distance between the ground and the panel drip edge to limit soil erosion. • Establishing native groundcover that will help prevent erosion, promote infiltration, and support ecological function."

- "BMPs that are applied during the construction phase of a project are designed to control the erosion and resulting sedimentation that can occur when natural land surfaces are disturbed. These BMPs include use of mats that are placed over exposed soil, silt fences, stone filters, and drainage swales, among other common methods. Each BMP reduces surface erosion and/or promotes the settlement of sediment particles that have been dislodged."
- "Requirements for post-construction stormwater management vary by location, but they typically include BMPs designed to reduce erosion, lessen off-site sediment transport, and mitigate any alteration of the natural volume and timing of runoff. These BMPs include site grading and terracing to reduce runoff flow velocity, soil stabilization through effective re-vegetation, constructed and natural depressions to promote stormwater infiltration, vegetated swales (with or without check dams), and retention ponds. Aligning re-vegetation activities with the growing season is encouraged to establish groundcover."
- "Vegetation management comprises a set of activities that aim to control the growth of undesirable flora around power plants. The general goal of vegetation management is to prevent vegetation from negatively impacting the technical performance, operational safety, and regulatory compliance of these assets. Typical ground covers used at ground-mounted PV facilities include bare earth, rock or sand, and various types of vegetation, such as grasses and grass-like species including forbs and sedges. If left unmanaged, other plants such as shrubs and trees can take root. Informed vegetation selection and management practices can avoid costly stormwater and maintenance expenses throughout a solar project's lifetime, while providing benefits to local ecosystems and the surrounding community, such as pollinator habitat…"
- "Regional climate, local weather, equipment design and configuration, and vegetation type affect vegetation growth and maintenance strategies. In regions with high levels of rainfall and sunlight, frequent mowing and continual monitoring and control may be required. PV facilities in arid regions receiving less than 10 inches of rainfall each year often utilize a "zero-vegetation" approach. Ground cover is composed of existing sand, gravel, or other construction aggregates, and vegetation growth is often sporadic and scattered. In these areas, herbicides are often preferred over mowing or trimming to prevent projectiles from damaging equipment and personnel."
- "There are several methods for controlling vegetation at PV plants. Common approaches include physical controls such as mechanical mowing or manual trimming, chemical controls in the form of selective and non-selective herbicide applications, and biological controls such as livestock grazing and weed seed predation — a method that introduces birds, insects, or rodents to consume or damage the seeds of unwanted weeds."

Best Practices at the End of the Photovoltaic System Performance Period, NREL/TP-5C00-78678 (National Renewable Energy Laboratory; NuLife Power, 2021): https://www.nrel.gov/docs/fy21osti/78678.pdf

- "A photovoltaic (PV) power generation project involves design, construction, and operation of a PV power plant over a performance period of 20–30 years. The duration of a financial prospectus or power purchase agreement (PPA) often determines the expected performance period. This paper investigates alternatives at the end of that performance period: extending the performance period and refurbishing, repowering, or decommissioning the system, as well as laws that can limit these options."
- "Issues that arise and costs that are incurred at the end of a PV project life cycle should be considered at the earliest stages of project planning and in the financial prospectus for the project. Often decisions are delayed until the future, but this frequently leaves one of the remaining project parties with additional, end-of-life costs."
- "Regulations regarding land-use plans might require that decommissioning plans and financial resources to accomplish decommissioning be established in the initial permitting process. Federal and state regulations

regarding transportation, storage, and disposal of waste must be observed. Recycling and disposing of PV systems equipment and materials at the end of their performance period can provide a financial benefit to the owner and can uphold goals of sustainability."

