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August 28, 2013

VIA ELECTRONIC DOCKETING

Ms. Felicia Miller, Project Siting Manager
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Re: Huntington Beach Energy Project (12-AFC-02)
Applicant's Offsite Consequence Analysis (Hazardous Materials Handling)

Dear Ms. Miller:

Enclosed herein please find Applicant AES Southland Development, LLC's Offsite Consequence Analysis ("OCA") for ammonia for the Huntington Beach Energy Project. The enclosed OCA is responsive to CEC Staff's July 30, 2013 inquiry regarding the same.

Respectfully submitted,

Melissa A. Foster

MAF:jmw
Enclosures
cc: Proof of Service List

Offsite Consequence Analysis, Huntington Beach Energy Project

PREPARED FOR: Robert Mason / CH2M HILL

PREPARED BY: Ben Beattie / CH2M HILL

DATE: August 27, 2013

As set forth in Appendix 5.5A of the Huntington Beach Energy Project (HBEP) Application for Certification (AFC) (June 2012), the Applicant has conducted an offsite consequence analysis (OCA) for ammonia for the project. HBEP is a proposed natural-gas-fired, combined-cycle electrical generating facility rated at a nominal generating capacity of 939 megawatts[1] at site average ambient temperature (SAAT)[2] conditions. The project will consist of two, three-on-one, combined cycle gas turbine power blocks with three natural-gas-fired combustion turbine generators, three heat recovery steam generators, and one steam turbine generator per power block. Aqueous ammonia (ammonium hydroxide at 19 percent nominal concentration by weight) will be used to reduce oxides of nitrogen (NOx) emissions. One 24,000-gallon aqueous ammonia aboveground storage tank (holding 20,400 gallons of aqueous ammonia) will be installed to provide an 11-day supply of aqueous ammonia. The ammonia tank will be 28.5 feet long and 12 feet in diameter.

Aqueous ammonia will be delivered to the plant by truck transport. The ammonia delivery truck unloading station will include a bermed and sloped pad surface, which will slope from the south end to a collection trough on the north end that will drain into the basin underlying the ammonia tank. The ammonia storage tank will also drain into the 38-foot-long by 18-foot-wide basin capable of holding the full contents of the tank, plus rainwater from a 25-year, 24-hour storm event.

The ammonia tank will be equipped with a pressure-relief valve set at 50 pounds per square inch gage, a vapor equalization system, and a vacuum breaker system. The storage tank will be maintained at ambient temperature and atmospheric pressure.

Analysis

An analysis of tank failure and subsequent release of aqueous ammonia was prepared using a numerical dispersion model. The analysis assumed the complete failure of the storage tank, the immediate release of the contents of the tank, and the formation of an evaporating pool of aqueous ammonia within the secondary containment structure. Evaporative emissions of ammonia would be subsequently released into the atmosphere. Meteorological conditions at the time of the release would control the evaporation rate, dispersion, and transport of ammonia released to the atmosphere. For purposes of this analysis, the following meteorological data were used:

- U.S. Environmental Protection Agency (EPA) default (worst-case) meteorological data, supplemented by daily temperature data as defined by Title 19, California Code of Regulations section 2750.2.

The maximum temperature recorded for the Santa Ana Fire Station near the HBEP site in the past 3 years was 105 degrees Fahrenheit (°F) or 313.7 Kelvin (K).[3] Maximum temperatures combined with low wind

[1] Approximate facility net output with six combustion turbines operating at 100 percent load with no inlet air evaporative cooling operating and no duct burner operation.

[2] SAAT is 65.8 degrees Fahrenheit (°F) (Dry Bulb) and 56.8 °F (Wet Bulb) and relative humidity (RH) of 57 percent.

[3] Source: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7888.

speeds and stable atmospheric conditions would be expected to result in the highest ammonia concentrations at the furthest distance downwind of the release site.

Table 1 lists the meteorological data values used in the modeling analysis.

TABLE 1
Meteorological Input Parameters

Parameter	Worst-case Meteorological Data
Wind Speed, meters/second	1.5
Stability Class	F
Relative Humidity, Percent	50
Ambient Temperature, Kelvin (°F)	313.7 (105)

A model run was conducted based on an evaporating pool release using the meteorological data presented in Table 1 and the SLAB numerical dispersion model. A complete description of the SLAB model is available in *User's Manual for SLAB: An Atmospheric Dispersion Model for Denser-Than-Air Releases* (SLAB User's Manual).[4] The SLAB User's Manual contains a substance database, which includes chemical-specific data for ammonia. These data were used in the modeling run without exception or modification.

