

Why did Gemasolar win?

Operating on the basis of concentrating sun rays, solar thermal power stations do have the potential to out-phase conventional power stations if they possess sufficient integrated thermal storage capacity. This would enable them to deliver electricity at any time – day and night - and on demand, thus following the load variations, and in addition compensating the fluctuating renewable energy sources that are eventually fed in the grid. These features qualify them as an ideal complement to the mix of renewable energies in any grid.

Does Gemasolar meet this important requirement?

- Considering an average grid in a desert region, a storage capacity for full load operation of 14-16 hours would be sufficient to operate the power station around the clock at any season in the year. Gemasolar has an integrated thermal storage capacity of 15 hours. It is thus qualified to fulfil this severe requirement.
- It is known that 2-4 days in the year desert regions suffer from sand storms. The sand grains in the air interfere with sunrays, preventing normal operation of a concentrating solar thermal power station. Neither electricity production during the day, nor heat storage would be possible during this time, which is just 1% of a year. As this phenomenon simultaneously affects large desert regions, electricity production would be interrupted in several neighboring countries; except if an emergency heating system is provided to enable production of steam. Gemasolar has such an emergency heating system that qualifies it to operate also in emergency cases. This means it possesses a “Safety Valve” to ensure operation even under unfavorable atmospheric conditions.
- Functional proficiency is a very important feature for security of electricity production. Gemasolar has proven its functional proficiency as it is operating since March 2011.
- The Name “DESERTEC” gives the impression that the technological features for conversion of sunrays into electrical energy will be installed in the deserts, which is true, because in the deserts nearly all year no clouds disturb the sunrays. However, water is rare in deserts. A practical solution to this problem which emerges when considering cooling of conventional condensers is to revert to completely dry air cooling. This, however, would raise the exhaust temperature of the steam from the turbine, thus reducing the cycle efficiency. This negative effect can be easily compensated by raising the steam inlet temperature. Gemasolar succeeded in enabling a high steam inlet temperature for the steam turbine as well as for the storage medium thus overcoming this hurdle.
- Another feature related to water use is the recently developed semi-automatic mirror cleaning device, with the distinguished feature of its extremely low water usage.
- The concept of Gemasolar, to combine both heat transfer fluid and storage medium in one and the same element cuts heat losses. Also concentrating all hot fluids in a limited space as well as the usage of the complete temperature range of the storage medium, resulting in deployment of less volume are valuable contributions to a higher global process efficiency.
- Although its capacity of 20 MW is relatively small, Gemasolar demonstrated that the concept works and that power stations of this type are capable to cover base load. We are confident that in near future we will see solar power stations using the same concept but with higher capacities; in this respect Gemasolar is considered a road paving pioneer for future power stations.