- "Decommissioning plans appear as provisions in land-use agreements (land lease, easement, right-of-way, etc.), might be required for construction and operating permits, and should be recorded with a registrar of deeds. These provisions arise in initial construction approval requirements and are negotiated between the landowner and the solar developer but might need to comply with local (town, city, county) laws. Decommissioning plans should include:1. Contact information for all parties (landowner; solar developer; authorities having jurisdiction; and known sources of services, such as recycling programs and emergency service providers) 2. Any warranted recycling of PV modules or other components that were provisioned as part of the original procurement; any bonds to take back PV modules or other equipment 3. Conditions that trigger the decommissioning (date certain, end of lease, system inoperative for 12 months, any other) 4. Time period within which the decommissioning must be completed (e.g., 6 months) 5. Scope of work for the decommissioning, which often includes removing all equipment, grading to restore water runoff characteristics, restoring ground cover (seed), or otherwise restoring the land to its original condition 6. Roles and responsibilities of the landowner, solar developer, and any other parties clearly delineated."
- "Begin with the end in mind. End-of-performance period issues are often framed much earlier: in the financing plans; in the design and specification of components; and in ongoing O&M, especially near the end of the performance period. Seek legal, technical, and tax advice regarding end-of-contract ownership transfer—both prior to executing the contract and during negotiations at the end of the contract term. Other recommendations include: 1. Avoid hazardous materials. 2. Use recoverable/recyclable materials. 3. Recycle PV modules and other recyclable materials. 4. Include contract terms regarding neglect of O&M late in the contract term. 5. Negotiate contract terms regarding the disposition of a system at end of the contract 6. Plan for a contingency if the contractor is out of business or neglects the project."

New York Solar Guidebook for Local Governments: Decommissioning Solar Panel Systems (NYSERDA, 2023): https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Siting-Resources/Solar-Guidebook

- NYSERDA provides guidance for the "decommissioning of large-scale solar panel systems through the topics of decommissioning plans and costs and financial and non-financial mechanisms in land-lease agreements." This document provides examples of abandonment as well as a checklist for decommissioning plans.
- "A decommissioning plan outlines required steps to remove the system, dispose of or recycle its components, and restore the land to its original state. Plans may also include an estimated cost schedule and a form of decommissioning security"
- "The following items are often addressed in decommissioning plans requirements:• Defined conditions upon which decommissioning will be initiated (i.e., end of land lease, no operation for 12 months, prior written notice to facility owner, etc.).• Removal of all nonutility owned equipment, conduit, structures, fencing, roads, and foundations.• Restoration of property to condition prior to solar development.• The timeframe for completion of decommissioning activities.• Description of any agreement (e.g., lease) with landowner regarding decommissioning.• The party responsible for decommissioning.• Plans for updating the decommissioning plan.• Before final electrical inspection, provide evidence that the decommissioning plan was recorded with the Register of Deeds"

Recommended Practices for the Responsible Siting and Design of Solar Development in Georgia (Georgia Department of Natural Resources, 2023):

https://gadnr.org/sites/default/files/wrd/pdf/GA%20Recommended%20Practices%20for%20Solar-%20Fall%202023%20-%20V1.0.pdf

- "Prioritize siting on previously disturbed or degraded lands whenever possible."
- "Avoid conversion of forested and sandhill habitats that provide important ecosystem services such as flood and stormwater mitigation, erosion and sedimentation controls, carbon sequestration, nutrient management in addition to potential habitat for endangered, threatened, and other species of concern."
- "To minimize habitat fragmentation and support conservation corridors, avoid siting next to lands that are already conserved for biodiversity or that provide connectivity between such protected lands or priority corridors."
- "Identify stream and wetland resources and develop plans to avoid and minimize impacts whenever possible. If a site is selected that contains wetland or stream characteristics, plan for the required vegetative buffers and consider the feasibility of increasing the buffers around these resources."
- "If significant land clearing will be required or if a site contains highly erodible or steeply sloped soils, plan to address a higher stormwater runoff potential."
- "Avoid irreversible conversion of highly productive agricultural lands. Prioritize siting on agricultural lands that are idle, low-yield, or that require significant irrigation."
- "Reduce barriers to wildlife movement through thoughtful consideration of retention of unfenced passageways or wildlife-friendly fencing practices."
- "Prior to beginning any land disturbing activity, approved erosion control measures (silt fencing etc.) should be placed between the disturbed area and any nearby waterways and maintained in a functioning capacity until the area is permanently stabilized. Prioritize topsoil protection and management on sites with steeper slopes."
- "Avoid unnecessary removal of topsoil or vegetation removal to minimize long-term impacts to soil health and hydraulic conductivity. Tree clearing in preparation of solar development should be handled as a development project rather than as silviculture. Unnecessary removal of trees should be minimized, and any tree clearing activities should stay out of all mandated stream buffers (or streamside management zones)."
- "Incorporate conservation practices into vegetation management. Use native and local ecotype seed mix sources when practicable to restore and/or augment the herbaceous vegetation."
- "To prepare for site planting, existing invasive, agricultural weeds and non-native vegetation should be eliminated prior to planting, taking into consideration past use of pre-emergent herbicides or persistent pesticides. Awareness of past herbicide practices can better inform weed control approaches and seed mix selection. Depending on the composition of existing vegetation, selective herbicide application prior to planting may be necessary."
- This document also includes detailed conservation measures and recommended seasonal considerations for various species including reptiles, mammals, birds, plants, aquatic species, and pollinators.

