B.1.2 CONTROL TECHNOLOGIES

TECHNOLOGIES FOR CONTROLLING EMISSIONS FROM THERMAL GENERATING STATIONS

The emphasis in controlling emissions from fossil-fuel-fired power plants is shifting somewhat from local considerations to regional concerns regarding problems such as acid rain, visibility, and respirable particulates. In view of this, a reassessment of abatement methods is needed, aimed at determining which of the processes are most capable of accomplishing the degree of control needed from the regional viewpoint, from the standpoints of both control efficiency and cost effectiveness.

In general, the optimum process for controlling a given pollutant depends on the degree of control required. Processes that reduce emissions to an extreme degree are quite expensive and are usually not implemented unless the high efficiency is considered to be essential. On the other hand, techniques that cost less are not normally capable of a high degree of control.

The pollutants of concern are sulphur oxides (SO_2 and SO_3), nitrogen oxides (NO and NO_2, generally referred to as NO_x), and solid material carried in the gas stream (ash from the fuel, unburned carbon, and other non-gaseous particles--all generally referred to as "particulate matter"). Most of these come from the fuel itself, by reaction of sulphur and nitrogen compounds with oxygen supplied by the combustion air, and by burning out the combustible compounds leaving the ash as small solid particles. In addition, some NO_x is formed by reaction of nitrogen and oxygen in the combustion air.

The amounts of such pollutants vary with type of fuel, design and size of boiler, and capacity factor. Typical data are given in Table B.1.5 for a 500 MW unit. Although the tonnages listed are high, the concentrations in the flue gas are quite low because of the very large flue gas volume, which is composed mainly of carbon dioxide and water vapor; the 500 MW boiler in Table B.1.5 would produce about 60 000 tons of flue gas per day, at full power; at 60% capacity factor, this is equivalent to 13 million tons of flue gas per year.

The large amounts of pollutants evolved have led to regulations for reducing emissions. As might be expected from Table B.1.5, the main emphasis in the past has been on particulate matter, where coal is the fuel, because of the large amount involved; devices to collect and remove particulates from the gas stream have been required for a long time. Since 1971, sulphur oxide and nitrogen oxide emissions have been regulated in the U.S.. In Canada, recommendations for emission controls have been submitted to the provinces.