A solar thermal power plant in principle works no differently than a conventional steam power plant but without the need for burning coal or natural gas. The "green" power is produced using the energy from the sun.
There are two main types of solar powered utilities.

1. Solar trough reflector plants
2. Solar power towers

Solar power plants that use long parabolic trough reflectors track the sun through the course of the day and focus the incident solar radiation onto an absorber tube, placed at the focus of the reflector. A heat transfer fluid flowing within the absorber tube captures the heat. Di-phenyl Oxide ($C_{12}H_{10}O$), also known as phenyl ether, is probably the best known heat transfer fluid. Di-phenyl oxide is a stable heat transfer medium that delivers the process heat at temperatures up to 400ºc. This heat is transmitted to a downstream heat exchanger that is capable of generating steam, which is then pressurised inside the turbine and drives the electric generator.

As solar power is an intermittent energy source there is an increasing requirement for thermal storage. Solar power towers, which produce electricity on a large scale, can store energy efficiently and cost effectively and offer continuous power, even after dark. Power towers operate by focusing a field of thousands of mirrors onto a receiver located at the top of a centrally located tower. The energy directed at the solar tower is used for heating water or molten salt. The molten salt is an effective storage medium because of its low-cost and high specific heat capacity. The molten salt consists of 60% sodium nitrate and 40% potassium nitrate (salpeter). The salt melts at about 700°C and is liquid at approximately 1000°c, it will be kept in an insulated storage tank until the time, when it will be needed for heating up the water in the steam generator. The cold salt is then returned to a cold storage tank. The most advanced thermal power plants use a two tank storage system where the heat transfer fluid (HTF) also serves as a storage medium.

In both types of solar power station it is important that the heat transfer fluid does not escape from both the heat exchange system and storage tanks. Leaks in pipe connections are inevitable as is the degradation of the heat transfer fluid with time. This results in small concentrations of di-phenyl oxide escaping into the headspace of storage tanks and similar concentrations being vented from expansion and overflow vessels of the HTF system to the atmosphere.

There is a protocol for equipment leak emission estimates EPA –453/R-95-017 that covers organics (http://www.epa.gov/ttn/chief/ap42/ch05/index.html see bottom of page.

Use of the Ultra Violet absorbance spectra of di-phenyl oxide can be made in order to monitor the headspace of storage tanks or gas vented from the expansion vessel.

The Procal 5000 UV gas analyser is able to “easily” detect the distinct spectra of Di-phenyl oxide providing a measurement range of 0-20ppm. This can be achieved even in the presence of nitric oxide and nitrogen dioxide (up to 4000ppm) and in high temperature environments where 300ºc is typical.

To calibrate the Procal 5000 so that it recognizes and measures a specific di-phenyl oxide concentration requires the generation of di-phenyl oxide vapour. The Procal R&D department produced a purpose built calibration system to generate known concentrations of di-phenyl oxide vapour. The di-phenyl oxide calibrator consists of a heated reservoir where di-phenyl oxide liquid is safely stored. In the heated reservoir a thermodynamic equilibrium is established as liquid evaporates into a vapour and vapour condenses into liquid. To prevent di-phenyl oxide from solidifying the reservoir temperature is kept at a temperature above 18ºc. By operating the reservoir at a fixed temperature the vapour pressure and hence concentration can be accurately controlled. Once the vapour is in equilibrium a small flow of nitrogen is introduced and the vapour can be siphoned off without disturbing the equilibrium. The siphoned off vapour with know concentration can then be further diluted to provide a wide range of gas concentrations for use in the analyser calibration.