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Report 513-17-13

AC01-77ET 28495

DOE/ET/28495--T1

DE84 009520

MANAGING FOR SUCCESS:
DEVELOPING AND EXPLOITING INTERNATIONAL OPPORTUNITIES
IN
GEOTHERMAL ENERGY

Prepared for the
U.S. Department of Energy
Division of Geothermal Energy

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July 1981

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FOREWORD

"Cheshire-Puss," she began, rather timidly..."Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where," said Alice.

"Then it doesn't matter which way you go," said the Cat.

Lewis Carroll

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INTRODUCTION

Background

In 1977-78, the Carter administration enunciated two policies which promised to affect the Division of Geothermal Energy (DGE) profoundly. The first of these, a sub-set of its national energy policy, was designed to spur commercial development of new energy technologies. The second initiative, a sub-set of the administration's general foreign policy, was designed to promote international economic development. The Carter initiatives suggested that mission agencies, such as DGE, could and ought to contribute to the achievement of objectives which were not traditionally or explicitly linked to their own specific technical goals.

These mandates held clear implications for DGE's international effort. In the first instance, President Carter's commercialization policy suggested that DGE should be concerned with promoting exports of hardware and other U.S. technology in order to build an overseas market which could help to sustain the fledgling domestic industry. In the second case, the Carter's administration development policy suggested that DGE should focus extensively on developing countries as potential partners for technical assistance or research and development (R&D) projects. In general, it was reasoned that such cooperation not only would further U.S. and international economic development goals, but would help to strengthen the position of the U.S. geothermal industry as well.

The implications of Carter's mandates posed a problem of no small proportion to DGE. Clearly, Carter's initiatives not only required an understanding of what was to be done, but required the presence of certain organizational and managerial tools necessary to carry out the initiatives as well. Although DGE understood what was required, they lacked confidence in the ability of their "international machinery" to do the job appropriately and effectively.

DGE's international activities had, in large part, not been the result of DGE's own doing. In many cases,¹ DGE's international activities had accrued to the division simply as a result of federal reorganization. In those few cases in which DGE had actually participated in the development of international activities, the agreements and projects that resulted seemed to reflect more the dominance of the negotiators' sense of purpose, than the dominance of a divisional strategy. Simply put, DGE lacked the organizational and managerial machinery necessary to integrate President Carter's initiatives with its own technical program.

Neither of the initiatives outlined above has ever been fully implemented, at least within DGE's domain of responsibility. With the arrival of the Reagan administration, a new set of initiatives has emerged and has effectively supplanted the Carter policies. First, mission agencies' roles have been narrowed significantly to extend only to the bounds of their generic interests. This has meant that DGE's focus in international activities will once again rest almost exclusively on technical objectives; other objectives will probably continue to be served, but they alone will not be sufficient motivation to pursue international cooperation. More important, perhaps, the Reagan administration has redefined DGE's scope of technical interests: away from near-term technological development, and in favor of longer-term, and more basic, R&D. Finally, the Reagan administration has reasserted the notion of program and budget accountability. Not only must DGE's international activities contribute to the achievement of programmatic goals in appropriate ways, but they must also do so effectively.

DGE must now shift its focus away from the demands of export promotion and technical assistance, to a more narrowly defined technical program and an increased need for greater accountability. DGE is, however, no more prepared to integrate President Reagan's policies now, with regard to its international effort, than it was prepared to integrate President Carter's policies three years ago. This study is designed to assist DGE in determining how best to structure, organize and manage its international effort to ensure DGE of consistent, significant and cost-effective benefits.

¹See, for more information, M. Oppenheimer, E. Fein, and J. Bye, "International Programs and Agreements in Geothermal Energy," Report #361-117-04, The Futures Group, June 1978.

Study Purpose

At its most fundamental, this study is designed to assist DGE in deciding what kind of strategy it wants and needs in order to make its international effort as cost-effective and appropriate as possible. More specifically, the purpose of this study is to construct a logic base on which DGE can, in turn, establish its own strategy for international cooperation, and can begin to plan for necessary organization, procedural and policy reforms. This report will constitute a set of decision guidelines for DGE to consider in determining the nature of future strategy-related reforms.

Study Approach

The approach employed in this study to develop an appropriate logic base for DGE decisionmaking was straightforward. Utilizing extensive documentation and expert opinion, the study team identified numerous concerns about DGE's approach to, and the results of, its international effort. The study team then constructed a framework for analysis which permitted it to generalize about those concerns in a way that suggested something meaningful in terms of the need for both a strategy and specific reform measures. Building on that framework, the study team constructed a normative strategy that could serve as a goal for DGE's ultimate reforms. Recognizing, however, that a normative goal is only an ideal, and that several expressions of more realistic approaches would be appropriate, the study team identified and examined three possible strategic scenarios. Each scenario reflected a different level of commitment and priority toward the development and implementation of DGE's international effort. Based on an assessment of each strategy's possible feasibility and impact, the study team then selected one of the strategic scenarios and recommended it as a model for the purpose of identifying necessary reforms. The study team's final effort was to identify and articulate several reforms which could be initiated without great cost in the very near future.

Report Organization

The chapters which follow closely approximate the study's methodological approach, both in terms of sequence and focus of interests. In order to make the presentation of its analysis and findings as clear as possible, the report is

organized around five questions. Each chapter asks, and then answers, the question on which it is centered, thereby addressing each major research need and contributing to the overall logic base which is the essential product of this study. The chapters and questions are as follows:

1. What are the deficiencies in DGE's current approach?
2. What should an international strategy for DGE ensure?
3. How can an international strategy for DGE be manifested?
4. Which strategic model presents the best opportunity now?
5. How can the recommended alternative be achieved?

QUESTION 1: WHAT ARE THE DEFICIENCIES IN DGE'S CURRENT APPROACH?

WHAT ARE THE DEFICIENCIES IN DGE'S CURRENT APPROACH?

