Potential Bird Avoidance or Attraction to Exhaust Stacks and Thermal Plumes

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Introduction

On November 30, 2009, the Contra Costa County Airport Land Use Commission (ALUC) submitted a list of data requests to the California Energy Commission (CEC) regarding the proposed Mariposa Energy Project (MEP). MEP will be located approximately 2.7 miles from the Byron Airport, in northeast Alameda County. The Contra Costa County ALUC asked about the potential for bird strikes with airplanes as a result of thermal plumes created by the MEP turbine exhaust stacks. On December 14, 2009, Mr. Hal Yeager, Vice Chair of the ALUC, submitted additional questions to the CEC, a few of which focused on an occurrence of ravens (*Corvus corax*) congregating over a cooling tower plume at a power plant in Anchorage, Alaska. On June 18, 2010, Mariposa submitted a detailed response to aviation-related questions raised by several parties, including the ALUC and Mr. Yeager. During the July 14, 2010 ALUC meeting further questions were voiced by Mr. Yeager regarding the potential for increased raven activity within the vicinity of MEP, and whether MEP could cause an impact to Byron Airport operations due to ravens being attracted to the plumes. CH2M HILL has performed additional research in an attempt to answer these questions related to ravens potentially congregating above MEP.

As set forth in more detail below, ravens have not been observed using thermal plumes at power plants in California. The CEC is not aware of any issues with regard to ravens or other birds using thermal plumes at power plants. There are no reported instances in the scientific literature of ravens congregating around power plants or of ravens flying in thermal plumes.

Ravens are the largest-bodied of all passerines (songbirds) and are widely known for scavenging on animal carcasses and human garbage. Ravens are also predators, hunting rodents in fields, pulling eggs and nestling birds out of nests, and taking food from other birds.

Ravens are geographically and ecologically one of the most widespread naturally occurring birds in the world. They are distributed throughout major portions of North America, Europe, Asia, and North Africa, and in all terrestrial habitats except tropical

rain forests. Ravens mostly live in wilderness areas throughout much of the North America, although more recently they have begun moving into urban areas in parts of their range, adapting to human presence. In some parts of their range, ravens are considered pests as their populations are rapidly expanding, and programs have been implemented to reduce population sizes. In other parts of their range, populations have declined so drastically that reintroduction programs have been implemented.

Observations at Power Plant Facilities in California

For the past 12 years, CH2M HILL has maintained a practice and staff group that is focused on California power plant licensing. CH2M HILL has managed the preparation of AFCs, SPPEs, PTAs, and other studies for more than 40 California power projects in this time frame. Many CH2M HILL staff members have worked on more than a dozen CEC licensing projects, dating as far back as the 1980s. Our current licensing staff group has well over 200 years of combined power plant permitting and compliance support experience. To date, we have neither observed nor heard of any unusual raven occurrences at any plants for which we have provided licensing or compliance support. Specifically, we have received no reports and have never observed ravens congregating in plumes or otherwise congregating near any of these facilities. Our experience includes operating facilities in the nearby locations of Tracy and Antioch. Thermal plumes at these facilities do not attract ravens.

CH2M HILL has provided compliance support, including biological resources monitoring, during the construction, commissioning, and operations of 11 power plants throughout California during the last 12 years, including locations in Lodi, Antioch, Pittsburg, San Jose, Humboldt, and Sutter County. In that time, biologists have occasionally observed individual common ravens in the vicinity of these plants, but these biologists have never observed ravens, either individually or in groups, above stacks or cooling towers, as is seen in the Alaska account. Based both on 12 years of direct field observations at 11 power plants and prior discussions with CEC Staff (personal communication between Rick York, CEC Biological Resources Supervisor, and Gary Santolo of CH2M HILL on November 11, 2009), I conclude that the attraction of birds in general, and ravens specifically, to power plant exhaust plumes has not been an issue.

The CEC has required focused avian collision studies for several power plant development projects to verify that the construction of transmission lines and other project features do not result in significant avian mortality. Results of avian collision studies conducted from 1998 through 2008 (for the Sutter Energy Center, Delta Energy Center, Los Medanos Energy Center, and Walnut Energy Center, all located within the Central Valley and Sacramento/San Joaquin delta), show no avian collisions with the stacks at any of the sites. The studies at each site included 3 to 5 years of monitoring with ongoing requests from the plant managers to report any avian collisions with the stacks. No avian collisions with stacks have been reported. Mr. Santolo performed necropsies on all birds found at the Sutter Energy Center for the avian collision study in order to determine the cause of death. Of the various bird species collected, no ravens were found, no birds were collected from around the stacks, and no birds had injuries consistent with striking the stacks.

Additionally, we spoke with a few local power plant operators to inquire whether they had ever observed birds flying above power plant stacks; their responses are presented below.

