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[Cost and Employment Impacts of Various Energy Technologies].
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Report to Sen. James Abourezk; by Elmer B. Staats, Comptroller
General.

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Cost and employment impacts involved in the fuel cycles
of various energy technologies could not be compared on a
consistent basis needed for valid comparisons.

Findings/Conclusions: The following steps appear to be necessary
as a starting point to initiate the dialogue in developing a
basis for analyzing the cost and employment impacts of energy
technologies on a consistent basis: (1) the energy technologies
should be analyzed on a basis providing energy for the same
level of end use; (2) total employment impacts should be
estimated for both the technologies and the industries which
support them; (3) differences in investments required to
generate each job should be determined; and (4) differences in
the nature and duration of employment should be determined. The
following basic elements are necessary in order to perform this
analysis: (1) a framework for transforming a raw material into
consumable energy under each technology considered; (2) data on
the cost and employment requirements for each step of the
transformation; and (3) a common level of end use for the
technologies. Aside from providing a consistent basis for
comparing technologies independent of energy growth projections,
this framework makes it possible to distinguish between
short-term and long-term employment on a consistent basis. (SC)

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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B-178205

The Honorable James Abourezk
United States Senate

In your letter of March 3, 1977, and in later discussions with your office, we were asked to determine from existing literature the cost and employment impacts involved in the fuel cycles of various energy technologies. To identify such impacts we reviewed numerous reports and studies and consulted planning and research groups in various Federal agencies and researchers familiar with evaluations of energy systems, trends, and policies.

Although some studies have attempted to estimate the cost and employment impacts of energy technologies, the impacts primarily were analyzed within the context of a projected growth in energy demand and the role of each technology in meeting its assumed share of the demand. As a result, we could not compare the cost and employment impacts of these technologies on a consistent basis needed for valid comparisons.

It seems to us that as a starting point to initiate the dialogue in developing a basis for analyzing the cost and employment impacts of energy technologies on a consistent basis, the following steps are necessary.

- The energy technologies should be analyzed on a basis of providing energy for the same level of end use.
- Total employment impacts should be estimated for both the technologies and the industries which support them.
- Differences in investments required to generate each job should be determined.
- Differences in the nature and duration of employment should be determined.

To aid in your further efforts on the cost and employment impacts of energy technologies, we developed a methodology which should allow these steps to be taken. The methodology would provide a consistent basis for comparison by measuring

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the production or conservation activities required under different technologies to provide a fixed amount of energy for a common end use. In this way, one can better identify the incremental cost and employment impacts of different energy technologies.

The following basic elements are needed to do the analysis:

- A framework for transforming a raw material into consumable energy under each technology considered.
- Data on the cost and employment requirements for each step of the transformation.
- A common level of end use for the technologies.

There seems to be considerable agreement in describing most technologies' energy cycles and on many of the principal assumptions related to them. This general agreement establishes a framework which can be used to identify the material flow and numbers of facilities in a typical or average energy cycle.

Data used in a number of recent studies of employment and capital needs for energy technologies were obtained from the "Energy Supply Planning Model" prepared by the Bechtel Corporation for the National Science Foundation, which is a commonly used data base for employment and investment requirements. These studies encompassed a broad range of opinion in the energy area. However, for those technologies it covers, the Bechtel data base provides only a measure of direct employment, not indirect employment.

Total employment estimates are lacking for most of the energy technologies researched. A serious data gap identified during our research was the absence of measures of indirect employment. Indirect employment is the employment associated with the work done in the industries which supply the required materials and services to an energy technology. Accounting for indirect employment may or may not substantially alter the relative impacts of different technologies. Because a study which comprehensively evaluated indirect employment impacts would require a considerably greater investment in time and money than an evaluation of direct employment impacts only, we believe it is appropriate to analyze indirect employment only if other considerations are relatively in balance and indirect employment impacts could be a significant factor in decisionmaking.

For the final element in the analysis, the end use selected should be the primary use which is most common to the technologies being compared. The most common use for the technologies we researched was residential heating. It is important to place the technologies on a common basis of providing energy for the same level of end use in order to consider the total system requirements. For example, current solar systems require a backup from another energy source, such as electricity or gas. The common end use approach would require the impacts of solar's backup to be added to the solar system requirements in comparing the break-even point of solar with other technologies which do not require similar backup.

Aside from providing a consistent basis for comparing technologies independent of energy growth projections, this framework makes it possible to distinguish between short-term (construction) and long-term (operation) employment on a consistent basis. For example, when employment is divided in this manner, direct employment impacts are identified in a way which highlights the possibility of employment fluctuations due to construction.

We are making arrangements with your office to discuss in more detail the common end use approach, its application, and limitations.

Sincerely yours,



Comptroller General
of the United States