GAO

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Washington, D.C. 20548

Resources, Community, and
Economic Development Division

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May 13, 1996

The Honorable George E. Brown, Jr.
House of Representatives

Dear Mr. Brown,

This responds to your April 17, 1996, letter to the Comptroller General expressing concerns about our April 15, 1996, report to the Chairman, House Committee on the Budget, entitled DOE's Success Stories Report (GAO/RCED-96-120R). In your letter, you state that our report, which examined a number of the case studies included in the Department of Energy's report Success Stories: the Energy Mission in the Marketplace, contains methodological errors and unfounded conclusions.

In view of the seriousness of the concerns you have expressed about the manner in which this work was performed, the report and the work on which it is based have been reviewed by GAO's Assistant Comptroller General for Policy, who was not involved in the assignment.

On the basis of this review, we believe that our work supports our conclusions about each case study we reviewed, and that our work was performed with due professional care consistent with generally accepted government auditing standards; GAO's standards, policies, and procedures; and the standards provided by the Office of Management and Budget (OMB) for evaluating the costs and benefits of federal activities. Enclosure I provides a point-by-point response to your specific concerns about our analysis of each of the nine case studies mentioned in your letter.

OBJECTIVES OF OUR REVIEW

Our objectives were to determine whether (1) DOE provided reasonable support that the benefits cited in the report resulted from DOE's investment and (2) Success Stories can be used to assess the overall value of DOE's applied research and development (R&D) programs.

METHODOLOGY APPLIED

Consistent with these objectives, we determined whether DOE could document each claim and assessed its analyses and studies supporting these claims. In some instances, DOE's analyses or studies were based on multiple assumptions or reached more than one conclusion. In such instances, we sought support for each assumption or conclusion. However, we accepted DOE's estimates when they involved models that calculated the energy savings or other benefits of the technology. Performing an evaluation of these models was beyond the scope of our work. Our standard of evidence for support was written documentation provided by DOE. We requested oral explanations for clarification or in those instances in which agency officials, following repeated requests, did not provide written documentation.

Our analysis is entirely consistent with the standards of analysis put forward by OMB in Circular No. A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," which must be adhered to in all analyses submitted to OMB in support of legislative and budget programs. This circular provides guidance on the use of incremental benefits and costs, appropriate use of discounting, and treatment of interactive effects. We applied all of these in our analysis.

BASES FOR OUR FINDINGS AND CONCLUSIONS

As we stated in our report, to accomplish the first objective we selected 15 of the case studies in Success Stories for detailed review. We found several types of problems or weaknesses in the documentation DOE provided us as support for the benefits claimed in the case studies. When the supporting documentation identified multiple assumptions or conclusions, the presence of any single weakness in these assumptions or conclusions was reflected in the table enclosed with our report. The background document mentioned in your letter was used to brief DOE and your staff and was not enclosed with our report. The interviews cited in the background document, such as an interview with an official of the California Air Resources Board, took place primarily when we sought clarification because of insufficient information. Our report makes clear that (1) the identification of a problem or weakness in a research project does not mean the project is unsuccessful and (2) although these problems cause us to question the amount of benefits claimed, substantial benefits may still be attributable to some of the projects.

In a meeting held on April 10, 1996, to obtain DOE's comments on a draft of our report, DOE officials expressed concern that some readers of our report would see it as a general condemnation of DOE's R&D programs. They also stated that the enclosure to our draft report summarizing the types of problems we found conveyed the message that the cases we identified as having problems were failures, with no benefits. However, DOE officials, including the Acting Assistant Secretary for Policy, acknowledged that our review revealed several errors in the analysis supporting the benefits cited in Success Stories and said that the Department intends to upgrade its quality control over such reports in the future.

Regarding our conclusion that Success Stories cannot be used to assess the overall value of DOE's applied R&D programs, we note that, in a meeting held on November 1, 1995, a Special Assistant in DOE's Office of the Secretary characterized Success Stories as a hastily prepared document meant to counteract criticism stating that DOE's applied R&D programs have produced few successes. Success Stories presented the benefits as anecdotes illustrating some of the positive outcomes of DOE's applied energy R&D programs rather than as a precise estimate of the net economic gains to society. As we stated in our report, we believe that Success Stories accomplishes that objective.

