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Revision II

An Analysis of Federal Incentives Used to Stimulate Energy Production

February 1980 Executive Summary

Prepared for the U.S. Department of Energy
under Contract EY-76-C-06-1830

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AN ANALYSIS OF FEDERAL INCENTIVES USED TO STIMULATE ENERGY PRODUCTION

An Executive Summary

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AN ANALYSIS OF FEDERAL INCENTIVES USED TO STIMULATE ENERGY PRODUCTION

An Executive Summary

The amount of solar energy that reaches the earth's surface every two weeks is equivalent to all of the known reserves of coal, gas, and oil. Yet, the use of this energy source to generate electricity and heat and cool buildings is negligible.

Debate over solar energy's role has caused policy makers to speculate on the reasons for the large difference between present and potential uses of solar energy. These reasons appear to be buried in complex technical, economic, legal, institutional, and political interrelationships. An improved understanding of forces that have shaped the existing energy budget may provide insights for the future.

The purpose of this research was to analyze past and present Federal incentives to production of various energy sources and thereby assist the Division of Conservation and Solar Applications, Department of Energy, in the study and recommendation of Federal incentives for the development of solar energy. The research was divided into five parts: a survey of current thought about incentives for solar energy production; the theoretical approach to analyzing and characterizing incentives; a generic view of the energy incentive creating landscape for 1978; analysis of the major energy sources (nuclear, hydro, coal, electricity, oil, and gas) along their trajectories from exploration to waste management, including their costs in 1978 dollars; and insights into potential incentives for solar policy.

Economic, political, organizational, and legal viewpoints were considered in formulating the typology of incentives. The following eight types of Incentives were identified:

1) Creation or prohibition of organizations that carry out actions,

2) Taxation exemption, or reduction of existing taxes,

3) Collection of fees for delivery of a governmental service or good,

4) Disbursements in which the Federal Government distributes money without requiring anything in return,

5) Requirements made by the government backed by criminal or civil sanctions,

6) Traditional government services provided through a nongovernmental entity without direct charge (i.e., regulating interstate and foreign commerce and providing inland waterways),

7) Nontraditional government services such as exploration, research, development and demonstration of new technology,

8) Market activity under conditions similar to those faced by nongovernmental producers or consumers.

GENERIC INCENTIVES

Using this typology of Federal actions, incentives provided during FY-1978 were identified on a generic basis. Forty-five organizational components spent an estimated $13.7 billion conducting energy-related activities. Expenditures of individual organizations ranged from $4.89 billion, spent by the Department of Energy (DOE) to negligible amounts. The DOE, the Tennessee Valley Authority, and the Army Corps of Engineers accounted for 76% of the incentives expended. Twenty-eight departmental agencies administered $9.25 billion in energy programs. Eleven Senate committees had jurisdiction over energy-related organizations, the largest of which, the Energy and Natural Resources Committee, had jurisdiction over 14 organizations with a total outlay of $10.24 billion. Fourteen House committees had jurisdiction over energy-related organizations; these included the Government Operations Committee, which had jurisdiction over 21 organizations with a total outlay of $12.63 billion.

Organizations emphasizing market activity spent 52% of all funds. Exploration, research, development, and demonstration accounted for 38.5%. Organizations whose primary action involved requirements backed by criminal and civil sanctions spent 5.5%. Only one organization was involved in altering the tax structure.

Twenty-nine percent of the $13.7 billion was directly related to incentives involving electricity, mostly for market activities. Of the remaining 71%, $5.59 billion was expended for incentives to the nuclear industry. The oil industry received $1.65 billion. Coal received $1.63 billion and gas received less than $300 million. The solar energy industry received $371 million of the incentives directed specifically toward energy-producing industries.

NUCLEAR INCENTIVES

Incentives for nuclear power are estimated to have cost the Federal Government $21.0 billion over the past 30 years. This was about 8.3% of total Federal incentives to stimulate energy production. The Civilian Reactor Development Program (CRDP) used approximately 81% of the research and development dollars allocated to commercial nuclear power by DOE. The Liquid Metal Fast Breeder Reactor (LMFBR) program has received $4.4 billion through the CRDP. The costs of regulating civilian reactors ($1.65 billion) and the investment in enrichment plants ($2.1 billion) were included in the total costs.

The total costs of incentives to the nuclear industry do not take into account several nonquantifiable incentives, namely the cost of the Price-Anderson Act (a legislative action which removed the liability insurance roadblock) and Federal uranium policies. No way was found to quantify them.

