nuclear energy

Gathered at the conference on Abundant Nuclear Energy at Gatlinburg, Tenn.

POWER

Projected use and cost of electricity

The per capita use of electricity will increase about six fold during the next 30 years and the cost will decrease about four fold, primarily because of nuclear power.

This prediction was made by James A. Lane, head of the study and evaluation group at Oak Ridge National Laboratory, Oak Ridge, Tenn. He said the delivered price of industrial electricity would be as low as 2.5 mills per kilowatt hour in 1980 and 1.5 mills per Kwhr in the year 2000.

The projected per capita use of electricity in the year 2000 represents merely a saturation of current applications such as home heating, air conditioning, color television, etc., and makes no allowance for the introduction of new applications. If, for example, the U.S. transportation industry converts to electrically powered vehicles, this would increase the per capita consumption of electricity by 10,000 Kwhrs per year with resulting decreases in cost.

Estimated generating costs are based on more-or-less conventional heat removal systems. The development of direct contact liquid-liquid cooling of liquid-fueled reactors could result in considerably lower nuclear plant costs. Direct cycle gas turbines might also reduce investment costs.

ENERGY CENTERS

Using low-cost power

How large blocks of low-cost power might be utilized has been the subject of a number of recent studies.

An intensive study of nuclear-powered agro-industrial complexes was carried out at Oak Ridge National Laboratories last summer. John Holmes of ORNL reviewed the industrial processes that were examined and attempted to provide a rationale for their selection.

Major processes considered for installation at nuclear energy centers include the manufacture of fertilizers; metals; plastics; brine chemicals, such as salt, chlorine, caustic soda, magnesium chloride; and other chemicals including cement, and sulfuric acid. Most of these processes are capable of absorbing large blocks of power from the reactor and many use intermediates from the processes.

Other energy-intensive systems that show promise include waste-water treatment, electric railways, high temperature process heating and several electro-organic processes.

PULP AND PAPER

Pulp mill for an agro-industrial complex

An agricultural-industrial complex based on nuclear energy could include a pulp mill. The pulp mill would use straw from a large wheat farm within the complex for its raw material. The mill would also use power, heat and water from the complex.

One possible specification for the pulp mill was drawn up by Dr. J. J. McGovern, vice president of Parsons and Whittemore, Inc., New York. His specifications are based on the straw from the farming of 300,000 acres of land with two crops annually.

Using an average production of straw of 0.75 tons per acre, the annual production from two crops would be 450,000 tons per year. Since the average straw requirement for bleached pulp is 2.75 tons of straw per ton of bleached pulp, the straw production could support the manufacture of 164,000 tons of pulp annually. This corresponds to a nominal mill size of 500 tons per day which is within the range of wood pulp mills built recently in Canada and the U.S. Capital requirements for a 500-ton mill are estimated at $60 million to $65 million.

SPACE HEATING

Advantages of nuclear district heating

A preliminary study conducted by Dr. Arthur J. Miller of ORNL indicates that major portions of cities can be heated economically with heat distributed from a nuclear energy center.

By 1980, a nuclear energy center could heat and air condition a large portion of a city at a cost per unit of heat equivalent to that now incurred by district heating in downtown commercial and high-rise apartment areas.

The heat employed would be steam out of back-pressure turbines or turbine bleed, rather than prime steam. Thus there would be some reduction in the amount of heat wasted from the plant which generates electricity.

The nuclear system would reduce both chemical pollution of the air and thermal pollution of streams. It would serve a larger area than now served by district heating systems, and it would consume much less heat per unit of area. Use of steam from a nearby nuclear plant in the present district heating system in New York might result in a savings of about $19 million a year.

SEWAGE REUSE

Sewage processing with low-cost energy

One of the major sources of pollution is urban sewage. Irving Spiewak of ORNL outlines some approaches to eliminating sewage pollution by applying advanced technology and low-cost energy.

Examples were given of a conventional system, a system using advanced waste treatment and a system using complete waste-water recycle. Low-cost energy has a significant impact only on the waste-water recycle system. This system includes a desalting process combining electrodialysis and distillation in which waste solids are distilled to dryness.

Cost of a total water system ranges from $0.33 per 1,000 gallons for the conventional system to $0.45 per 1,000 gallons for the water recycle system.

Spiewak says that the application of advanced technology on a massive scale is urgently needed to control urban sewage.