

5.15 HAZARDOUS MATERIALS HANDLING

This section discusses the potential effects from the storage and use of hazardous materials during construction and operation of the SES Solar Two, LLC (Solar Two or Applicant), Project generating facility and its ancillary systems (Project). Design features (specifically storage procedures) have been incorporated into the Solar Two Project regarding the use of hazardous materials, to keep maximum potential effects below defined thresholds of significance. Hazardous waste generation and management are further discussed in Section 5.14, Waste Management.

The following discussion covers the affected environment; the environmental consequences associated with hazardous materials usage during construction and operation of the Project; cumulative effects; mitigation measures; and applicable laws, ordinances, regulations, and standards (LORS).

5.15.1 Affected Environment

The Solar Two Project involves the construction, operation, and maintenance of a 750-megawatt (MW) capacity solar electric generation facility and its ancillary systems. The Project will consist of approximately 30,000 solar concentrator dishes and its associated infrastructure.

The Project Site is located in an undeveloped area of Imperial County, California, that is located approximately 100 miles east of San Diego, California, and 14 miles west of El Centro, California. The Project Site will be located on approximately 6,140 acres of the Bureau of Land Management administered public land and approximately 360 acres of private land for a total of approximately 6,500 acres. Approval of the Solar Two Project Right-of-Way (ROW) Grant Application Form 299 (Application CACA 047740) will result in the issuance of a ROW Grant Permit for use of the Bureau of Land Management administered public land.

The area adjoining the Project is primarily open, undeveloped land. No future residential development is anticipated in the immediate vicinity of the site. Also, no sensitive receptors were identified in the immediate vicinity of the Solar Two Project. See Section 5.16, Public Health and Safety, for additional information on sensitive receptors.

The initial phase of the Project (Phase I) will consist of up to 12,000 solar units called SunCatchers configured in 200 1.5-MW solar groups of 60 SunCatchers per group that will have a generating capacity of 300 MW. Ultimately, the Solar Two Project will be expanded to up to 30,000 SunCatchers configured in 500 1.5-MW solar groups of 60 SunCatchers per group that will have a generating capacity of 750 MW at the interconnection point with the California Independent System Operator electric grid at the San Diego Gas & Electric (SDG&E) Imperial Valley Substation. Other than the Solar Two Project interconnection transmission line that Solar Two will construct to the SDG&E Imperial Valley Substation, no new transmission lines or off-site substations will be required for the 300-MW Phase I construction of the Solar Two Project.

The Project will be connected to the Imperial Valley Substation via an approximate 10.3-mile double-circuit 230-kilovolt (kV) transmission line.

The Solar Two Project will include a centrally located Main Services Complex that will include three SunCatcher assembly buildings, administrative offices, an operations control room, maintenance facilities, and a water treatment complex including a water treatment structure, a raw water storage tank, a demineralized water storage tank, and a potable water tank.

Adjacent to the Main Services Complex, an 11-acre construction laydown area will be built; this area will include three SunCatcher assembly buildings. A separate 100-acre laydown area will be located just east of Dunaway Road.

Project Site access will be provided via Interstate 8 or Evan Hewes Highway from Dunaway Road. Dunaway Road has an existing exit from Interstate 8 at the southeastern corner of the Solar Two Project Site, 14 miles west of El Centro, California.

Contractors and equipment suppliers will use the 100-acre laydown area east of Dunaway Road during construction to coordinate delivery of construction equipment and materials, for construction worker parking and processing, and for staging truck traffic exiting Interstate 8 before entry to the Project Site. The 100-acre laydown area will include a 25-acre staging area.

An 8-inch diameter water supply pipeline will be constructed a distance of approximately 7.2 miles from the Imperial Irrigation District Westside Main Canal to the Main Services Complex of the Solar Two Project. The water supply pipeline will be defined by a linear survey and will be routed in the Union Pacific Railroad ROW, or adjacent to this ROW on federal and private lands.

The Solar Two Project transmission system will require construction of approximately 10.3 miles of 230-kV transmission line. The Solar Two Project transmission line extends from the Project Site substation to a point inside the SDG&E Imperial Valley Substation ROW. The overhead line begins at the dead-end structure in the Solar Two Project switchyard, continues south and east to the SDG&E 500-kV Southwest Powerlink transmission ROW, then transits southeast on the southwest side of the SDG&E 500-kV transmission line to approximately the third tower west of the Imperial Valley Substation, where it crosses under the SDG&E 500-kV line and transits due east to the Imperial Valley Substation which it enters from the north. Construction of the line will include a dead end structure at the substation and 85 to 100 lattice towers and/or tubular steel poles with concrete foundations.

A summary of hazardous materials to be used and stored for construction of the Solar Two Project is provided in Table 5.15-1, Hazardous Materials Usage and Storage During Construction. A summary of hazardous materials to be used and stored on-site for operation of the Solar Two Project is provided in Table 5.15-2, Hazardous Materials Usage and Storage During Operations.

**Table 5.15-1
Hazardous Materials Usage and Storage During Construction**

Material	Purpose	Storage Location	Maximum Stored¹	Storage Type
Diesel fuel	Refueling construction vehicles and equipment	Equipment Service Area	4,000 gallons	Tank
Diesel fuel	Refueling truck	Equipment Service Area/mobile	1,000 gallons	Truck
Gasoline	Refueling construction vehicles and equipment	Equipment Service Area	1,000 gallons	Tank
Gasoline	Refueling truck	Equipment Service Area/mobile	1,000 gallons	Truck
Lubricating oil	Lubricating equipment parts	Equipment Service Area	500 gallons	Tanks
Hydraulic oil	Lubricating equipment parts	Equipment Service Area	1,500 gallons	Tanks
Grease	Lubricating equipment parts	Equipment Service Area	45 gallons	Drum
Ethylene Glycol	Coolant, antifreeze	Equipment Service Area	500 gallons	Tanks
Acetylene	Welding	Equipment Service Area	500 cubic feet	Cylinders
Oxygen	Welding	Equipment Service Area	500 cubic feet	Cylinders
Cleaning chemicals/detergents	Periodic cleaning	Equipment Service Area	150 gallons	Drums or small containers

Source: SES Solar Two, LLC, 2008.