Preliminary Indications

According to interviews with experts in DGE's international efforts, there is substantial reason to be concerned about DGE's approach to the development and use of international opportunities. Expert opinions revealed concerns, for example, about:

- Too wide a variation in benefits and cost. The experts suggested that, although costs associated with DGE's international activities have, in general, been less significant than those associated with its domestic activities, benefits have been irregular, and there has been little consistency in the correlation of cost-to-benefits--either within or among DGE's international activities.
- Missed and mismanaged opportunities. Many experts felt that developed and developing country geothermal R&D programs alike merit closer and more regular scrutiny. They often cited inquiries by foreign nationals (scientists and industrialists) to indicate that there have been interests and pools of R&D resources which DGE has either not explored adequately, or not tapped effectively. Participants regularly cited as well examples of conferences or other cooperative endeavors which occasioned instances of personal embarrassment, or risked political/diplomatic rows, each of which was traceable directly to DGE's management of the situation.
- The apparent trauma DGE has endured when faced with policy directives that have required a change in the scope or focus of its international efforts. The experts felt that DGE's international component should not have been quite so susceptible to the vagaries of domestic politics, or to the personal ambitions of any single individual. They suggested that there must

be a way to make DGE's international component more immune to such forces, and still maintain adequate flexibility and responsiveness.

- A general inability to promote or ensure U.S./DGE interests adequately in relationships with foreign partners. The experts were bothered by a perceived lack of U.S. control, or even influence, particularly in multilateral settings. In general, this concern reflected considerable doubt that DGE could manage the political element which inheres to international cooperation.
- Finally, the development of a general stagnation which has seemed almost to preclude any new or follow-on international efforts. The experts cited this apparent retrenchment in terms of international activities as being more than a function of diminished budgets; they felt that it was a basic, if not conscious, declaration of policy designed to diminish significantly the role of DGE's international effort.

The Probable Causes

In general, many of the experts interviewed for this study attributed these problems to three factors which have come to characterize DGE's traditional approach to the development and use of international opportunities:

- First, to a persistent and dominant rationale that international opportunities exist only as isolated activities; that they ought not to be linked, and often cannot be linked, to DGE's domestic activities, or even to DGE's technical development program in general.
- Second, to a persistent and dominant organizational mode which not only permits, but actively promotes, highly personalized efforts in developing and utilizing international resources.

- Finally, to a persistent and dominant procedural mode which prefers the ad-hoc approach to the exclusion of all others.

In explaining the roles of these three factors as roots of the international effort's problems, the experts suggested that:

- First, DGE's current and traditional rationale for international activities has tended to trivialize the international effort as a whole. The current rationale fails to establish consistently clear linkages between DGE's technical development goals, and the objectives of international cooperation. Without clear guidelines, and a sense of linkage, DGE risks international activities which border on the inappropriate. If DGE's international activities are not formulated according to a clear notion of what is required and permissible in terms of objectives, then the benefits of international cooperation will always be in some doubt. DGE's current rationale has tended to reinforce the lack of clear linkages and policy guidelines for developing and utilizing international sources of R&D.
- Second, DGE's current and traditional organizational approach to developing and utilizing international opportunities has made the success and failure of international cooperation more a function of personal power and initiative than a function of each activity's internal merits. It stands to reason that, in a highly personalized system, individuals with sufficient power and motivation can impose or deny activities (on or to the division)--activities which may or may not be appropriate. In a highly personalized system, it also stands to reason that senses of commitment to individual activities may well vary from manager to manager. This poses obvious problems for ensuring a consistent level of attention and effort on the parts of project managers in negotiating or implementing international activities. Moreover, the personalized approach risks significant trauma to international cooperative relations whenever staffing needs require changes in project manager assignments.

- Finally, DGE's current and traditional procedural approach to developing and utilizing international opportunities has made each activity an exercise in "reinventing the wheel." The lack of standard operating procedures has meant that coordination of DGE, contractor and DOE support services has been a constant and major problem. Rather than flowing predictably from effort to effort, DGE's international activities--indeed, the effort as a whole--has tended to be response-driven and often crisis-oriented. Poor preparation for conferences, poor attendance at scheduled meetings, and inadequate reporting and documentation are not regular features of DGE's international cooperation, but they are too frequent to allow them to go unnoticed.

The experts interviewed for this study often suggested that the fundamental problems and deficiencies outlined above could be directly and appropriately attributed to a lack of planning and oversight in DGE's international effort. More than that, they suggested that there was a pronounced lack of strategy. The remainder of this report is dedicated to articulating a logic base on which DGE can construct an appropriate and effective strategy for developing and utilizing international opportunities.

What is a Strategy?

According to Webster, "strategy" may be defined as

- "...a careful plan or method"..."the art of devising or employing plans or stratagems toward a goal."

That definition may be somewhat misleading, for it gives the immediate impression that a strategy might well be expressed in a single isolated act or pronouncement. In truth, a strategy is a complex of actors and their roles, institutions and their structures, and procedures and their functions. It is a complex choreography which requires foresight, planning, active oversight, and a willingness to take prescriptive action whenever necessary.

A strategy can be conceived of in a number of ways. It can be conceived of in terms of its goals and objectives. In DGE's case, a strategy for developing and utilizing international sources of R&D might have as its scope geothermal

technology development in general. As its focus, it might emphasize the objectives and priorities of DGE's technology development program.

DGE's strategy also might be conceived of in terms of its fundamental components: an underlying or motivating rationale; organizational roles and responsibilities, and general operating procedures and their functions. The underlying rationale might well specify a cost-benefit assessment for determining when and how DGE might want to develop and employ an international opportunity over a similar domestic opportunity. Organizational roles and responsibilities would be clearly enunciated in terms of both the development and utilization of international activities. Similarly, general operating procedures would be standardized, and would be clearly linked to planning and oversight needs.

There is another way, however, to understand the notion of strategy--strategy as a process. In the case of DGE's international effort, it is clear that a strategy might be expressed in terms of at least four sequentially linked phases, as indicated below.