- *"I have seen bird populations associated with large evaporation ponds and pigeons nesting in the steel structures."* Ed Warner, Combustion Turbine Facilities Manager, Northern California Power Agency.
- *"I saw a hawk riding the updrafts a few years ago, but I can't remember any other occurrence."* George Davies, Turbine Division Manager, Turlock Irrigation District.
- *"I worked at Contra Costa Power Plant which had a total of nine stacks, Pittsburg Power Plant with a total of seven and Potrero with four stacks. No birds visibly noticed at any of them."* Joe Bittner, Project Superintendant, Northern California Power Agency.
- We spoke to Mark Kehoe, Director of Environmental for GWF Power (including the GWF Tracy Power Plant). He indicated to the best of his knowledge, GWF has not experienced any circling of the power plant stacks or cooling towers by birds.

We are not aware of instances of flocks of birds congregating above stacks nor have we learned, through experience, research, or inquiries, that it is an issue in California. Consultation with CEC staff confirmed that ravens are not an issue in California power plant cases. It is apparent from our significant experience that no birds of any type are attracted to or congregate above power plant stacks.

Follow up on the Anchorage, AK Occurrence

The ALUC asked about the potential for MEP exhaust plumes to attract ravens based on an occurrence of ravens congregating above a cooling tower at the Anchorage Municipal Light and Power (AML&P) George M. Sullivan Generation Plant Two, in Anchorage, Alaska. It should be noted that MEP will not have cooling towers, due to the use of dry cooling technology. This account addressed a flock of common ravens that were observed soaring over a power plant in Anchorage, Alaska[1]. Mr. Yeager has asked that CEC Staff speak with the Rick Sinnott, the Anchorage area biologist for the Alaska Department of Fish and Game who was cited in an on-line blog[2] as having studied the local raven population and behavior in Anchorage. We also attempted to contact Alaskan biologist Rick Sinnott to obtain additional information relating to the raven behavior at this facility and to facilitate conversation with a CEC staff biologist, if possible. We were informed that Mr. Sinnott retired effective June 30, 2010 and we contacted the assistant Anchorage area biologist, Jessie Coltrane, who has worked with Mr. Sinnott the past few years. Ms. Coltrane said that the ravens come into Anchorage in the winter for the trash and garbage and that they use the cooling tower thermal regularly in the winter. To her knowledge, ravens are not found soaring in the thermals of other cooling towers or other exhaust stack plumes in Alaska.

[1] http://www.youtube.com/watch?v=sJxTzAjeEbk

[2] http://www.farnorthscience.com/cold-quests/ravens-in-the-city/

A literature search was conducted to determine if other facilities that generate thermal plumes had known issues with attracting or deflecting birds. The literature search did not reveal any reported instances of bird behavior in relation to industrial thermal plumes. A fairly extensive specific search of avian journals (i.e., The Auk [1884-2001], North American Birds [1973-2008], California Birds/Western Birds [1970-2007], Ornithological Monographs [1964-2005], The Condor [1899-2000], Studies in Avian Biology [1978-1999], Journal of Field Ornithology [1930-1999], Journal of Raptor Research [1967-2005], The Wilson Bulletin [1889-1999], and North American Bird Bander [1976-2000]) using the search term "raven" in the Searchable Ornithological Research Archive (SORA) was conducted and only 117 manuscripts were identified. Of those, based on the titles, only eight were on the subject of foraging, roosting, or daily activity, which seemed pertinent to the MEP discussion. No literature was found that referenced power plants, thermal plumes, or exhaust stacks. Additionally, an extensive literature and internet search was conducted to find information available on raven activity in the central valley and bay area, as well as, raven activity at and around power plants. No conclusive information was found. A likely reason why there is little or no information on ravens (or other birds) use or attraction to thermal plumes or stacks is because there have been few, if any, sightings of this behavior, and as such, it is not an issue. Obviously, events which do not occur are not reported in the scientific literature (Sena et al. 2010).

It is not surprising that a power plant thermal plume from a large cooling tower on a cold Alaskan day would create a singular distinctive thermal front in an otherwise frigid atmosphere largely devoid of thermal lift and that ravens would gravitate toward such a singular source of heat. From December through March, the average high temperature in Anchorage is around 25°F, while in Tracy the average high for the same period is around 60°F. Consequently, in the relatively mild climate of central California, even in mid-winter, there are far more thermal updrafts to be found throughout the landscape.

There are profound differences between the raven population that was studied in Anchorage and the population in the region where the MEP site is located. Ravens are generalists when it comes to foraging (Heinrich et al. 1995), extremely intelligent (Heinrich 1995), and are able to exploit new food resources and communicate the location to other ravens. The unusual behavior observed in Anchorage suggests that ravens are attracted to the city because the available food from fast food restaurants, the landfill, and other sources that are a bonanza for them in an otherwise food-limited habitat. In Contra Costa County, raven population behavior is more typical, possibly because food resources are widespread and there is no singular resource to attract ravens. Research has shown that, although ravens are solitary species that are not typically associated with urban habitats, non-nesting ravens roost communally and will lead other ravens to food sources (Boarman and Heinrich 1999, Marzluff and Heinrich 1991). They seem to do this so that non-dominant individuals (e.g., non-breeding individuals [floaters] and juvenile ravens) can exploit food resources without being driven off by dominant, territorial pairs (Marzluff and Heinrich 1991).