Note:

¹All numbers are approximate.

**Table 5.15-2
Hazardous Materials Usage and Storage During Operations**

Chemical	Use	Storage Location/Type	State	Storage Quantity¹
Insulating oil	Electrical equipment	Electrical equipment (contained in transformers and electrical switches)	Liquid	50,000 gallons initial fill
Lubricating oil	Stirling Engine/dish drives	Equipment Maintenance Buildings	Liquid	108,333 gallons initial fill 300-gallon recycle tank
Hydrogen	PCU working fluid	k-bottles mounted on each SunCatcher, and within Stirling Engine	Gas	210 cubic feet within each SunCatcher (30,000 SunCatchers)
		k-bottles located in Hydrogen Storage area		196 cubic feet in each k-bottle (100 k-bottles) Total hydrogen storage = 6,319,600 million cubic feet (equivalent to 32,862 pounds of hydrogen)
Acetylene	Welding	Cylinders stored in maintenance buildings	Gas	1,000 cubic feet
Oxygen	Welding	Cylinders stored in maintenance buildings	Gas	1,000 cubic feet
Ethylene glycol	Coolant, antifreeze	PCU radiator maintenance buildings	Liquid	110,000 initial fill
Various solvents, detergents, paints, and other cleaners	Building maintenance and equipment cleaning	55-gallon drums and 1-gallon containers will be stored maintenance buildings	Liquid	550 gallons
Gasoline	Maintenance vehicles	5,000 gallon AST at refueling station with containment	Liquid	5,000 gallons
Diesel fuel	Firewater pump maintenance vehicles	Firewater skid 5,000-gallon AST refueling station with containment	Liquid	100 gallons 5,000 gallons
Sodium hypochlorite 12.5 percent solution (bleach)	Disinfectant for potable water	Water treatment structure	Liquid	4 gallons

Source: SES Solar Two, LLC, 2008.

Notes:

¹All numbers are approximate.

AST = aboveground storage tank

PCU = power conversion unit

5.15.2 Environmental Consequences

5.15.2.1 Construction Phase

Hazardous materials to be used during construction include gasoline, diesel fuel, oil, and small amounts of lubricants, cleaners, solvents, and adhesives. No feasible alternatives to these materials are available for construction vehicles and equipment. No acutely hazardous materials will be used or stored on-site during construction. No storage of hazardous materials is planned outside of the Project Site or laydown areas.

In general, construction contractors will use fuel, lubricating oils, and other hazardous materials during construction of the Solar Two Project. The contractor will be responsible for ensuring that the use, storage, and handling of these materials will be in compliance with applicable federal, state, and local LORS, including licensing, personnel training, accumulation limits, reporting requirements, and recordkeeping. A Hazardous Materials Business Plan (HMBP), which outlines hazardous materials handling, storage, spill response, and reporting procedures, will be prepared before construction activities.

The following Project Site services will also be provided by separate contract or incorporated into individual construction subcontracts for the Solar Two Project:

- environmental health and safety training,
- site security,
- site first aid,
- construction testing (e.g., soil, concrete),
- furnishing and servicing of sanitary facilities,
- trash collection and disposal, and
- disposal of hazardous materials and waste in accordance with local, state, and federal regulations.

Small quantities of spilled fuel oil and lubricant/grease drippings from construction equipment may occur during construction. Such materials generally have a low relative risk to human health and the environment. If a large spill should occur, the spill area will be bermed or controlled as quickly as practical to minimize the footprint of the spill. Contaminated soil materials produced during cleanup of a spill will be placed into drums for off-site disposal as a hazardous waste at a permitted hazardous waste transfer, storage, and disposal facility. If a spill or leak into the environment involves hazardous materials equal to or greater than the specific reportable quantity, federal, state, and local reporting requirements will be adhered to. In particular, the California Department of Toxic Substances Control (DTSC) Imperial County Certified Unified Program Agency (CUPA) will be notified. The El Centro Fire Department will also be called in the event of a fire or injury. Contractors will be expected to implement best management practices consistent with hazardous materials storage, handling, emergency spill response, and reporting specified in the HMBP. The effects associated with the use of hazardous materials will be less than significant as a result of the Applicant implementing the above procedures.

5.15.2.2 Operation and Maintenance

The major hazardous materials to be stored and/or used at the Project Site during Solar Two Project operations are listed in Table 5.15-2, Hazardous Materials Usage and Storage During Operations. Fire and explosion from the use and storage of hydrogen are the potential hazards associated with the storage of hazardous or acutely hazardous materials for the Project.

Fire and Explosion Risks

There are three types of hazardous highly flammable or explosive materials that will be used at the Project Site during operation and maintenance: hydrogen gas, oxygen and acetylene welding gases, and gasoline fuel for the operation of vehicles. Two other flammable materials that are difficult to ignite will also be used at the Project Site during operation and maintenance: transformer insulating oil and diesel fuels for the operation vehicles.

Hydrogen Gas

A flammable gas, hydrogen, will be used in the Power Conversion Unit of the Stirling Cycle Engine as a working fluid. A maximum of 100 k-bottles of hydrogen may be stored at the Main Services Complex at any one time to provide for maintenance replacement and make-up consumption of hydrogen by the Power Conversion Units of the Stirling Cycle Engines. The gas will be stored in approved individual gas cylinders (k-bottles) supplied by an approved hydrogen gas supplier. The cylinders will be stored outside, near the Main Services Complex away from electrical lines and other potential ignition sources, as required by the applicable LORS. Cylinders will be stored upright, chained to a supporting structure, and protected from vehicular effect and other effects by bollards constructed of steel pipe filled with concrete and set in concrete or concrete equivalent.

The potential fire or explosion risks for hydrogen storage and use on the SunCatchers are not significant. Hydrogen gas will only be used outdoors in well-ventilated open areas, which will allow the gas to dissipate to the atmosphere, thus mitigating the potential fire and explosion risk.

The risk of a fire and/or explosion from hydrogen will be minimized through adherence to applicable codes and design features, and the continued implementation of effective safety management practices. Appendix K, Hydrogen System Design Criteria, summarizes the applicable codes, standards, standard design criteria, and practices that form the basis of the design for the Solar Two Project hydrogen system. Project hydrogen usage and storage requirements are listed below.