1. Conceptualization
2. Negotiation
3. Implementation
4. Review/Evaluation, and Reform

To some degree, DGE has already engaged in each of these "phases," but it is clear that they have never been adequately explored or developed as the essential "stuff" of an international strategy. Traditionally, DGE has focused on its international efforts only as isolated and disparate activities, and has seldom viewed them with the same sense of purpose or managerial scrutiny with which it has developed and utilized domestic activities. The remainder of this report is designed to demonstrate how DGE might explore and develop these phases--how they might understand and plan for goals, objective, a motivating rationale, an appropriate organizational approach, and an effective procedural approach--and how, in turn, they might build an appropriate and effective strategy for developing and utilizing international activities.

The following two chapters posit, first, a normative strategy and then three different expressions of that strategy under various environmental conditions. The normative strategy is really a set of guidelines for a "best-case" scenario. If there were no restrictions on DGE's ability to redefine its approach to international cooperation and if DGE were committed to redefining its approach, then these guidelines would be useful in determining necessary organizational, procedural, and policy-related reforms. Obviously, DGE does operate under clear and significant restrictions, and there is still some question about DGE's level of commitment to the development and use of international opportunities. Nevertheless, the normative model is an effective orienting device. With some notion of an idealized situation in mind, it becomes easier to determine and assess alternatives. The proposed alternatives reflect different levels of DGE's commitment to an international effort as an integral part of its overall technical development program. Clearly, different levels of commitment will have a profound effect on the purpose, form, and content of DGE's international effort.

The chapters which conclude this report attempt to help DGE select one of the alternatives as a possible framework for a strategy, and then suggest several reform measures that might be considered as preliminary strategy-building steps.

QUESTION 2: WHAT SHOULD AN INTERNATIONAL STRATEGY FOR DGE ENSURE?

WHAT SHOULD AN INTERNATIONAL STRATEGY FOR DGE ENSURE?

General Assessment

DGE's international strategy should ensure that planning and oversight are well-grounded, not only in terms of organizational roles and responsibilities, and procedures, but in terms as well of policy goals and objectives.

Specific Assessment

DGE's international strategy should ensure that the Conceptualization Phase

- is firmly grounded in the understanding that its international effort constitutes a contributing component to DGE's overall technical development program. In that regard, then, direct linkages should be established between the international component, the domestic component, and DGE's general goals and objectives. This will ensure that international initiatives are appropriate and timely.
- is clearly established in terms of organizational roles and responsibilities. The strategy should ensure as well that adequate oversight and coordination are part of the responsibilities established. This will ensure that adequate and appropriate resources and attention are brought to bear on the consideration of new initiatives. It will also ensure that new initiatives reflect less the the personal ambitions of their originators, and more the Division's domain of responsibilities.
- provides for the regular and systematic review of new initiatives. Although it should not preclude ad-hoc consideration of an initiative, the strategy should ensure that there is a clear and regular provision for considering international opportunities which can contribute to the achievement of DGE's technical goals and objectives.

Specific Assessment

DGE's international strategy should ensure that the Negotiation Phase

- is underlain with the knowledge that various frameworks for cooperation can be used in numerous ways to serve that DGE's broader interests. This will ensure that the negotiators seek the most appropriate and effective framework rather than the most convenient one.
- includes all participants who can appropriately contribute to or support the activity. Moreover, the strategy should ensure that responsibility for coordination is clearly linked to a decision-maker with the experience and knowledge to move the process along effectively.
- is employed with some sense of timing. If resources are to be set aside for activities, then it is important that some advance warning be given. In the same vein, it is equally important that negotiations not be permitted to drag on past the point where the opportunity no longer applies. The strategy should ensure that, to as great a degree as possible, negotiations be conducted with a time-frame in mind.

Specific Assessment

DGE's international strategy should ensure that the Implementation Phase

- is well-grounded in a specific sense of technical mission. This will ensure that both the international component in general, and its activities in particular, will fulfill specific technical roles, and will command no resources beyond those necessary to their specific missions.
- is well-grounded in terms of organizational commitment, as well as personal linkages. This will ensure that, should staff reorganizations occur, international cooperative relations will be least traumatized. It will also ensure that personal senses of commitment will not adversely affect cooperative activities.
- clearly establishes oversight and coordination procedures. This will ensure that adequate preparations can be made in advance of scheduled activities. It will also ensure, ultimately, that DGE's international component and activity objectives are met in a timely fashion.

Specific Assessment

DGE's international strategy should ensure that the Review/Evaluation and Reform Phase

- is underlain by an understanding that evaluation and reform are necessary aspects of program development and management. This will ensure that the international component and its activities will be prepared to deal with necessary changes, as a consequence of either policy reformulation or perceived inefficiency.
- is made the responsibility of the least vulnerable, most unbiased group possible. This will promote accurate and appropriate assessments.
- is a regular feature of international cooperation, occurring at regular calendar intervals or at regular points in component development and project implementation. This will establish a basis for determining whether or not costs and benefits associated with particular activities are acceptable and, if they are unacceptable, what might be changed to improve them.

QUESTION 3: HOW CAN IMPROVEMENTS IN THE STRATEGY BE MANIFESTED?

HOW CAN IMPROVEMENTS IN THE STRATEGY BE MANIFESTED?

Introduction

Improved formulations of DGE's international strategy need not be limited to any single type of individual expression; in fact there are numerous ways to express such reformulations. This section identifies three such expressions, each of which is characterized as an internally consistent scenario of strategy development. The scenarios are identified, in general, by DGE's commitment to the use of an international geothermal component. They are, in brief, as follows:

1. The Limited Commitment Scenario
2. The Moderate Commitment Scenario
3. The Intensive Commitment Scenario

THE LIMITED COMMITMENT SCENARIO

Setting:

In this scenario DGE is hypothesized to give only limited credence and commitment to the notion that its international effort can become more valuable when it is considered as a component of DGE's broader program.

