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Comments of Defenders of Wildlife on Draft EPR Report

Additional submitted attachment is included below.

ATTACHMENT A

Thermal Plumes

The potential for natural gas-fired power plants and cooling towers to generate thermal plumes that could impact aviation is now being recognized and considered. While impacts to air traffic from natural-gas fired generation have remained unchanged over the last 10 years, these were not discussed in the previous *EPRs*.

Power plants emit thermal plumes through exhaust stacks, dry-cooling towers, and wet-cooling towers. The thermal buoyancy and the volumes of air and exhaust used in the processes create a vertical thermal plume. Exhaust stacks tend to generate higher velocity plumes than those generated by cooling towers. Aircraft flying over high-velocity plumes at low altitudes could experience loss of stability and control. Plume-related hazards to aircraft can be reduced by notifying pilots to avoid overflight at low altitudes and by siting projects in areas away from airport areas, including approach and departure corridors.

The Federal Aviation Administration (FAA) has regulations advising when facility, or facility feature, height requires a review and hazard determination by FAA,[151] has acknowledged that thermal plumes can pose hazards, and provides guidance to pilots for avoiding them in flight. In its December 2015 *Aeronautical Information Manual*, the FAA states that plumes can be hazardous to aircraft, especially during low-altitude flight in calm and cold air, and in and around approach and departure corridors or airport traffic areas. The FAA advises that pilots should avoid exhaust plumes whenever possible by flying on the upwind side of smokestacks or cooling towers.

The FAA has recently provided tools for local agencies to evaluate potential hazards from thermal plumes, even though the FAA does not perform these evaluations or regulate plumes. In an FAA memorandum dated September 24, 2015, the FAA states that land-use planning and permitting agencies around airports are encouraged to evaluate and take into account potential flight impacts from existing or planned development that produces plumes.

Land-Use Changes from Renewable Energy Expansion

This section reviews the increase in renewable energy generation across the State from a land use perspective. While the estimated average efficiency of each technology in regard to land use varies, renewable technologies tend to require more land per megawatt than natural gas and nuclear power plants, as shown in Table 8. As a result, the amount of land needed for electricity generation has increased with the expansion

151 Code of Federal Regulations Title 14 Aeronautics and Space, Part 77 - Objects Affecting Navigable Airspace

of large-scale renewable energy technologies. The average acres per MW shown in Table 8 are planning assumptions that were used for planning in the *Desert Renewable Energy Conservation Plan (DRECP)* and are based on averages for each technology type. These values are used in this *EPR* to better understand the scale of the number of acres developed for renewable energy.

The acreages should also account for disturbances associated with extraction of natural gas, nuclear and biomass.

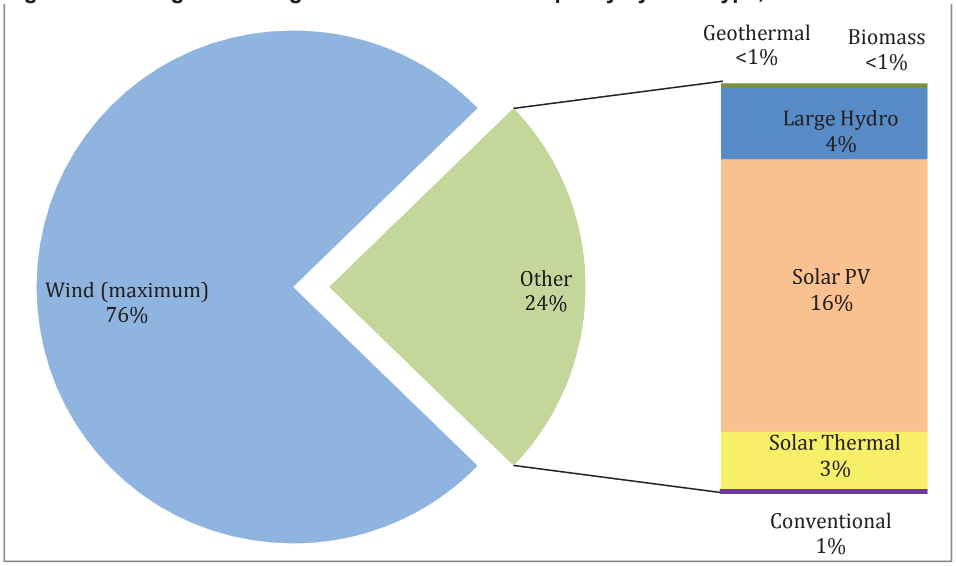
Table 8: Average Land Use per MW by Fuel Type

