

In July 2011, MEI commissioned the world's largest operating solar heating project, 25MWth, for PNUW (Princess Noura University for Women) in Saudi Arabia (KSA).

The implementation of a large scale solar thermal district application to provide for space heating and hot water needs of PNUW. The University Campus has to supply 40.000 students, 13 faculties, lecturers and university personnel, dormitories, research facilities and a gymnasium. The area supplied with hot water and space heating even comprises a hospital and hotel along with all other necessary infrastructure for living, working and studying. The implementation of the solar system should lower the capital cost, lower operational and maintenance cost, support the saving of conventional fuels and provide safer operation. The Challenges of this actual case study are the arid desert conditions with possible severe sandstorms generating fine dust and the desert climate where it can be very hot during the day and very cold, sometimes freezing during the night. The sandstorms generating fine dust require the system to be built sealed and in addition the cleaning process should be easy and not altogether time consuming. The complexity of excess heat has to be resolved since in summer there is no need of space heating and during vacation periods the demand of hot is much lower.

Because of a freezing probability during the cold desert nights the system and solutions will have to be tested to withstand low ambient temperature. The size of the project causes challenges in space allocation and uncertainty of solar input because of weather conditions. Integration with sophisticated Building Management Systems (BMS) has to be implemented. Easy and simple transfer of technology to the customer should be achieved. Saving of carbon emission gained by saving on fuel consumption. With a solid background and engineering experience, identification of the customer needs for the project and the analysis of the given facts for the supply of domestic hot water and space heating during the 40 heating days in Riyadh, are conducted and a solar supported district heating network is installed. The demand of heat is covered by oil fired boilers with a peak load capacity of 70 MWth together with a 25 MWth generated from 36.305m<sup>2</sup> of flat plate collectors especially designed to withstand harsh desert conditions with low maintenance needs. The collectors are placed on the rooftop of a 60.000m<sup>2</sup> warehouse. During the summer period the thermal load of the district heating network is calculated to be 30MWth. While the prevailing share of the solar thermal generated heat is directly fed into the district heating grid, during times of high solar radiation and low demand of hot water excess heat can also be stored in tanks with a total capacity of 900m<sup>3</sup>. The system will save estimated 52 million liters of diesel and 125 million kg CO<sub>2</sub> emission in its 25 year system life.



The solar system installed consists of the following:

3,616 Flat plate large scale solar collectors MEI-GK3100 fixed on the roof level at 45 degree inclination. Located on the warehouse divided into 6 zones.

6 storage tanks with approximately size 166 m<sup>3</sup> each.

Solar Circulating pumps consisting of one duty and one stand by pump, to circulate the heat transfer fluid between the collectors and storage tank.

Expansion vessel.

Dry Coolers.

The solar systems feed the solar energy to the boiler return line through the main heat exchanger.

The application is an example of how sustainable renewable systems can be successful in saving conventional fuel and reduce carbon emission. With proven sustainability, cost reduction in conventional fuel consumption among others and environmental benefits at hand the project is an important showcase to any community on how to integrate renewable energy into their energy mix.

Working on slowing the depletion of valuable resources and stabilizing economy as well as preserving the environment should be an incentive and the actual project showcase a reassurance that it is achievable.

