TRANSPORTATION AND ENERGY—A FUTURE CONFRONTATION

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ABSTRACT

An examination of the relationship between energy supplies and transportation systems indicates that a major confrontation is forthcoming. Predictions of the world’s petroleum supplies and the primary dependence of transportation systems on petroleum show that there will be a depletion of these supplies in the next 50 years unless major changes in transportation and energy planning and policy making are forthcoming. A closer examination of specific transportation systems through the use of the transportation/energy efficiency indicates that automobiles, aircraft and inter-city trucking are most inefficient on a mobility per unit of petroleum basis. Recommendations on the difficult problem of how to account for the depletion characteristics of transportation systems are given. These include coordinated transportation and energy planning, restricted petroleum and transportation toll and tax rates, research and development on propulsion systems less dependent on petroleum, and a shifting of emphasis to higher transportation/energy efficiency systems such as compact automobiles, buses and trains.

Introduction

Ever since the advent of modern fuel refining techniques, with the possible exception of war-time emergencies, the world’s consumers have had the luxury of an abundant supply of energy (in the form of liquid fuels) for their various transportation systems. Our current transportation systems are primarily dependent on liquid fuels due to cost and convenience of use advantages—the continued use and development of such systems will depend on the assured supplies of this form of energy. The purpose of this paper is to examine the relationships between energy supplies and transportation systems and to show that energy considerations may play an important role in future transportation planning.

In a similar vein, studies have been carried out for the electrical power generating systems of the world. There are many references concerned with the relationship between the generating capability of the
United States and its energy reserves. (For example, see Perry, 1972 or Vogely, 1969). In addition there have been numerous references (Freeman, 1970), to the restrictions that may be placed on this energy sector due to environmental considerations. These studies, coupled with events such as the U.S. Northeast blackout of 1965, have demonstrated that, especially with respect to electric power generation, our energy supplies cannot always be taken for granted. Furthermore, it is not unusual to find many energy specialists who predict that serious shortages of electrical generating capability may confront the nations of the world in the near future.

Although there has been a considerable amount of research dealing with the environmental impact of transportation systems (especially air pollution), except for the work of Rice (1970a, b), there have been few comprehensive studies relating energy sources and our transportation systems. This subject will be examined in detail in this paper and some possible guidelines or alternatives for future transportation system planners will be proposed. It should be pointed out that most of our specific examples and data will be confined to the United States energy and transportation systems. This is primarily due to lack of detailed energy consumption data for the other countries of the world. However, it is assumed that this omission will not overly bias the general results since presently the United States, as the largest energy consuming nation in the world, will probably be the first to face a major transportation crisis.

**Energy Sectors and Demands**

In order to determine the impact that transportation uses place on the energy supply, one should first look at the energy demand for transportation uses as compared to other forms of utilization. In general, the energy use statistics in this section are based on energy balances from the U.S. Department of the Interior (Morrison and Readling, 1968; Vogely, 1969) and compare well with averaged projected forecasts from a variety of sources (Battelle Northwest, 1969). Actual data are used for the periods from 1947 to 1965 and projected trends have been calculated to the year 2000. It is beyond the scope of this paper to discuss the rationale behind the various energy use projections; however, it should be noted that these projections are generally based on extrapolations from current energy consumption trends using technical improvements which are predicted for various categories. Since revolutionary technical changes (such as the national network of gas pipelines, the dieselization of the railroads, or the extension of the utility electric grid) have radically