Fuel Type	**Average Land Use per Megawatt**
Natural Gas	0.08 acres/MW
Nuclear	0.832 acres/MW
Biomass	2.5 acres/MW
Geothermal	6.0 acres/MW
Solar	7.0 acres/MW
Small Hydro	7.5 acres/MW
Large Hydro	29.125 acres/MW
Wind	Ranges from 24.8 to 40 acres/MW

Sources: (1) California Energy Commission staff; (2) NREL Technical Report NREL/TP-6A2-45834, available at: http://www.nrel.gov/docs/fy09osti/45834.pdf; (3) NREL Technical Report NREL/TP-6A20-56290, available at: http://www.nrel.gov/docs/fy13osti/56290.pdf; and (4) DRECP Acreage Calculator at: http://www.drecp.org/documents/docs/DRECP_Acreage_Calculator_Documentation.pdf

By multiplying the acres per MW presented in Table 8 by the MW of in-state generation capacity depicted in Chapter 3, Table 1, staff can estimate the amount of acreage that each technology type used from 2005-2015. The acreage impacts for wind shown in Figure 24 are a conservative estimate that assumes all wind capacity added between 2005 and 2015 is new and not replacement or repower capacity, so the acreage assumption is likely higher than the actual acres that were developed. As expected, Figure 24 shows that the number of acres that have been developed for solar and wind technologies has grown because of the large increase in solar and wind capacity.

Figure 24: Change in Acreage of Installed In-state Capacity by Fuel Type, 2005-2015



Source: California Energy Commission, Siting, Transmission, and Environmental Protection Division

These estimates of land use per MW reflect overall project footprints, but not necessarily the intensity of the land use. For example, on average a wind energy facility requires 40 acres per MW of capacity to ensure that the facility has adequate clearance between wind turbine blades, as well as strategic placement and spacing of turbines to capture maximum wind energy potential. The amount of spacing between wind turbines depends on the wind resource and topography of the site where a wind energy facility is developed. In some locations with certain configurations, wind energy facilities are capable of providing 1 MW of power with 24 acres, which is why there is a range in Table 8.

Though the space required between turbines drives up the amount of land used per MW, the spacing also means that wind energy facilities use land less intensely than solar technologies. Solar technologies have minimum spacing between solar collectors to minimize shading of the collectors by equipment; otherwise, solar collectors tend to be developed densely and use land intensively.

There are opportunities to develop both wind and solar technologies in ways that retain some level of ongoing habitat or agricultural land value where conditions allow. In addition, these technologies may be in areas where they support other local or regional land use objectives, such as groundwater recharge, soil stabilization, dust control, and

We are not aware of a single solar facility developed in the desert where functional habitat remains. Even the technique called "disc and roll", purported to have less impact, completely removes all vegetation.

We question how a project site would contribute to groundwater recharge unless it replaced a previous use that consumed groundwater, such as an irrigated field for alfalfa or turf grass.

economic opportunities on otherwise degraded land.[152] [153] Furthermore, the fact that both wind and solar PV technologies use virtually no water during operation makes them potentially attractive land uses in areas with highly constrained water supplies.[154] [155]

Inevitably, the growth of renewable energy as a land use in California over the last decade has impacted natural lands and resources, especially (though not exclusively) in the California desert. Loss of agricultural land from the conversion to energy generation has also increased, in agricultural areas such as the San Joaquin Valley and parts of Imperial and Riverside Counties. The California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP) has created a database of commercial solar developments within its survey area that are proposed, under construction, or completed. As of summer 2015, at least 205,000 acres are within this database.

Given the amount of land needed for renewable energy now and in the future, it will be increasingly important to look for opportunities to reduce conflicts with other land uses and to incorporate renewable energy technologies into the landscape in ways that provide multiple benefits where possible. As described in Chapter 6, the primary approach in California to balance the need for renewable energy growth with other environmental and land use opportunities and constraints is through multistakeholder and multiagency landscape planning processes, coupled with close coordination with local governments.

Biological Impacts

California has 218 state- and 187 federally protected native plants,[156] and 85 state- and 132 federally protected wildlife species, an increase since the *2005 EPR*.[157] This increase

Water used in construction, especially for dust control, is relatively high, and should be reported. PV panels require periodic washing.

Of these, how many acres were viable farmland vs acres that were unviable due to drainage and salt impaired?

Please provide a link to this database.

This should identify the need to site renewable energy projects on degraded lands with no or little biological value, near load centers and to maximize siting in the already built environment (buildings, parking lots, highways, canals, etc.) and on marginal farmland in overdrawn water basins

This "balance" has yet to be realized due to the multitude of existing solar and wind project applications covering remote, ecologically intact lands. Many of these applications may be ultimately approved and not subject to the "balanced" approach that may be achieved through smart land use planning (e.g., DRECP, San Joaquin Valley, Antelope Valley, etc.).

