



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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September 30, 1981

ENERGY AND MINERALS
DIVISION

B-204902

RELEASED

The Honorable James A. McClure
Chairman, Committee on Energy and
Natural Resources
United States Senate



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Dear Mr. Chairman:

Subject: Comparison of Management, Overhead, and Direct Costs of Six Projects Managed by the Department of Energy and Government-Owned, Contractor-Operated Laboratories (EMD-81-137)

This report responds to your request for management, overhead, and direct cost data on six Department of Energy (DOE) projects--three managed directly by DOE and three managed for DOE by Government-owned, contractor-operated (GOCO) laboratories. You requested this data so that the management and overhead costs of DOE-managed projects could be compared with similar GOCO-managed projects. Your office believes this comparison would help determine which type of management is less costly to the Government and whether DOE should consider costs before it decides to contract out for project management services.

Unfortunately, the cost data we collected are inconclusive. Certain DOE management costs are missing (because DOE did not routinely collect or assign them to the projects) and six projects, we feel, are not enough on which to base general conclusions. We did not look at more than six projects because of the specific directions and limited time frames stipulated by your committee's staff.

We have previously briefed your staff on this subject, and at its request, are presenting the information we collected in enclosure I, which includes the summary chart of the cost data on the six projects as well as some explanatory information.

OBJECTIVES, SCOPE AND METHODOLOGY

The objective of this report was to collect cost data on six DOE projects. These projects, according to your request, were to be recently or nearly completed and grouped into three pairs according to type and size: \$100 million construction,

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\$10 million construction, and \$3 million report-oriented research projects. In addition, one project in each pair was to be managed by DOE and the other by a GOCO.

We selected the six projects from lists provided by DOE. We did not use scientific selection methods but attempted to pick projects which would not only meet your selection criteria but would also be as close in scope as possible. For instance, we only selected advanced-technology construction projects because they require more management attention than standard construction projects, such as those for office space. Mixing these two types of construction projects could have distorted the data and made it less comparable. Also, we only selected research projects that had clear starting and target completion dates. This, we hoped, would help us determine which type of management is more efficient at meeting prescribed time and cost milestones. (Enclosure II identifies and describes the six projects selected for review.)

We were unable, however, to identify a GOCO-managed, report-oriented, research project in the \$3 million range. These types of projects were either much less than \$3 million in cost, hardware rather than report-oriented, or multi-year projects without a specified end date or product. Therefore, we selected the largest applicable GOCO-managed research project we could find and paired it with a similar DOE-managed project. These two projects are valued at approximately \$1 million each rather than the \$3 million you requested.

We also had difficulty identifying both the large and small GOCO-managed construction projects. DOE was unwilling to concede that any of these projects were GOCO-managed without some degree of DOE oversight. Therefore, after reviewing many projects in which DOE and GOCOs provided joint management, we selected two somewhat unique projects that seemed to be predominately GOCO-managed.

DOE, either at headquarters, an operations office, or a GOCO, had records tracking most costs associated with the six projects. Usually, however, these data were not readily available in the form we needed. It was necessary, therefore, to visit several DOE and contractor locations (in Denver, Colorado; Idaho Falls, Idaho; and Princeton, New Jersey) or request that the appropriate officials either summarize or reconstruct the project costs.

In this respect, DOE and contractor personnel were very cooperative and provided much of the data required for this review. DOE for instance, retroactively estimated its staff time as well as the cost of consultants for each of the six projects. This was necessary because DOE does not keep track of

or assign these costs to projects. We used this information to estimate the DOE management costs shown in the enclosed summary chart. We did not, however, attempt to estimate the DOE overhead costs which would normally be assigned to the projects if such costs were kept. In addition, we did not attempt to verify the accuracy of the cost data provided to us by DOE or included in its (or its contractors') records.

LACK OF SOME DATA MAKES
COMPARISONS SUSPECT

Unfortunately, the data we collected are both incomplete and inconsistent. Thus, we are unable to reach supportable conclusions about the preference of DOE project management over GOCO management. For instance, when comparing the projects by their three cost elements--management, overhead, and direct costs--two of the DOE-managed projects (the \$10 million construction and research projects) had relatively lower management and overhead costs and higher direct costs than the GOCO-managed projects. This could indicate that DOE-managed projects are more efficiently run and that DOE is getting more value (in terms of direct costs) for each dollar spent. However, because the data does not include reliable estimates of DOE management and overhead costs, we are not sure whether this assumption is valid.