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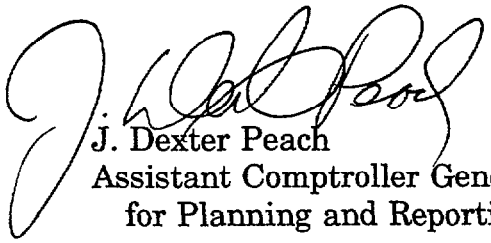
In summary, we continue to stand behind our report, which found weaknesses in the support DOE used to document the claims of economic benefit made in many of the Success Stories case studies we examined. These weaknesses cause us to question the amount of benefits claimed for these cases--even though we recognize that some of these projects may still be considered "successes." Our report fairly concludes that reports like Success Stories are not very useful for evaluating DOE's overall applied R&D programs, regardless of how well they are prepared, because they (1) do not consider overall program costs and (2) look only at a very small percentage of the projects in DOE's applied R&D programs. In addition, we note that the benefits cited in Success Stories do not necessarily represent the net economic benefits to society. Rather, as we stated in our report, a comprehensive analysis of all of DOE's R&D programs should rigorously consider all of the costs and benefits. We also believe that such a review should use widely accepted economic guidelines such as those provided by OMB. In addition, consistent with our previous work in this area, we believe that DOE needs to evaluate whether the private sector could or should be conducting this research.

We hope that this information responds to the concerns you expressed in your letter. I would be glad to meet with you if you have any further questions.

Sincerely yours,



J. Dexter Peach
Assistant Comptroller General
for Planning and Reporting

Enclosure

GAO'S RESPONSES TO SPECIFIC CONCERNS

The following are GAO's responses to the specific concerns you expressed about the technologies we examined in our review of DOE's Success Stories report (GAO/RCED-96-120R, Apr. 15, 1996).

1. Fluorescent electronic light ballast, low-emissivity windows, flame retention head oil burner. Your letter states that we "had no problem" with DOE's analyses or benefits in these cases. This portrayal of our position is not accurate. Our report concludes that DOE's claims about these case studies were based on inadequate support. In the case studies on the ballast and on low-emissivity windows, DOE did not include an analysis of the higher cost of the technology to the consumer. For example, DOE did not consider that a fluorescent electronic light ballast costs a consumer $8 more than the conventional magnetic ballast. When this price premium is considered, consumers spent $52 million more for fluorescent lamp electronic ballasts than they saved in energy bills during the period DOE examined (January 1988 to April 1995).

In the case study on the flame retention head oil burner, we were concerned about the implied linkage between DOE's investment in the project and the $5 billion in energy savings DOE attributed to the technology. As Success Stories reports, DOE's role was limited to testing and publicizing the technology, which subsequently captured the market following the energy crisis in the 1970s. According to a DOE official, DOE's efforts accelerated the commercialization of this technology by 5 to 6 years. Thus, we believe a more reasonable estimate of the benefits of DOE's investment in this project would be based on the savings attributable to the early introduction of this product. DOE later claimed that this technology might not have been commercialized without its efforts, but failed to provide convincing support for this claim.

Your letter also states that we believe DOE should have used "an alternative or a longer, more involved analysis" to address these problems. For these three cases, we believe that adequate support could have been provided without a longer, more involved analysis. For example, although the value of the energy savings may exceed the ballast's higher price over a longer period of time, we believe that DOE should have included the higher price in its calculation. Such an analysis would not have required much additional work because DOE had this information in hand.

2. Nickel metal hydride battery. Your letter states that although we critique DOE's use of an environmental mandate to illustrate the success of the battery, we acknowledged in a meeting with your staff that "the market exists none-the-less." We believe that the California mandate for electric vehicles created a potential market

for all technologies for these vehicles, not just the nickel metal hydride battery. Also, a potential market does not mean that this battery or any technology will be technically feasible or economically viable. These two points form the basis for our conclusion that DOE did not adequately support the benefits claimed.

Industry analysts also question whether this battery will ever be competitive in an open market that includes gas-powered cars. In a recent report, we said that at the price projected for the battery, large subsidies will be needed to sell the electric vehicles that use it.[1] Although research has developed a battery that can meet mid-term performance goals, many industry analysts question whether the battery will enable electric vehicles to perform well enough to have wide appeal to large numbers of consumers. It remains unclear whether the feasibility of a long-term battery--one that can compete in performance and cost with gas-powered vehicles--will be demonstrated.

We did not make a math error in estimating the price of the battery DOE used to calculate future sales. DOE estimated the price at $7,500 per battery. Our concerns were that this price (1) does not reflect the cost of the battery at today's level of technology ($12,000), (2) exceeds the Advanced Battery Consortium's mid-term goal by $3,000, and (3) would require large subsidies to make electric vehicles marketable, according to industry experts.

