SUMMARY OF PA MONG PROJECT INTERIM REPORT

The Mekong River, one of the world's 10 largest, is potentially a tremendous asset to the nations claiming its ownership. It can be harnessed to provide a large supply of low-cost electric power, and water supplies for large-scale irrigation and domestic uses that will permit accelerated economic growth of Southeast Asia. International treaties or agreements among Laos and Thailand and their downstream neighbors, Cambodia and Vietnam, will pave the way for construction and operation of the Pa Mong Project which is an initial, important element in providing these benefits.

The so-called Phase I investigations of the Pa Mong Project revealed sufficient land and water resources to indicate, with reasonable assurance, that it would be a feasible project. Based on these favorable indicators, we in the Bureau of Reclamation undertook the task of bringing the investigations up to our reconnaissance standards. Those standards can be defined as generalized estimates of costs and benefits of all aspects of the project. The Phase II investigations were authorized in late 1965; and, as the studies progressed, it became evident that the available water supply had been underestimated in the earlier investigations. New topographic findings indicated that the proposed reservoir could store seven times the amount of water previously estimated. The change in the estimated water supply would also result in a three-fold increase in electrical power generation. Independent studies of the projected growth of the power market showed that the power from Pa Mong could be assimilated as soon as the facilities are installed and placed in operation. It is encouraging
to note that the growth of the power market in Thailand since 1967 indicates that earlier forecasts were conservative and fully supports our assumptions that a ready market will exist for power from the project.

Based on the reconnaissance studies, it was decided that a feasibility report should be completed as soon as possible to cover a logical first stage of the Pa Mong Project. The report would contain detailed studies, designs, and cost estimates of all major elements of the project plan. Prior to the completion, however, of the Stage I Feasibility Report, it was decided that an interim report should be prepared to present a factual analysis of the proposal. Such a report, it was reasoned, would permit the many interests and responsible agencies in the Mekong Basin to consider the proposal and submit their views and advice on development.

The Pa Mong Project Interim Report, issued in January 1969, basically is an assessment of the technical and economic soundness of the power component of the project. The Interim Report has two other objectives. First, it gives the various administrative entities an estimate of the amount of capital required and a projected rate at which it will be needed; secondly, it presents the status of all phases of the investigation that are required for the Stage I Feasibility Report and the final Phase II Report. Attention is called to the requirements for outside support programs on which complete evaluation of project benefits depend.

The average annual stream flow of the Mekong River at the Pa Mong dam site exceeds 123 billion cubic meters (100 million acre-feet). A reservoir water surface elevation of 250 meters is needed to regulate satisfactorily this quantity of water. Engineering and geologic investigations supported
by laboratory testing and analysis indicate that the site is structurally sound to impound such a reservoir. Additional tributary dams on the Nam Lik to the north and the Nam Mong to the south would be required to contain the reservoir. Our studies to date show that it is not structurally feasible to construct Pa Mong Dam in stages. Therefore, Stage I facilities include the storage works, built to ultimate size; 3,000 mw of installed generating and related transmission capacity; and facilities to serve the initial irrigation development of about 75,000 acres (30,000 hectares).

The heart of the Pa Mong Project is the proposed storage reservoir of 61 million acre-feet (100 billion cubic meters). Pa Mong Dam is proposed as a concrete structure 380 feet high (116 meters) with a crest length of about 5,400 feet (1,650 meters). Nam Lik Dam is also proposed as a concrete structure 318 feet high (97 meters) with a crest length of 1,640 feet (500 meters). The other major dam, Nam Mong, is planned as an earthfill structure 210 feet high (63 meters) with a crest length of 6,560 feet (2,000 meters). Several dikes will also be required to provide closure at other low points along the reservoir rim.

