Chapter II

DEPARTMENTAL GOALS AND PRIORITIES

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Some of the most basic questions and issues raised by this critique can only be answered at the highest levels of the Department of Energy (DOE). During the course of the review, it became clear that the elements of meaningful goals and priorities, and strategies to meet those goals, were lacking. These elements are crucial to the success of any effort, either in Government or in the private sector, and they are particularly important in clarifying the value of an effort undertaken to deal with a problem of enormous national and international importance, such as the present energy situation Goals, priorities, and plans must be set not only for programs within Conservation and Solar Energy (C&SE) areas, but these goals must complement or match similar goals, priorities, and plans for conventional fuels and other new supply opt ions. Senior DOE management is responsible for this effort, the sum of which represents our national energy policy.

Issue 1

Goals and Plans

The ambitious goals set by the President for solar and conservation must be kept current and translated into specific interim objectives for the various programs.

Summary

Goals are used in planning programs to meet national object Ives To be relevant, solar and conservation goals must be derived from the best estimates of what is desirable and achievable This analysis requires the consideration of factors such as the expected cost and availability of other sources, economic growth, technologicla development (and failure), and new concepts for achieving the same end. The Program Summary Documents (PSDs or gold-books) present energy production goals for solar energy based on the Domestic Policy Review (DPR), and energy-saved goals for conservation based on the the Committee on Nuclear and Alternative Energy Systems (CONAES) scenarios. Refinements of these goals should be expected in future versions of the gold books. I n particular, the conservation goals must be much more more rigorously defined, perhaps by a DPR for conservation.

Simple Quad goals for 1990 or 2000, however, are not adequate for planning programs It is necessary to define what actually has to happen for the Nation to meet the goals and what DOE role must be to ensure success. Explicit, year-by-year milestones should be provided so that Congress can determine it these goals should be accepted as national policy, appropriate the resources necessary for meeting them, and hold the programs accountable for progress made. Congress ion a l pressure may be required to ensure that DOE augments its analytic capability to produce i m proved goals and plans.

Quest ions

1. **Has** DOE accepted the DPR scenarios as the guides for the solar programs?
2. When will comprehensive conservation goals (that will be useful for program planning) be developed?
3. When will DOE prepare detailed plans for the Nat ion to reach the stated goals?
4. How will DOE keep the goals current and how often should they be revised?
5. Can the Assistant Secretary for Policy and Evaluation work with the Oft ice of Planning and Analysis in C&SE to produce such a plan w ı t h their present resources and mandate?

Background

Table 1 contains DOE's solar goals, as announced by the President on June 23, 1979, which were derived from the Maximum Practical Scenario of the DPR on solar energy.

The conservation goals (table 2), which have not been endorsed directly by the President, are stated to be at least adequate to meet the savings suggested by the recent report of CONAES, evidently for scenario A of that report,

As pointed out in the CONAES study, achieving these goals will require great and sustained efforts by both the private and public sectors, This effort can be estimated only if detailed breakdowns by specific program objectives are available. For instance, the wind-power goal is 1.7 Quads in 2000. An adequately detailed plan would specify how many machines of varying sizes would be required to produce 1.7 Quads, the industrial capacity over time to produce and deploy them, material and capital requirements, the schedule for technological improvements and resource mapping, and estimates of when and how non-hardware-related market barriers can be evaluated and addressed. Such a plan would delineate a clear path to the desired goals including what must be done this year as part of the overall effort Not only would such a plan provide clear direction to the programs, but it would also provide a means for Congress to evaluate programs' progress and need for funding relative to other programs and national objectives. The wind energy program was chosen here as an example because it is

Table 1 .—Solar Goals[a]

Solar technology	1977	2000		
		Base case at $32/bbl	Maximum practical	Technical limit
Active heating and cooling	Small	1.3	**2.0**	**3.8**
Passive heating and cooling	Small	**0.3**	1.0	1,7
Industrial and agricultural	—	1.4	2.6	3.5
Biomass	1.8	4.4	5.4	7.0
Photovoltaic systems	—	0.2	1.0	2.5
Wind systems	—	0.9	1.7	3.0
Solar thermal power	—	0.2	0.4	1.5
Ocean thermal	—	—	0.1	1.0
Hydro		4.0	4.3	4.5
High head	(2.4)	(3.5)	(3.5)	(3.5)
Low head	(Small)	(0.5)	(0.8)	(1 .0)
Total (Quads)	4.2	12.7	18.5	28.5

