4.5 HAZARDOUS MATERIALS MANAGEMENT

As described in detail below impacts of the Modified Project to hazardous materials management are expected to be less than or equal to those of the Approved Project and will remain less than significant.

4.5.1 Project Changes Related to Hazardous Materials Management

The Modified Project proposes to utilize either fixed tilt or single-axis tracking PV modules for the Project's electrical generation. The elimination of SunCatchers would eliminate the need for hydrogen production and storage on site.

4.5.1.1 Construction Phase

Tables 4.5-1 and 4.5-2 provide an amended summary of the hazardous materials to be used and stored during construction of the Modified Project as compared to the Approved Project. These tables identify, respectively, the hazardous materials to be used during construction based on the characteristics criteria identified in Title 22 of the CCR, and based on the properties of the substances themselves.

TABLE 4.5-1
HAZARDOUS MATERIALS USE AND STORAGE DURING CONSTRUCTION
BASED ON TITLE 22 HAZARDOUS CHARACTERIZATION

Material	Hazardous Characteristics	Purpose	Storage Location	Maximum Stored (Approved Project)	Maximum Stored (Modified Project)	Storage Type
Diesel fuel	Ignitability	Refueling construction vehicles and equipment	Equipment Service Area	4,000 gallons	5,000 gallons	Tank
Diesel fuel	Ignitability	Refueling truck	Equipment Service Area/mobile	1,000 gallons	1,000 gallons	Truck
Gasoline	Ignitability	Refueling construction vehicles and equipment	Equipment Service Area	1,000 gallons	1,000 gallons	Tank

TABLE 4.5-1
HAZARDOUS MATERIALS USE AND STORAGE DURING CONSTRUCTION
BASED ON TITLE 22 HAZARDOUS CHARACTERIZATION

Material	Hazardous Characteristics	Purpose	Storage Location	Maximum Stored (Approved Project)	Maximum Stored (Modified Project)	Storage Type
Gasoline	Ignitability	Refueling truck	Equipment Service Area/mobile	1,000 gallons	1,000 gallons	Truck
Acetylene	Ignitability	Welding	Equipment Service Area	500 cubic feet	500 cubic feet	Cylinders
Oxygen	Ignitability	Welding	Equipment Service Area	500 cubic feet	500 cubic feet	Cylinders

TABLE 4.5-2
HAZARDOUS MATERIALS USE AND STORAGE DURING CONSTRUCTION
BASED ON MATERIAL PROPERTIES

Material	Hazardous Characteristics[1]	Purpose	Storage Location	Maximum Stored (Approved Project)	Maximum Stored (Modified Project)	Storage Type
Lubricating oil	Mildly toxic	Lubricating equipment parts	Equipment Service Area	500 gallons	500 gallons	Tanks
Hydraulic oil	Mildly toxic	Lubricating equipment parts	Equipment Service Area	1,500 gallons	1,500 gallons	Tanks
Grease	Mildly toxic	Lubricating equipment parts	Equipment Service Area	45 gallons	45 gallons	Drum
Cleaning chemicals/ detergents	Toxicity, irritant	Periodic cleaning	Equipment Service Area	150 gallons	150 gallons	Drums or small containers

4.5.1.2 Operations Phase

Tables 4.5-3 and 4.5-4 provide an amended summary of hazardous materials to be used or stored on site during operation of the Modified Project as compared to the Approved Project. These two tables list the materials to be used during regular operation that can be characterized as hazardous based on Title 22 criteria and the properties of the materials, respectively.

TABLE 4.5-3
HAZARDOUS MATERIALS USE AND STORAGE DURING OPERATION
BASED ON TITLE 22 HAZARDOUS CHARACTERIZATION

Material	Hazardous Characteristics	Purpose	Storage Location	Maximum Stored (Approved Project)	Maximum Stored (Modified Project)	Storage Type
Acetylene	Ignitability	Welding	Maintenance buildings	1,000 cubic feet	1,000 cubic feet	Cylinders stored in maintenance buildings
Oxygen	Ignitability	Welding	Maintenance buildings	1,000 cubic feet	1,000 cubic feet	Cylinders stored in maintenance buildings
Miscellaneous Scale Inhibitors & Algae control chemicals	Toxicity	Corrosion & Biological build-up of Reverse Osmosis Equipment & Pipes	Waste Water Treatment Area		Four (4) 55-gallon drums	Gallon drums
Various solvents, detergents, paints, water treatment chemicals and other cleaners	Toxicity	Building maintenance and equipment cleaning	Maintenance buildings		Three (3) 55-gallon drums commercial 1-gallon containers	Containers will be stored in secondary containments in the maintenance area
Gasoline	Ignitability	Maintenance vehicles	Refueling station with containment	5,000 gallons	5,000 gallons	Aboveground storage tank