- Only experienced and properly instructed personnel will handle compressed gases. During filling, the cylinders will be secured in an upright position. The valve protection cap will be removed only just before connecting the cylinder to the manifold. The cylinder units will be electrically bonded to the system before discharging hydrogen. Personnel will ensure all connections will remain gas-tight during filling.
- Cylinders will be stored in compliance with the requirements of Compressed Gas Association pamphlet P-1, Safe Handling of Compressed Gases in Containers.

- The stored cylinders will be legibly marked with the name “Hydrogen” and proper identification labels. The identification labels applied by the gas supplier will be the primary identifier; not the color of the container.
- The storage areas will be prominently posted with the hazard class and gas identified. Signs stating “No Smoking” and “No Open Flames” will be posted.
- The storage area will be designed to accommodate the cylinder containers with adequate spacing and segregation by partitioning. Empty and full containers will be stored separately. The area will be above grade, well-drained, well-ventilated, and will have adequate separation from combustibles. The storage area will consist of a paved asphalt or concrete surface that has been graded to prevent accumulation of water. The cylinders will not be subject to prolonged exposure to damp environments. Structures used for shielding and shading will be fire-resistive. The cylinders will be stored in a fenced area to protect against tampering and damage. The cylinders will not be stored near readily ignitable substances or exposed to corrosive chemicals or fumes. The cylinders will be protected from objects that can produce harmful cuts or abrasions in the surface of the metal. The cylinders will not be stored in a location where heavy moving objects can strike or fall on them. The cylinders will be kept at pressures and temperatures not to exceed normal operating parameters. The ambient temperatures in the storage areas will not exceed 125 degrees Fahrenheit.
- The cylinders will be stored in a secured position to prevent falling or rolling. The cylinders will be nested to maintain a three-point contact grounding system or a grounding wire will be connected and used in all storage cylinders. Valve protection caps will be used and hand tightened.
- The cylinders will be stored in a secure area with access limited to authorized personnel only. Product inventory will be maintained. All inventory discrepancies will be investigated. All incidents involving thefts, misuse, or inventory shortages will be reported to law enforcement and to the supplier.

Other Gases

Other gases to be stored and used at the Project Site may include shop welding gases for maintenance activities. Typical welding gases are oxygen and acetylene. The potential effects presented by the use of these gases at the Project Site do not appear to be significant based on the data presented below.

- A limited quantity of each gas will be stored at the Project Site: a maximum of 6 to 10 bottles at the Main Services Complex and Satellite Services Complex.
- The gases will be stored in U.S. Department of Transportation approved safety cylinders secured to prevent upset and physical damage.
- Incompatible gases (e.g., flammable gases and oxidizers) will be stored separately.
- The gases will be stored in multiple standard-sized portable cylinders (in contrast to larger cylinders), generally limiting the quantity of gas released from an individual cylinder failure to less than 200 cubic feet.

Gasoline and Diesel Fuel

Gasoline is a Type 1B flammable liquid and is considered a severe fire hazard. Gasoline vapor is heavier than air. Vapor or gases may be ignited by distant ignition sources and flash back. To mitigate the fire and explosion risks, the gasoline storage tank shall have emergency relief venting in the form of construction of a device or devices that will relieve excessive internal pressure caused by an exposure fire.

The gasoline and diesel fuels will be stored in 5,000-gallon tanks in the refueling area. Gasoline and diesel fuel tanks will be located away from electrical lines and other potential ignition sources. The fuel tanks will be provided with dikes and/or firewalls capable of containing the volume of the largest tank. These tanks will be installed in a way that the exterior surface, including the bottom of the tank and connection piping, can be directly monitored and directly viewed.

The storage tanks for gasoline and diesel fuel will be protected from vehicular effect and other effects by bollards constructed of steel pipe filled with concrete and set in concrete or equivalent.

Transformer oil will not be stored on-site except in the transformers. Nearly the only risk of a transformer oil fire would be the unlikely event of a catastrophic transformer failure. This would require an emergency response from the El Centro Fire Department.

Acutely Hazardous Materials

The chemicals proposed for use at the Solar Two Project Site are not Regulated Substances subject to the requirements of the California Accidental Release Prevention (CalARP) Program and process safety management, with the exception of hydrogen, which will be stored in each SunCatcher and in a hydrogen storage area.

In September 1996, Senate Bill 1889 was enacted to change the California Health and Safety Code (CHSC) Section 25531 *et seq.*, replacing the Risk Management and Prevention Program requirements with the Risk Management Plan (RMP) requirements established pursuant to Section 112(r) of the federal Clean Air Act (42 United States Code Section 7412). Pursuant to Senate Bill 1889, the California Office of Emergency Services is required to adopt implementing regulations, initially as emergency regulations, and to seek and maintain delegation of the federal program. The CalARP Program merges federal and state programs for the prevention of accidental releases of toxic and flammable substances. The goal was to eliminate the need for two separate and distinct chemical risk management programs. The CalARP Phase I Final Regulations were approved on 16 November 1998.

The CalARP Program final regulations (Title 19 California Code of Regulations [CCR] Division 12, Chapter 4.5) provide two sets of lists of regulated substances: one for Federal Regulated Substances and one for State Regulated Substances.

- **Section 2770.5:** Tables 1 and 2 of Section 2770.5 list Federal Regulated Substances and threshold quantities for accidental release prevention, including flammable substances. Hydrogen is on the list.
- **Section 2770.5:** Table 3 of Section 2770.5 lists State Regulated Substances and threshold quantities for accidental release prevention. Hydrogen is on the list.

Based on the above regulations and the future use of hydrogen, an RMP is required and will be submitted to the DTSC Imperial County CUPA.

An Off-site Consequences Analysis (OCA) for accidental release of hydrogen has been conducted in accordance with CEC regulations. The analysis is included in Section 5.15.2.3, Off-site Consequence Analysis.

Other Hazardous Materials

No adverse environmental effects related to other hazardous materials used at the Project Site are anticipated. Only small quantities of hazardous materials will be present during operation of the Project.