More importantly, we did not attempt to determine the reasons for each project's management and overhead costs. Thus, we do not know whether these costs resulted from the management approach used or other factors unique to those projects. For instance, the third group of projects (\$100 million construction) show the opposite result of the first two. In this case, the DOE project (H-Coal Pilot Plant) experienced higher management and overhead costs than the large GOCO-managed project. From a previous review of this project, ¹/ however, we know that it had extensive difficulties which accelerated its management and overhead costs. Therefore, the project may not be representative of a typical DOE-managed project. This could equally be true of the other five projects in our sample.

GOCO-MANAGED PROJECTS STAYED
CLOSER TO TARGETED COSTS AND
SCHEDULES

As the chart in enclosure I shows, we found that the GOCO-managed projects stayed closer to their projected costs

¹/U.S. General Accounting Office "Controlling Federal Costs for Coal Liquefaction Program Hinges on Management and Contracting Improvements," PSAD-81-19, February 4, 1981.

and schedules than the DOE-run projects. This was also true of one DOE-managed project (the Pilot Geothermal Power Plant) which had major management input from a GOCO. Thus, it is possible that GOCO-managed projects--although costing more in terms of management and overhead--are more efficiently run. As with the previous section, however, our limited sample made it impossible to project whether these projects are representative of others with major GOCO participation.

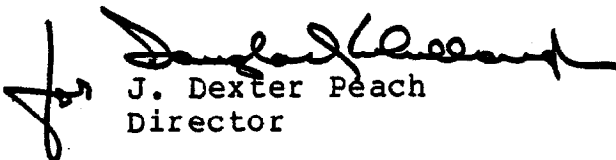
We do know, however, that DOE relies extensively on GOCOs or other contractors for management support on most of its projects. Of the six projects we reviewed, for instance, DOE contracted with GOCOs or others for large portions of the project management. This was true even for the three projects which we considered DOE-managed. In those, the contractor management support costs were as much as, and sometimes substantially more than, DOE's management costs. In the H-Coal Pilot Plant, for example, DOE spent about \$3 for outside management for each \$1 spent on in-house management. According to DOE officials, this was due primarily to the lack of sufficient DOE management personnel.

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Because this report does not contain specific conclusions on DOE operations or recommendations for corrective action, we did not obtain DOE comments. Also, as arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested parties and make copies available to others upon request.

We hope that this information adequately responds to your committee's request. If we can be of further assistance, please do not hesitate to let us know.