TABLE 4.5-3
HAZARDOUS MATERIALS USE AND STORAGE DURING OPERATION
BASED ON TITLE 22 HAZARDOUS CHARACTERIZATION

Material	Hazardous Characteristics	Purpose	Storage Location	Maximum Stored (Approved Project)	Maximum Stored (Modified Project)	Storage Type
Diesel fuel	Ignitability	Firewater pump Maintenance Vehicles	Firewater skid refueling station with containment	100 gallons initial fill 5,000 gallons	100 gallons initial fill for diesel generator 5,000 gallons for main diesel storage tank	Firewater skid. Aboveground storage tank (refueling station)

TABLE 4.5-4
HAZARDOUS MATERIALS USE AND STORAGE DURING OPERATION
BASED ON MATERIAL PROPERTIES

Material	Hazardous Characteristics	Purpose	Storage Location	Maximum Stored (Approved Project)	Maximum Stored (Modified Project)	Storage Type
Insulating oil	Mildly toxic	Electrical equipment	Electrical equipment	60,000 gallons initial fill	25,000 gallons initial fill. 2,000 gallons stored on-site in tanks for refill	Electrical equipment contained in transformers and electrical switches
Lubricating oil	Mildly toxic	Misc. PV Tracker parts	Maintenance buildings	40,000 gallons initial fill with use of 21 gallons per month	2,500 gallons initial fill with usage of 10 gallons per month	Equipment 150-gallon recycle tank located in the maintenance building

Sodium hypochlorite 12.5 percent solution (bleach)	Toxicity	Disinfectant for potable water	Water treatment structure	4 gallons	4 gallons	Aboveground container

Acronyms/Notes:
PV - photovoltaic

4.5.2 Changes to Environmental Impacts

4.5.2.1 Construction

The types and amounts of hazardous materials to be used during construction under the Modified Project are the same in type and amount as the hazardous materials as contemplated for the Approved Project, with the exception of the SunCatcher specific materials. Therefore, the Modified Project's impacts to public health and safety associated with the use of hazardous materials during construction would be less than the impacts from the Approved Project and would remain less than significant.

4.5.2.2 Operations

The types of hazardous materials that would be used during operation under the Modified Project would be consistent with the hazardous materials contemplated for the Approved Project, with the materials solely associated with the SunCatcher technology being eliminated. This would result in the elimination of hydrogen from the Modified Project and would eliminate the need for an off-site consequence analysis of accidental release

As discussed in Section 1 of this Petition, K Road Calico Solar LLC has not selected the specific panel for installation at the CSP. Some manufacturers employ the compound CdTe (cadmium telluride) as the semiconductor material within the modules. Cadmium telluride is a stable compound of cadmium (Cd) and tellurium (Te). Cadmium, Cd, produced primarily as a byproduct of zinc refining, is a human carcinogen as an independent element, but when combined with Te, a byproduct of copper refining, forms the stable, non-hazardous compound CdTe. In module manufacturing Cd, a hazardous material, is safely sequestered in the form of CdTe in a module for the over 30-year lifetime of the module, after which it is recycled for use in new solar modules or other new products.

In addition, CdTe's physical properties, including its extremely low vapor pressure and high melting point, along with its insolubility in water, limit its mobility. Furthermore, the very thin layer of CdTe in PV modules is encapsulated between two protective sheets of

glass. As a result, the risk of health or environmental exposure in fires, from accidental breakage, or from leaching is de minimus. The exposure routes to CdTe in modules are limited; furthermore, recent toxicological testing indicates that CdTe is significantly less toxic than elemental Cd.

First Solar, a manufacturer that uses CdTe, employs a collection and recycling program to ensure that PV materials stay in the production cycle and out of municipal landfills. The program is designed to recover approximately 95 percent of the semiconductor material and 90 percent of the glass. The remaining materials (e.g., glass fines, dust) are collected in HEPA filters and are disposed of properly. Commercial scale recycling facilities are currently in operation at each of First Solar's manufacturing facilities to recycle manufacturing materials. If K Road Calico Solar LLC elects to use a PV panel that uses CdTe, it would participate in that manufacturer's recycling program.