Given that basic condition, DGE's international strategy might well approximate the following:

The Limited Commitment Scenario

Conceptualization Phase

- Divisional-level policy encourages the consideration of current international agreements (inactive as well as active) whenever new research and development activities are planned. Consideration of new international activities is, however, still largely response-motivated, and not anticipatory.
- Proposals for new initiatives continue to be largely personalized. Division Branch Chiefs are principally responsible for primary review and evaluation of proposals (giving consideration specifically to the utilities of cooperation, and proposed cost-benefit configurations). They are also primarily responsible for soliciting proposals for activities which have not been specified previously. The program planning and budget review group is responsible for advising the Branch Chiefs as to the availability and extent of budgeting resources. The Division Director is responsible for the final approval or disapproval of proposals recommended by the Branch Chiefs.
- The consideration of new initiatives continues primarily in an ad-hoc fashion, although special consideration is given to proposals aired coincidental to the Division's annual budget review.

The Limited Commitment Scenario

Negotiation Phase

- Divisional-level policy encourages at least a brief review and evaluation of options for cooperative frameworks at the start of each formal undertaking; but the development of specific frameworks rests largely on DGE's sense of what is the most pragmatic instrumental approach in response to foreign proposals.
- The division's Branch Chiefs are principally responsible for coordinating and overseeing the actual negotiating process. DOE's support services are responsible to the principal Branch Chief, but are not consistently included in actual negotiating activities; neither are the principal or planned technical field personnel consistently included. Negotiations are still highly personalized, although the Division Director and Deputy Director retain theoretical oversight and final approval or disapproval responsibilities.
- Negotiations continue to proceed in an ad hoc fashion.

The Limited Commitment Scenario

Implementation Phase

- Divisional-level policy emphasizes the achievement of technical objectives as the key focal point for activity management. Multiple technical objectives are allowed to "sort themselves out." Those apparently eliciting the most active interest in the field command more active managerial attention in DGE.
- Program Managers establish relationships primarily on an individual level with foreign counterparts and with the field and contracting personnel. Technical management is delegated to the field and contracting personnel with the understanding that they are to keep the Program Manager regularly informed of technical progress in each identified endeavor, aware of unforeseen needs and problems, and provided with sufficient documentation to permit DGE/DOE auditing and accounting. The Program Manager is responsible for coordination and oversight concerning: preparations for major project meetings involving foreign participants in the United States; briefings of, and attendance by, U.S. personnel at overseas meetings; and unforeseen problems or requests originating in the field (e.g., unscheduled travel requests). Program Managers keep the division's Branch Chiefs informed of sensitive or burdensome problems.
- The designations and introductions of project or activity personnel proceed as necessitated by project and task development. Replacement personnel due to staffing changes are designated as soon as it can be arranged. Tasks proceed according to individually designed schedules, and are terminated with the submission of final documentation.

The Limited Commitment Scenario

Review/Evaluation and Reform Phase

- Divisional-level policy encourages the general review and evaluation of agreements, with an eye toward renewal or reformulation. Emphasis is on the costs and benefits of cooperation.
- The division's Branch Chiefs are responsible for the coordination and oversight of review and evaluation processes. IA/OTC is sometimes involved, but primary responsibility for the review and evaluation process lies with the Branch Chiefs. The Branch Chiefs are also responsible for developing and recommending reforms which might affect current or planned cooperative activities. The division's Deputy Director has ultimate oversight responsibilities for reviews and evaluations.
- Reviews and evaluations are scheduled to precede agreement terminations or renewals.

THE MODERATE COMMITMENT SCENARIO

Setting

In this scenario DGE is hypothesized to give more credence and commitment (than was illustrated in the Limited Commitment Scenario) to the notion that its international effort can become more valuable when it is considered as a purposeful, integrated component. In this scenario, DGE's commitment is not, however, without some reservation.

Given those basic conditions, DGE's international strategy might well resemble the following:

The Moderate Commitment Scenario

Conceptualization Phase

- DGE's consideration of new international activities is both responsive and anticipatory. Proposals for new research and development activities are encouraged to examine existing international frameworks as potentially cost-effective mechanisms for cooperation, and to consider potentially new frameworks in the same regard. Proposals originating outside DGE are considered in the context of current and planned priorities of R&D--those originating as a result of U.S. foreign policy initiatives are considered for their appropriateness and potential, and suitable frameworks are sought to reflect DGE's findings.
- The division's Branch Chiefs are still principally responsible for soliciting and reviewing proposals. In addition, the Branch Chiefs, with the assistance of IA/OTC and the program planning and budget group, are responsible for developing concept papers outlining potentially worthwhile relationships which might facilitate future DGE R&D needs. The Division Director is responsible for the final disposition of proposals approved by the Branch Chiefs, and for recommending further action based on a review of the Branch Chiefs' concept papers.
- The consideration of proposals is still ad-hoc, but is increasingly tied to the division's program planning and budget review schedule. Concept papers are developed and reviewed annually, so as to establish a schedule for development which does not compete with other DGE activities.

The Moderate Commitment Scenario

Negotiation Phase

- Divisional-level policy recommends informal strategy sessions among negotiators prior to entering into actual negotiations. The negotiators are encouraged to establish clear and specific goals (substantive and otherwise) and to develop a more formal agenda in order to propel negotiations.
- Although the division's Branch Chiefs are responsible for the actual coordination and implementation of negotiations (as well as their preparation), the division's Deputy Director is responsible for general oversight. The division's Branch Chiefs more consistently rely on general IA/OTC and OGC support, but do not yet consistently include them in planning or implementation. Field personnel are occasionally included, but only when it is deemed absolutely essential. The division's Deputy Director exercises penultimate review and disposition responsibilities and makes recommendations to the Division Director.
- Negotiations (and planning for negotiations) are pursued with a clear sense of timeliness. Status reports are infrequent, but regular (perhaps semi-annual), resulting in the more active involvement of the Deputy Director in an oversight capacity.

