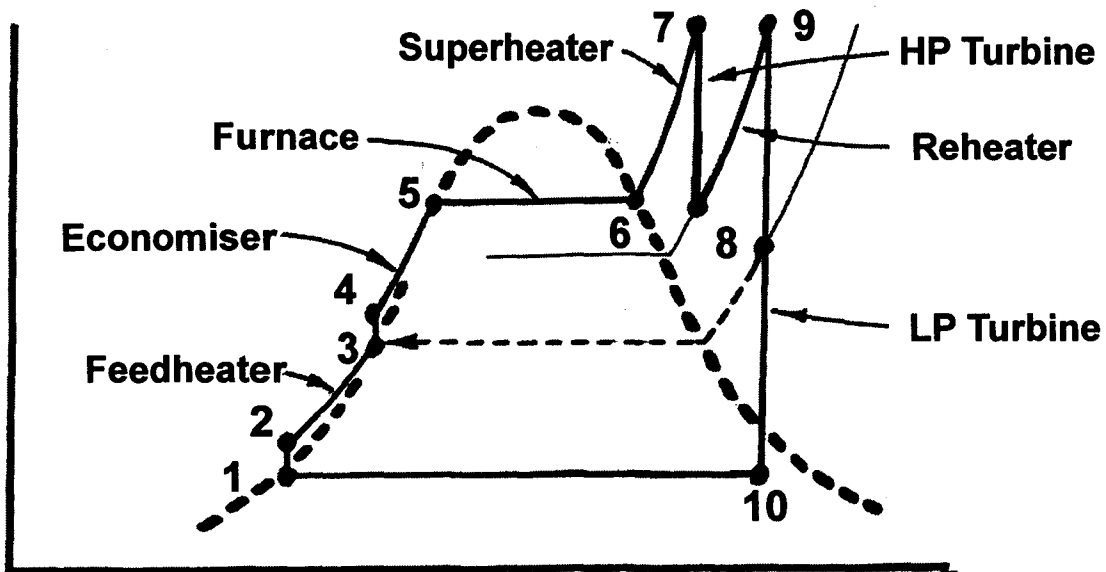
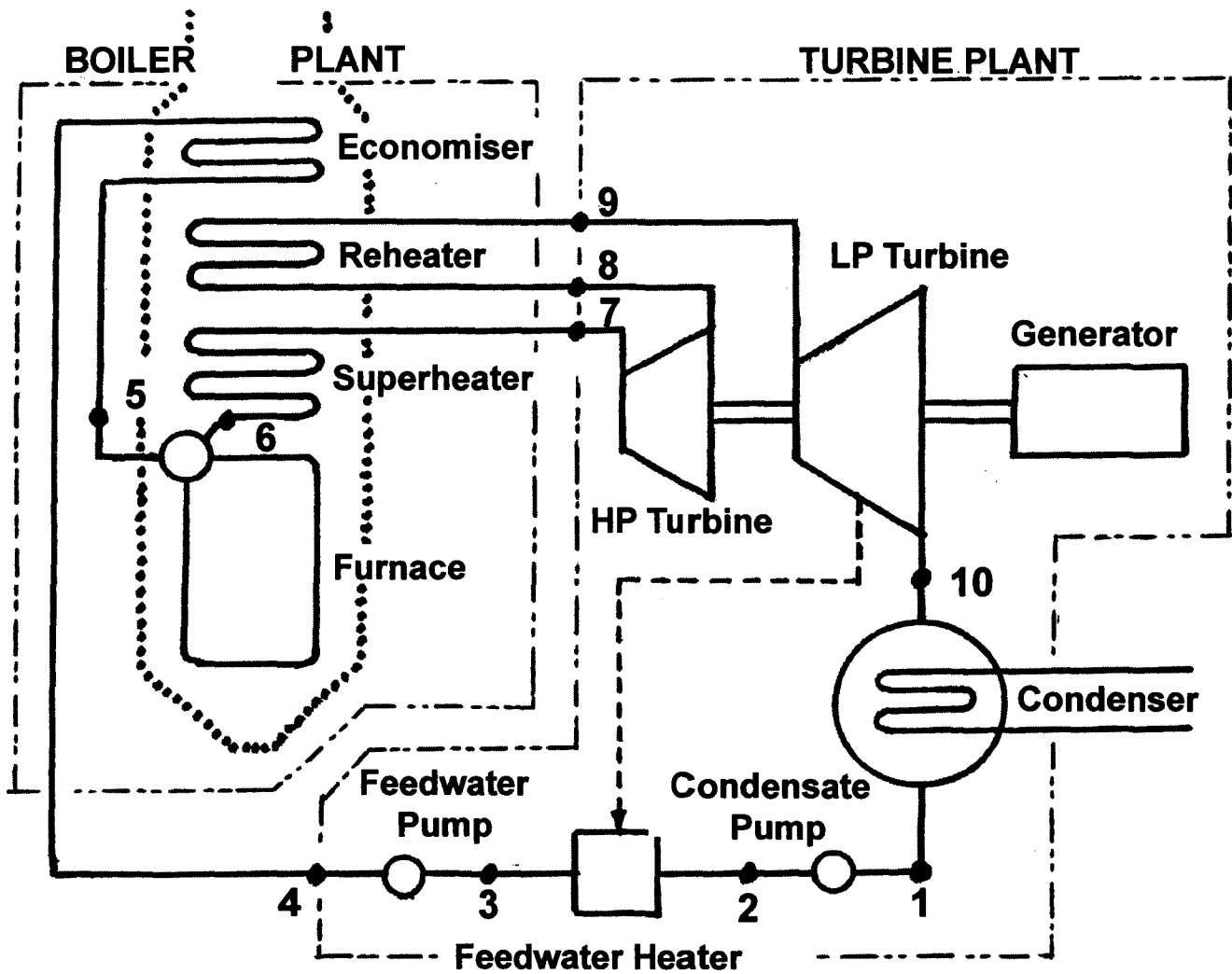