Presence of Ravens in MEP Vicinity/Region

Near MEP, the open rangelands of the coastal hills and the extensive expanse of agricultural fields in the adjacent valley provide copious amounts of thermal lift; enough

so that the Northern California Soaring Association bases its glider business at nearby Byron Airport.

Ravens are usually observed either alone or in pairs and pairs stay together all year (Jollie 1976). Occasionally groups of three are observed (of unknown relationships) and they may associate loosely throughout the year (Boarman and Heinrich 1999). Nonbreeders are solitary, but they are gregarious at concentrated food sources and they sleep in communal roosts where they recruit each other to food concentrations (Heinrich 1988, Marzluff and Heinrich 1991, Marzluff et al. 1996). Large congregations of ravens are only found around large concentrations of food and at roost sites, neither of which are found in the vicinity of the MEP site.

Based on review of the findings of avian studies conducted at the Altamont Pass Wind Resource Area (APWRA; Smallwood et al. 2008), the common raven was the second most prevalent species in the study group. Raven numbers appeared to increase between 2000 and 2007, likely due to the regular food source provided by wind farm bird kills and the presence of roosting habitat in the vicinity. This is another example of ravens responding to a new and increased food resource. MEP will not provide a raven food source; therefore there will be no similar attractant at the MEP location.

It is unlikely that ravens will be drawn from miles away specifically to use the plumes because there is abundant thermal lift to be found throughout the California Coast Range and Central Valley and the intermittent nature of the operations of a peaking power plant would not provide a constant thermal. Additionally, the area around the MEP stacks does not provide an attractant to ravens such as a regular food source.

Raven activity is influenced by characteristics of the food supply and preparation for reproduction. Daily patterns of activity are influenced by ambient temperature and food availability (Engel and Young 1992). Furthermore, it is worth noting that common ravens appear to be far more abundant in the Anchorage region than in the Altamont region. An investigation of Christmas Bird Count (CBC) data from the archives of the National Audubon Society revealed that the Anchorage CBC recorded an annual average of 747 ravens between 2001 and 2009, while over that same period, the East Contra Costa County CBC (with its 15 mile diameter count circle centered in Brentwood about 10 miles northwest of MEP) recorded an annual average of 41 ravens. Over that period, the Anchorage CBC never recorded fewer than 600 ravens during the count day, while the East Contra Costa count never recorded more than 61.

Staff at the Altamont landfill was also contacted to inquire about raven activity but we were not able to reach staff that could provide any information relating to avian presence at the landfill. The landfill is approximately 4 miles southwest of MEP, with ridges and hills between. With abundant thermals between the landfill and the MEP stack, it is unlikely that a raven would be attracted to the MEP site or expend the energy to fly to the MEP site without some attractant.

Even if ravens were to use MEP's thermal plumes occasionally, they would be an unlikely aircraft hazard. Ravens are known for their intelligence and also for their caution around novel stimuli (Heinrich et al. 1995, Boarman and Heinrich 1999). A search of the FAA Wildlife Strike Database (http://wildlife-

mitigation.tc.faa.gov/wildlife/database.aspx) for all strikes reported in California found that out of 9,191 records, there was only one report of a common raven possibly being involved in a bird strike. It was a reported as "REMAINS FOUND ON RWY 27 @ B-8. POSITION SUGGESTS STRIKE BY DEPARTING A/C. TIME 0720, DAY" and although it was suggestive of a bird strike, the report was not definitive of a raven being struck by a plane. In fact, there were more reports of cats (8) and dogs (3) being involved in aircraft strikes than ravens.

Conclusions

While working on compliance monitoring at 11 power plants over the past 12 years, the CH2M Hill staff has never observed ravens using thermal plumes. The CEC is not aware of any issues of ravens or birds in general using thermal plumes at power plants. There is no reported instance of raven activity at power plants or in thermal plumes in the scientific literature.

Ravens are far less abundant in Alameda and Contra Costa County than they are in Anchorage, Alaska. It is likely that ravens are attracted to Anchorage because of the concentration of food resources in the city and the creation of an unusual thermal effect that the cooling towers create in the winter, which the ravens may chose to exploit. In contrast, food resources are not concentrated near the MEP site, and the MEP stack does not create an unusual thermal effect in the area. Based on our significant experience working with California power plants, CEC Staff experience with California power plants, and our review of the literature and understanding of raven behavioral patterns, we conclude that it is highly unlikely that ravens will fly or congregate above the MEP exhaust stacks.

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