Sincerely yours,


J. Dexter Peach
Director

Enclosures - 2

COMPARISON OF COSTS FOR DOE AND GOCO-MANAGED PROJECTS												
	Large Construction Projects — \$100 Million				Smaller Construction Projects — \$10 Million				Research Projects			
	H-Coal (DOE)		Positron-Electron Joint Project (GOCO)		Geothermal Power Plant Thermal Loop (DOE)		Neutra Beam Project (GOCO)		Solar Chiller Project (DOE)		Gallium Arsenide Solar Cell Project (GOCO)	
Original Cost Estimate	\$ 86,300,000		\$78,000,000		\$11,400,000		\$11,300,000		\$1,380,509		^{2/} \$ 916,640	
Project Cost to Date (PC)	137,933,836		78,081,100		13,717,214		11,992,382		1,676,996		^{2/} 1,064,020	
Start-Finish Dates	Jan. 1977 to Dec. 1979		Apr. 1976 to Apr. 1980		July 1976 to Sept. 1980		May 1978 to Mar. 1981		Sept. 1979 to (d)		Jan. 1979 to Sept. 1980	
Item	Cost	% of PC	Cost	% of PC	Cost	% of PC	Cost	% of PC	Cost	% of PC	Cost	% of PC
A. Management												
DOE (note a)	\$ 4,753,428	3.4	\$ 579,720	0.7	\$ 396,810	2.9	\$ 10,781	0.1	\$ 43,849	2.6	\$ 4,615	0.4
Laboratory (GOCO)	—		1,458,500	1.9	414,500	3.0	794,803	6.6	—		^{2/} 16,887	1.6
Other Contractors	14,635,439	10.6	3,166,600	4.1	—		—		—		33,000	3.1
Total	19,388,867	14.0	5,204,820	6.6	811,310	5.9	805,584	6.7	43,849	2.6	54,502	5.1
B. Overhead												
DOE (note b)	—		—		—		—		—		—	
Laboratory	—		2,247,800	2.9	1,417,014	10.3	2,627,682	21.9	—		^{2/} 33,113	3.1
Other Contractors	21,164,852	15.3	981,100	1.3	—		109,676	0.9	697,859	41.6	501,670	47.1
Total	21,164,852	15.3	3,228,900	4.1	1,417,014	10.3	2,737,358	22.8	697,859	41.6	534,783	50.2
A & B Total	40,553,719	29.4	8,433,720	10.8	2,834,028	16.2	3,542,942	29.5	741,708	44.2	589,285	55.3
C. Direct Costs												
DOE	—		—		—		—		—		—	
Laboratory	—		32,082,495	41.0	70,000	0.5	7,472,147	62.3	—		—	
Other Contractors	102,133,545	74.0	38,144,605	48.9	11,815,700	86.1	988,074	8.2	979,137	58.4	479,350	45.1
Total	102,133,545	74.0	70,227,100	89.9	11,885,700	86.6	8,460,221	70.5	979,137	58.4	479,350	45.1
Total — A, B, & C (note c)	\$142,687,264	103.4	\$78,660,820	100.6	\$14,114,024	102.8	\$12,003,163	100.0	\$1,720,845	102.6	\$1,068,635	101.4

^{2/} These are estimated costs based on the best guess of DOE to GOCO project managers.

^{2/} DOE did not accumulate or assign overhead costs to projects. Because of the complexity, we did not attempt to estimate these costs.

^{2/} These totals are more than 100 percent because DOE management costs are not included in project costs.

^{2/} This project has experienced technical difficulties, and its completion date is uncertain.

^{2/} Figure includes \$50,000 (\$16,887 + \$33,113) for laboratory management and overhead costs. These costs were not included in DOE's official project costs but were in other GOCO contract cost estimates.

The table on page 1 separates the latest estimate of each project's cost into three categories: management, overhead, and direct costs. In each case, the dollar amounts are shown as well as their percentages of the projects' total cost. The percentages add to more than 100 percent because DOE's management costs are not included in the official project costs. The following sections explain the costs included in the three major categories and identify data limitations as appropriate.

MANAGEMENT

Management costs are subdivided into DOE, GOCO, and other contractor cost elements. DOE management includes the cost of the in-house staff (at headquarters and field offices) as well as that of consultants who worked specifically on the six projects. Because it does not regularly accumulate these costs by projects, however, DOE, at our request, estimated the consultant costs and the in-house staff time spent on each project. We, in turn, converted the staff time to a cost by multiplying it by the average salary of the employees who helped manage the projects. The resulting dollar figures, therefore, are rough estimates.

The GOCO management costs for the construction projects are much more precise. In each of these, the GOCO management costs had been accumulated and included in the projects' costs. This was not true, however, for the GOCO research project managed by the Solar Energy Research Institute (the Polycrystal Gallium Arsenide Solar Cell Project). Thus, the Institute, at our request, estimated its management costs for this project.

The management costs of other contractors were specifically identified (when applicable) in DOE's or the GOCO's cost records. They reflect the cost of contractors hired to provide management direction or support for the six projects.

OVERHEAD

Overhead, the second major cost category identified in the summary table, includes the cost of functions required to maintain an organization, but which are not related to any single project. Examples would include top departmental or corporate management as well as accounting and personnel operations. These costs, in most situations, are accumulated and distributed (in some equitable manner) to projects or other operations of the organization.