Solar Two will maintain and implement an HMBP. Solar Two will also implement best management practices consistent with the hazardous materials handling, emergency spill response, and reporting as specified in the HMBP. If a spill or release of hazardous materials should occur during operations, the spill area will be bermed or controlled as quickly as practical to minimize the footprint of the spill. Contaminated soil materials produced during cleanup of a spill will be placed into drums for off-site disposal as a hazardous waste at a permitted hazardous waste, transfer, storage, and disposal facility. If a spill or leak into the environment involves hazardous materials equal to or greater than the specific reportable quantity, federal, state, and local reporting requirements will be adhered to. In particular, the DTSC Imperial County CUPA will be notified. The El Centro Fire Department will also be called in the event of a fire or injury. Long-term or cumulative effects will be avoided by cleaning up any accidental leaks or spills of these materials as soon as they occur.

Material Safety Data Sheets

Material Safety Data Sheets for the hazardous materials will be kept on-site as required by 29 Code of Federal Regulations (CFR) 1910 Occupational Safety and Health hazard communication rules and regulations.

5.15.2.3 Off-site Consequence Analysis

The Solar Two Project will use hydrogen gas as the working fluid in the Stirling Cycle Engine within each SunCatcher. The Project is projected to use 30,000 SunCatchers on the Project Site. Each unit will be equipped with a 196-cubic foot hydrogen gas cylinder and the engine will contain 14 cubic feet of hydrogen within the unit for a total of 210 cubic feet of hydrogen at each unit location. Also, a maximum of 100 196-cubic foot capacity hydrogen cylinders will be present in an outdoor storage area at any given time. The total quantity of hydrogen storage on-site will be 6,319,600 million cubic feet (equivalent to 32,862 pounds of hydrogen using a density of 0.0052 pounds per cubic foot).

Although hydrogen will be stored separately in 196-cubic foot (1.02-pound) capacity cylinders, the total combined amount to be stored at the Solar Two Project Site will be approximately 32,862 pounds, which exceeds federal threshold quantities for risk management. Title 40 CFR Part 68, Chemical Accident Prevention, requires all facilities storing hydrogen in excess of 10,000 pounds to comply with all RMP requirements.

An off-site consequence analysis evaluation was conducted for the storage and use of hydrogen at the Solar Two Project Site to determine the worst case effect from the release of hydrogen from a single unit. A secondary release case scenario was also considered using the storage room with 100 hydrogen cylinders. For the secondary scenario, it was considered that an explosion for one cylinder will affect the total amount of 100 cylinders stored at that location. The evaluation was conducted following the Environmental Protection Agency (EPA) RMP OCA Guidance (EPA 1999a, 1999b, 1999c) documents. The purpose of the modeling was to estimate the consequences from potential releases of hydrogen gas from the storage cylinders that can potentially lead to an explosion. The modeling was based on equations obtained from the RMP OCA Guidance document for estimating effects. Due to the property of hydrogen, the hazard caused by explosion is considered to be the most significant effect for accidental hydrogen releases. The EPA Vapor Cloud Explosion method was used for the evaluation (EPA 1999c). Although it might not represent the exact method in which an effect may be caused, it will be representative of the actual scenario. The equation used is provided below. Consequence modeling was performed for the scenarios identified below. Figure 5.15-1, Worst-Case Scenario for Hydrogen Explosion, illustrates these scenarios.

Vapor Cloud Explosions

For vapor cloud explosions, the total quantity of hydrogen is assumed to form a vapor cloud. The entire cloud is assumed to be within the flammability limits, and the cloud is assumed to explode. Ten percent of the flammable vapor in the cloud is assumed to participate in the explosion. The effect is measured as the distance to the 1 pound per square inch (psi) overpressure level. This is determined using the following equation:

$$X = 0.0081 \left(0.1 W_f \frac{H_{Cf}}{H_{CTNT}} \right)^{1/3}$$

where:

- X = distance to overpressure of 1 pound psi (miles)
- W_f = weight of flammable substance (pounds)
- H_{Cf} = heat of combustion of flammable substance (joules/kilogram)
- H_{CTNT} = heat of combustion of trinitrotoluene (4.6 E+06 joules/kilogram)

Effect Determination

A vapor cloud explosion was used to model the hazard of blast from a hydrogen release event. The following section explains the determination of the endpoint for each effect evaluation.

Blast Evaluation Endpoint

A vapor cloud explosion was used to model the hazard of the blast from a hydrogen release event. Blast effects are of concern wherever flammable materials and ignition sources are present, or where processes operate under high temperatures and pressures. Blast effects are described in terms of overpressure. The endpoint selected by the EPA as a significance criterion is an overpressure of 1.0 psi. An overpressure of 1.0 psi may cause partial demolition of houses, which can result in serious injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.

Release Scenarios

The accident scenarios below were considered in the analysis of off-site effects. The selection of these worst case scenarios was based on EPA's RMP criteria.

- Scenario 1:** The contents of one hydrogen cylinder plus the one contained in the engine (210 cubic feet) within a SunCatcher at the Solar Two Project Site leak into the atmosphere. The released hydrogen forms a vapor cloud and 10 percent of the flammable vapor in the cloud participates in the explosion. (Note: vapor cloud explosions generally are considered unlikely events.)
- Scenario 2:** The contents of 100 hydrogen cylinders (19,600 cubic feet) in the hydrogen storage area at the Project Site leak into the atmosphere. The released hydrogen forms a vapor cloud and 10 percent of the flammable vapor in the cloud participates in the explosion. (Note: vapor cloud explosions generally are considered unlikely events.)

Table 5.15-3, Chemical Physical Parameters, and Table 5.15-4, Scenario Definitions, show the parameters and scenarios used in the analysis.

**Table 5.15-3
Chemical Physical Parameters**

Chemical	H _c (joules/kilogram)	Density (pound per cubic foot)	Reference
Hydrogen	119,950	0.0052	1, 2

Sources: EPA Risk Management Plan Off-site Consequence Analysis Guidance Exhibit C-2, Appendix C, 1999; and Hydrogen Material Safety Data Sheet, 2008.

