If coal is to be utilized in California it must be made compatible with the State's drive toward restoring environmental quality. The impacts resulting from coal's mining and transportation, or from water consumption, water quality degradation and electric transmission line routing can probably be adequately mitigated through strong and early planning efforts, the use of improved control and process technologies, and sincere utility commitment. The socioeconomic impacts may prove somewhat more difficult to satisfactorily mitigate. Of greatest concern is adequate control of generated air pollutants and disposal of solid and liquid wastes since acceptable technologies or handling techniques have yet to be conclusively demonstrated.

II. THE MINING SEGMENT

Impacts can occur from either subsurface or surface mining, and they can be large-scale impacts. The size of today's large coal mines can range from one to three million tons per year for individual underground mines, to nearly ten million tons per year for the very large surface mines. These large mines require a tremendous number of workers, both in the mine itself and in the beneficial on cycle. The introduction of these new workers can result in tremendous disturbances to the local socioeconomic system, a system which is often unstable enough in already established districts, but which can be essentially nonexistent in some of the remote, unpopulated areas where new mines may be opening in the near future. These small rural economies can expect a population influx that would completely change their entire socioeconomic system.

Surface mining will require a direct and substantial commitment of land to a use whose impacts are usually not totally reversible. Landscape modifications, surface and ground water disturbances and pollution, and significant wildlife and vegetation disruptions can result. Ecological network alterations can require decades to reestablish, and even with restoration efforts, we are never truly convinced that complete reestablishment is possible. In subsurface mining, subsidence of the surface and disruption to ground water are both significant impacts. Since only
approximately fifty percent of the coal in any seam mined underground can be recovered, a lot of that coal resource is lost. The ground water can also occur from underground mining. Underground mining is one of the most hazardous occupations in the United States today. The beneficiation process that takes place at the mine can produce large quantities of solid wastes. Sometimes ten to twenty percent or more of the mined product has to be discarded. These discarded wastes, as well as the beneficiated process itself, could result in additional air and water pollution.

III. THE TRANSPORTATION SEGMENT

The over-water movement of coal, from either Alaska or Washington via seagoing barges, has been considered as a viable coal transportation option. Any establishment of a large seagoing traffic in coal could result in the need for additional port facilities and the destruction of coastal resources.

The environmental impacts that may result from the use of a coal slurry system are generally more benign. Some air quality degradation will result from the preparation process. The water that is used in the slurry is not consumed in the slurry and can be reclaimed and used at the power plant. This would, however, result in interbasin or interstate water transfers, which are likely to be politically, if not environmentally, significant. Slurry transportation does result in a higher energy cost than that residual water 'left' in the coal after mining does result in a one to two percent decrease in the amount of available heat from the burning process.

Coal slurries, of course, do have a fixed throughput which allows very little flexibility in altering the amount of coal delivered to the utilization site. Construction impacts are generally minimal in that from two to six weeks from the first impact (ie land can be restored for at least 60% to its natural condition) to the slurry lines are also generally as.

In transportation, on the other hand, can result in a much larger number of safety and environment impacts. As an advantage, it does have a variable throughput. It does not lose heat to the atmosphere as the addition of water, but requires energy to move those locomotives, either electrically or diesel. Relatively large amounts of air pollution can result from coal transport by rail via losses in transit. The movement of a large quantity of coal by rail can lead to quite significant social impacts to the areas through which it runs. A 1000 MW coal plant will probably require 300 unit trains per year to supply it with coal. That is 600 trips through every town along the route, a tremendous impact to any local rail community.

IV. THE UTILIZATION SEGMENT

The list of the possible impacts from coal utilization could be enormous, so herein will be described only those considered most significant. These most conveniently fall into the categories of impacts to air quality, water quality and supply, socioeconomic systems and land use. Since others in these proceedings will be specifically discussing the impacts to and constraints of air quality and water quality and supply, these topics will be only lightly touched upon below.

Possible degradation to air quality has so far received the most attention, and it appears that this is rightfully so, as it is probably the most critical and yet undefinable constraint. It must be said that we cannot afford to compromise California's progress toward achieving compliance with the Clean Air Act and its amendments as the price of meeting a portion of the State's energy demand with coal, and that it appears necessary to have at a minimum those recently described advanced control technologies and processes correctly incorporated into any California coal-fired power plant before it will be capable of meeting our air standards.

Water is a constraint to any large power project and coal, of course, is no exception. We do believe that the State's existing policy correctly places the consumptive use of fresh water by power generation facilities as the lowest possible priority; and that this does restrict the alternatives that coal-fired power plants can utilize for their water.

The term "land use" impacts is used here as a catch-all phrase to describe any impact to land-based systems. For example, a 1000 MW plant will probably utilize anywhere from one to two thousand acres for structures, transportation facilities, coal storage, water storage and liquid and solid waste storage or disposal. The life of the plant. Many of those are going to be irreversible land commitments in that restoration is going to be very difficult task. Tremendous quantities of solid and liquid waste are going to have to be disposed of, and, at present, the technologies utilized to dispose of those wastes are very crude. As an example, the current technology
liquid waste disposal is in open storage ponds. Most biologic communities can be tremendously affected by not only the siting of a power plant itself, but by the increased activity of man in the surrounding environment. Impacts resulting from the emission of trace elements is an often overlooked and poorly understood result of coal burning. The visual impacts of the project, with its gas stacks over 700 feet high, along with the plant itself, the storage ponds, cooling towers, transmission lines, etc., can be tremendous. Finally, there are the possible conflicts with existing and planned other land uses. For example, the desert wilderness area in California is being evaluated by the BLM for wilderness areas and there are plans for a Mojave national park.

Some very direct socioeconomic impacts result from the construction of a coal-tired power plant in a generally remote area. The primary concern is over the boom and bust cycle of intense employment in construction activities, followed by a very reduced employment opportuniy in the actual operation of the plant. Large plants mean, of course, large ooms and large busts. One possible mitigation option may be to try to limit the size of these units to smaller, more moderately-sized facilities, thus limiting the size of the amplitude of the cycle. We could also try to locate these facilities closer to our load centers. This system would allow us to tailor the construction of new plants to better meet our incremental power needs. With smaller plants we would also be able to more rapidly utilize advanced coal combustion technology or methods, as these advanced processes become available.

CONCLUSIONS

We believe that improved coal utilization and pollution control technologies can help to alleviate impacts, but technology alone cannot solve all of the anticipated impacts. The new technologies cannot solve the socioeconomic impacts and they cannot completely solve the air and water quality impacts. Good planning can help to alleviate many impacts, specifically those arising from coal mining or transportation, from water consumption and water quality degradation, or from electric transmission line routes. The staged construction of relatively moderate sized facilities can help to alleviate socioeconomic impacts but cannot eliminate them. Of primary concern is that the potential problems of air quality degradation and waste disposal as solutions to these problems have not yet been adequately developed or tested.

In summary, if coal is to be utilized in California, it must prove itself to be an environmentally viable energy source, as must any other energy source. All effects of the entire coal fuel cycle must be considered and weighed against the perceived benefits, and these costs and benefits compared with other alternative generating sources. Coal utilization in California, or anywhere else, does have inherent in it a large number of environmental impacts which need to be mitigated before it can be rationally used. Although a maximum diversity in our energy production mix can assist us in meeting California's energy needs, we cannot rely on going with coal ina big way for it is not a panacea for our problems. Coal utilization can only be considered as an intermediate term measure, necessary only to provide electric power until such time as other advanced systems utilizing renewable resources are fully capable of supplying our energy requirements. We cannot expect coal to be both clean and cheap, nor can we afford to utilize anything but clean coal.

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