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152 See the August 5, 2014, IEPR Update workshop comment from Andy Horne of the County of Imperial on pages 142-143 of the workshop transcript, available at http://www.energy.ca.gov/2014_energypolicy/documents/2014-08-05_workshop/2014-08-05_transcript.pdf.

153 See the March 30, 2016, letter from Westlands Solar Park to the RETI 2.0 Docket, available at http://docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN210903_20160330T140735_Daniel_Kim_Comments_WSP_comments_to_RETI_20_plenary_group_meeti.pdf.

154 See, for example, the June 14, 2016, letter from Lorelei Oviatt (Kern County Planning and Natural Resources Department) to CPUC President Picker, et al., entitled *Request for Transmission Special Study Area – Solar: Kern County Indian Wells Valley, Ridgecrest, California*, available at http://docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN211992_20160627T160721_Kern_County_Planning_Natural_Resources_Comments_Request_for_Tr.pdf.

155 Lawrence Berkley National Laboratory, 2016, reports that a high-penetration of solar in the United States could greatly reduce water-use for power generation. *The Environmental and Public Health Benefits of Achieving High Penetrations of Solar Energy in the United States*, available at https://emp.lbl.gov/publications/environmental-and-public-health.

156 California Department of Fish and Wildlife. 2016. "State Federally Listed Endangered, Threatened, and Rare Plants in California." April 2016. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline

is mainly due to impacts and habitat loss associated with human development and climate change, though several species that have been listed since 2005 are potentially sensitive to impacts associated specifically with energy development.[158] California has more endemic[159] and federally protected species than any other state and is the most biologically diverse state within the continental United States.

This diversity is a result of the wide range of climates and habitats within California. Many rare or sensitive species in California have localized distributions, increasing their potential to be negatively impacted by energy development. While existing policies on minimization and reduction of environmental impacts have been effective at offsetting many of these impacts, many of the various habitats encompassed by California are rare or sensitive, increasing the potential for negative cumulative impacts.

Biological Trends Over the Last 10 Years

Since 2005, more than 10,000 MW of conventional generation has been added to California's electricity generation mix. This addition was entirely in the form of natural gas-fired power plants and is estimated to have affected about 600 acres. While natural gas-fired power plants have generally well-understood environmental effects, the impacts from those plants built since 2005 are varied and largely related to the habitats that they were built on or near. Vernal pools and seasonal wetlands were among the habitats impacted by natural gas-fired plants, with mitigation typically involving purchasing land for permanent conservation and/or payment to conservation foundations. Although the number of natural gas-fired power plants has increased, technology improvements have increased efficiency and decreased nitrogen emissions,[160] decreasing the potential impact of these facilities on a per-unit basis.

Over the same period, nearly 11,000 MW of renewable generation has been added to California's electrical generation capacity. These projects have affected roughly 200,000 acres in a variety of general and technology-specific ways. While many of the effects observed since 2005 were predictable and similar to those discussed in the *2005 EPR*, the scale and locations of renewable projects raised new issues and highlighted land use

157 Ibid.

158 Townsend's big-eared bat (http://www.fgc.ca.gov/CESA/Townsends_Big-eared_Bat/tbebpetition.pdf) and the flat-tailed horned lizard (http://www.fgc.ca.gov/CESA/Flat-tailed_Horned_Lizard/fthl_petition_reduced.pdf) are both state candidates for special-status species listing that may be sensitive to impacts associated with energy development.

159 481 endemic species. (https://dfg.ca.gov/SWAP/2005/docs/SWAP-2005.pdf,).

160 Nitrogen emissions can cause shifts in the species composition of ecosystems that are found in nitrogen-sensitive areas. Nitrogen is the primary limiting factor to plant growth in nitrogen-poor soils, and excess nitrogen can alter soil toxicity or encourage the growth of nonnative or invasive species.

Are sensitive due to renewable energy project impacts, not just "potentially."

Missing here is the policy on impact avoidance as the first priority in the mitigation hierarchy. Existing policies haven't fully offset impacts – with each project there has been an incremental and cumulative net loss of intact habitat and its associated assemblage of native species.

Still resulted in a net loss of these sensitive habitats.

Source? Note that this number should be calculated by drawing from both the CPUC and the CEC project databases, since neither is complete, and both contain projects missing from the other. CPUC project list can be found in the RPS calculator (http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=11513) tab called "Active portfolio." Select existing projects only. The CEC database can be found here: http://www.energy.ca.gov/maps/renewable/renewable_development.html

PV solar projects in the built environment need to be included here, not just MWs generated and delivered to load centers through regional transmission lines. The RPS and DG MWs should be described separately so as to compare/contrast impacts.