Site Renewables Right: Accelerating a Clean and Green Renewable Energy Buildout in the Central United States (The Nature Conservancy, 2022):
https://www.nature.org/content/dam/tnc/nature/en/documents/SRR_Methods_20220202_LR.pdf;
https://www.nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/climate-change-stories/site-wind-right/?vu=siterenewablesright

- "The Site Renewables Right analysis includes maps of key wildlife areas relevant to wind and photovoltaic (PV) solar energy development, which may be used to identify areas where projects are less likely to encounter significant wildlife-related conflict, delays, and cost overruns by prioritizing areas for avoidance. The maps were designed to serve as an important source of information to inform screening early in the project siting process."

- "This information is not intended to replace consultation with federal and state wildlife agencies and tribal governments."
- "To support site evaluations early in the project development process, we identified a subset of key wildlife areas from the wind map that may be relevant in the context of PV solar facility siting. The habitat elements featured in the solar map include:
    - Whooping crane stopover sites (with 400 m avoidance buffer; cf. Baasch et al. 2019)
    - Threatened and endangered species
    - Water and wetland features (no buffers)
    - Protected and managed lands
    - Intact natural habitats
    - Other areas of biodiversity significance
    - Climate resilient lands"
- "We note that our delineation of sensitive wildlife habitats is not exhaustive. Spatial data on species of concern are missing or incomplete in some areas. With all development projects, wildlife concerns should also be addressed through careful micrositing."

Solar Energy Facility Construction and Operation Recommendations (Virginia Department of Wildlife Resources, 2023): https://dwr.virginia.gov/wp-content/uploads/media/Solar-Energy-Facility-Guidance.pdf

- "Solar facilities typically incorporate perimeter fencing that may act as a barrier to ground-based wildlife movement. We recommend documenting wildlife travel corridors and observed passage prior to construction activities, and encourage the consultant/applicant to coordinate with DWR regarding wildlife fencing that would allow ingress and egress through the enclosure, as well as the development of wildlife corridors. Adaptive strategies may include lower fence height in wildlife corridors; dividing large sites into smaller fenced sub-parcels (approximately 40 acres maximum) to establish unfenced wildlife corridors; use of larger mesh fence at ground level (i.e., "wildlife-permeable fencing"); and facilitating wildlife passage via ground-level openings or pipes (approximately 8-inch diameter) through the fence."
- "General fencing recommendations: We recommend that the fences enclosing solar facilities either be 61 inches or less in height, so that deer will have easy ingress and egress to/from the enclosure; or that the fences (including barbed wire if desired) be at least 96 inches in height, so that deer would not normally enter the site. Fence design recommendations for deer management: Under certain conditions deer may seek refuge or become entrapped within fenced enclosures. To address this concern, perimeter fences around solar facilities should either be no more than 61" high OR greater than or equal to 96" (8') high. Fences lower than 61" should provide free ingress and egress of deer. Fences of heights between 61" and 8' are likely to entrap deer that are motivated to enter but not leave the enclosure. Fences over 8', if properly maintained, should exclude deer so that they do not become entrapped. Maintenance along the bottom of an exclusionary fence is critical to prevent deer incursions; fences should be erected tight to the ground and any gaps should be filled with rip rap or other barriers (except at purposeful wildlife crossings)."