In 2009, an in-depth assessment of the environmental, health and safety aspects of First Solar's CdTe PV systems and manufacturing operations was carried out under the authority of the French Ministry of Ecology, Energy, Sustainable Development, and the Sea. It concluded that, "During standard operation of CdTe PV systems, there are no cadmium emissions – to air, to water, or to soil. In the exceptional case of accidental fires or broken panels, scientific studies show that cadmium emissions remain negligible. Accordingly, large-scale deployment of CdTe PV can be considered safe to human health and the environment."[4]

A 2005 peer review of three major published studies on the environmental profile of CdTe PV organized by the European Commission, Joint Research Center and sponsored by the German Environment Ministry concluded "…CdTe used in PV is in an environmentally stable form that does not leak into the environment during normal use or foreseeable accidents, and therefore can be considered the environmentally safest current use of cadmium." This review also concluded that "Large scale use of CdTe photovoltaic modules does not present any risks to public health and the environment."[5]

Independent analysis also indicates that CdTe modules do not pose a risk during fires. CdTe has an extremely low vapor pressure, high boiling and melting points and is almost completely encapsulated by molten glass when exposed to fire. Exposure of pieces of CdTe PV modules to flame temperatures from 1,400°F to 2,000°F illustrated

4. Summary Report, "Environmental, Health, and Safety (EHS) Aspects of First Solar Cadmium Telluride (CdTe) Photovoltaic (PV) Systems," carried out under the authority of the French Ministry of Ecology, Energy, Sustainable Development, and the Sea, July 2009.

5. Summary Report, "Peer Review of Major Published Studies on the Environmental Profile of Cadmium Telluride (CdTe) Photovoltaic (PV) Systems," European Commission, Joint Research Centre

that CdTe diffuses into glass, rather than being released into the atmosphere. Higher temperatures produce further CdTe diffusion into the glass.[6]

4.5.3 Changes in Cumulative Environmental Impacts

The Commission Decision concluded that the Approved Project would not result in any significant cumulative impacts to hazardous materials management. Incremental impacts of the Modified Project on hazardous materials management are expected to be the same or slightly reduced compared to the Approved Project. As described in Section 1.4.1, Cumulative Scenario, no new reasonably foreseeable future actions beyond those assumed in the Commission Decision have been identified. Therefore, no increase in cumulative impacts under the Modified Project is anticipated.

4.5.4 Changes in LORS Conformance and Other Permits

In the Commission Decision, the Commission concluded that, with the implementation of the Conditions, the Approved Project would comply with all applicable LORS. As with the Approved Project, the Modified Project would comply with all applicable LORS, and no new or additional LORS have been identified.

4.5.5 Changes in Proposed Mitigation

No new or more severe impacts requiring additional mitigation would result from the Modified Project. The mitigation measures proposed in the Commission Decision would mitigate impacts associated with the Modified Project to levels that would be less than significant.

4.5.6 Changes in Conditions of Certification

The conforming changes to the Conditions for the Modified Project related to hazardous materials management are:

HAZ-2 ~~The~~If required under applicable LORS, the project owner shall concurrently provide a Hazardous Materials Business Plan (HMBP), a Risk Management Plan (RMP)~~ that includes the consequences of a train derailment resulting in a hydrogen pipeline leak and fire~~, and a Spill Prevention, Control, and Countermeasure Plan (SPCC) to the San Bernardino County Fire Department, and the CPM for review. After receiving comments from the San Bernardino County Fire Department, and the CPM, the project owner shall reflect all received recommendations in the final documents. If no comments are received from the county within 30 days of

[6]. Fthenakis, V., Fuhrmann, M., Heiser, J., Lanzirotti, A., Fitts, J., and Wang, W.,""Emissions and Encapsulation of Cadmium in CdTe PV Modules During Fires," *Progress in Photovoltaics: Research and Applications*, 6, 99-103 (1998).

submittal, the project owner may proceed with preparation of final documents upon receiving comments from the CPM. Copies of the final HMBP, RMP, and SPCC Plan shall then be provided to the San Bernardino County Fire Department for their records and to the CPM for approval.

Verification: At least 60 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan (HMBP) and a Spill Prevention, Control, and Countermeasure Plan (SPCC) to the CPM for approval, as required. At least 60 days prior to ~~existence of any hydrogen on the site for commissioning or~~ operations, the project owner shall provide a copy of a final Risk Management Plan (RMP) to the CPM for approval, as required.