Note:

H_c = Heat of Combustion

**Table 5.15-4
Scenario Definitions**

Scenario	Container	Event Type	Chemical	Cubic Feet	Pounds
1	hydrogen k-bottle	Vapor Cloud Explosion	Hydrogen	210	1.092
2	hydrogen k-bottle			19,600	101.92

Source: EPA, 1999a.

The off-site consequence results are summarized in Table 5.15-5, Blast Distance to Endpoint (overpressure of 1 psi) from Center of Upset.

Table 5.15-5
Blast Distance to Endpoint (overpressure of 1 psi) from Center of Upset

Scenario	Size (cubic feet)	Chemical	Weight (pounds)	Distance (miles)
1	210	Hydrogen	1.014	0.0114
2	19,600	Hydrogen	101.4	0.0518

Source: EPA, 1999a.

Note:

psi = pounds per square inch

Conclusion

Off-site consequence modeling was performed using the EPA-RMP guidance to determine the area of effect arising from a catastrophic release of hydrogen at the Solar Two Project Site. Two accident scenarios were considered in the off-site consequence analysis evaluation. It should be noted that the parameters used for modeling were on the conservative side, which serves the purpose of determining and planning for the worst case scenario. The distance from the center of the upset to the endpoint for the two scenarios is presented in Table 5.15-6, Off-site Consequence Analysis Result.

Table 5.15-6
Off-site Consequence Analysis Result

Event	Scenario	Distance (miles)
Explosion	1	0.0114
	2	0.0518

Source: EPA, 1999a.

The modeling results for the scenarios evaluated identified that the extent of the explosion effects would be within the Project Site boundaries. Because the effects would remain on-site, no sensitive receptors are expected to be reached by the explosion effects.

Because the area of effect has no potential for affecting off-site sensitive receptors, the Project Site will be classified as an RMP Program Level 1. The Project Site will comply with all the requirements for the RMP Program Level 1 facility.

5.15.2.4 Abandonment/Closure

Premature closure or unexpected cessation of Project operations will be outlined in the Project Closure Plan. The plan will outline steps to secure hazardous and non-hazardous materials and wastes. Such steps will be consistent with Best Management Practices, the HMBP, the RMP, and according to applicable LORS. The plan will include monitoring of vessels and receptacles of hazardous material and wastes, safe cessation of processes using hazardous materials or hazardous wastes, and inspection of secondary containment structures.

Planned permanent closure effects will be incorporated into the Project Closure Plan and evaluated at the end of the Project's economic operation. The Project Closure Plan will document non-hazardous and hazardous waste management practices including the inventory, management, and disposal of hazardous materials and wastes and the permanent closure of permitted hazardous materials and waste storage units.

5.15.3 Cumulative Effects

Based on land uses in the surrounding area and the limited amount and type of hazardous materials to be used as part of the Solar Two Project, no significant cumulative effects due to hazardous materials handling are expected from future projects in combination with the Solar Two Project.

5.15.4 Mitigation Measures

The CEC standard conditions provide appropriate mitigation and compliance conditions that ensure that the Solar Two Project uses hazardous materials in a way that complies with all applicable LORS in a manner that ensures no significant environmental effects.

5.15.4.1 Construction Phase

During construction, the hazardous materials to be stored on-site will be limited to small quantities of paint, coatings, adhesives, and emergency refueling containers. These materials will be stored in a locked utility shed or in a secured, fenced area with secondary containment. It is anticipated that fuels, lubricants, and other various fluids needed for operation of construction equipment will be transported to the construction site on an as-needed basis by equipment service trucks. Personnel working on the Project during construction will be trained in handling hazardous material, and will be alerted to the dangers associated with these materials. An on-site safety officer will be designated to implement health and safety guidelines and contact emergency response personnel and the local hospital, if necessary.

Construction contractors for the Solar Two Project will be required to develop standard operating procedures for servicing and fueling construction equipment. These procedures will, at a minimum, include the items listed below.

HAZMAT-1

The following measures will be implemented related to fueling and maintenance of vehicles and equipment.

- No smoking, open flames, or welding will be allowed in the fueling/services areas.
- Servicing and fueling of vehicles and equipment will occur only in designated areas.
- Fueling service and maintenance will be conducted only by authorized, trained personnel.
- Refueling will be conducted only with approved pumps, hoses, and nozzles.
- All disconnected hoses will be handled in a manner that prevents residual fuel and fluids from being released into the environment.

- Catch pans will be placed under equipment/hose connections to catch potential spills during fueling and servicing.
- Service trucks will be provided with fire extinguishers and spill containment equipment, such as absorbents, shovels, and containers.
- Service trucks will not remain on the job site after fueling and service are complete.

HAZMAT-2

Spills that occur during vehicle maintenance will be cleaned up immediately, and contaminated soil will be containerized and sent for subsequent evaluation and off-site disposal. A log of all spills and cleanup actions will be maintained.

HAZMAT-3

Emergency telephone numbers will be available on-site for the fire department, police, local hospitals, ambulance service(s), and environmental regulatory agencies.

HAZMAT-4

Containers used to store hazardous materials will be properly labeled and kept in good condition. It is anticipated that these standard operating procedures will minimize the potential for incidents involving hazardous materials during construction.

5.15.4.2 Operation and Maintenance

A listing of anticipated hazardous materials to be used on-site during Project operation can be found in Table 5.15-2, Hazardous Materials Usage and Storage During Operations.

HAZMAT-5: Hazardous Materials Storage

Hazardous materials storage will typically consist of the storage of oil within equipment, aboveground fuel storage tanks, 55-gallon drums, or 5-gallon pails of lubricants and oils, and smaller containers of paints and solvents. These materials will be managed as described below to mitigate potential releases.

- Hazardous materials will be stored in accordance with applicable regulations and codes (i.e., the Uniform Fire Code).
- Trucks delivering hazardous materials will be parked adjacent to the usage area or storage area where the chemicals are to be stored to minimize potential unloading and transportation accidents.
- Incompatible materials will be stored separately from each other.
- Containerized hazardous materials will be stored in original containers appropriately designed for the individual characteristics of the contained material. Containers will be labeled with contents and identification of fire hazards as required by the National Fire Prevention Association, 704.