For BLM managed lands in CA alone, solar projects totaling 4400 MW, and wind projects totaling 700 MW, have been approved as of April 2016.

Primarily because many of these projects, both wind and solar, were sited in inappropriate locations with high biological resources values. Examples are Ivanpah, Stateline Solar, Pine Tree Wind and North Sky River Ranch Wind. Alternative locations were never seriously considered.

concerns associated with large-scale renewables. The following section discusses the general and technology-specific impacts observed due to renewable energy development from 2005-2015, with an emphasis on impacts not discussed in the *2005 EPR* or the *2007 EPR*.

The general effects associated with renewable development from 2005 to 2015 include habitat loss, degradation, and alteration. Due to factors such as resource availability, transmission availability, and efforts to avoid known environmental and land use conflicts, large renewable projects of similar technology types tended to be built in clusters. For example, wind farms are built in wind resource areas such as on ridgelines, and solar plants are often built in areas with flat ground and high levels of insolation[161] and access to transmission.

Since 2005, numerous indirect impacts to ecosystems from the development of large-scale solar projects and associated facilities in the desert have been observed. Communities that depend upon sand dune habitat were potentially disrupted by the elimination or modification of sand transport systems, both on-site and off-site. Sand dune-dependent species such as Mojave fringe-toed lizards and several special-status plants were impacted by large-scale solar development through reduced sand transport, leading to deflation of the dunes, plant successional shifts, and other related events that degraded habitat for these species. Furthermore, the first cases of canine distemper in desert kit fox were detected near solar development areas in 2011. Potential causes of the outbreak include added stress on the foxes from passive relocation efforts for development of solar facilities, as well as relocating foxes to areas where they were potentially exposed to the canine distemper virus.

Development of energy projects also has presented the challenge of attracting species that would otherwise not be found in the area, or increasing the concentration of predatory species. For example, ravens can be attracted to water or trash that is present at solar projects in the desert. These ravens then present a predatory risk to desert tortoises and other prey species. Moreover, issues have arisen related to bird collisions with reflective solar panels.[162]

These are direct impacts that could have been largely avoided by locating projects in alternative locations.

There was ample opportunity statewide to site projects in low-conflict areas, brownfields, the built environment and in non-viable agricultural lands, as well as prioritize DG as opposed to siting utility-scale facilities in remote locations with high environmental value.

Many wind farms have been built in areas with significant bird use areas, including golden eagle nesting and foraging territories. And many solar projects have been built in habitats occupied by threatened species such as the desert tortoise and Swainson's hawk.

Delete "potentially"

This is a direct impact.

Impacts continue to occur in some areas where motorized vehicle access for facility operations and maintenance is needed. An example is the new Colorado River Substation located within the sand transport corridor and dune system in the Palo Verde Valley near Blythe, where a high density of Mojave fringe-toed lizards occur and are subject to high mortality from motorized vehicle use.

161 *Insolation* is the amount of solar radiation that reaches the Earth's surface. Cloud cover and airborne particulate matter negatively impact insolation, and solar plants are typically built in areas (for example, the desert) that minimize these conditions.

162 "There is growing concern about 'polarized light pollution' as a source of mortality for wildlife, with evidence that photovoltaic panels may be particularly effective sources of polarized light. A desert environment punctuated by a large expanse of reflective, blue panels may be reminiscent of a large body of water. Birds for which the primary habitat is water, including coots, grebes, and cormorants, were over-represented in mortalities at the Desert Sunlight facility (44%) compared to Genesis (19%) and Ivanpah (10%)." (Kagan, R. A., T. C. Viner, P. W. Trail, and E. O. Espinoza (2014). *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis.* National Fish and Wildlife Forensics Laboratory, Ashland, OR, USA. Pp. 16-17. http://alternativeenergy.procon.org/sourcefiles/avian-mortality-solar-energy-ivanpah-apr-2014.pdf)

Because of the technical requirements of many renewable energy projects, large areas of landscape had to be graded, and roads and supporting infrastructure had to be built. This landscape alteration changed drainage patterns and the flow of water to surrounding areas, further altering landscapes and affecting biological resources. Projects access roads built in or near habitat for species such as desert kit fox, desert tortoise, and Mojave fringe-toed lizard had the potential to cause high rates of road kill injury and mortality during construction and operation, and site perimeter or wildlife exclusion fencing along these roads potentially interrupted migration routes of sensitive species.

All these problems indicate that most projects were located in inappropriate areas.

