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HUMAN RESOURCES FOR ENERGY SYSTEMS: ALTERNATIVE STRATEGIES OF ALLOCATION

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Abstract

The choice of strategies in establishing manpower policy for energy is critical for the attainment of energy goals. Three alternative strategies are considered with the tradeoffs of each evaluated.

1. INTRODUCTION

A necessary condition for continued success in attaining long run national energy goals is a minimum supply of certain professional and technical manpower. The attainment of these goals, which include a doubling of energy output by the turn of the century, are critical if the U.S. is to continue to prosper materially and culturally as in the past.*

Unfortunately, continued expansion of energy at the same rate and in the same manner as in the past is no longer possible. Depleation of natural resources, environmental consideration, and the shifting international situation, to name a few, has imposed critical constraints which were peripheral to energy policy consideration a few short years ago. Because of these new constraints, future professional and technical manpower requirements are also much harder to project, but are of utmost importance because of the higher probability of long run shifts in energy systems and changing manpower needs.

Given the uncertainties that exist concerning long run supplies of fossil fuels for existing energy systems and the real or imagined threats to people and the environment of the use of nuclear power, the possibility of drastic shifts in energy producing systems is a distinct possibility.**

Manpower policy is critical to successful attainment of our energy goals. The following section will deal with alternate strategies for manpower allocation in the energy field given current and future constraints.

2. STRATEGY I

Traditionally, manpower allocation in the U.S. has been tied almost exclusively to the market system. As new occupations opened up, or as shifts in specific manpower needs arose higher wage rates would prevail in these areas attracting labor from

* See, for example, Buggey, JoAnne and Tyler, June, The Energy Crisis: What Are Our Choices? Prentice Hall Inc., Engle Wood Cliffs, N.J., 1975.

** For a critical review see Ridgeway, James and Conner, Bettina, New Energy: Understanding the Crisis and A Guide to an Alternative Energy System. Beacon Press, Boston, 1975.

existing or declining occupations or new additions to the labor supply. Even with the institutionalization and formalization of the process of human capital investment, changes in market demand resulted in relatively rapid shifts in manpower allocation.

The last quarter century has seen large increases in institutional and education requirement for most types of occupations. This is especially true for professional and technically trained manpower. Therefore, it is to be expected that shifts in demand for highly trained manpower resulted in relatively long lag periods before the supply of such manpower could catch up with the demand. High relative wage rates in these areas generally prevailed until market equilibrium could be established.*

The more human capital investment required, the longer the lag time will be, given a shift in demand for a specific category of manpower. What this means in essence is that professional and skilled manpower has a relatively long lag associated with supply shift in responce to shifts in demand. Changes in the energy system occuring in the past, which produced lags in supply of new manpower did not assume crisis proportion. Such changes in the energy system were due to changes in relative cost dictated by changes in technology and not because existing systems were no longer applicable due to natural resource shortage or because of environmental dictate. The market mechanism therefore served very adequately as an allocator of manpower.

This is basically the manpower allocation system that prevails presently in the U.S.

3. STRATEGY II

The market system of manpower allocation has served very adequately in the past but has one glaring weakness with respect to future manpower needs. The lag time associated with supply response to a change in demand constitutes a serious threat to attainment of energy goals. Supply response to an increased demand for professional manpower can lag as much as ten years. Professional level manpower shortage would then constitute a bottleneck to attainment of energy goals especially in the area of new energy systems. One solution to this problem is to adopt a different strategy of manpower allocation, where projected manpower needs determine current decisions on manpower education and training.

In a practical, as well as a structural, sense this deviation from current practice would require a financial as well as philisophical commitment from government and industry. As a matter of general policy, under the present system of manpower allocation, an individual is responsible for his own miscalculation and cost with respect to employment opportunities in a given field, i.e., an individual must stand the retraining cost necessary to become employable given job opportunities in his original field.* The rational being that the individual had a choice initially and was not cohearsed or directed in to that occupation. With a strategy of pre-planning for manpower needs, in many cases manpower will be educated before an actual shift in demand occurs, so therefore short run over supply of certain manpower could exist. Because the choice was not free, equity (and a successful program) dictates that government and the industries involved stand the cost rather than the individual.

Implied, also, is the necessity for government, and to some extent industry, to financially underwrite the fixed base institutional education

* See Scoville, James G., The Job Content of the U.S. Economy, 1940-1970, New York; McGraw-Hill, Inc., 1969.