[a]The estimates in this table represent the amount of conventional energy than can be displaced by solar systems, rather than the amount of energy actually delivered by solar systems
[b]Includes process heat, onsite electricity, and heating and hot water

SOURCE "Solar Energy Domestic Policy Review, Response Memorandum, February 1979, as printed in the *Solar Energy Program Document,* January 1980

Table 2.—Conservation Goals

	U.S. energy consumption (Quads)			
	Residential/ commercial	Industrial	Transportation	Total
1975 consumption	16.8	36.7	17,3	70.8
1990 no change path (scenario C)	23.6	69.5	26.9	120
1990 possible (scenario B)	18.4	58.6	23.0	100
Percent savings	220/0	15.7%	1 4.5%	16.70/0
1990 possible (scenario A)	14.1	43.6	16.5	74.2
Percent savings	40.3%	37.30/o	38.6%	38.1%
Scenario A Quad savings	9.5	25.9	10.4	45.8%

SOURCE Committee on Nuclear and Alternative Energy Systems, December 1979, as printed in the *Energy Conservation Program Summary Document* February 1980 corrected by OTA

one of the best defined, but it still does not present a long-term plan of what must happen by when and what DOE's role must be to make sure it happens.

The goldbooks describe a range of energy measures, and provide suggested budgets and timetables Unfortunately, however, the programs are not clearly l inked to the goals. On **page I I-7 of** the conservation PSD it is stated that the "overall objective of the Federal Government's Conservation Program is to encourage the adoption by the economy of **cost-effective** conservation measures as rapidly as possible." Yet nowhere in the document can one find a ranking of the proposals in terms of cost effectiveness Many interesting programs are presented, but without clear represent ation of anticipated costs, benefits, or probabi1ities of success. There is a substantial range of investment between what is cost effective for an individual and what is cost effective for the Nation; this range holds many opportunities for policymaking, Nor are overall quantitative goals of energy conservation presented; one would be interested, for example, in the total energy to be saved in the United States as a result of the completion of the proposed programs The contribution of each solar project is a l so presented without ranking, The costs and benefits of each program are essential elements in deciding how the whole system fits together

Goals and plans are critical elements to the success of C&SE, but they must be used with caution. Goals must be kept up to date with other energy, environmental, and societal objectives. They can be invalidated by changes in energy demand, or the price and availability of other fuels (either shortfalls or unexpected surpluses such as conceivably might develop with natural gas as the price rises). National security considerations may make solar and conservation implementation even more imperative than it appeared at the time the goals were set Progress in technological development is always uncertain, especially in the early stages, and future costs are unpredictable These factors cannot simply be cranked into an equation that could be solved. There is no one best goa1, on l y estimates of what is desirable and achievable. Thus, goals, and the plans for meeting them, m ust explicitly incorporate these uncertainties and contingencies for dealing with setbacks.

Finally, it also follows that plans and goals should not be changed **continually in** response to possibly short-term trends or premises. Program implementation can become hopelessly unstable if objectives shift frequent l y. Measurable targets, and criteria for revising the targets, should be set for each technology and conservation strategy, in accordance with explicitly stated assumptions.

Issue 2

Setting Priorities

DOE does not appear to have set priorities among the various programs in C&SE to ensure that the total resources are being apportioned to achieve the maximum benefit.

Summary

The impending budget constraints, as well as normal fiscal prudence, suggest that C&SE favor those programs most likely to produce energy benefits. The gold books do not indicate that priorities are being set by rigorous, comparative analysis. An analytical basis for comparing technologies and emphasizing the most successful ones must be employed, or programs that eventually prove to have only minor benefits may receive a disproportionate share of the budget. This analysis should include (in addition to Quad goals) the ultimate energy contribution of the technology, economic factors, environmental impacts, effect on employment, stage of development, and other factors. Such a listing of priorities would be an integral part of the overall plan to reach the goals, as discussed in Issue 1. Congressional insistence on both the analysis and the analytical capability to produce it would probably be required to ensure that a process is created to lead to this type of effort.