The Moderate Commitment Scenario

Implementation Phase

- Divisional-level policy emphasizes the importance of maintaining priorities in the implementation of tasks with multiple and composite objectives. Higher priority R&D commands more, and more active, attention than lower priority R&D. Tasks exhibiting higher priority R&D in addition to other clearly identified nontechnical objectives command more active attention than single or limited-objective activities.
- DGE's Program Managers and Branch Chiefs make a deliberate effort to acquaint all participants (contractor and field, as well as foreign) with DGE's roles, responsibilities, capabilities, and standard operating procedures. Technical management remains delegated, but the Program Managers play a more major and active role in coordinating DOE support services to the field and contracting personnel. The division's Branch Chiefs maintain a more active oversight role as a result of the Program Manager's status reports, and keep an eye on budget accountability, technical progress and problem management.
- The designations and introductions of project and activity personnel follow the finalization of negotiations, agreements and authorizations. Staffing needs are filled by appropriate branch personnel whenever required. Tasks proceed according to schedules devised by project personnel.

The Moderate Commitment Scenario

Review/Evaluation and Reform Phase

- Divisional-level policy requires an in-depth review and evaluation of agreements, with an eye toward accounting for appropriateness and efficiency of task management as well as specific costs and benefits.
- IA/OTC is principally responsible for the assessment process. In conference with the Program Managers and Branch Chiefs, IA/OTC develops and recommends reforms. The division's Deputy Director retains ultimate oversight responsibilities.
- Reviews and evaluations are scheduled periodically, depending on the availability of IA/OTC reviewing staff; but reviews tend to coincide more with the program planning and budget process than with the schedule of agreement terminations.

THE INTENSIVE COMMITMENT SCENARIO

Setting

In this scenario DGE is hypothesized to give equal consideration to the use of international and domestic opportunities, in determining the most appropriate and cost-effective way of achieving individual and general technical objectives. This would mean that all DGE technical goals and objectives would be considered achievable by international, as well as domestic, means. DGE would work aggressively to integrate both domestic and international activities in the development of its technical program.

Given those conditions, DGE's international strategy might well approximate the following:

The Intensive Commitment Scenario

Conceptualization Phase

- The consideration of new international activities is decidedly anticipatory. Proposals for new research and development activities are required to examine existing international frameworks and current concept papers in order to determine whether real gains might be realized by developing and utilizing international opportunities. Proposals for international cooperation which originate outside of DGE are examined for their abilities to address high priority R&D needs, their ease of integration with the current program, and DGE's ability to incorporate the activity into its own management structure effectively, as well as in terms of costs and benefits. Those foreign policy initiatives involving geothermal energy which cannot effectively contribute significant benefits are examined in terms of their ability to be effected with a minimal effort and with a limited sense of obligation.
- The division's Branch Chiefs, with assistance from IA/OTC are responsible for the principal development and review of proposals. The Branch Chiefs, IA/OTC, and the program planning and budget group are responsible for the development of concept papers. The Division Director, in conference with the Branch Chiefs, IA/OTC, and the program planning and budget group is responsible for the final disposition of recommended proposals and the concept papers.
- The consideration of new proposals is limited, almost without exception, to an annual review session, which is scheduled to coincide with the early stages of the annual program and budget review process. Schedules for the further development of proposals and concept papers are developed as a consequence of the annual review.

The Intensive Commitment Scenario

Negotiation Phase

- Divisional-level policy requires more formalized strategy sessions prior to entering into actual negotiations. Strategy sessions are to establish a recommended schedule, negotiating goals and objectives, and an agenda to be proposed to foreign negotiating partners. Goals and objectives are to include specific R&D priorities and management mechanisms (including a recommended framework).
- The division's Deputy Director is responsible for ensuring timely and adequate support to the Branch Chiefs, as well as general adherence to the proposed schedule. The Branch Chiefs are responsible for scheduling and coordinating strategy sessions and actual negotiations. The Branch Chiefs are also responsible for designating and ensuring the regular involvement of all negotiating team members in the proceedings (primarily DGE, IA/OTC, OGC, and principal field or contracting personnel). The Deputy Director is responsible for addressing and resolving particularly troublesome or sensitive problems. Together with the principal negotiators, the Deputy Director also makes the team's final recommendations to the Division Director.
- Negotiations are frequent and regular, as are status reports to the division's Deputy Director and interim strategy sessions. Significant delays prompt appropriate review and remedial action.

The Intensive Commitment Scenario

Implementation Phase

- Divisional-level policy emphasizes the need for efficiency and cost-accountability in addition to the pursuit of objectives by priorities. Program managers are required to be able to document tasks and projects thoroughly as they progress.
- The Division Director and the Deputy Director, along with the appropriate Branch Chiefs and Program Managers, clarify the relationships within DOE and DGE (including field and contracting personnel) for the benefit of foreign participants at the outset of each major task which involves new foreign partners. Technical management remains delegated, but IA/OTC is informed of activities and problems as well as the Program Manager (and is provided with similar information and documentation). The Program Managers and IA/OTC keep the Branch Managers and the Deputy Director informed for the purposes of oversight. The Program Manager is still primarily responsible for dealing with planning and preparation needs, and requests from the field.
- The designations and introductions of project or activity personnel, and the familiarization of foreign partners with DGE/DOE project and task procedures, occur immediately following final approval of negotiations. When staffing replacement needs can be anticipated, replacements are designated prior to the departure of current staff. Tasks proceed according to schedules designated during negotiations (or subsequently approved revisions). Requests for adjustments to schedules are submitted and reviewed as early as possible.

The Intensive Commitment Scenario

Review/Evaluation and Reform Phase

- Divisional-level policy requires an in-depth assessment of DGE's use of all international activities, informal as well as formal, in order to gauge the component's overall worth and contribution.
- IA/OTC is principally responsible for the assessment process. All principal project personnel are polled for assessments and recommendations for reforms. The division's Deputy Director maintains active oversight of the development of component-related and activity-related reforms by IA/OTC and the Division's Branch staffs. The Division Director considers their final recommendations and ensures that they are accounted for in the program conceptualization phase.
- Assessments are annual inputs into the program--planning and budget process.

QUESTION 4: WHICH ALTERNATIVE PRESENTS THE BEST OPPORTUNITY NOW?