Commercial Solar Siting Guidance (Minnesota Department of Natural Resources, 2023): https://files.dnr.state.mn.us/publications/ewr/commercial_solar_siting_guidance.pdf

- The Minnesota Department of Natural Resources provides guidelines for commercial solar siting and design considerations to limit impacts to native plant communities, wetlands, wildlife species, public lands and water, and other resources. For example, its recommendations on fence design include setbacks to prevent wildlife from

being directed into roadways. It also recommends the use of biodegradable, wildlife-friendly erosion control materials, pollinator-friendly plantings, and light fixtures that reduce light pollution, among other practices.

Best Management Practices for Solar Energy Development (Colorado Parks and Wildlife, Department of Natural Resources, 2023): https://cpw.state.co.us/Documents/Conservation-Resources/Energy-Mining/Solar-Energy-BMPs.pdf

- Colorado Parks and Wildlife recommends BMPs in a guidance document for large scale solar projects. Topics addressed include site selection, habitat loss and fragmentation, wildlife survey protocols, riparian areas and playas, construction and operational considerations, weed management, fencing, lighting, and decommissioning.

Minimizing environmental impacts of solar farms: a review of current science on landscape hydrology and guidance on stormwater management (Rouhangiz, Y., et al., 2022) Environmental Research: Infrastructure and Sustainability 2 032002: https://iopscience.iop.org/article/10.1088/2634-4505/ac76dd)

- "In states with solar farm-specific guidance, typical recommendations include minimizing construction-related compaction, ensuring a high cover of perennial vegetation with minimal maintenance, and designing with pervious space between solar panel rows to promote infiltration of any runoff; in some cases, structural stormwater management like infiltration basins may be required."
- "In general, solar farms can be designed to minimize the impact on landscape ecohydrological processes, but more research is needed to determine whether current recommendations are adequate. In particular, there is a need for more field research on less ideal sites such as those with higher slopes."

Nebraska Game and Parks Commission Guidance Utility-Scale Photovoltaic Solar Energy Projects (Nebraska Game and Parks Commission, 2021): https://outdoornebraska.gov/wp-content/uploads/2023/03/NGPC-Solar-Energy-Guidelines-Updated-2022.pdf

- The Nebraska Game and Parks Commission recommends using wildlife-friendly fencing, which includes larger openings along the bottom to allow small animals to pass through the solar facility and use of C-style pipe or cap open pipes to minimize impacts to birds during construction.

Establishing Utility-Scale Solar Projects: Federal Involvement (Working Paper 21-11) (Resources for the Future, 2021): https://media.rff.org/documents/WP_21-11_Solar_Federal_Process.pdf

- "The case study identified 45 utility-scale solar projects in 21 states seeking approval to begin construction over the period from 2008 to 2019 (see Attachments A and B). The solar farms range in capacity from 1 to 594 MW. Thirty-eight of the projects generate electricity using photovoltaic (PV) technology…."
- "Of the 20 utility-scale solar farms requiring a substantive review under NEPA in this study, 10 required a formal Section 7 consultation under the ESA, and FWS issued a BO prior to completion of the project's final ROD or FONSI under NEPA. For the remaining solar projects, the action agency determined that a formal consultation was not required and issued BAs."
- "With respect to utility-scale solar electric projects, studies over the last decade suggest that solar projects can contribute to avian mortality resulting from collisions with solar panels, exposure to amplified levels of solar flux, and the continuing displacement of birds from their habitat (FWS 2018c; Upton 2014)…. Since avian mortality can be reduced by strategic design (FWS 2014), the FWS highly recommends that every solar project prepare an Avian and Bat Protection Plan (ABPP)…."
- "Most of the solar facilities covered in this study required state- or federal-issued NPDES discharge permits to address stormwater runoff."