Questions

1. What priorities does DOE now accord the various C&SE programs?
2. What are the criteria DOE uses to set these priorities?
3. What are the procedures by which DOE will be evaluating the programs in light of these criteria to revise the priorities?
4. How will DOE use these priority rankings, and how will they be integrated with DOE priorities for other efforts?

Background

Setting relative priorities is a way of determining which programs are most likely to contribute substantially to national objectives, and which therefore should be expedited. DOE should be able to demonstrate that it is distributing its funds in such a way as to have maximum impact both in the near and long term. Ideally, DOE would have a clear concept of how each technology would be implemented, and the costs and impacts of doing so. Then a cost/benefit analysis of DOE funding could be confidently performed for each program, and the appropriate funding levels determined. It is clearly premature to expect such a convincing analysis, but some sort of cross-technology comparison is sorely needed to maximize the overall effectiveness of C&SE. Assigning rationally determined priorities to each technology is a way of doing this.

The goldbooks present neither a cross-technology analysis nor sufficient data to perform one. Even comparing the Quad goals for 2000 and the program costs is impossible because meaningful cost data (for the full periods of the programs) are not known. Table 3 compares the DOE fiscal year 1981 budget request with the DPR solar energy goals for 2000 or the conservation savings expected in 1990 (see issue 1). This table is much too simplistic to use for planning purposes. For instance, the low ratio for industrial conservation indicates that DOE expects private industry to do most of its own R&D. Nevertheless, some sort of program comparison must be done to know if DOE is getting the maximum value for its fundin, in the context of meeting overall goals. Table 3 also presents qualitative estimates of the importance of several other factors.

If the budget were closely related to the goals, a low ratio would indicate a high national energy return on DOE money. As stated above, this table must be used with extreme caution. Expensive long-term R&D programs, such as photovoltaics, cannot be expected to compare with near-term applications such as solar heating, but their eventual contribution could be much greater. Furthermore, the estimates for 2000 could shift, changing the ratio considerably. However, the table does suggest which programs might be scrutinized for either augmenting (low ratios] or cutting back (high ratios).

The qualitative rankings are relative indicators of promise or problems. These preliminary rankings are illustrative only, and different orderings could be justified, Ultimate potential refers to the maximum Quad production (or conservation) that might eventually be expected. The indirect solar applications rank highest because they have the most general use. Conservation technologies are the lowest because the potential shrinks as implementation progresses. **However, it is noteworthy that the potential for conservation before the end of the century dwarfs that of solar.** Conservation technologies have very attractive economics at this time; economics for the solar R&D programs are largely speculative. The stage of development refers to technological readiness and the risk in depending on that readiness. Institutional and market barriers are the nontechnical problems that may beset new technologies, particularly if they call for radically new producer or consumer patterns, or different ways of managing the energy flow. Both these columns are subjective.

Table 3.—Comparison of the DOE Fiscal Year 1981 Budget Request With DPR Solar Energy Goals for 2000 or Conservation Savings Expected in 1990

	Fiscal year 1981 budget request	Quad goal (2000)	Ratio	Ultimate potential (Quads)	Economics	Stage of development	Institutional and market barriers
Solar							
Active heating and cooling	$57.7	2	$30	B	B	A	C
Passive heating and cooling	33.9	1	30	B	B	A	C
Industrial and agricultural	49.0	2.6	20	B	B	B	A
Biomass	**66.7**	36[a]	20	A	B	A	A
Photovoltaics	175.6	1.0	180	A	?	C	B
Wind	80.0	1.7	50	A	A	B	C
Solar thermal (electricity)	117.5	0.4	290	A	?	C	C
Ocean	*39.2*	*0.1*	*390*	A	?	C	C
Conservation		(1990)					
Residential/commercial	97.6[b]	9.5	10	C	A	A	C
Industrial	58.9	25.9	2	C	A	B	A
Transportation	113.0	10.4	11	C	A	A	B