For the GOCOs (other than the Solar Energy Research Institute) and other contractors, the overhead costs had been

accumulated by DOE and were readily identifiable. DOE, however, does not accumulate or assign overhead costs to projects. Because of the complexity of identifying all of DOE's overhead costs and determining the rate that should be assigned to projects, we excluded them from our review. The Research Institute, however, estimated the amount of overhead that should be charged to the Gallium Arsenide Solar Cell Project.

DIRECT COSTS

The final category is direct costs. This includes the GOCO and contractor material and labor charges that are spent directly on the primary output of the project. These were accumulated, charged to each project, and readily identifiable. There are no DOE direct costs because these charges are normally expended under contracts with GOCOs or other contractors.

PROJECT DESCRIPTIONSLARGE CONSTRUCTION PROJECTS

- The H-Coal Pilot Plant at Catlettsburg, Kentucky--a DOE-managed project--is intended to convert 200 to 600 tons of coal a day into synthetic liquid fuel. Construction started in January 1977 and was completed in December 1979, 15 months later than planned. During this period, costs escalated from \$86.3 million to over \$137.0 million. DOE used its staff at headquarters, the Oak Ridge Operations Office, and the Catlettsburg site office, and a variety of consultants to manage the design and construction efforts of the project's several major contractors.
- The Positron-Electron Joint Project--a GOCO-managed project--was constructed at the Stanford Linear Accelerator Center to study a broad range of fundamental particle physics questions in a new and presently inaccessible energy range. Construction began in April 1976 and was completed in April 1980, 3 months ahead of schedule. The completed project cost was only \$81,000 more than the first approved estimate of \$78,000,000. Stanford and the University of California's Lawrence Berkeley Laboratory--both GOCOs--managed the project with little outside management or technical contractor support.

SMALL CONSTRUCTION PROJECTS

- The 5-Megawatt Pilot Geothermal Power Plant Thermal Loop Facility at Raft River, Idaho--a DOE-managed project--is intended to determine if it is economically, environmentally, and technically feasible to use moderate temperature (300° F) ground water to produce electric power. Construction began in August 1978 and was completed in September 1980, 3 months late. The original \$8.5-million estimate increased to \$14 million by the end of the project. Three million of the increase resulted from adding a turbine that the utility participant was supposed to provide. DOE staff at headquarters and the Idaho Operations Office managed the project using the Idaho National Engineering Laboratory--a GOCO--as project manager. DOE thus received management support from the Idaho GOCO and, to a lesser extent, from other national laboratories.
- The PDX6-Megawatt Neutral Beam project--a GOCO-managed project--was constructed at the Princeton Plasma Physics Laboratory. The project's objective is to advance

fusion energy research by installing four devices called particle beam lines on Princeton's PDX-fusion device and using them to generate the heat needed to cause fusion. The project began in May 1978 and was completed in March 1981, 13 months later than planned. The delay seems largely to have resulted from Princeton's decision to delay this project so that work could be done on another project at the laboratory. The project cost increased from an original estimate of \$11,300,000 to \$11,992,382. Princeton managed the project which called for support from the Oak Ridge Operations Office. The project required little outside management or technical support.

RESEARCH PROJECTS

- The High-Temperature Solar-Powered Water Chiller--a DOE-managed project--is intended to obtain high-efficiency performance from low temperature, solar-generated heat. The project began in September 1977 with the original completion scheduled for September 1980. Technical problems have delayed the project, and no completion date has been set. The first approved project cost was \$1,380,509; the cost to date is \$1,676,996, and DOE estimates the project will likely cost \$1.9 to \$2 million. DOE used a variety of consultants to review and evaluate the project and to assist in problem solving.

- The Polycrystal Gallium Arsenide Solar Cell Project--a GOCO-managed project--is intended to construct gallium arsenide solar cells that will convert light energy from the sun directly to electric energy 10 percent more efficiently than previous gallium arsenide compounds. The project began in January 1979 and was completed after two modifications, in September 1980, 9 months later than planned. The project cost increased from an original estimate of \$866,640 to \$1,014,020. DOE's Solar Energy Research Institute managed the efforts of a contractor who, in turn, coordinated the work of three universities. The Institute thus relied on the coordinating contractor for technical and managerial support.