- "In our review, all 20 projects required permits under the CWA: 6 received Section 401 state certifications, 20 received NPDES permits (most were general permits issued by states), and 6 received Section 404 permits. USACE also made determinations that no US jurisdictional waters were present for 11 projects."
- "Solar projects do not typically release water during operation, so an NPDES permit is generally required only to address stormwater and construction activities."
- "If a solar project has only minimal effects, it can obtain a nationwide general permit…. General permits are issued for particular categories of activities with minimal effects on wetlands, eliminating individual review and allowing these projects to proceed with little or no delay…. Projects using nationwide or regional general permits can proceed with construction 45 days after providing USACE with a complete preconstruction notification…."

A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities (Argonne National Laboratory, 2015): https://blmsolar.anl.gov/related/avian-solar/docs/Avian_Monitoring_Mitigation_Solar.pdf

- "Like many industrial activities, utility-scale solar energy development has the potential to impact, directly and indirectly, birds and bird communities in a number of ways, such as by habitat degradation, habitat loss, habitat fragmentation, and direct fatality. This report summarizes existing information about direct impacts, of which there are two general types: collision-related and solar-flux-related. Collision-related impacts may occur from all types of solar energy technologies. The effects of solar flux on birds have so far been observed only at facilities employing concentrated-solar-power towers."
- "Recent studies have demonstrated that utility-scale solar developments represent a source of fatality for wildlife such as birds (e.g., Kagan et al. 2014); however, there are relatively few systematic and empirically based studies that address avian fatality issues at solar facilities (but see McCrary et al. 1986; WEST 2014)."
- "Like all industrial activities, utility-scale solar energy development has the potential to directly and indirectly impact birds and bird communities in a number of ways (Table 2). In general, direct impacts result from ground-disturbing activities at the project and are observable within the solar project footprint, whereas indirect impacts may extend beyond the solar project footprint as the result of factors such as runoff, water depletion, dust deposition, noise, or visual impacts."
- "At PV and CSP facilities, collision hazards to birds are greatest among the solar field arrays. It has been suggested that PV facilities may attract some species of birds through what has been called the "lake effect" (Kagan et al. 2014), whereby migrating birds perceive the reflective surfaces of PV panels as bodies of water and collide with project structures as they attempt to land on the panels. However, no empirical research has been conducted to confirm or refute this hypothesis."
- "Avian fatalities have been documented at solar energy facilities employing both PV and CSP technology types. Several federal and state regulations apply to the protection of birds at solar energy facilities. Most birds are protected by the Migratory Bird Treaty Act, which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the USFWS. Projects are also required to comply with state and federal regulations to protect threatened, endangered, and sensitive species (e.g., ESA, Bald and Golden Eagle Protection Act, BLM policy, and state wildlife codes). Mortality risks to threatened, endangered, and sensitive bird species are related to solar energy project size, location, and technology. Because the potential for impact to birds and their populations depends largely on project size and location, specific requirements for threatened, endangered, and sensitive bird species are often considered on a project-specific basis."
- "In an effort to reduce electrocutions and collision fatalities at electric utility power lines, the APLIC, formed in 1989, developed voluntary BMPs that serve as a valuable knowledge base. Many of these BMPs will apply to utility-scale solar projects."

Guidelines for Solar Development in Arizona (Arizona Game and Fish Department, 2010): https://s3.amazonaws.com/azgfd-portal-wordpress/PortalImages/files/wildlife/planningFor/wildlifeFriendlyGuidelines/FinalSolarGuidelines03122010.pdf

- The Arizona Game and Fish Department provides guidelines for reducing impacts to wildlife from solar development. This document includes resources to assist in preliminary site screening and recommends various avoidance and minimization measures.
- Among the topics addressed are facility design, surface water and groundwater protection, erosion prevention, wildlife habitat, vegetation management, noxious weeds, and fencing.

Principles of Low Impact Solar Siting and Design (The Nature Conservancy in North Carolina, 2019): https://conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/ED_TNCNCPrinciplesofSolarSitingandDesignJan2019.pdf

- The Nature Conservancy in North Carolina has summarized best practices for low impact solar siting and design. Their siting and design recommendations are based on six principles: (1) avoid areas of high native biodiversity and high-quality natural communities; (2) allow for wildlife connectivity, now and in the face of climate change; (3) preferentially use disturbed or degraded lands; (4) protect water quality and avoid erosion; (5) restore native vegetation and grasslands; and (6) provide wildlife habitat.