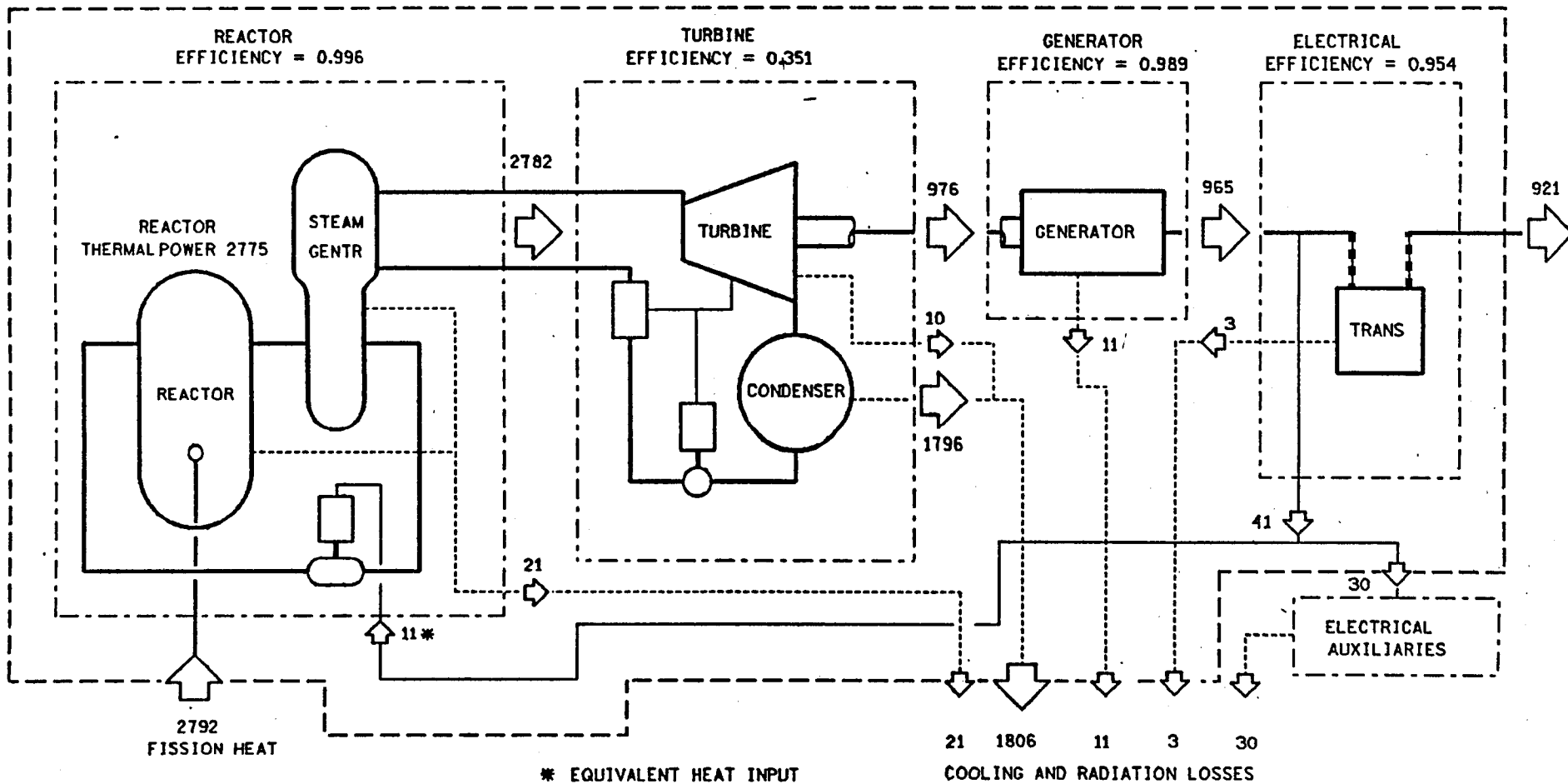