In its power plant licensing process, the Energy Commission requires a variety of mitigations for impacts to habitats and special status species, including avoidance of habitats, exclusion fencing to protect habitats, and securing compensatory replacement habitat acreages to compensate for those removed by development. Ratios of compensatory mitigation acreages depend on the specific value of the resources being impacted and typically range from 1:1 to as much as 5:1. Assurance that the replacement habitat is financed (for procurement) is required before a project is built. That replacement habitat is then secured (through a conservation instrument) and endowed (for continual maintenance) within 18 months after the start of construction. Thousands of acres in compensatory mitigation habitat were required in the conditions of certification for the various desert renewable projects. Some federal and state agencies have issued guidance on the application of mitigation for impacts on specific resources or habitats. Examples include the U.S. Army Corps of Engineers' (USACE) guidance on compensation for aquatic resources and California Department of Fish and Wildlife's (CDFW) guidance on compensation for various special status plants and animals.[163] [164]

Which project(s) have been relocated to an alternative location to avoid impacts?

Examples? Tortoise barrier fencing around solar projects to keep tortoises out of the project footprint area is the only exclusion fencing we know.

Although compensatory mitigation for desert tortoise impacts is supposed to occur within the same recovery unit that was impacted, the CEC and CDFW authorized compensatory mitigation for the Ivanpah SEGS to occur in the Western Mojave Recovery Unit, approximately 200 miles away.

In addition to the general impacts discussed above, the following technology-specific impacts were identified.

Biological Impacts From Wind Energy Development

Wind energy development accounted for about 75 percent of the estimated acreage impacted from 2005-2015. This number takes into account the area between the turbines as well as the turbine pads.

Historically, the biggest biological resource issue for wind energy development has been avian mortality due to collisions with wind turbine blades, and the past 12 years have conformed to the observed trends, with both migratory and resident birds killed. In addition, adverse effects to bats have also been documented. Bats were killed through

Among the most significant mortality evens were the loss of 10 golden eagles at the Pine Tree and North Sky River Ranch wind farms in the southern Sierra south of Jawbone Canyon. And, most existing wind projects in the greater Tehachapi Wind Resource Area have no requirement for monitoring and reporting avian mortality.

163 http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/final_mitig_rule.pdf.

164 https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83843&inline=true.

direct strikes with turbine blades, as well as barotrauma[165] because they flew too close to spinning turbine blades.

Wind developers have focused pursuing new development in areas with very high wind resource potential and repowering existing facilities, by redeveloping existing sites and replacing older technologies with new technologies.[166] Repowering should continue as a focus in California, as there is a high degree of opportunity to repower existing facilities. As new wind has been deployed and existing sites are repowered, the industry has moved to the use of larger and more efficient turbine technology, resulting in a significant reduction in the number of turbines per facility. These new turbines also incorporate a solid pillar type of support column, instead of a lattice tower. These improvements help reduce the collision risk by reducing the number of turbines on the landscape and discouraging perching and occupancy of wind facilities by vulnerable birds.

In 2005, the Energy Commission adopted a recommendation that "statewide protocols should be developed for studying avian mortality to address site-specific impacts in each individual wind resource area."[167] This recommendation led to the 2007 Commission adoption of the voluntary *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development.* The Energy Commission, working with the California Department of Fish and Wildlife, developed this document to recommend methods to assess bird and bat activity at proposed wind energy sites; design prepermitting and operations monitoring plans; and develop impact avoidance, minimization, and mitigation measures. In March 2012, the U.S. Fish and Wildlife Service (USFWS) followed suit, issuing the *Land-Based Wind Energy Guidelines*, which provided similar siting, impact reduction, mitigation guidance at a national level. Together, these guidelines provide information to help guide best management practices for decreasing the impacts associated with wind facility siting.

Despite these efforts, collisions and barotrauma remain issues at wind facilities. However, the wind industry, federal and state agencies, academia, and private consultants are working cooperatively to identify ways of reducing or avoiding these impacts. Research is focusing on reducing the potential for collisions and other impacts by deploying more efficient technologies, improving micrositing, and installing automated radar radio systems that can trigger turbine shutdown to help avoid imminent collisions, as well as other areas.

Needs to be mandatory to be effective.

New, future projects, not those that already exist.

Where has this happened? Just monitoring and mitigation, the latter which is questionable because few viable options exist once a project is built and operating in a sensitive area.

Successful examples?

Successful examples?

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165 Barotrauma definition: Injury to body tissue caused by a change in air pressure, typically affecting the ear or the lung.

166 Highest wind resource areas are those with wind speed of 7m/s or above.

167 California Energy Commission, *2005 Integrated Energy Policy Report,* CEC-100-2005-007CMF, November 2005, p. 117.

Wind energy projects can be a major concern and conflict with military testing and training missions. The State has worked closely with the U.S. Department of Defense to limit potential conflicts with and encroachment on military installations and important testing and training that could arise from developing renewable energy and transmission projects.