HYDRO INCENTIVES

The estimated cost of incentives to hydroelectric power was $16.9 billion. This is 6.7% of the total Federal incentives to stimulate energy production. In the development of hydropower, the government has acted primarily as a market entity in each step of the production-consumption cycle. Most of the incentives used to stimulate hydro energy production would, therefore, be categorized as market activity. Two procedures were used to quantify the incentives. For the first, return on investment from power revenues and costs of construction, operation, maintenance, management, and regulation of dams

(that could be allocated to power development) were calculated. For the second, subsidies provided by the low interest rates on Federal loans were calculated. The total incentive costs based on either procedure include regulation cost and the incentives from tax exempt power revenues. Using the first procedure, it was estimated that the costs of incentives were $16.9 billion for hydroelectric generation. With the second, the costs were $8.9 billion.

COAL INCENTIVES

The depletion allowance has been the single largest incentive to increased coal production. It amounted to $4.7 billion between 1950 to 1978. Traditional services, which include facilities to aid the water-borne movement of coal, amounted to $2.6 billion between 1950 and 1978. The nontraditional services of research, exploration, development, and safety accounted for $3.6 billion of incentives. An estimated $11.7 billion has been expended for incentives to the coal industry, or 4.6% of the total cost of incentives.

OIL INCENTIVES

Incentives to oil production were considered as two categories: 1) exploration and production and 2) refining and distribution. Exploration and production was defined to include the search for and recovery of both crude oil and natural gas, so that incentives to the exploration and production of one of these energy sources acted as an incentive to the other. However, refining and distribution was limited to petroleum conversion.

An estimated $123.6 billion has been expended for incentives to the oil industry. This was 49% of the total Federal incentives to stimulate energy production. A large incentive to the petroleum industry was the reduction of existing taxes through intangible drilling expensing and the percentage depletion allowance. This incentive amounted to $55.5 billion. Requirements, including stripper well price incentives, incentives for new oil, subsidies for pipelines and the Federal Energy Administration (now the ERA), had an estimated value from 1921 to 1978 of $57.5 billion. Traditional services,

such as the maintenance of ports and waterways to handle oil tankers, accounted for $6.9 billion. Research and development and data collection by the Geological Survey and Bureau of Mines accounted for $1.9 billion of incentives. Disbursements ($1.3 billion) and market activity ($0.5 billion) accounted for a small percentage of the total cost of incentives to oil.

NATURAL GAS INCENTIVES

An estimated $14.6 billion was expended for incentives to the natural gas industry between 1950 and 1978. This was 5.8% of total incentives to energy production. Most of the incentives were in the form of exemptions or reductions of existing taxes. Intangible drilling expensing and the percentage depletion allowance accounted for $14.9 billion. Requirements in the form of wellhead price controls were disincentives to the natural gas industry of $0.8 billion. Nontraditional services (which included data from the Bureau of Mines and the Geological Survey) and market activity accounted for $0.45 billion.

ELECTRICITY INCENTIVES

The total cost of incentives for electricity generation and transmission were $64.5 billion or 25.6% of the total energy incentives provided by the Federal Government to the six major energy sources.

To estimate the value of incentives, the analysis distinguished between the investor-owned private utilities and the government sponsored utilities. Emphasis was placed on public utilities since the distribution of electricity has traditionally been the principle concern of public utilities.

The same two alternative procedures used to estimate hydro incentives were applied to the calculation of electricity incentives. Using the first procedure (Federal investment money outstanding), it was estimated that the costs of incentives were $64.5 billion. With the second (interest rate incentive), the costs of incentives were estimated at $51.4 billion. Most of these incentives to electricity generation and transmission constitute market activity and taxation actions by the Federal Government.

CONCLUSIONS

In the years since 1918 the Federal Government has expended $252 billion for incentives to stimulate energy production. A precedent therefore exists for the Federal Government to spend or forego large sums to increase energy production.

Considering the sums of the columns of Table 1, it can be seen that oil received the largest share of incentive funds. Possible reasons are 1) a large percentage of the population enters the oil market, at the gasoline pumps, each week; 2) oil has been commonly assumed to be difficult to find and in relatively limited supply; and 3) oil is perceived by the average citizen as necessary for a desirable lifestyle. The great value placed on oil by the public makes legislators sensitive to an assured supply.

The second largest share of Federal incentives went to the promotion of electricity generation and transmission. Reasons for this expenditure may have been the desirability of an inexpensive and readily available source of power for the public. The Rural Electrification Administration was created to provide the financing necessary to develop an electrical distribution system for all areas of the country.