The Pa Mong powerplant as contemplated in the Interim Report was similar in design to the third powerplant being constructed at Grand Coulee, with all units paralleling the Mekong River immediately below the dam on the Thailand side. However, for several significant reasons relating to implementation of the project and to prerequisite international agreements, it may be highly desirable, I believe, to evaluate and plan for initial construction of two powerplants, one on each side of the river. This
alternative is being investigated. Three 300 mw units are scheduled for initial installation. Seven additional units of 300 mw each would probably be needed and could be added at the rate of about one each year to meet load-growth. Forebay design should contemplate eventual addition of generating capacity up to a maximum of 12,000 mw. Transmission facilities, as presently visualized, would be constructed to interconnect Pa Mong with the existing electric authorities. Because of the size of the turbines and generators, most materials are expected to be transported to the damsite by barge during periods of high flow in the Mekong River.

Power generation facilities at Pa Mong can be physically expanded as needed without conflicting with project operation for irrigation and other project purposes. Based on conservative load forecasts which project an annual load growth of 27 percent in 1968 declining to 8 percent in 1992, Laos and Thailand will be in need of Pa Mong power by the time it could be made available in 1982. The initial installed capacity of 3,000 mw with an annual generation of over 18 billion kwh of firm energy could meet the projected area demand for capacity and energy through the 1980 decade. Thereafter, additional units would be needed and added as required.

About 135,000 persons now living in the reservoir area in Thailand will require relocation. An estimate of the number of people living in the Laos portion of the reservoir area was not available for the Interim Report. The proposed Stage I irrigation development would be sufficiently great to provide at least for the resettlement of persons displaced by the reservoir. This would consist of about 25,000 acres (10,000 hectares) in Laos and 50,000 acres (20,000 hectares) in Thailand. Increasing
irrigation withdrawals for an estimated 800,000 acres (340,000 hectares), which is the estimated 15-year development level, would decrease potential firm power production by only about 2 percent.

Economic justification of water resource development projects are normally made by a comparison of the estimated project benefits and costs. However, neither benefits nor costs associated with Pa Mong project purposes, other than power, were evaluated in the Interim Report. Electric power is considered fundamental in the continued economic growth of Southeast Asia. Also power sales represent the most tangible measure of the project's repayment ability. Because power is the only project purpose that has been evaluated, an indication of the economic worth of Stage I development may be determined by comparison of the cost of an alternative thermal power system with the costs of the Pa Mong Stage I development. Without the Pa Mong Project it is assumed that the projected power demand would be met by thermal plants near the load centers. For our comparative analysis, we selected a 2,800 mw nuclear plant located near Bangkok, Thailand, as the least costly alternative for Pa Mong Project power. Units of 400 mw and 600 mw size were scheduled to meet the same total energy output of Pa Mong. The larger units were selected to take advantage of the economies of scale.

Construction cost of the Pa Mong Project was estimated to be 1.04 billion United States dollars. This estimate includes the joint works (primarily dams, auxiliary dikes, Pa Mong reservoir and related features); 3,000 mw generating facilities, substations, and transmission system to the market load centers. A comparative cost analysis shows that power from the
multiple purpose Pa Mong Project would cost about 5 mills per kwh compared to 5-1/2 mills per kwh for the single-purpose nuclear-fired thermal alternative. In addition to power, the Pa Mong Project will also provide vitally needed irrigation; fisheries; navigation; flood control; domestic, municipal, and industrial water supply; and water quality, public health, and recreation benefits.

Two additional factors in favor of hydropower which could be included in the comparative analysis are:

1. The inherent advantage of hydroelectric fast loading characteristics and service reliability

2. Increased construction costs of nuclear thermal systems in areas where technological skills must be recruited from more industrialized nations

To bring the Pa Mong Project to fruition, some international body will probably be needed to finance and construct the project facilities. Treaties or agreements among the four riparian nations would be necessary to establish the framework for equitable assignment among participants of obligations and benefits, and for operation and maintenance of facilities and marketing of the products—water and energy primarily. A basinwide plan for integrated development, management, and operation of a multiple-function river system would maximize benefits.

The technical studies and data presented in the Interim Report have been used to identify the major project features, accomplishments, and river operation effects. The Pa Mong site can provide both power and irrigation water in enormous quantities simultaneously, without restricting either
use. The Stage I Feasibility Report scheduled for completion in January 1970 will include a more detailed discussion of delivered power costs, multipurpose aspects, and environmental effects of project development and operation.

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