Solar Farm Conservation Measures in Alabama (U.S. Fish and Wildlife Service, accessed April 2024): https://www.fws.gov/project/solar-farm-conservation-measures-alabama

- The U.S. Fish and Wildlife Service (FWS) outlined several BMPs for solar development in their Solar Farm Conservation Measures in Alabama document. These recommendations include measures for minimizing impacts on migratory birds and terrestrial and aquatic species.
- For example, the document recommends maintaining or establishing a minimum 50-foot buffer of undisturbed native forested vegetation along intermittent streams and ephemeral wetlands and 100-foot-wide buffers along perennial streams and wetlands, burying collector lines below photovoltaic panels, using markers or reflectors on wires and powerlines that cannot be buried, co-locating generation tie lines with existing infrastructure, using avian-safe pole designs, conducting vegetation management outside of nesting season, using down-lighting and shielding to minimize lighting impacts during the night, and implementing year-round bird-strike and attraction monitoring/surveying.
- Additionally, to protect terrestrial species, FWS recommends elevating solar panels at least two to three feet above the ground and using wildflower/native warm-season grass mix. This document also lists specific measures to protect gopher tortoise, bat hibernacula, and protected snake species.

Wildlife and Habitat Management Plans and Resources

The various wildlife and habitat management plans established by states, Tribes, and territories are another source of guidance and BMPs for renewable energy development, including solar photovoltaic facilities. For example, in 2005 all fifty states and five territories submitted State Wildlife Action Plans (SWAPs) for approval to the U.S. Fish and Wildlife Service. These plans help guide state fish and wildlife planning and conservation and address a broad array of wildlife-related issues, with a focus on the species in greatest need of conservation (https://www.fishwildlife.org/application/files/5815/7125/4229/SWAP_Eight_Required_Elements.pdf). The plans are reviewed at least every ten years and updated as needed, with many 2015 plans currently undergoing revision for 2025 (https://www.fishwildlife.org/afwa-informs/state-wildlife-action-plans). Some of these plans specifically address solar development and impacts to wildlife and wildlife habitat, or point to other relevant guidance, resources, mapping tools, or BMPs.

States may also provide separate habitat connectivity plans and mapping tools that can be used to inform site selection and reduce impacts to wildlife connectivity and migration corridors. These resources vary by state and region or by species. The following examples are not an exhaustive list.

Idaho State Wildlife Action Plan (Idaho Department of Fish and Game, 2023): https://idfg.idaho.gov/sites/default/files/plan-2023-state-wildlife-action.pdf

- "Idaho's State Wildlife Action Plan (SWAP) is a statewide plan for conserving and managing Idaho's most at-risk fish, wildlife, and plants and the habitats they depend on. For the first time, plant species were incorporated into the 2023 revision. Designed to span 10 years, the SWAP provides strategic and voluntary guidance on priority conservation actions needed for SWAP species including both "species of greatest conservation need" (hereafter SGCN) and "species of greatest information need" (hereafter SGIN) (collectively "SWAP species") as determined by the Idaho Department of Fish and Game (IDFG)."
- "We summarize the challenges (both natural and human-caused) to SWAP species in Idaho and identify voluntary actions that can be considered to address stressors associated with these challenges and the resulting effects on species and habitats."
- "Voluntary Actions Related to Native Species and Their Habitats…. Collaborate with industry, project proponents, resource managers, landowners, and other stakeholders to plan and implement approaches to achieve joint SGCN [Species of Greatest Conservation Need] and Energy Production & Mining goals and objectives. The following are examples of voluntary actions…. • Encourage the siting of facilities and infrastructure if feasible away from areas, habitats, and movement routes important for SGCN. • Construct infrastructure and install deterrents on existing infrastructure to discourage predatory bird perching and nesting as appropriate to protect SGCN ground-nesting birds (e.g., Greater Sage-Grouse). • When excluding wildlife from hazard areas, design, install, and maintain fencing that avoids or minimizes risk of wildlife collision or entanglement. • When facilitating wildlife movements, reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences."

