

Structure of power system and its components

Structure of Power System

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Major components of a power system are- synchronous generators, synchronising equipment, circuit breakers, isolators, earthing switches, bus-bars, transformers, transmission lines, current transformers, potential transformers, relay and protection equipment, lightning arresters, station transformer, motors for driving auxiliaries in power station. Some of the components will be discussed here as shown in Fig. 1.7 .

The synchronous generators used in generating stations are revolving field type owing to its inherent advantages.

The synchronous generators, based on the type of prime movers to which they are mechanically coupled, may be classified as:

(ii) Turbo-generators, and

(iii) Diesel engine driven generators.

Power transformers are used for stepping-up the voltage for transmission at generating stations and for stepping-down voltage for further distribution at main step-down transformer substations. Usually naturally cooled, oil immersed, known as ON type, two winding, three-phase transformers, are used up to the rating of 10 MVA.

The transformers of rating higher than 10 MVA are usually air blast cooled. For very high rating, the forced oil, water cooling and air blast cooling may be used. For regulating the voltage the transformers used are provided with on load tap changer.

They are put in operation during load hours and disconnected during light load hours i.e. they are usually operated at approximately full load. This is possible because they are arranged in banks and can be thrown in parallel with other units or disconnected at will. So power transformers are designed to have maximum efficiency at or near full load (i.e. with iron loss to full-load copper loss ratio of 1: 1).

Power transformers are designed to have considerable leakage reactance than is permissible in distribution transformers because in power transformers inherent voltage regulation is not as much important as current limiting effect of the higher leakage reactance. Power transformers usually make use of flux density of 1.5 to

1.77; have percentage impedance ranging from 6-18% and regulation 6-10%.

The transformer specifications cover the following:

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Web: <https://kary.com.pl/contact-us/>

Email: energystorage2000@gmail.com

WhatsApp: 8613816583346