Coal received the smallest percentage of incentives. The reasons may be: 1) coal has supplied energy over the longest period of time; 2) it is thought to be available in abundant quantities; and 3) coal is perceived as an inconvenient and dirty fuel. It therefore commands less political popularity.

Incentives for gas, nuclear, and hydro power have received intermediate amounts of funding. Production of gas is strongly related to the production of oil and the creation of incentives to increase oil production is correlated to that for gas. Incentives to the nuclear industry could result from 1) a strong puritan ethic which valued the making of something useful out of an investment conceived for destruction, and 2) a recognized need for new power sources. This was manifested as a dream of the future and articulated by the Joint Committee on Atomic Energy. The driving forces behind Federal expenditures for hydro power were largely social, as part of the taming of a raw land with flood control, irrigation, and recreational facilities.

TABLE 1. An Estimate of the Cost Incentives Used to Stimulate Energy Production (in Billions of 1978 Dollars)

	Nuclear	Hydro	Coal	Oil	Gas	Electricity	Total	Percent of Total Incentives
Taxation		2.0	4.74	55.48	14.92	38.83	115.97	46.0
Disbursements			-	1.30			1.30	0.5
Requirements	1.7	0.04	0.80	57.49	-0.80		59.23	23.5
Traditional Services			2.57	6.92	-	0.52	10.01	4.0
Nontraditional Services	17.2		3.55	1.88	0.30		22.93	9.1
Market Activity	2.1	14.86[a]		0.02	0.50	0.15	25.17[a]	42.80
17.0								
Totals	21.0	16.90	11.68	123.57	14.57	64.52	252.24	100
Percent of Total Incentives	8.3	6.7	4.6	49.0	5.8	25.6	100	

(a) This value based on incentive definition 1 (Federal money outstanding).

Considering the sum of the rows of Table 1, it can be seen that 46% of the total cost of incentives could be categorized as the action of levying a tax or the exemption or reduction of an existing one. Taxation is relatively easy to administer, has an immediate financial impact on those affected, is flexible, and is expedient. Approximately 0.5% of the cost of incentives was in the form of disbursements for which the Federal Government received no direct or indirect good or service in return. Requirements, such as price controls, accounted for 23.5% of the incentives. The Federal Government allocated 9.1% of the money expended to create incentives for energy production through nontraditional services such as exploration, research, development, and demonstration. Though popular in promise, nontraditional services are not as flexible as taxation and requirements. One reason for this is the limited size of the research community, which cannot be readily expanded. Seventeen percent of the total expenditure for incentives to increase energy production involved government market activity such as TVA. Traditional government services accounted for 4% of the total. These, too, are inflexible.

Creation or prohibition of organizations, and collection of fees, have not been emphasized as incentives to increase energy production. Such incentives are often unpopular. When they are potentially feasible, as in the case of creating the TVA, they must be acted upon quickly.

The analysis indicates two apparent rationales for incentives: 1) promotion of a new technology during its early stages and 2) payment of the difference between the value of an activity to the private sector and its value to the public sector. The support of nuclear energy represents an example of the first justification. Examples of the second are rural electrification (REA), economic development (TVA), flood control (dams), and price controls (oil, gas, and coal). If solar policy were developed according to these rationales, two-thirds of the action would focus on taxation and requirements. It would appear that these incentives should affect the technical elements of solar energy production for which consumers most often enter the marketplace.

During the course of the analysis, incentives were identified which did not have a quantifiable cost to the American taxpayer. Examples of these are

the Price-Anderson liability indentification for nuclear power, the Connally Hot Oil Act, the Interstate Oil Compact Commission, and the Natural Gas Act of 1938. An analysis of the results of such incentives in which the Federal Government assumes responsibility and risk could lend considerable insight to the formulation of a strategy for solar development.

In conclusion, a precedent exists for utilizing Federal incentives to increase energy production. Design of national energy policy which considers the results of Federal investment in incentives to increase energy production could be an efficient basis upon which to integrate current and impending technology, existing energy stocks, and consumer requirements and preferences. The conclusion of micro-economic solar energy feasibility studies could be inconsequential without a comprehensive understanding of the costs and results of incentives to increase energy production. This is so because of the disparity in rationale between the Federal Government and the private sector. The Federal Government need not predicate national policy on short-term micro-economic analysis. As confirmed by this study, Federal justification is predicated on long-term goals met with the aid of new technology and supported by social values of the nation. If it is socially desirable and technologically feasible to increase solar energy's share in the national energy budget, the paramount policy question is one of selecting an incentive strategy and determining the government's level of investment in it.

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