(7124

TITLE: Minerals Critical to Developing Future Energy Technologies, Their Availability, and Projected Demand

Contact: Charles S. Cotton, Senior Evaluator
Energy and Minerals Division
U.S. General Accounting Office
Tel. 275-4959

Feb. 20, 1981
Addressee:
National Research Council
Washington, D.C.

BACKGROUND

The next 20 to 30 years are expected to be a period of transition from major dependence on conventional energy sources such as oil and natural gas to a more stable era heavily dependent on nonconventional renewable and inexhaustible sources of energy. The viability of these future alternative energy sources, however, is contingent, in part, on future materials and minerals availability, technology, and cost.

In April 1980, GAO began a self-initiated survey to identify materials implications of accelerated solar power, synthetic fuel, and energy conservation programs. The scope included minerals; raw and bulk materials; and processed, fabricated, and finished products and focused on materials availability and supply (including recycling), technological capability (including substitutes), and cost in relation to the viability of these future alternative energy sources.

On June 20, 1980, the Chairman of the Senate Committee on Energy and Natural Resources asked GAO to concentrate its initial efforts on identifying minerals critical to developing future energy technologies, their availability, and projected demand to the year 2000. The Chairman hoped that from this effort, the Committee could "identify whether legislation is needed to develop new alloys or substitutes; increase domestic, foreign, and undersea supplies; develop new technologies; promote recycling; augment stockpiles, etc." He asked that our evaluation be available to the 97th Congress for use in formulating future energy-related materials policy legislation.

Speech

015644

OBJECTIVES

To respond to the Chairman's request, we have planned and implemented a two-phased examination, the first of which will

--assess the impact of the future alternative energy technologies on the supply and availability of 26 nonfuel minerals within the context of four DOE energy technology scenarios,

--identify uncertainties and potential constraints posed by minerals supply and availability on implementing a given national energy program,

--determine how effective Federal policy and planning efforts have been and will be in meeting national energy-related nonfuel minerals needs, and

--identify if there is a need for a reasonably reliable comparative nonfuel minerals forecasting capability within the Federal Government to evaluate the effects of various policy options and provide a basis for guiding action in both the public and private sectors.

If our examination identifies energy-related nonfuel minerals facing supply uncertainties or potential availability constraints we plan a follow-on effort to

--identify the causes of the uncertainties or potential constraints on a mineral-by-mineral basis,

--identify previous studies which have addressed mineral specific uncertainties or constraints and determine if the recommendations made are adequate considering the increased demand generated by the energy technologies and, if adequate, the status of their implementation by the responsible Executive agencies, and

--identify and recommend to the Congress alternative options including legislative actions required to assure the availability of these minerals.

METHODOLOGY

The methodology we have employed through an inter-agency agreement with DOE's Lawrence Berkeley Laboratory modifies and interlinks two accepted computer models to project the demand for 26 selected nonfuel minerals in 5-year intervals to the year 2000 under four Energy technology scenarios. First, the Energy Supply Planning Model, originally developed by the Bechtel Group of Companies for NSF, is used to compute the capital investment for materials, equipment, and labor required to construct and operate 74 nominal energy supply facilities and 27 energy transportation facilities in each of the four energy technology scenarios. To this is added the materials and engineering cost requirements for 38 model or nominal solar systems developed by DOE's national laboratories and the MITRE Corporation as part of the Technology Assessment of Solar Energy Systems or TASE project.

The Energy Supply Planning Model's capital investment output can be linked directly to Commerce's Bureau of Economic Analysis codes which, in turn, have a direct relationship to Census' Standard Industrial Classification (SIC) codes. This allows direct use of the Lawrence Berkeley econometric input-output model to project the impact of the Energy Supply Planning Model's intermediate output on other sectors of the national economy, including the minerals industry sectors. However, the Bureau of Economic Analysis' U.S. national I/O table shows only seven minerals industry sectors in its most disaggregated 496 sector table.

For purposes of expanding the national I/O table for analysis of U.S. mining activities, the Dry Lands Research Institute, under a grant from Interior's Bureau of Mines, has disaggregated the seven minerals industry

sectors to show detail for 38 minerals industries. Lawrence Berkeley Laboratory, under its interagency agreement with GAO, further disaggregated 5 of the 38 sectors to show detail for 19 mineral industries for a total of 52 sectors.

To project the minerals demand by the alternative energy technologies, LBL collapsed the I/O table to 163 industry sectors but added the 26 minerals industries selected for review. The Energy Supply Planning Model capital investment output was then deflated to 1972 dollars, aggregated to 5-year intervals, rearranged to fit the I/O table, and adjusted based on the Bureau of Economic Analysis' 1972 National Income and Products Accounts (e.g. labor costs were deflated to 78 percent to reflect 1972 personal expenditures). The I/O model then computes the capital investment requirements for the 26 minerals sectors and its monetary values are converted to physical units.

In the interim, we have requested and obtained from Bureau of Mines commodity specialists U.S. and world production and capacity projections for each of the 26 minerals. We are also developing data on various supply indicators such as import dependency, construction lead time, reserves and resources, pending technological developments, etc. to assist in identifying and analyzing potential constraints or uncertainties. We intend to provide the Committee with the results of our initial effort in July of this year.