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GFA and SwissFEL Accelerator Seminar

The Fermi@Elettra Trigeneration Plant: an innovative energy saving plant for a state-of-the-art FEL facility

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A state-of-the-art Free Electron Laser is under construction at the Elettra Synchrotron Radiation Laboratory near Trieste (Italy). The FEL is a sophisticated research tool and its specifications represent a technologic challenge in various fields. On the plant side, also, the machine requires a high stability both for the electrical power and for the thermal regulations. The FEL is a great energy consumer and so it is important to provide an efficient power plant for cutting off its primary energy costs.

Besides, according to the Sincrotrone Trieste environmental end energy saving policy, we are now aiming to drastically reduce the laboratory carbon footprint within the next ten years. This requires in the short term to optimize the use of energy, in terms of efficiency and mix of primary power, also to reduce costs and minimize the environmental impact, and, in the longer term, to install directly, and stimulate the installation elsewhere, of enough renewable power to offset the primary energy needs of the overall Laboratory. In this view, a first solar photovoltaic installation has been installed in 2007, in collaboration with the local energy Company, to acquire the necessary skills and data for further projects. A further step in this direction is represented by a project of a 1MW cogeneration plant feed by biomass. To implement further this policy we will consider not only the internal energy needs, but also those of the surrounding Area Science Park facilities and of the adjacent territory. Therefore agreements with the other scientific facilities and Universities in the area and in Trieste will be pursued to develop common projects.

To start along these lines within the FERMI project we are increasing the co-generation quota and the use of low energy consumption technologies, and a decision has been taken to install a trigeneration plant capable to cover both the heating and cooling needs and the UPS power requirements. This system will use three 0.5 MWe generation sets run by gas engines (total 1.5 MW electric power) directly connected to the main FERMI electric supply line. A similar amount of heat will be available to be used directly in the heating plants (e.g. in winter) or, when heat will not be needed it will produce, by an adsorption chiller, cooled water to be used in the cooling plants (e.g. in summer). This plant will be designed as a no-break system and will be able to sustain the UPS electric loads during micro-interruptions or interruptions of the external electric power supply. In these cases, the system will be insulated from the FERMI electric net (island operation mode) and will supply the UPS electric power needed. During the transition phases of breakaway from, and parallel to, the FERMI electric net, the system will guarantee the very tight tolerances of voltage and frequency variation required.

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