- Containers of flammable materials will be stored in inflammable storage cabinet(s) when not in use.
- Hazardous materials will be stored within secondary containment structures, typically constructed of sealed concrete. These structures will have capacity for the largest container plus an allowance for rainwater equivalent to a 24-hour, 50-year storm, if the area is outdoors. Alternatively, containerized hazardous materials may also be stored in commercially available hazardous materials storage sheds with built-in secondary containment.
- Bulk hazardous materials at the Project Site will consist primarily of gasoline, diesel fuel, and mineral oil. These materials will be stored in aboveground storage tanks or in equipment with secondary containment of 110 percent of the tank volume plus an allowance for rainwater for a 24-hour, 25-year storm. Hazardous materials are described below to mitigate the potential for releases to the environment.

Seismic loads for hazardous materials storage and containment areas will be determined by the static lateral force procedures for the Uniform Building Code, and site-specific design features will be incorporated into these storage facilities. These structures will be designed and constructed in accordance with applicable codes, regulations, and standards.

Underground piping and piping runs outside of secondary containment structures will be constructed with single-wall (secondary containment) piping to minimize the potential for releases and enable the Project staff to detect leaks, should they occur.

- Empty containers, especially portable tanks and drums, will be emptied, drained, and returned to the supplier for reuse to the maximum extent possible or recycled off-site.
- Pollution prevention efforts such as replacement of hazardous materials with less hazardous materials, reduction of hazardous waste generation volumes, and recycling will be employed at the Project Site, as practical.

HAZMAT-6: Personnel Training and Equipment

Personnel working with hazardous materials will be trained in proper handling and emergency response to chemical spills or accidental releases. Designated personnel will also be trained as a Project hazardous materials response team.

Safety equipment will be provided for use as required during chemical containment and cleanup activities and equipment will include safety showers and eyewash stations. Service water hose connections will be provided near chemical usage and storage areas to allow flushing of chemical spills, if needed.

HAZMAT-7: Hazardous Materials Management – Plans and Procedures

Several programs will address hazardous materials storage locations, emergency response procedures, employee training requirements, hazard recognition fire safety, first aid/emergency medical procedures, hazardous materials release containment/control procedures, hazard communication training, personnel protective equipment training, and release reporting requirements. These programs will include the HMBP, the worker safety program, the fire response program, the health and safety program, and Project standard operating procedures. The HMBP will cover procedures on hazardous materials handling, use, and storage; emergency response; spill prevention and control; training; record keeping; and reporting.

As discussed previously, an RMP for hydrogen will also be prepared.

HAZMAT-8: Spill Response Procedures

The following describes the general spill response procedures for the Solar Two Project. Personnel will be trained in spill response reporting and cleanup procedures. The Project will maintain on-site one or more spill response kits. These kits will contain absorbents appropriate for the hazardous materials kept on-site and each kit will be clearly designated for the type of spilled material for which it should be used. Typically, these kits contain a barrel, shovel, and absorbents. Also, a supply of gloves and protective clothing will be maintained for use during spill response events.

The on-site coordinator will assess the situation, contain the leak or spill, begin cleanup operations with on-site staff or off-site contractors, as needed, and collect information for reporting, if needed. The following information will be needed for reporting:

- type of chemical released,
- amount of release or spill (i.e., volume and description, liquid, vapor, etc.),
- direction of release and distance traveled (if the release is outside the secondary containment),
- cause of spill or release,
- potential hazard to off-site personnel and local water bodies, including groundwater, and
- actions undertaken to mitigate the spill or release.

Outside authorities will be contacted if required by laws and regulations, or as deemed necessary by the on-site coordinator.

In the case of a small spill involving 55 gallons or less of liquid hazardous materials, the spill will be retained by a secondary containment structure. This type of spill will be confined to as small a space as possible using absorbent pigs or pillows, and be cleaned up with properly trained employees using absorbents available on-site. Similarly, small spills outside of secondary containment structures could be cleaned up by trained employees with on-site spill kit equipment.

Larger spills will normally be contained within secondary containment and will be cleaned up by outside contractors using trained spill response personnel if on-site employees could not handle the spill using available on-site spill response equipment.

Waste generated from spill cleanup will be placed in closed, labeled containers, typically 55-gallon drums or roll-off containers. Labeling will include the name of the facility (Solar Two Project), date of start of accumulation, name of the spilled material, and hazardous waste identification language from 22 CCR 66262.32, and the established U.S. Department of Transportation shipping name, as needed.

Collected waste will be properly disposed of off-site at an approved recycling, landfill, or other appropriate disposal facility. Off-site transportation of spilled wastes will be contracted with a licensed hazardous materials transportation company. Hazardous waste spill cleanup residues will be properly manifested.

5.15.5 Compliance with LORS

Construction and operation of the Project will be conducted in accordance with all applicable LORS pertaining to hazardous materials. Applicable laws and regulations address the use and storage of hazardous materials to protect the environment from contamination, and Project workers and the surrounding community from exposure to hazardous and acutely hazardous materials.

5.15.5.1 *Federal*

The Superfund Amendments and Reauthorization Act of 1980 Title III (Sections 302, 304, 311, and 313) and regulations pursuant to the Clean Air Act of 1990 (40 CFR 68) established a nationwide emergency planning and response program, and imposed reporting requirements for businesses that store, handle, or produce significant quantities of extremely hazardous materials. The Acts require the states to implement a comprehensive system to inform local agencies and the public when a significant quantity of such materials is stored or handled at a facility (see 40 CFR 68.115). The requirements of these acts are reflected in CHSC, Section 25531 *et seq.* The Project will comply with these requirements as discussed below in Section 5.15.5.2, State.

Title 49 CFR Parts 171–177 govern the transportation of hazardous materials, the types of materials defined as hazardous, and the marking of the transportation vehicles.

5.15.5.2 *State*

CHSC Section 25500 requires companies that handle hazardous materials in sufficient quantities to develop an HMBP. The HMBP includes basic information on the location, type, quantity, and health risks of hazardous materials handled, stored, used, or disposed of that could be accidentally released into the environment. It also includes a plan for training new personnel, and for annual training of all personnel in safety procedures to follow in the event of a release of hazardous materials. It also includes an emergency response plan and identifies the business representative able to assist emergency personnel in the event of a release.