Emissions of aqueous ammonia were calculated pursuant to the guidance given in EPA's *RMP Offsite Consequence Analysis Guidance,*[5] using the emission calculation tool for evaporating solutions provided in the Area Locations of Hazardous Atmospheres (ALOHA) model provided by the EPA.[6]

Release rates for ammonia vapor from an evaporating 19 percent solution of aqueous ammonia were calculated assuming mass transfer of ammonia across the liquid surface occurs according to principles of heat transfer by natural convection. The ammonia release rate was calculated using ALOHA, the meteorological data listed in Table 1, and the dimensions of the secondary containment area. For the worst-case condition, it was assumed that a complete failure of the storage tank occurred that resulted in an evaporating pool of aqueous ammonia within the secondary containment area.

During the worst-case scenario, an initial ammonia evaporation rate was calculated and assumed to occur for one hour after the initial release. For concentrated solutions, the initial evaporation rate is substantially higher than the rate averaged over periods of a few minutes or more because the concentration of the solution immediately begins to decrease as evaporation begins.

Although the edge of the tank containment area is raised above ground level, the release height used in the modeling was set at 0 meters (m) above ground level (AGL) to maintain the conservative nature of the analysis. Downwind concentrations of ammonia were calculated at heights of 1.6 and 0 m AGL. The California Office of Environmental Health Hazard Assessment (OEHHA) has designated 1.6 m as the breathing zone height for individuals.

An analysis of the tank loading hose failure with a leak below the excess flow valves activation set-point and the subsequent impacts was also considered. This analysis would normally be completed under typical or average meteorological conditions for the area. However, after review of the possible failure modes, it was

[4] Ermak, D. E. 1990. *User's Manual for SLAB: An Atmospheric Dispersion Model for Denser-Than-Air Releases.* Lawrence Livermore National Laboratory. June.

[5] U.S. Environmental Protection Agency. 1999. *RMP Offsite Consequence Analysis Guidance*. April.

[6] Source: http://www.epa.gov/emergencies/content/cameo/index.htm. Located approximately 10 miles from HBEP.

determined that the impact of this leak would be less than the result of a complete tank failure worst-case scenario.

Toxic Effects of Ammonia

With respect to the assessment of potential impacts associated with an accidental release of ammonia, four offsite "benchmark" exposure levels were evaluated, as follows:

1. The lowest concentration posing a risk of lethality: 2,000 parts per million (ppm)
2. The Occupational Safety and Health Administration's (OSHA) Immediately Dangerous to Life and Health (IDLH) level of 300 ppm
3. The Emergency Response Planning Guideline (ERPG) level of 150 ppm, which is the American Industrial Hygiene Association's (AIHA) updated ERPG-2 for ammonia
4. The level considered by California Energy Commission (CEC) staff to be without serious adverse effects on the public for a one-time exposure of 75 ppm (*Preliminary Staff Assessment-Otay Mesa Generating Project, 99-AFC-5, May 2000)*.

The odor threshold of ammonia is approximately 5 ppm, and minor irritation of the nose and throat will occur at 30 to 50 ppm. Concentrations greater than 140 ppm will cause detectable effects on lung function, even for short-term exposures (0.5 to 2 hours). At higher concentrations of 700 to 1,700 ppm, ammonia gas will cause severe effects; death occurs at concentrations of 2,500 to 7,000 ppm.

The ERPG-2 value is based on a one-hour exposure or averaging time; therefore, the modeled distance to ERPG-2 concentrations are presented in terms of a one-hour (or 60-minute) averaging time. The ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action. OSHA's IDLH for ammonia is based on a 30-minute exposure or averaging time; therefore, the IDLH modeling concentrations at all offsite receptors will be given in terms of a 30-minute averaging time.

Modeling Results

Table 2 shows the modeled distance to the four benchmark criteria concentrations: lowest concentration posing a risk of lethality (2,000 ppm), OSHA's IDLH (300 ppm), AIHA's ERPG-2 (150 ppm), and the CEC significance value (75 ppm).