Biological Impacts from Solar PV Development

Solar PV has relatively few technology-specific effects aside from the general issues of habitat loss, degradation, and alteration. Direct mortality may result from construction or equipment, loss or modification of habitat, and stress due to relocation activities. Relocation of some species – such as burrowing owl, desert tortoise, and desert kit fox – can be time- and labor-intensive, causing construction delays and scheduling constraints.

Ivanpah SEGS is a good example, where the developer has spent over $50 million on just desert tortoise clearances, translocation, monitoring and compensatory mitigation to date.

Nesting birds, protected under Fish and Game Code as well as the federal Migratory Bird Treaty Act, may cause significant construction delays. Issues have arisen related to bird collisions with solar panels. Birds flying over a project may mistake the reflective surfaces of the solar panels for bodies of water and fly into those panels.

Since 2005, a significant portion of new solar PV development has occurred on agricultural lands. While the primary concern of solar PV on agricultural lands is the potential displacement of agricultural resources, certain types of agricultural lands also support specific biological resources. For example, the burrowing owl relies on agricultural lands in Southern California, and the Swainson's hawk is supported by agricultural resources in Northern California.

There is a Swainson's hawk population in the Antelope Valley within the California Desert that consists of approximately 10 breeding pairs. This population is considered distinct from that occurring in the Central Valley of California.

Numerous PV solar projects in the Antelope Valley have resulted in the loss of their foraging habitat, and the effectiveness of compensatory mitigation, if required, is unknown.

Biological Impacts from Solar Thermal Development

Solar Flux

Power towers have been subject to increased public scrutiny over bird deaths due to the effects of f*lux.*[168] Solar flux impacts birds by singeing feathers, leading to whole or partial loss of flight capability; potential short- or long-term ocular effects such as "bright spots"; and nonlethal loss of flight capability resulting in "grounded" birds, which may then suffer delayed mortality due to predation, hyper- or hypothermia, or other causes. In addition to these effects, avian mortality at solar power towers has been observed as a result of birds colliding with reflective heliostat arrays.

Parabolic troughs concentrate flux onto receiver tubes that run the length of the trough, and the total volume of space filled by the flux reflected off each heliostat is

168 *Solar flux* is the concentrated sunlight that is reflected off the heliostats, measured in kW/m^2. The sun emits the equivalent of 1 kW/m^2.

significantly less at parabolic trough facilities than power towers plants.[169] While flux is present at parabolic trough facilities, the avian deaths that have been documented at these locations have been the result of collisions with the troughs, not solar flux.

Avian mortality at these project sites also occurs when birds collide with the perimeter chain-link fence, such as at the Genesis solar project in the Chuckwalla Valley.

Furthermore, insect mortality due to solar flux has been documented.[170] Insects are attracted to the bright glare of the solar flux, and can be killed by flux-induced hyperthermia or the delayed effects of singed wings.

Heat Rejection and Water Disposal

Solar power towers and parabolic troughs employ similar technologies for cooling their equipment and disposal of wastewater. Sites that employ air-cooled condensers (ACC) have impacted birds and bats, as the ACC provides an attractive roosting location, and birds and bats that find themselves inside the ACC risk death due to overheating or entrapment.

Moreover, a significant number of avian mortalities have been recorded in evaporation ponds at solar thermal plants since 2005. The evaporation ponds are filled with "process" water, which comes from various sources on-site but primarily from cooling tower blow down. The water can contain toxins, salts, oils, or other substances that pose a risk to bird species. Avian mortalities in evaporation ponds have been linked to poisoning from ingestion of chemicals or salts, drowning in oil-rich evaporation pond fluids, hyper- or hypothermia due to feathers being coated by oily substances or salt crystals, entrapment in exclusionary netting encircling evaporation ponds, and predation from avian and terrestrial predators who are attracted to the water and the birds who use it.

Biological Resources Impacts of Transmission and Interconnection

Since 2005, new transmission lines, substations, and ancillary infrastructure were built for the power generated by conventional and renewable power plants to be delivered to the grid. The transmission lines and related corridors, by far the largest component of this development, had lengths typically ranging from 1 mile to well over 100 miles and widths ranging from 60 to 200 feet. The development and construction of these transmission lines led to temporary and permanent loss of habitat, with impacts similar to those associated with other terrestrial development. However, there were also several unique impacts to biological resources, such as habitat fragmentation and loss or death through collisions or electrocution.[171] While efforts were made to avoid these unique

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169 For additional discussion of flux impacts, please refer to "Solar Thermal Development" in the Visual Resources Section.