An HMBP will be developed before construction and operation of Project.

CHSC Section 25531 directs facility owners storing or handling acutely hazardous materials in reportable quantities to develop a RMP and submit it to appropriate local authorities, EPA, and the DTSC Imperial County CUPA for review and approval. The RMP includes: an evaluation of the potential effects associated with an accidental release, the likelihood of an accidental release

occurring, the magnitude of potential human exposure, any pre-existing evaluations or studies of the material, the likelihood of the substance being handled in the manner indicated, and the accident history of the material. This recently developed program supersedes the California Risk Management and Prevention Plan and is known as the CalARP. Solar Two is required to prepare an RMP for the storage of hydrogen before operation of the Project.

Title 8 CCR Section 5189 requires facility owners to develop and implement effective Safety Management Plans to ensure that large quantities of hazardous materials are handled safely. Although such requirements primarily provide for the protection of workers, they also indirectly improve public safety and are coordinated with the RMP process.

California Government Code, Section 65850.2, states that a city or county shall not issue a final certificate of occupancy unless verification is available that the applicant has met the applicable requirements of CHSC Section 25531 and the requirements, if any, for a permit from the air pollution control district.

The Uniform Building Code contains requirements regarding the storage and handling of hazardous materials. The Chief Building Official must inspect and verify compliance with these requirements before issuance of an occupancy permit.

5.15.5.3 Local

The designated CUPA for the Project Site is the DTSC Imperial County office, which is responsible for (1) the implementation of the HMBP and emergency response plan, and (2) the storage of hazardous materials in underground storage tanks and cleanup of petroleum releases.

The DTSC Imperial County CUPA will be contacted in the event of a release of hazardous wastes or materials to the environment.

5.15.5.4 Industry Standards

The Uniform Fire Code contains provisions regarding the storage and handling of hazardous materials. These provisions are contained in Articles 79 and 80. Article 80 was extensively revised in the latest edition (1994). These articles contain requirements that are generally similar to those contained in the California Health and Safety Code, Section 25531, *et seq.* However, the Uniform Fire Code does contain unique requirements for secondary containment, monitoring, and treatment of toxic gases emitted through emergency venting. These unique requirements are generally restricted to extremely hazardous materials.

The applicable LORS related to hazardous materials handling are summarized in Table 5.15-7, Summary of LORS – Hazardous Materials Handling.

**Table 5.15-7
Summary of LORS – Hazardous Materials Handling**

LORS	Requirements	Conformance Section	Administering Agency	Agency Contact
Federal Jurisdiction				
U.S. DOT Regulations, 49 CFR 171–177	Governs the transportation of hazardous materials, including the marking of the transportation vehicles.	Section 5.15.5.1	DOT Federal Motor Carrier Safety Administration	California Division 916-930-2760
State Jurisdiction				
Health and Safety Code Section 25500 <i>et seq.</i> (Waters Bill)	Requires preparation of an HMBP if hazardous materials are handled or stored in excess of TQ.	Section 5.15.5.2	DTSC	DTSC Imperial County CUPA Office 760-768-7107
Health and Safety Code Section 25531, <i>et seq.</i> (La Follette Bill)	Requires registration of the Project with local authorities and preparation of an RMP if hazardous materials stored or handled in excess of TQ.	Section 5.15.5.2	DTSC	DTSC Imperial County CUPA Office 760-768-7107
Title 8 CCR Section 5189	Facility owners are required to implement safety management plans to ensure safe handling of hazardous materials.	Section 5.15.5.2	DTSC	DTSC Imperial County CUPA Office 760-768-7107
California Uniform Building Code	Requirements regarding the storage and handling of hazardous materials.	Section 5.15.5.2	Imperial County Department of Planning and Building	760-482-4675
California Government Code Section 65850.2	Restricts issuance of COD until the Applicant has submitted an RMP.	Section 5.15.5.2	DTSC	DTSC Imperial County CUPA Office 760-768-7107
Local Jurisdiction				
DTSC Imperial County CUPA	Requires new/modified businesses to complete a hazardous materials business before final plan/permit approval.	Section 5.15.5.3	DTSC	DTSC Imperial County CUPA Office 760-768-7107
Industry Standards Jurisdiction				
UFC (Articles 79 and 80)	Requirements for secondary containment, monitoring, etc., for extremely hazardous materials.	Section 5.15.5.4	El Centro Fire Department, Prevention Division	Chris Petree Fire Chief 760-337-4567

Source: California Department of Toxic Substances Control, 2008; Cal/EPA, 2008; City of El Centro Fire Department, 2008; Imperial County Department of Building and Planning, 2008.

Notes:

CCR	=	California Code of Regulations
CFR	=	Code of Federal Regulations
CUPA	=	Certified Unified Program Agency
DOT	=	U.S. Department of Transportation
DTSC	=	Department of Toxic Substances Control
HMBP	=	Hazardous Materials Business Plan
LORS	=	laws, ordinances, regulations, and standards
RMP	=	Risk Management Protection Plan
TQ	=	Threshold Quantity
U.S.	=	United States
UFC	=	Uniform Fire Code

5.15.5.5 Agencies and Agency Contacts

A number of federal and state agencies regulate hazardous materials, including the EPA at the federal level and the California/Environmental Protection Agency at the state level. However, local agencies are the primary enforcers of hazardous materials laws. For the Solar Two Project Site, the local agency is the DTSC Imperial County CUPA, as indicated in Table 5.15-8, Agency Contact List for LORS.

**Table 5.15-8
Agency Contact List for LORS**

	Agency	Contact	Address	Telephone
1	DTSC Imperial County CUPA Office	Roger Vintze, CUPA Director DTSC Duty Officer Clovis Field Office	301 Hever Avenue Calexico, CA 92231	760-768-7107
2	El Centro Fire Department Prevention Division	Chris Petree Fire Chief	900 South Dogwood El Centro, CA 92243	760-337-4567

Source: California Department of Toxic Substances Control, 2008; City of El Centro Fire Department, 2008.

