



Auxiliary System Load Schemes in Large Thermal and Nuclear Power Plants

IGOR KUZLE,
DARJAN BOŠNJAK,
HRVOJE PANDŽIĆ

*University of Zagreb, Faculty
of Electrical Engineering and
Computing*

Unska 3, 10000 Zagreb, Croatia
igor.kuzle@fer.hr,
darjan.bosnjak@fer.hr,
hrvoje.pandzic@fer.hr

Uninterrupted auxiliary system power supply in large power plants is a key factor for normal operation, transient states, start-ups and shutdowns and particularly during fault conditions. Therefore, there are many challenges in designing the main electrical system as well as the auxiliary systems power supply. Depending upon the type of fuel used and the environmental control system required, a thermal power plant may consume as much as 10% of its total generation for auxiliary power, while a nuclear power plant may require only 4 – 6% auxiliaries. In general, the larger the power generating plant, the higher the voltage selected for the AC auxiliary electric system. Most stations in the 75 to 500 MW range utilize 4,2 kV as the base auxiliary system voltage. Large generating stations 500 – 1000 MW

and more use voltage levels of 6,9 kV and more. Some single dedicated loads such as electric driven boiler feed pumps are supplied by a 13,8 kV bus. While designing the auxiliary electric system, the following areas must be considered: motor starting requirements, voltage regulation requirements, short-circuit duty requirements, economic considerations, reliability and alternate sources. Auxiliary power supply can't be completely generalized and each situation should be studied on its own merits to determine the optimal solution. Naturally, nuclear power plants have more reliability requirements and safety design criteria. Main coolant-pump power supply and continuity of service to other vital loads deserve special attention.

This paper presents an overview of some up-to-date power plant auxiliary load system concepts. The main types of auxiliary loads are described and the electric diagrams of the modern auxiliary system supply concepts are given. Various alternative sources of auxiliary electrical supply are considered, the advantages and disadvantages of these are compared and proposals are made for high voltage distribution systems around the thermal and nuclear plant. Arrangements for DC supply systems and uninterruptable power supply (UPS) systems are also discussed.

Keywords: *auxiliary electric system, thermal power plants, nuclear power plants*