170 Kagan et al. P. 20.

171 For a more in-depth discussion of the impacts associated with transmission lines, please refer to the *2005 EPR* and the *Assessment of Avian Mortality From Collisions and Electrocutions*, 2005. CEC-700-2005-015.

impacts by conducting comprehensive biological surveys and carefully siting transmission poles, towers, and substations, impacts did occur to biological resources due to transmission and interconnection development in California from 2005 to 2015.

The impacts are greater than reported because the new dirt roads paralleling the transmission lines are open to motorized vehicle use by the public, at least on public lands managed by BLM. This use leads to increased mortality of desert tortoises and Mojave fringe-toed lizards due to vehicle strikes.

Avian Species Impacts of Transmission and Interconnection Lines

Transmission and interconnection lines impacted avian species through two primary mechanisms: collisions and electrocutions. Collisions occur when birds collide with power poles or lines, causing injury or death. Electrocution occurs when large birds, such as raptors, simultaneously contact two active phases of the power line. These impacts are well-understood, and best management practices to avoid these impacts are a standard part of the construction of transmission lines. Energy projects typically have avian protection plans or bird and bat conservation strategies specifically focused on avoiding and minimizing these impacts. Avian protection plans and bird and bat conservation strategies frequently refer to and rely upon guidance from the Avian Powerline Interaction Committee, a coalition of private interest groups and agencies that collaborate to design power lines with specifications that avoid and minimize the risk of electrocution and collision. The committee has published documents on how to implement these design elements,[172] and most, if not all, of the transmission line development that occurred in California from 2005 to 2015 relied on this guidance.

Terrestrial Impacts From Transmission and Interconnection Lines

The length of a new transmission line typically correlates to the potential impacts that may occur. Commercial-scale renewable projects, due to the remote sites and long distances to the nearest point of interconnection, had a higher likelihood of affect habitat. Furthermore, due to the locations where renewable power plants were sited in California from 2005 to 2015, the transmission lines had a greater potential for significant impacts than those of conventional power plants built during the same period.

Terrestrial impacts from transmission lines in the desert can result in temporary and permanent loss of habitat for species such as burrowing owl, desert tortoise, and desert kit fox. Moreover, the slow and often difficult recovery for desert-dwelling plants means that any restoration efforts may take much longer than they would have in other ecosystems. Due to this, impact avoidance, minimization, and mitigation were chief concerns when siting transmission lines in California's deserts. Efforts were made to avoid impacts to special status habitat such as desert washes by planning power pole siting to span sensitive habitats, or mitigation by purchase of compensatory habitat.

The dirt roads paralleling transmission lines built for construction, maintenance and inspection are typically left open for public use, resulting in mortality to desert tortoises and other species due to vehicle strikes. Roads should be minimized and closed to public motorized vehicle use, and fully reclaimed if not needed.

172 Avian Powerline Interaction Committee. 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.* Edison Electric Institute, APLIC, and the California Energy Commission, Washington, D.C. and Sacramento, California.

Conclusions: Outlook for Biological Resources

Despite the large land-use component of the renewables that will continue to be a large portion of California's energy infrastructure development, the outlook for energy development impacts on biological resources in California is mostly positive. Experience gained from the projects permitted and built in recent years will lead to improvements to avoidance, minimization, and mitigation. Continued advances in the efficiency of renewable technologies and impact monitoring methods will help decrease both the footprint of renewable power plants and the number of organisms impacted by them.

Most, if not all, impacts discussed in this section will continue to be a concern and will require attention and management. However, as staff gathers more data about renewable power plants, it will be able to draw conclusions with more certainty, allowing staff to refine strategies to address potential or observed impacts. Improvements to the implementation and efficiency of the technologies, as well as changes to the technologies themselves, will reduce the impacts associated with these power plants. Some of these improvements are already evident, as wind turbine efficiency and micrositing have become more sophisticated, and turbine height and blade length have increased the efficiency of turbines.

Increased monitoring and observation aimed at improving staff's data sets may make it appear as though the impacts are increasing, as the number of reported impacts will increase. For example, the recent increase in wind farm-related bat injury/mortality may be due to an increase in monitoring and not turbine size. This does not necessarily mean that the actual impacts increased.

Regulatory and permitting agencies at local and state levels have instituted and followed policies aimed at protecting biological resources. Most, if not all, of the impacts (anticipated or otherwise) that occurred at power plant project sites have been offset by mitigation. Efforts were also made to minimize these impacts using deterrents, design alterations, and selection of alternative sites.

Mitigation by permanently preserving habitat similar to the habitat disturbed by construction has become increasingly difficult. The amount of suitable habitat is decreasing, land owners are increasing prices in regions prized for high solar insolation, and finding contiguous parcels (which are preferred for mitigation) is becoming less likely. Recognizing this situation, in 2010, the California Legislature passed the California Advance Mitigation Act,[173] which provided funds for CDFW to purchase and manage appropriate habitat within the DRECP plan area that developers could then purchase as mitigation for their eligible renewable energy projects. Furthermore, federal lands in California offer a unique opportunity for conserving and protecting sensitive and threatened species and related habitats. In recognition of this, CDFW and U.S.