Introduction

Clearly, each of the scenarios articulated in the previous section suggests a unique set of opportunities and requirements: opportunities which can be measured in terms of improved cost-effectiveness, predictability, consistency, and/or appropriateness, among others; and requirements which can be gauged in terms of the costs and ease of implementation. This section is designed to develop a preliminary assessment of the potential opportunities and costs, and to display them in such a way as to facilitate the selection of an alternative strategy for an international effort by DGE.

Assessment

The matrix featured below is an attempt to compare the relative opportunities and requirements posed by each of the three alternative strategies. Although bordering on the impressionistic, it is a useful device for illustrating this comparison graphically. The narrative which follows the matrix explains the rationale underlying each of the rankings, and suggests certain conclusions which might be drawn from this assessment.

RELATIVE RANKINGS OF ALTERNATIVE INTERNATIONAL STRATEGIES

	The Limited <u>Commitment Approach</u>	The Moderate <u>Commitment Approach</u>	The Intensive <u>Commitment Approach</u>
Impact on Benefits			
Cost-effectiveness	2nd	1st	3rd
Predictability	3	2	1
Consistency	3	2	1
Appropriateness	3	2	1
Feasibility			
Ease of Implementation	1	2	3
Cost of Implementation	1	2	3

It is clear that the intensive approach offers the greatest prospect of achieving predictability, internal consistency, and component and task appropriateness. The strategy's emphasis is on a maximum effort in both planning and oversight. By standardizing DGE structures and procedures for planning and oversight, the strategy attempts to minimize the influence of personalities and individual managerial styles on interim and final results. It seems logical to expect that the anticipatory focus of the strategy would reduce the likelihood and need for crisis management, and the inefficiencies resulting from inattentiveness or inadequate management system design.

The key question to ask, however, in assessing this alternative appears not to be related to feasibility which, of the three alternatives assessed, was clearly the lowest; rather, the key question appears to concern cost-effectiveness. Considerable resources in terms of staff, time and attention are implied by the conditions of the intensive-commitment approach, clearly far more than either of the other alternatives would require. Although the benefits resulting from the development of the component in general, and from the projects and tasks specifically, might be higher than in the other two cases, it is not clear that they would be any more than incremental improvements. Since the resource costs implied are considerable, and since the projected increase in benefits is only marginal, the intensive approach is clearly not warranted.

The Limited and Moderate Approaches, on the other hand, suggest costs, benefits, and general feasibilities which are less easily distinguished by comparison. The Limited Approach, with few significant exceptions, reflects a large amount of the current status-quo in its assumptions. It would not be illogical to assume that, although it suggests high feasibility, it does not present the certain prospect of significant increases in cost-effectiveness. In fact, the lingering dominance of the current ad-hoc and personalized nature of DGE's international effort would seem to suggest that many of its current problems would probably remain, although somewhat decreased in general scope and degree.

The Moderate Approach, then, appears to offer the greatest prospect for reducing the likelihood of the current set of problems, and combines it with increases in predictability, programmatic consistency, and appropriateness. The fact that the moderate strategy suggests increased requirements over the limited strategy, and that it would probably be somewhat more complicated to establish, accounts for its ranking behind the Limited Approach in terms of feasibility. The requirement for DGE's resources, however, is not likely to be significantly greater in the Moderate Approach than in the Limited Approach. What is called for by the Moderate Approach, more than a broad reorganization or restructuring of processes, is a general understanding by DGE that its international effort is really a component to its overall technical development program, and that an increased commitment toward improved planning and oversight capabilities can derive increased benefits from the use of the component as well as the individual activities.

QUESTION 5: HOW CAN THE RECOMMENDED ALTERNATIVE BE ACHIEVED?

HOW CAN THE RECOMMENDED ALTERNATIVE BE ACHIEVED?

Introduction

The problems related to DGE's international effort are not entirely debilitating. Viewed in historical perspective, there have been many bright moments in DGE's international effort--that is in terms of cost-effective and appropriate technical achievements. The early stages of Project 3 of the DOE-ENEL (UNG) agreement, and (at least until recently)) the entire DOE-CFE cooperative agreement in general, have each been high points in DGE's development and utilization of international opportunities. Currently, international cooperation in the Hot Dry Rock project and in the materials testing arrangement (the DGE/BNL-CFE/IE informal agreement) appears to be both appropriate and effective.

DGE's significantly diminished budget of today commands, however, that benefits be more predictable and certain; that the demand on DGE's staff and budgetary resources be limited to only those activities with an appropriate and effective return-on-investment; and that the probability of crises be kept to an absolute minimum. DGE now needs to reconsider its approach to the development and utilization of international opportunities if it is to ensure that its technical development program is all that it can be, and that best use is made of the international component in effecting that program.

Recommendations

Clearly, DGE must decide whether or not to commit itself to the task of building a strategy where there has been none before. This study was founded on the assumption that the preservation of the status-quo was an unacceptable alternative; so, quite naturally, it has recommended that DGE consider developing and implementing some sort of international strategy.

There is no such thing as "the best strategy." This study has demonstrated that there are many different kinds of strategies, each of which is designed to express a unique commitment to international cooperation, and each of which is designed to fulfill that commitment in a unique way. The normative model featured at the outset of this analysis is a possible goal. It provides an orientation point for constructing a strategy. The scenarios which were articulated in the course of the report illustrate how, under different environmental conditions, DGE might effect an international strategy; how DGE might plan for and oversee the development and utilization of international opportunities in the quest for technical goals and objectives.

The study team, like many of the experts interviewed for this study, believes that strategy-building at this point in DGE's program would be not only warranted, but wise. The inescapable fact is that DGE's budget has been diminished significantly. If ever there was a sufficient reason for ensuring that maximum attention be given to program-related planning and oversight, then surely DGE's recent budget constraints are that reason. DGE simply cannot afford to support activities which do not guarantee clearly significant, appropriate and cost-effective results. Conversely, DGE must make the absolute most of its limited resources in developing international, as well as domestic, R&D.