A = favorable outlook B = intermediate C = limited potential or difficult problems

[a] Excludes the 18 Quads already being used

[b] Does not include $202.5 million for the Schools and Hospitals Grant program or $19895 for the Weatherization Ass[stance Program The *energy* contribution Of these programs presumably is Included in the 95 Quads but the high budget levels result from the actual implementation being done by DOE. unlike the other programs which are limited to R&D or demonstration projects

SOURCE Office of Technology Assessment

Issue 3

Planning Programs to Meet Goals

DOE Solar and Conservation Programs do not appear adequate to meet the suggested goals.

Summary

It is difficult to discern the impact of the President's goals on the DOE programs since neither the PSDs nor the fiscal year 1981 budget submission relate the programs and the goals in any detail. The solar R&D components are generally described adequately, but there is little evaluative perspective to indicate whether the programs are actually on track. Commercialization plans are described more vaguely, evidently reflecting DOE uncertainty about how to address this phase. Meeting the goals will require that considerably more effort be given to implementation relative to R&D than is now the case. In the absence of a detailed technology implementation plan coupled with rigorous evaluation to ensure appropriate progress, there will be a natural tendency to continue perfecting technology that may never be introduced to the marketplace.

Present solar programs appear inadequate for reaching the President's 20-percent solar goal. In real dollar terms, the fiscal year 1981 budget request for DOE solar programs is slightly lower now than before the President's goal was announced. While solar funding probably must be increased to meet the goal, increases should be justified and determined by an improved analytical rationale to ensure that a coherent, least cost solar strategy is developed.

Questions

1. Was the fiscal year **1981** budget request prepared under a plan to meet the President's goals? If not, should such a plan be developed?

2 What procedures is DOE using to determine if its programs are operating at the appropriate level and efficiency?
3. What mechanisms does DOE have for accelerating programs shown most promising by the research, development, and demonstration and commercialization programs and curtailing those considered less promising? For abandoning failed initiatives? How are these evaluations to be made?

Background

At a minimum, the development of a program strategy requires an initial assessment of:

- potential contribution to goals assuming technological and commercial success;
- alternate program approaches and identification of resources required for achieving levels of contribution for each technology path and confidence levels of attaining these contributions;
- potential infrastructure or societal barriers to commercial application, and plans for overcoming such barriers;
- the optimum timing and degree of private sector involvement in program development;
- potential environmental and socioeconomic impacts; and
- methods for determining when the level of effort should be reduced or eliminated, either because commercialization has been achieved or the strategy has failed,

The strategic plan should clearly identify specific subprogram goals, the program approaches to meet them, methods of implementation, the required funding levels, contingency plans, schedules, and decision-point milestones,

Coherent, long-range solar and conservation plans of this kind have not yet been developed by DOE. At present, different documents produced by DOE do not even contain agreed-upon estimates of the most basic parameters, such as the number of solar systems that must be deployed to meet the DPR goals. For example, the fiscal year 1981 budget request estimates that 14 billion ft^2 of collectors must be installed to reach the DPR goal of 2.6 Quads of agricultural and industrial process heat, while the 1980 PSD estimates that only 5.9 billion ft^2 will be required. There is little evidence of in-place mechanisms for objective evaluation of relative progress, changing assessment of ultimate potential, timing, and resource requirements.

In addition, there appear to be no centingen-(-y plans to effect required changes in emphasis, should the need be identified, Some technological approaches almost certainly will fail to meet short- or long-term goals If the over-all goals are to be reached, other technologies will have to be developed or deployed more rapidly than expected.

A major deficiency of the gold books is the lack of evaluation of existing programs. Historical achievements and results to date are not described. Each program is presented as virgin, without review of previous failures and successes. Most ongoing programs should involve adjustment and correction as they proceed, as well as evaluation to ensure that they are still relevant to achieving the overall goals. This topic is discussed in Issue 5.