3. AC electric drive train. Your letter states that "GAO relied upon hearsay evidence" from the California Air Resources Board to repudiate DOE's claim. Our conclusion was not based on the conversation referred to in your letter. During our review, a DOE official told us that General Motors-Delco and Chrysler-Westinghouse had independently developed AC electric drive trains, leading us to question whether DOE could take sole credit for the projected benefits of this technology. DOE said that its research had spurred General Motors and Chrysler to develop their own technologies. However, DOE provided no evidence to document its claim. As a result, we concluded that the technology was not directly linked to the benefits that DOE cited. The purpose of our conversation with an official of the California Air Resources Board was to learn whether the board had created its electric vehicle mandate in response to the development of the AC electric drive train, not why GM and Chrysler had developed their own drive trains.

4. Integrated gasification combined cycle (IGCC). Your letter states that our only criticism of DOE's analysis was that it neglected to discount DOE's claimed benefit.

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[1]Electric Vehicles: Efforts to Complete Advanced Battery Development Will Require More Time and Funding (GAO/RCED-95-234, Aug. 17, 1995).

We believe this is an important weakness in the supporting analysis. An economic analysis that projects income from sales far into the future should account for the time value of money. As we state in our report, discounting can have a dramatic effect on the analysis. For example, the conservative rate we used (6.33 percent) reduced the value of the benefit claimed for this technology by 71 percent, or about $106 billion. Although DOE did not state in Success Stories that it had discounted its number, we believe it should have employed this common economic technique. Moreover, DOE appears to have recognized the importance of discounting in another case describing the benefits of the fluorescent electronic light ballast.

Your letter also suggests that we downplayed the importance of the $44 billion revised sales estimate. Our analysis was focused solely on arriving at a sales figure that reflected the time value of money. Furthermore, we note that the $44 billion in projected IGCC sales by domestic manufacturers may exceed the net economic gain from this technology. For example, DOE did not compare its sales estimate to the sales of competing technologies that would have occurred if IGCC had not been developed. OMB Circular A-94 suggests that a benefit-cost analysis should identify the extent to which a policy promotes substitutes for activities of a similar nature that would occur without the policy.

5. Atmospheric fluidized bed coal combustor. Your letter identified a problem with GAO's assessment of the DOE estimate of jobs created as a result of this technology. In fact, our concern was focused on DOE's lack of adherence to a rigorous method of calculating the technology's net impact on the job market. The basis for our conclusion that this technology did not necessarily result in an increase of 250,000 jobs is the guidance provided by OMB Circular A-94, which, as mentioned above, states that an analysis should identify the extent to which a policy promotes substitutes for similar activities that would occur without the policy. Because replacement technologies could have resulted in just as many jobs, the net impact on jobs is uncertain.

6. Electrochemical dezincing of steel scrap. Your letter states that we improperly based our criticism of DOE's claim of success on an inference that production costs were lower in other countries. It also states that we did not accurately calculate the energy that will be saved by this technology.

Regarding our critique of DOE's claim of success, our conclusion was based on the fact that DOE could not support its assertion in Success Stories that all zinc produced from steel scrap would displace imported zinc. In our review, we learned that over two-thirds of the zinc consumed in the United States is imported. This figure suggests that imported zinc is at least competitive on price and other terms with domestically produced zinc. Even if the new process allows zinc to be produced at a

lower cost than the existing domestic or imported sources, there is no reason to believe that the new production would displace only imports.

Your letter further notes that investigations by your staff revealed that Canada--the largest exporter of zinc to the United States--produces zinc at a higher price than domestic producers. We believe that Canada's position as the largest exporter of zinc to the United States indicates that its prices and other terms must be competitive with those of other suppliers, irrespective of production costs.

As to the amount of energy that will be saved by this technology, our background document, which was shared with DOE throughout our review, questioned whether DOE had made consistent assumptions in its analysis of the energy savings. Upon further review, we agree that DOE's assumptions were consistent. However, it is important to note that this issue was not included in our report, nor did it form the basis for our conclusion that DOE's supporting analysis was weak.

7. Mud pulse telemetry. Your letter states that there are "no means to accurately calculate benefits" for such "breakthrough technologies." You further question our critique of the supporting analysis for this case, stating that the technology is an obvious success. Although it is clear that this technology has cut costs for the oil and gas drilling industries, the basis for the conclusion in our report is that DOE used a weak methodology to calculate the cited benefits. The supporting documentation for the benefits claimed for this technology states that DOE used the cumulative sales of the mud pulse telemetry service to determine how much the technology has saved the oil and gas drilling industry. As we stated in our report, a better measure of the value of this technology is the amount of money industry has saved using it; that is, the difference between what the industry has spent on the technology and what it would have spent on the next best process. In responding to our initial findings, DOE justified the cited benefits by assuming that the technology's benefit equals 8 percent of the drilling industry's cumulative sales. DOE provided no support for this assumption.

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