The normative model and the scenarios featured previously provide an effective logic base on which DGE might begin to construct the organizational, procedural and policy-related complex of an international strategy. Clearly, that is a task not to be taken lightly, and one which will require considerable deliberation. Nevertheless, there are several key reform measures which DGE might consider implementing in the very near future--measures which could appreciably advance that task. Featured below are four specific reforms which the study team believes should be given immediate consideration:

1. The study team recommends that DGE consider tasking IA/OTC with the responsibility for designing a review and evaluation process. DGE might also consider authorizing an "across-the-board" evaluation of both the current international component as a whole and the individual projects and tasks themselves, in order to establish a data base which could be used in future evaluations. The study team also recommends that the review be constructed in

such a way as to permit a clear understanding of (at least) the cost-effectiveness, appropriateness, and significance of DGE's international efforts.

2. The study team recommends in addition that DGE designate one member of its senior to have primary oversight responsibilities for all of the division's international activities. Ultimately this person could be the division's keystone in developing and implementing a strategy; but for now, this person would be responsible for ensuring that DGE's activities proceed according to current plans. At the very least, this would mean that DGE's Program Managers would be required to keep this person informed and, if particularly nettlesome problems arose, they would be encouraged to seek his assistance. It might be well-advised also for this person to work closely with IA/OTC in developing a centralized, historical documentation, or data, base of DGE's international activities. This would be an effective start toward developing an "institutional memory" which could be drawn on for planning as well as review and evaluation purposes.
3. The study team also recommends that DGE consider designating its major international efforts as focal points in the division's program planning and budgeting activities. Just as major domestic activities are now clearly identified as line-items, it might be helpful to identify international activities as line-items too. This would serve a couple of purposes: first, it would ensure that the costs and benefits of international cooperation would be well documented, and could be accurately accounted for with very little effort; second, it would ensure that both the international and the domestic components would be understood as being closely linked within the context of DGE's technical program. The goals and objectives of the domestic component are, and ought to be, the same as those of the international component. One component should be used instead of the other only when it can be shown that use of the one might results in more appropriate and significant objectives than the use of the other. In a similar fashion, DGE should also consider cost effectiveness as a criterion

for determining which component they ought to employ toward the achievement of specific objectives. Giving equal consideration to international efforts during the division's program planning and budget process will ensure not only adequate accountability, but a sense of purpose and direction for the international effort as well.

4. Finally, the study team recommends that the DGE Division Director consider developing and issuing a policy statement to all principal U.S. participants in international geothermal activities. It is recommended that the policy statement establish DGE's clear intention with regard to the international effort. It should indicate, first, DGE's understanding of the purpose of international cooperation. Second, the policy statement should indicate DGE's general organizational approach. Finally, it should identify DGE's procedural approach to developing and utilizing international opportunities. Until DGE has firmly agreed upon a strategy, this statement understandably would be somewhat generalized. It would, however, clearly establish guidelines for planning and oversight; guidelines which would help DGE to manage its international effort until a strategy is realized. The Division Director might also consider utilizing the framework for analysis contained in this study to articulate DGE's desired approach to international cooperation. An enunciation of DGE's strategy in terms of the scope, focus, components and procedures of each major strategic phase might make DGE's reforms more understandable and, ultimately, more effective.

Closing Remarks

DGE is clearly at a major turning point with regard to its international effort: it can accord the effort a very limited role and responsibility, and allow a "natural selection" process to determine what might be a "manageable" effort; or DGE can accord the effort a more important role, and actively determine what might be truly an appropriate, significant, and cost-effective effort. From the perspective of DGE's significantly diminished budget, the latter would seem preferable to the former.

DGE has the power and the resources to ensure that the best possible use is made of its international component. Adequate planning and oversight are essential elements in any program, and a strategy for developing and utilizing international opportunities could ensure both in this case. Building a strategy would require that DGE consider many organizational and procedural options; they would be many, but not overwhelming. What DGE must first decide, however, if it is indeed to make the best possible use of its international effort, is how committed it wants to be to the notion of an appropriate, effective, and contributing international component. Like Alice, in the quotation featured in this report's foreword, DGE must first decide where it wants to go.

Appendix A

INTERVIEW QUESTIONNAIRE

INTERVIEW QUESTIONNAIRE

Development of a Strategy for the Formulation and Management of DOE's International Geothermal Program

Introduction

This study is designed to assist the Department of Energy in planning for the future of its international geothermal program. Recent changes in Federal energy policy emphasis and in budgeting have made this effort all the more essential. Briefly, the study will proceed in two directions.

- It will identify and evaluate both the costs and benefits which can be associated with the current program; and,
- It will explore both the domain of opportunities and the range of restrictions which will characterize the climate for international program development.

The intended result of this two-pronged approach is a set of recommendations for program refinement and program building, both in terms of policy orientation and management strategy.

There are four sections to this questionnaire. We ask that you examine each of them briefly prior to our meeting. This will save time by allowing us to concentrate the discussion on your individual areas of expertise.

Professional Background

Tell us about your involvement in DOE's international geothermal program. In which projects have you been, or are you now, involved? What were/are your roles and responsibilities? At what level of involvement did/do you participate? If you are currently involved in a project, what is its status? Are there any plans being aired yet concerning major changes in the project, or in possible follow-on or related efforts?

If you have not actually participated in any of the past or current international geothermal projects, how is it that you are familiar with the program? Do you maintain an association with DOE or national lab program personnel, or have you followed project and program developments by some other means? If you do maintain contact with program personnel, who are your primary contacts, what is your area of interest, what is the extent of your association? If you follow the program by other means, what are they; how much do you depend on them?

Cost-Benefit Assessment

Tell us about the past, current and projected costs of the projects with which you are familiar. Are budget statements available which detail tasks by objectives and resource expenditures? Which projects currently received the greatest/least allocations? Is this projected to change significantly in the near future? If so, why? How are budgets determined for future projects? Do budget projections reflect the cost of possible projects or the cost of fulfilling certain research needs? Does budget size tend to reflect more the priority of anticipated benefits; or are the exogenous factors which tend to make some projects more resource-intensive than others? Are any of the current projects overfunded or underfunded? Why do you feel that's so? Could increased budgets in some areas yield more significant results more quickly, or do projects normally operate close to the "point of diminishing returns"?