# **PLANT EFFICIENCIES**

# BOILER - TURBINE UNIT



STATION EFFICIENCY = 0.330



ALL FIGURES IN MEGAWATTS

Figure 3  
Basic energy flow diagram for Koeberg with associated terminal conditions.

Using the four efficiency factors for the reactor, turbine, generator and transformer plus electrical auxiliaries, the overall station efficiency is  $0,996 \times 0,351 \times 0,989 \times 0,954 = 0,330$ . More simply, the overall station efficiency is electrical output over fission heat, that is  $921/2792 = 0,33$ . In practice, it is impossible to measure the fission heat directly and it is common to measure the plant efficiency using the steam generator output as the starting point. This gives an overall efficiency of  $921/2782 = 0,331$ , which is the value guaranteed by the contractor.

If this efficiency is compared with that of a typical fossil fired plant, it will be noted that the efficiency of the latter is somewhat greater. This is due to the higher steam conditions at the boiler outlet which, on a typical coal fired

boiler, are approximately 160 bar and 540 °C. This gives a turbine efficiency of about 0,45 as opposed to 0,35 for the nuclear turbine just described. The boiler efficiency is about 0,94 with the loss being carried away in the flue gas. Drawing a comparison of heat flows similar to that in Figure 3 for a fossil power station of the same output assuming equivalent electrical consumption, yields the following:

	Nuclear	Fossil	
Fuel Input	2 792	2 307	MW
Boiler Output	2 782	2 169	MW
Turbine Output	976	976	MW
Generator Output	965	965	MW
Station Output	921	921	MW
Loss from Boiler	21	138	MW
Loss from Turbine	1 806	1 193	MW
Loss from Generator	11	11	MW
Loss from Auxiliaries	33	44	MW

It is significant to note that the heat lost in the cooling water flowing through the condenser is 50 per cent greater for a nuclear power station having the same electrical output as a fossil power station. This is the main reason why nuclear power stations of the water reactor type are invariably located at sites having a plentiful supply of cooling water.