*Current excess supply of Phd's in many areas resulting in underutilization, depressed salaries and unemployment gives witness to our current policy on bearing of cost by the individual.

cost for increased capacity in specific manpower areas.

Most Universities, for example, are not in the position to create new, or expand existing, programs based on the projected increase in manpower demand for these areas. Future expansion will be even more costly given the relative shortage of manpower in the area and the higher cost for instructional purposes. Indeed, an expansion of formal arrangements between educational institutions and government and industry may be necessary whereby professional and skilled manpower is shared in order to provide needed instructional manpower. Moreover, such agreements will probably be mandentory if bottlenecks are to avoided.

In any case, it should be apparent that the traditional strategy of manpower allocation represents a potential constraint to energy goals and that an alternative strategy which designs future manpower needs is essential for attainment of energy goals.

4. STRATEGY III

A plan which dictates current decisions regarding manpower education and training programs for future energy needs will optimize energy goals only if the projected manpower needs are themselves accurate. Projected manpower needs, themselves, are based on projected future energy systems.* A mistake in the projections of the composition of future energy systems will, therefore, constitute manpower projections which are inaccurate.

The structuring of manpower programs for future energy needs, therefore, must account for errors in forecasting energy systems. The greater the likelyhood for errors, the less clear cut manpower programs can be for specific educational areas. While an inadequate supply of specific manpower constitutes a major constraint to energy goals, over supply of the wrong type of specialized manpower is even more costly considering the fixed cost involved.

Given the relatively higher probability of error in accurately forecasting future energy systems, the strategy for manpower allocation must also include a flexability to cope with such errors. Such a strategy implies a more broadly based manpower program with specific intense training programs available to reallocate manpower to specific needs. A strategy which emphasizes a more general manpower policy is necessarily more costly then specific manpower programs, but less costly in the long run, given alternative strategies, when energy goal achievement is the principle consideration.

Given the plight of most educational institutions, there exist compelling reasons for a greater government and industry underwriting of manpower programs. Much of the individual's cost of education and training will also have to be underwritten because of the relatively long training period involved. A manpower strategy of this type will provide the necessary human resources for attainment of energy goals in the time space envisioned. It will be costly, but not as costly as not having adequate manpower resources to cope with our energy problems.

5. CONCLUSION

The choice of manpower strategies is of vital importance in achieving national energy goals. A shortage of critical specialized manpower can set back energy programs by years. The three strategies reviewed in this paper, while not inclusive, gives the range of general manpower strategies available for policy consideration.

* There have been numerous manpower for energy projections made, but without exception, they were based on very conventional energy system projections. Their validity is, therefore, somewhat in question. See, for example, U.S. Department of Labor, Project Independence, Final Task Force Report, U. S. Government Printing Office, 1974, and U.S. Department of Labor, Tomorrow's Manpower Needs. Bulletin 1606, Four Volumes, U.S. Government Printing Office, 1969.

Market strategy of manpower allocation implies too much of a time lag in manpower supply response to serve as a reliable strategy because of the critical time element included in our energy goals. Forecasting manpower requirements in order to pre-plan manpower training is therefore necessary to eliminate the time lag in the supply of specialized manpower. How specific the guidelines can be depends on the reliability of energy systems forecasting.

Either Strategy II or III will require increased government involvement in order to underwrite the cost of specific manpower training, prior to an actual viable demand for such manpower. There are, of course, many grave philosophical considerations that must be deliberated before such a strategy should be adopted, which this paper has not touched on. Nevertheless, continuation of present manpower policy based on market allocation will probably represent the weakest link in the attainment of national energy goals.

6. SELECTED REFERENCES

1. Bezelek, R. H., Long Range Forecasting of Manpower Requirements, New York; Institute of Electrical and Electronic Engineers, Inc., 1974.

2. Buggey, J. and Tyler J., The Energy Crisis: What Are Our Choices?, Engle Wood Cliffs, N.J., Prentice-Hall Inc., 1975.

3. OECD, Energy Prospects to 1985, Two Volumes, Paris, OECD, 1974.

4. OECD, Manpower Forecasting in Educational Planning, Paris, OECD, 1966.

5. Ridgeway, James and Conner, Bettina; New Energy: Understanding the Crisis and A Guide to A Alternative Energy System, Boston, Beacon Press, 1975.

6. U.S. Department of Labor, Project Independence Federal Energy Administration final task force report, Washington D.C., U.S. Government Printing Office, 1974.

7. U.S. Department of Labor, Tomorrow's Manpower Needs, Bulletin 1606, Four Volumes, Washington D.C. U.S. Government Printing Office, 1969.