Notes:

- CUPA = Certified Unified Program Agency
- DTSC = Department of Toxic Substances Control
- LORS = laws, ordinances, regulations, and standards

5.15.5.6 Permits Required and Permitting Schedule

Solar Two will develop an HMBP before undertaking to construction activities. Solar Two will also develop and implement an RMP before the operation of the Project. See Table 5.15-9, Applicable Permits, for a list of potential permit requirements.

**Table 5.15-9
Applicable Permits**

Responsible Agency	Permit/Approval	Schedule
Federal	No permits required	N/A
State	No permits required	N/A
Local - DTSC Imperial County CUPA	Hazardous Materials Business Plan	30 days before storage of hazardous materials on-site
Local - DTSC Imperial County CUPA	Risk Management Plan	Before delivery of hydrogen to the Project Site

Source: California Department of Toxic Substances Control, 2008.

Notes:

- CUPA = Certified Unified Program Agency
- DTSC = Department of Toxic Substances Control
- N/A = not applicable

5.15.6 References

- Cal/EPA (California Environmental Protection Agency) and SDRWQCB (San Diego Regional Water Quality Control Board). 2008. Information downloaded from: <http://www.waterboards.ca.gov/sandiego/>. March.
- California Code of Regulations Title 19 Division 2. Chapter 4.5 Article 8, Table 2. Federal Threshold Quantity for Hydrogen.
- California Department of Toxic Substances Control. 2008. Information downloaded from: <http://www.dtsc.ca.gov>. April.
- City of El Centro Fire Department. 2008. Information downloaded from www.cityofelcentro.org/fire/index.html. April.
- EPA (Environmental Protection Agency). 1999a. Risk Management Program Guidance for Off-site Consequence Analysis. EPA RMP OCA, Chapter 5. Hydrogen Explosion Endpoint. April.
- _____. 1999b. Risk Management Program Off-site Consequence Analysis Guidance. EPA RMP OCA, Exhibit C-1. Heat of Combustion of Hydrogen.
- _____. 1999c. Risk Management Program Off-site Consequence Analysis Guidance. EPA RMP OCA, App C-1. Equation C-2. Vapor Cloud Explosion Equation.
- Imperial County. Building and Planning Department. 2008. Information downloaded from: <http://www.co.imperial.ca.us/planning/>. April.
- Lees, F.P. 1983. *Loss Prevention in the Process Industries*. Volumes I and II. Butterworths.
- Lewis, Richard J., Sr. 1992. *Sax's Dangerous Properties of Industrial Materials*. Eighth Edition. Van Nostrand Reinhold. New York, New York.
- MSDS (Material Safety Data Sheet) for Hydrogen. 2008. Downloaded at <http://www.acialloys.com/msds/h.html>
- NIOSH (National Institute of Occupational Safety and Health). 1997. NIOSH Pocket Guide to Chemical Hazards. DHHS Publication No. 97-140. U.S. Government Printing Office. Washington, D.C.
- SES Solar Two, LLC. 2008. *Project Description and Plan of Development*.

Adequacy Issue:		Adequate	Inadequate	DATA ADEQUACY WORKSHEET			Revision No.	0	Date
Technical Area:		Hazardous Materials Handling		Project: Solar Two Project					Technical Staff:
Project Manager:				Docket:					Technical Senior:
SITING REGULATIONS		INFORMATION		AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS			
Appendix B (e) (1)	A discussion of how Project closure will be accomplished in the event of premature or unexpected cessation of operations.			Section 5.15.2.4					
Appendix B (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative effects due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental effects of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.			Section 5.15.1 Section 5.15.2 Section 5.15.3 Section 5.15.4					
Appendix B (g) (10) (A)	A list of all materials used or stored on-site which are hazardous or acutely hazardous, as defined in Title 22, California Code of Regulations, § 66261.20 <i>et seq.</i> , and a discussion of the toxicity of each material.			Section 5.15.1 Table 5.15-1 Table 5.15-2					
Appendix B (g) (10) (B)	A map at a scale of 1:24,000 depicting the location of schools, hospitals, daycare facilities, emergency response facilities and long-term health care facilities, within the area potentially affected by any release of hazardous materials.			Figure 5.16-1* *Map at scale other than 1:24,000 due to very large Project Site size					
Appendix B (g) (10) (C)	A discussion of the storage and handling system for each hazardous material used or stored at the site.			Section 5.15.1 Section 5.15.2 Table 5.15-1 Table 5.15-2					

Adequacy Issue:		Adequate	Inadequate	DATA ADEQUACY WORKSHEET			Revision No.	0	Date
Technical Area:		Hazardous Materials Handling		Project: Solar Two Project			Technical Staff:		
Project Manager:				Docket:			Technical Senior:		
SITING REGULATIONS		INFORMATION		AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS			
Appendix B (g) (10) (D)	The protocol that will be used in modeling potential consequences of accidental releases that could result in off site effects. Identify the mode(s) to be used, a description of all input assumptions, including meteorological conditions. The results of the modeling analysis can be submitted after the AFC is complete.			Section 5.15.2.3					
Appendix B (g) (10) (E)	A discussion of whether a risk management plan (Health and Safety Code § 25531 <i>et seq.</i>) will be required, and if so, the requirements that will likely be incorporated into the plan.			Section 5.15.2.2 Section 5.15.2.3					
Appendix B (g) (10) (F)	A discussion of measures proposed to reduce the risk of any release of hazardous materials.			Section 5.15.2 Section 5.15.4					
Appendix B (g) (10) (G)	A discussion of the fire and explosion risks associated with the project.			Section 5.15.2					
Appendix B (i) (1) (A)	Tables that identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the Project is discussed; and			Section 5.15.5 Table 5.15-7					

Adequacy Issue:		Adequate	Inadequate	DATA ADEQUACY WORKSHEET			Revision No.	0	Date
Technical Area:		Hazardous Materials Handling		Project: Solar Two Project					Technical Staff:
Project Manager:		Docket:							Technical Senior:
SITING REGULATIONS		INFORMATION		AFC SECTION NUMBER		ADEQUATE YES OR NO		INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS	
Appendix B (i) (1) (B)		Tables that identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.		Section 5.15.5.5 Table 5.15-7 Table 5.15-8					
Appendix B (i) (2)		The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.		Table 5.15-8					
Appendix B (i) (3)		A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.		Table 5.15-9					

