

4.5 HAZARDOUS MATERIALS MANAGEMENT

As described 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 Modified Project's electrical generation. The elimination of the solar thermal technology and power blocks will reduce the need for some hazardous materials storage, management and disposal. Hazardous materials used during construction will be the same for the Modified Project as for the Approved Project. A description of the types, quantities and methods for management and disposal is discussed in Sections 2.10.1.3 and 2.10.1.4 of this Petition.

4.5.2 Changes in Environmental Impacts

4.5.2.1 Construction

The types and amounts of hazardous materials to be used during construction for the Modified Project are the same in type and amount as the hazardous materials as contemplated for the Approved Project. Therefore, the Modified Project's impacts to public health and safety associated with the use of hazardous materials during construction would be similar to 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 less than those assumed for the Approved Project because the power blocks and HTF would be completely eliminated.

As discussed in this Petition, PVSI has not yet selected the specific panel for installation at the plant site. 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). 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 PVSII 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."²

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."³

². 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.

³. Summary Report, "Peer Review of Major Published Studies on the Environmental Profile of Cadmium Telluride (CdTe) Photovoltaic (PV) Systems," European Commission, Joint Research Centre.

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 that CdTe diffuses into glass, rather than being released into the atmosphere. Higher temperatures produce further CdTe diffusion into the glass.⁴

4.5.3 Compliance With LORS

In the Commission Final 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.

4.5.4 Conditions of Certification

Condition of Certification **HAZ-4** should be deleted as it pertains solely to use of HTF which will be eliminated from the Modified Project.

⁴. 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).