What are the opportunity costs involved in funding the international geothermal program? Are there other areas in domestic geothermal research which might yield a greater return for the cost? What are they? Are international and domestic research projects complementary, competing or mutually supporting? Have there been apparent international opportunities which the United States has chosen either to ignore or dismiss? Cite examples.

What sort of benefits do you ascribe to current or past projects? Is there a priority among benefits in the planning and negotiating of projects; i.e., do technical objectives assume a priority higher than commercial and other types of objectives? Are there priorities within areas of benefit; i.e., does one type of technology or commercial opportunity assume a higher priority than another? Have these priorities changed as the domestic geothermal and international geothermal programs have developed? If so, how?

Who benefits? Is there any evidence to show that the U.S. geothermal industry has received and applied any significant benefits from the international geothermal program; technological, commercial or otherwise? Have benefits been shared equally with our developed and developing country partners--how successful has reciprocity proved to be as a guideline for cooperation? If reciprocity has not been strictly applied, what has been the outcome in terms of benefits for the United States. Has the principle of reciprocity actually precluded any opportunities from becoming agreements or projects?

How significant have the program's and projects' achievements been? Are there any that you would call major successes or even "breakthroughs?" What domestic geothermal development needs and U.S. foreign policy needs have the international projects served? To what degree have specific projects served the U.S. geothermal industry? How might the industry, our various international partners, the state-of-the-art in geothermal sciences and technology, and U.S. development of geothermal resources fare without the international program? Are the program's science and technology achievements more important in the long run or in the short run? Have there been any projects whose outcomes you would categorize as failures? Which ones? In general, have the achievements of the program outweighed its failures? If so, how many of those initial project achievements have induced a "rippling" effect of still further positive developments? Have these ripples of positive development led to consequences of significant importance? Is the international geothermal program cost-effective, or are there simply too many interests and objectives to be served to maximize the cost-benefit ratio? In other words, does the international geothermal program pay for benefits which are not germane to DOE's mandate; benefits which might better be sought in another forum?

Future International Opportunities

Are there particular needs in the domestic geothermal arena (technical and otherwise) which must be met in near-term but cannot be met (or can't be accomplished as effectively) except via the international program? Are there priorities among these needs? Where might the opportunities lie to achieve these objectives: altogether new partners, familiar partners with new programs or extensions of current or past programs? Are these potential partners aware of our needs? Are they open to discussion? Can cooperation in these areas achieve mutually satisfactory results? Are our objectives similar to those of our partners, or will a "quid pro quo" determine the nature of the cooperative effort? Do you have any feel for the possible costs and returns of such efforts? Are there any apparent problems which might inhibit or altogether preclude cooperation?

Organization and Management as Possible Constraints to Maximizing the Cost-Benefit Ratio

What are the goals of the international program? Have they ever been adequately articulated and institutionalized as part of the overall federal geothermal program? How might the recent changes in DOE's mandate, budgets and organization affect the scope, focus and priorities of these goals?

Has strategic planning ever played an important role in developing the program (as opposed to the projects)? Is there now, or has there ever been, a clearly defined strategy which has guided program development? How and when are objectives considered and reviewed? Are program objectives considered in terms of domestic geothermal development needs, or are they rationalizations to justify granting a request for a cooperative agreement? How much of the current program is the result of request from outside of DOE, and how much is the result of DOE's own initiative? In the event of DOE initiative, was the original idea conceived and developed on an individual level or with the active knowledge and cooperation of the program management team? In the event of requests originating outside of DOE, how have these been handled by the program management team, especially if DOE's objectives cannot be fully or even adequately satisfied by the proposed agreement?

Is there, or was there ever, a model or a set of guidelines for developing projects? How do the guidelines apply to the following project stages (do these stages reflect the essence of project development and management?):

- Conceptualization. What is the process for considering projects? Must project objectives conform to specific program objectives (e.g., fulfill initial steps in the development or testing of a desired piece of hardware), or are projects more important in terms of the complex of opportunities they present at the moment they are considered (in other words, can an array of possible opportunities, or a compelling diplomatic opportunity in concert with some technical and commercial opportunities, provide sufficient impetus for an agreement, regardless of whatever grand design strategy exists)? Do diplomatic concerns ever over-ride technical or commercial concerns.
- Negotiation. Who negotiates? Are there upper and lower bounds (legal, economic and otherwise) for U.S. participation? What are they? Are there rules or guidelines for negotiators?
- Implementation. Who is in charge at all levels (task, project, program)? Who has the authority to deal with major problems--are responsibilities and limitations of authority clear and understood? Have there been instances when they obviously were not? Lines of communication--how is the interface with non-DOE actors managed? Is the interface regular of ad-hoc, institutionalized or personalized? Are members of the industry ever actively involved or consulted in the course of projects, or is there any other type of outreach effort made? Is the industry ever involved in planning or review of the program and its projects? Do projects seem to "run themselves" according to the agreements of cooperation and research plans, or do they require constant attention and troubleshooting? Do some partners or project types seem to present more problems than others?

- Review, Evaluation and Reform. Is monitoring and review regular and procedural? Who participates in the review--on what scope and level is the review process effected? Has there ever been an effort to improve a project or task which was seen to be problematic or less than worthwhile, or are such tasks and projects allowed to "run their course"? Do reforms work? If not, why not? Who ultimately decides how reforms are to be initiated, and how are those decisions made.

Are any of the project stages identified above more critical to the success of projects than others? Which ones? Are they adequately handled now? If not, can you hypothesize why they are not being managed optimally?

Do you feel that one particular mode of cooperation is more likely to result in a high cost-benefit ratio than another--bilateral v. multilateral, multilateral (unrestricted membership) v. multilateral (exclusive membership)? Is one particular technique of cooperation more valuable than another--e.g., data exchange, personnel exchange, joint R&D or analytical studies, joint exploration, or cooperative demonstration projects?

Appendix B
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INTERVIEW RESPONDENTS

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