TABLE 2
Distance to EPA and CEC Toxic Endpoints (Ammonia)

Scenario	Distance in Meters to 2,000 ppm	Distance in Meters to IDLH (300 ppm)	Distance in Meters to AIHA's ERPG-2 (150 ppm)	Distance in Meters to CEC Significance Value (75 ppm)
0 m AGL	23.4	28.5	29.9	30.6
1.6 m AGL	25.3	30.5	32.7	34.3

The model input and output files are available upon request.

The closest distance between the project boundary and the secondary containment area is 50 m to the southeast of the secondary containment area, which is well beyond the distance of the worst-case release scenarios set forth in Table 2.Thus, the results of the offsite consequence analysis for the worst-case release scenarios of ammonia at HBEP indicate that the concentrations exceeding the above benchmarks would not extend beyond the property boundaries at the 0 and 1.6 m AGL scenarios.

Assessment of the Methodology Used

Numerous conservative assumptions were used in the above analysis of the worst-case release scenario, including the following:

- Worst-case of a constant mass flow at the highest possible initial evaporation rate for the modeled wind speed and temperature was used, whereas, in reality, the evaporation rate would decrease with time as the concentration in the solution decreases.
- Worst-case stability class was used, which almost exclusively occurs during nighttime hours, but the maximum ambient temperature of 105°F was used, which would occur during daylight hours.
- Again, worst-case meteorology corresponds to nighttime hours, whereas the worst-case release of a tank failure would most likely occur during daytime activities at the power plant. At night, activity at a power plant is typically minimal.

Risk Probability

Accidental releases of aqueous ammonia in industrial use situations are rare. Statistics compiled on the normalized accident rates for Risk Management Program chemicals for the years 1994–1999 from *Chemical Accident Risks in U.S. Industry-A Preliminary Analysis of Accident Risk Data from U.S. Hazardous Chemical Facilities,*[7] indicate that ammonia (all forms) averages 0.017 accidental releases per process per year, and 0.018 accidental releases per million pounds stored per year. Data derived from *The Center for Chemical Process Safety*,[8] indicate the accidental release scenarios and probabilities for ammonia in general, as shown in Table 3.

TABLE 3
General Accidental Release Scenarios and Probabilities for Ammonia

Accident Scenario	Failure Probability
Onsite Truck Release	0.0000022
Loading Line Failure	0.005
Storage Tank Failure	0.000095
Process Line Failure	0.00053
Evaporator Failure	0.00015

Conclusions

Several factors need to be considered when determining the potential risk from the use and storage of hazardous materials. These factors include the probability of equipment failure, population densities near the project site, meteorological conditions, and the process design. Considering the results of the above analysis, and accounting for the probabilities of a tank failure resulting in the modeled ammonia concentrations at the conditions modeled, the risk posed to the local community from the storage of aqueous ammonia at HBEP is not significant.

The results of the catastrophic scenario analysis indicate that the probability of a complete storage tank failure in combination with the conservatively modeled meteorological conditions would not pose a

[7] Belke, J. C. 2000. *Chemical Accident Risks in U.S. Industry-A Preliminary Analysis of Accident Risk Data from U.S. Hazardous Chemical Facilities.* September.

[8] The Center for Chemical Process Safety. 1989. *Guidelines for Process Equipment Reliability Data - With Data Tables.*

significant threat because ammonia concentrations above the four "benchmark" thresholds of 2,000, 300, 150, and 75 ppm would not be accessible to the public.

As described, numerous conservative assumptions have been made at each step in this analysis. The conservative nature of these assumptions has resulted in a significant overestimation of the probability of an ammonia release at the HBEP site, and the predicted distances and elevations to toxic endpoints do not pose a threat to the public. Therefore, it is concluded that risk from exposure to aqueous ammonia due to HBEP is less than significant.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION FOR THE
HUNTINGTON BEACH ENERGY PROJECT

Docket No. 12-AFC-02

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(Revised 07/18/2013)

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DECLARATION OF SERVICE

I, Kimberly J. Hellwig, declare that on August 28, 2013, I served and filed copies of the attached Applicant's Offsite Consequence Analysis (Hazardous Materials Handling). This document is accompanied by the most recent Proof of Service, which I copied from the web page for this project at: http://www.energy.ca.gov/sitingcases/huntington_beach_energy/index.html.

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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am over the age of 18 years.

Dated: August 28, 2013

Kim Hellwig

Kimberly J. Hellwig