The Arizona Wildlife Conservation Strategy, 2022-2032 (Arizona Game and Fish Department, 2022): https://awcs.azgfd.com/; https://azgfd-wdw.s3.amazonaws.com/awcs-2022/documents/AWCS_Final_Approved_11-22.pdf

- "The first key component of the AWCS [Arizona Wildlife Conservation Strategy] is a habitat-based conservation plan that is driven by data. This 10-year plan — also known as the SWAP — is a roadmap for the AWCS and an integral part of a comprehensive conservation strategy as it identifies current and potential challenges, sets conservation priorities, provides recommended actions, describes actionable goals to conserve our wildlife and habitats, and so much more. For the first time, specific geographic areas are identified on the landscape — called Conservation Opportunity Areas (COAs) — that reflect multiple conservation priorities to create an integrated framework for action that can be scaled up or down as conditions change. The result is an actionable plan that focuses conservation where it's needed most. The second key component of the AWCS is a sophisticated data management system and web-based tools and data viewers that supports conservation planning and informs land use decisions."
- "Strategic siting of solar facilities to avoid known wildlife movement corridors and sensitive habitat such as riparian areas is an important step the industry can take to reduce environmental impacts of utility-scale facilities. In order to protect Arizona's natural resources while still fostering growth of the solar industry, AZGFD has developed recommendations and protocols to reduce the impact of solar energy development on wildlife, which can be found in Guidelines for Solar Development in Arizona."

- "With Arizona's ample sunshine and wind, renewable energy sources from wind and solar energy plants are particularly appealing alternatives to fossil fuels. These renewable energy sources, as well as thermal power energy, are feasible options when site selection adequately avoids high use areas for birds, raptors, and bats, installations don't disrupt important habitat connectivity areas, and the impact of resulting habitat loss is carefully evaluated. In addition, the effect of associated transmission lines must be evaluated and mitigated. Additionally, all properly-vetted sites that move to construction and energy production must be accompanied by comprehensive wildlife conservation strategies to minimize and/or mitigate wildlife impacts."

Oregon Wildlife Corridor Action Plan (Oregon Department of Fish and Wildlife, 2024): https://www.dfw.state.or.us/wildlife/management_plans/docs/WCAP%20Final%20January%202024.pdf

- "Priority Wildlife Connectivity Areas are an informational tool to guide the work of all entities engaged in land, wildlife, and other natural resource conservation and management, including state, federal, county, and local governmental organizations, sportsmen's organizations, conservation groups, NGOs, and private landowners interested in restoring, enhancing, and protecting habitat important for wildlife connectivity. Priority Wildlife Connectivity Areas are not regulatory and do not dictate land use for any public or private entity…. Priority Wildlife Connectivity Areas represent the parts of the landscape with the highest overall value for facilitating wildlife movement."
- "Siting development in areas outside of essential wildlife habitat, including PWCAs, can help reduce impacts. For example, an energy developer may be looking for suitable land to develop a new utility-scale solar installation. The developer could use PWCAs to ensure that the parcels they are considering fall outside of critical habitat for facilitating wildlife movement, either through the PWCA tool, or through the Oregon Renewable Energy Siting and Assessment (ORESA) mapping tool, which includes PWCAs as a layer under Natural Resource Considerations/Species and Habitats. The developer can use the PWCA and/or ORESA tool to get a sense of potential impacts to wildlife habitat connectivity prior to consultation with ODFW and other departments for permitting and mitigation requirements."
- The Oregon Renewable Energy Siting Assessment Tool is located here: https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=renewable (accessed April 2024).

Health and Safety of PV Panels

DOE reviewed literature regarding the health and safety of solar PV panels and the potential for toxic materials or heavy metals to leach into the environment. Decommissioning best practices are described in the section above.

