Part 8

# RENEWABLE ENERGY SOURCES

## 8.3. Solar power plants and heat supply systems

## 8.3.3. Combined photo-thermodynamic installations

### 8.3.3.1. Configuration of combined solar power plant

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Recently in the OJSC "ENIN of G.M. Krzhyzhanovskiy" new effective technology of solar energy transformation into electricity was developed. This technology is based on application of combined photo-thermodynamic solar power installations [32].

A block-diagram of the combined solar power installation is correspondent to its main purpose, that is, combination of photoelectric and thermodynamic methods of power transformation in one installation. This combination is based on application of steam-power cycle for utilization of heat, which is removed from the photoelectric bus. General configuration of the suggested combined solar power plant is shown in fig 8.16. At the plant there is a field of paracylinder mirror concentrators with line receivers of solar radiation in their focus, that is, photoelectric busses of one or several rows of photoelectric elements, from which excess heat is removed to steam-turbine power installation. Electricity of photoelectric bus is supplied by inverters into the system of capacity output, where electricity from steam-turbine installation generator is also supplied.

Heat form photoelectric busses can be extracted by a single-circuit or a double-circuit scheme. In the single-circuit scheme the heat from photoelectric bus is transferred directly to the working substance, circulating in the circuit of stream-turbine cycle. The double-circuit scheme includes the first circuit, filled by high-temperature heat-carrier, which removes the heat from photoelectric bus and transfers this heat in the heat exchanger – steam generator to the working substance of the second circuit.

Photoelectric bus can be made of SEs on the basis of GaAs, which is rather effective at high temperatures contrary to silicon ones.

Calculations show that the net efficiency factor of such installation makes from 0,26 to 0,27 in single-circuit implementation, considering the energy consumption for auxiliaries at steam temperature before the turbine from 175 to 200°C, that is 1,5-2 times as large as the efficiency of photoelectric and steam-power solar installations, applied separately.

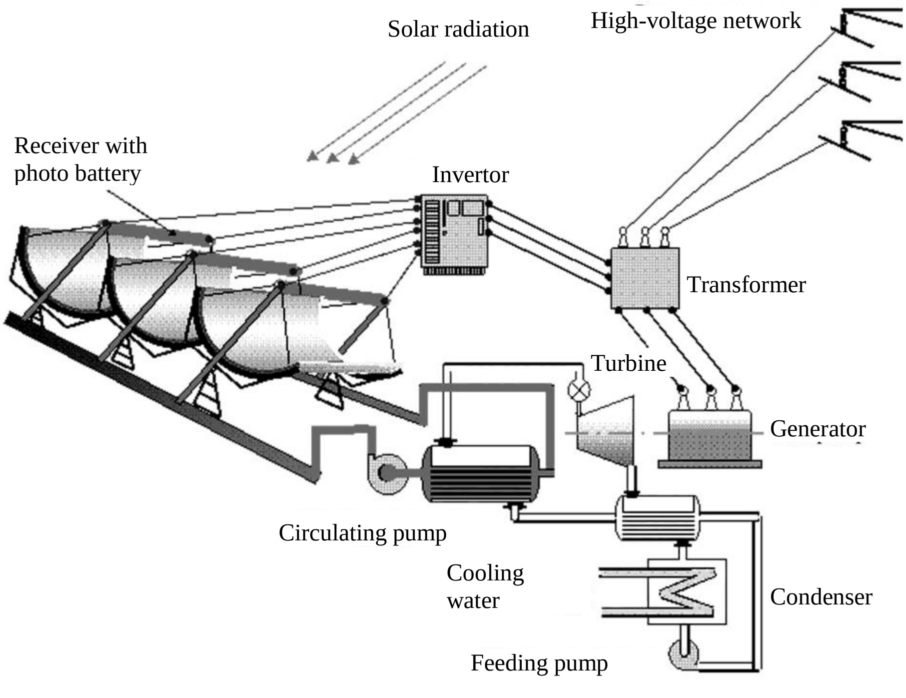


**Fig. 8.16. General configuration of combined photo-thermodynamic power plant**