173 SBX8 34, Padilla, Chapter 9, Statutes of 2009-2010 Eighth Extraordinary Session, SBx8 34.

We strongly disagree. The outlook will continue to be negative until we stop siting utility scale projects in intact natural habitats and stop building new regional transmission lines across natural landscapes. This can only happen if DG is prioritized over all remotely-sited utility scale projects, and projects are built close to load centers on brownfields, industrial sites, on marginal agricultural land in overdrawn water basins, and in the existing built environment.

This is meaningless. We already know what the impacts are and will continue to be. The "strategy" is to get serious about impact avoidance and to properly scale and site projects close to load centers, etc. as noted above.

Yes on efficiency, but where are the studies that prove these improvements reduce impacts?

True, but monitoring of impacts occurs only at some of the newer projects, and seldom, if ever, at older operating projects. So the cumulative impacts are not known, but could be established through extrapolation and modeling.

We disagree. Where and how have impacts been fully offset or mitigated? What design deterrents, alternations and alternative project sites have actually been made? The report should provide project-specific data to back this up.

This is justification for siting projects on disturbed, degraded lands close to load centers, on brownfields, industrial sites, the built environment, and agricultural lands in overdrawn water basins, as well as prioritizing development of DG using the existing distribution grid and upgrading distribution substations to accommodate more MW input.

Bureau of Land Management (U.S. BLM) signed a durability agreement in 2015[174] that provides BLM-managed federal lands may be used for a variety of conservation actions and, in specific circumstances, for project level mitigation. Allowed actions include establishing wildlife connectivity, conserving habitat under future climate conditions, offsetting project impacts, and, in specific circumstances, mitigating at the project level.

Even with effective, project-specific mitigation, there are concerns about compounding stressors or cumulative impacts to species and ecosystems from the expansion of renewable energy development across the landscape. This is especially a concern in light of the additional stress to natural systems from the unknown impacts of future climate change.

The *DRECP* addressed this concern through a broad planning initiative that identified the most appropriate areas for large-scale renewable energy development in the desert and developed a conservation framework to foster and maintain species resiliency across the planning area, with explicit consideration of the impacts of climate change. Other landscape planning efforts for renewable energy have also incorporated environmental data. These data have been used to identify the most appropriate locations for large-scale renewable energy development in the context of high-level renewable energy opportunities and constraints.

To meet state requirements to fully offset adverse impacts to certain species and habitats under CEQA, conservation actions must result in at least a no-net loss and, preferably, a net gain in conservation. Conservation actions must therefore include not only compensatory mitigation of securing conservation lands, but also habitat enhancement through control or elimination of existing land uses (e.g., livestock grazing, off-road vehicle use, exotic species control, etc.).

In addition, the existing land uses that contribute to cumulative adverse impacts must also be addressed, as noted above.

However, there remain a large number of older applications for large-scale projects that are not subject to the provisions of the DRECP that BLM will continue to process, some of which may not be located in "appropriate areas."

Such as the San Joaquin Valley study.

Cultural Resources

Cultural resources are "those aspects of the environment—both physical and intangible, both natural and built—that have cultural value of some kind to a group of people."[175] Cultural resource specialists commonly categorize those cultural resources considered historical resources into three broad classes: prehistoric, ethnographic, and historic.[176] State laws, notably CEQA, establish legal definitions for these cultural resources.

174 http://www.drecp.org/documents/docs/2015_Durability_Agreement_BLM_CAFW.pdf.

175 King, Thomas F. 2008. *Cultural Resource Laws and Practice* (3rd ed.). Lanham, MD: Alta Mira Press, p. 3.

176 *Prehistoric archaeological resources* are those materials relating to prehistoric human occupation and use of an area. These resources may include sites and deposits, structures, artifacts, rock art, trails, and other traces of Native American cultures. In California, the prehistoric period began more than 12,000 years ago and extended through the 18th century until 1769, when the first Europeans settled in California.

Ethnographic resources are those materials and places important to the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, or Asian immigrants. They may include tribal cultural resources, traditional resource collecting areas, ceremonial sites, topographic features, value-imbued rural and urban landscapes, cemeteries, shrines, or ethnic neighborhoods and structures. Ethnographic resources are variations of natural resources and standard cultural resource types. They are assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their life ways.

Historic-period resources are those materials, archaeological and architectural, usually associated with Euro-American exploration and settlement of an area and the beginning of a written historical record. They may