Health and Safety Impacts of Solar Photovoltaics (North Carolina State University Clean Energy Technology Center, 2017): https://nccleantech.ncsu.edu/wp-content/uploads/2019/10/Health-and-Safety-Impacts-of-Solar-Photovoltaics-PV.pdf

- "Solar PV panels typically consist of glass, polymer, aluminum, copper, and semiconductor materials that can be recovered and recycled at the end of their useful life."
- "To provide decades of corrosion-free operation, PV cells in PV panels are encapsulated from air and moisture between two layers of plastic. The encapsulation layers are protected on the top with a layer of tempered glass and on the backside with a polymer sheet. Frameless modules include a protective layer of glass on the rear of the panel, which may also be tempered. The plastic ethylene-vinyl acetate (EVA) commonly provides the cell encapsulation. For decades, this same material has been used between layers of tempered glass to give car windshields and hurricane windows their great strength. In the same way that a car windshield cracks but stays intact, the EVA layers in PV panels keep broken panels intact (see Figure 4). Thus, a damaged module does not generally create small pieces of debris; instead, it largely remains together as one piece. PV panels constructed with the same basic components as modern panels have been installed across the globe for well over thirty years.

The long-term durability and performance demonstrated over these decades, as well as the results of accelerated lifetime testing, helped lead to an industry standard 25-year power production warranty for PV panels. These power warranties warrant a PV panel to produce at least 80% of their original nameplate production after 25 years of use."

- "This subsection explores the toxicity of silicon-based PV panels and concludes that they do not pose a material risk of toxicity to public health and safety. Modern crystalline silicon PV panels, which account for over 90% of solar PV panels installed today, are, more or less, a commodity product."
- "In the U.S., end-of-life disposal of solar products is governed by the Federal Resource Conservation and Recovery Act (RCRA), as well as state policies in some situations. RCRA separates waste into hazardous (not accepted at ordinary landfill) and solid waste (generally accepted at ordinary landfill) based on a series of rules. According to RCRA, the way to determine if a PV panel is classified as hazardous waste is the Toxic Characteristic Leaching Procedure (TCLP) test. This EPA test is designed to simulate landfill disposal and determine the risk of hazardous substances leaching out of the landfill. Multiple sources report that most modern PV panels (both crystalline silicon and cadmium telluride) pass the TCLP test."
- "PV-specific panel recycling technologies have been researched and implemented to some extent for the past decade, and have been shown to be able to recover over 95% of PV material (semiconductor) and over 90% of the glass in a PV panel."
- "Questions about the potential health and environmental impacts from the use of this PV technology are related to the concern that these panels contain cadmium, a toxic heavy metal. However, scientific studies have shown that cadmium telluride differs from cadmium due to its high chemical and thermal stability. Research has shown that the tiny amount of cadmium in these panels does not pose a health or safety risk."

Change to 10 CFR part 1021, Appendix C, Classes of Actions that Normally require EAs but not Necessarily EISs:

C7 *Contracts, Policies, and Marketing and Allocation Plans for Electric Power*

(a) Establishment and implementation of contracts, policies, and marketing and allocation plans related to electric power acquisition that involve:
(1) The interconnection of, or acquisition of power from, new generation resources that are equal to or less than 50 average megawatts, unless the generation resource is eligible for a categorical exclusion;
(2) Cehanges in the normal operating limits of generation resources equal to or less than 50 average megawatts; or
(3) Sservice to discrete new loads of less than 10 average megawatts over a 12-month period.

Supplemental Supporting Basis:

Discussion of the class of action is provided in Section II.C of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.D of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).

Change to 10 CFR part 1021, Appendix D, Classes of Actions that Normally Require EISs:

D7 *Contracts, Policies, and Marketing and Allocation Plans for Electric Power*

(a) Establishment and implementation of contracts, policies, and marketing and allocation plans related to electric power acquisition that involve:

(1) The interconnection of, or acquisition of power from, new generation resources greater than 50 average megawatts, unless the generation resource is eligible for a categorical exclusion or was evaluated in an environmental assessment resulting in a finding of no significant impact;
(2) Cehanges in the normal operating limits of generation resources greater than 50 average megawatts; or
(3) Sservice to discrete new loads of 10 average megawatts or more over a 12-month period.

Supplemental Supporting Basis:

Discussion of the class of action is provided in Section II.D of the preamble to the Notice of Proposed Rulemaking, November 16, 2023 (88 FR 78681) and Section III.D of the preamble to the Notice of Final Rulemaking, May XX, 2024 (89 FR XXXX).